THE EXTENSION SYSTEM IN BURUNDI: KAYANZA PROVINCE, MURUTA COMMUNE

Ruth Kinuthia, Evelyne Kiptot and Claudette Nkurunzinza.

ACIAR ‘TREES FOR FOOD SECURITY’ PROJECT

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CONTRIBUTORS
Ruth Kinuthia
World Agroforestry Centre
P.0 Box 30677-00100
Nairobi, Kenya

Evelyne Kiptot
World Agroforestry Centre
P.0 Box 30677-00100
Nairobi, Kenya

Claudette Nkurunzinza
Institut des Sciences Agronomique du Burundi (ISABU)
Avenue de la Cathédrale BP 795
Bujumbura, Burundi
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<td>ACIAR</td>
<td>Australian Centre for International Agricultural research</td>
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<td>ACORD</td>
<td>A Cooperation Agency for Research and Development</td>
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<td>ADISCO</td>
<td><em>Appui au développement intégral et à la solidarité des collines</em></td>
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<td>AIDS</td>
<td>Acquired Immunodeficiency Syndrome</td>
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<td>ARFIC</td>
<td><em>Autorité de Régulation de la Filière Café au Burundi</em></td>
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<td>ASARECA</td>
<td>Association for Strengthening Agricultural Research in Eastern and Central Africa</td>
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<td>ASTI</td>
<td>Agricultural Science and Technology Indicators</td>
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<td>CAADP</td>
<td>Comprehensive Africa Agriculture Development Programme</td>
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<td>CAPAD</td>
<td>Confederation of Associations of Agricultural Producers for Development</td>
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<td>CIAT</td>
<td>International Center for Tropical Agriculture</td>
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<tr>
<td>CNTA</td>
<td><em>Centre National de Technologie Alimentaire</em></td>
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<td>DGMAVA</td>
<td><em>Direction Générale de la Mobilisation pour l’Auto-développement et la Vulgarisation Agricoles</em></td>
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<td>DPAE</td>
<td><em>Direction Provinciale de l’Agriculture et de l’Élevage</em></td>
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<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<td>FHI</td>
<td>Family Health International/Burundi</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GPRS</td>
<td>Growth and Poverty Reduction Strategy</td>
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<td>GTZ</td>
<td><em>Gesellschaft für Technische Zusammenarbeit</em></td>
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<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>IFAD</td>
<td>International Food Policy Research Institute</td>
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<td>MINAGRI</td>
<td>Ministry of Agriculture and Livestock</td>
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<td>Non-governmental Organization</td>
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<td>PAIVA-B</td>
<td><em>Projet d’Appui à l’Intensification et à la Valorisation Agricoles du Burundi</em></td>
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<td>PNIA</td>
<td><em>Plan National d’investissement Agricole</em></td>
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<td>RoB</td>
<td>Republic of Burundi</td>
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<td>T4FS</td>
<td>Trees for Food security</td>
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<td>TUBURA</td>
<td>One Acre Fund</td>
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EXECUTIVE SUMMARY

Key informant interviews (KII) were conducted in March 2015 with the aim of understanding the structure of agricultural extension in Burundi. The interviews formed part of the Australian Centre for International Agricultural research (ACIAR) funded ‘Trees for Food Security’ project work package 3 activities- Reporting on different extension methods and their suitability for different contexts. A total of 12 key informants drawn from National extension directorate, Ministry of Agriculture and Livestock and Non-governmental Organizations (NGOs) were interviewed. The major thematic areas were:

- Extension services disseminated to farmers
- Extension approaches
- Community engagement,
- Capacity/efficiency
- Strengths and weaknesses of extension
- Commercialization and marketing

Extension in Burundi is under the General Directorate of Mobilization for Self- Development and Agricultural Extension, one of the four directorates in the Ministry of Agriculture and Livestock (MINAGRI). The Director General of agricultural extension heads this directorate at the national level. At the provincial level, agricultural extension is under the Provincial Directorate of Agriculture and Livestock which is headed by the Provincial Director of Agriculture and Livestock.

The Provincial Directorate of Agriculture and Livestock comprises six departments: Crop production, Livestock production, Water (shed) management, Finance and administration, Monitoring and evaluation and Training and extension. Each of these departments is headed by a specialized chief director. Extension service is specifically under the ‘Training and extension’ department. At the lower levels; commune, zone and colline, agronomists and veterinary officers are in charge of extension.

Extension services in Muruta commune are focused on crop production, livestock production, and soil and water conservation. Techniques in crop and animal production include but are not limited to introduction of modern varieties of wheat, Irish potatoes, maize and beans, application of inorganic fertilizers, preparation and application of manure and zero grazing. Soil and water conservation techniques include contour farming as well as planting trees and fodder grasses along contours and on the embankments.

Knowledge and skill dissemination is mainly done through trainings, model farmers, demonstrations and exchange visits. Demonstration plots are perceived to be most suitable for most farmers in the collines with low literacy levels. Furthermore, it is easier for the farmers to apply what they observe during demonstrations as opposed to what they hear during trainings.
1.0 INTRODUCTION
The ‘Trees for Food Security Project’ is an Australian Centre for International Agricultural Research (ACIAR) funded project led by the World Agroforestry Centre (ICRAF). The aim of the project is to enhance food security for resource-poor rural people in Eastern Africa through research that underpins national programmes to scale up the use of trees within farming systems in Ethiopia and Rwanda, and then scale out successes to relevant agro-ecological zones in Uganda and Burundi.

The research approach is designed to underpin, and is therefore fully integrated with national programmes to take agroforestry to scale in Ethiopia and Rwanda, and then to extend successes from these countries to Uganda and Burundi. The key research questions are designed to address transformation of site specific examples of how trees can improve farm productivity into scalable results that deliver productivity gains across large agro ecologies in the target countries.

The research is organised in four scientific work packages that are tied together by a major effort to strengthen national capacities:

1. Characterisation and targeting;
2. Measurement and modelling of impacts of trees on crop yields, farming systems and livelihoods;
3. Innovations in scaling up methods (how to reach farmers with appropriate materials and information) and the associated enabling environments required for adoption (in terms of policies and institutions);
4. Monitoring and evaluation.

The four work packages together comprise an iterative cycle of co-learning and refinement that address key barriers to adoption of trees on farms, followed by immediate promotion of best-bet agroforestry options across a range of conditions (Figure 1).
Large scale adoption of farm trees requires removing barriers to adoption and so will depend on understanding the policy, socio-economic and institutional factors required for farmers to integrate trees on their farms. Of equal importance is the need to use appropriate extension methods to get quality tree germplasm and information to farmers. Therefore, the objective of work package 3 (under which the study is based) is to develop effective methods and enabling environments for scaling up and out adoption of trees on farms.

Under this objective, we focus on extension methods required to deliver germplasm and information to farmers as well as the institutional and policy environment required to overcome barriers to adoption. Together these constitute the scaling approaches that will be developed, tested and promoted. In order to identify the best fit extension approaches for scaling out the adoption of trees on farms, it is important to first understand the extension systems in the respective national countries, hence this study.

This report therefore presents the findings of the status of extension in Burundi based on a review of literature and key informant interviews which are described in detail. The report begins with a general introduction of extension in Burundi followed by an overview of various extension initiatives. Methods of the study and findings of the key informant’s survey are presented followed by a summary and conclusion session.
2.0 AN OVERVIEW OF THE AGRICULTURAL AND EXTENSION SYSTEM IN BURUNDI

2.1 Introduction
Burundi is a small resource-poor country landlocked to Tanzania in the East, Democratic Republic of Congo to the West and Rwanda to the North (Nkurunziza & Ngaruko, 2002). It occupies a land area of about 27,834km² of which 2,700km² is covered by lakes while the potential agricultural land is approximately 23,500km². The total population was estimated at 8.1million in 2008 (297 inhabitants/km²) making it the second most densely populated country in Africa. The country has two rainy seasons: February-May and September-November, and another short rainy period in January (Baramburiye et al., 2013).

The economy is predominantly agricultural with more than 90% of the population dependent on subsistence agriculture (Republic of Burundi, 2012). The agriculture sector accounts for about 50% of the country’s Gross Domestic Product (GDP) and approximately 90% total foreign earnings having tea and coffee as the major exports. However, constraints such as droughts, heightened population growth, traditional farming methods, land fragmentation, low land productivity, inadequate management of water resources, outbreak of diseases on crops, lack of credit facilities among small holder farmers and limited access to research and extension services impede agricultural productivity in the country (Stads & Ndimurirwo, 2011).

Despite these challenges, there are substantial opportunities for the agricultural sector. The climatic conditions in most parts of the country are favorable hence offering prospective development in agriculture. Furthermore, the country possesses abundant water resources as well as potential irrigable lands (IFAD, 2008). The government has also developed policies such as the Growth and Poverty Reduction Strategy (GPRS), National Agricultural Strategy, Burundi vision 2025 among others in support of the agricultural sector.

The Growth and Poverty Reduction Strategy (GPRS) – a reference document for the country’s economic and social development, adopted in 2006 has four main objectives: governance and security, sustainable and equitable growth, development of human capital, and combating AIDS. The development of agricultural sector is identified as the primary source of economic growth. Priority actions concern the development of agricultural production—food and export crops and livestock and fisheries production (IMF, 2012). In consultation with its development partners, the government also designed a Priority Action Plan for 2007-2010 to guide the implementation of this strategy. The Action Plan included 17 programmes for a total investment of US$1.3 billion (IFAD, 2012).

Following the GPRS, the National Agricultural Strategy was developed to rehabilitate and modernize the agricultural sector (ActionAid, 2013). Principally, the strategy took into account and followed the guidelines and priorities of the country’s basic strategic documents, particularly ‘Outlook 2025’ and the Strategic Framework for Poverty Alleviation which are all in line with the Millennium Development Goals (MINAGRI, 2012).
The National Agricultural Strategy did not contain an adequate operationalization mechanism. Therefore with the impetus of Comprehensive Africa Agriculture Development Programme (CAADP), the government developed a National Agricultural Investment Plan (2012-2017). The plan stresses on increasing crop and livestock production, by raising productivity and ensuring optimal management of soil and water resources. It also aims at strengthening of human resource capacities of national institutions and farmer organizations, in the areas of organization and management with an emphasis on women and the importance of their role in agricultural sector development (MINAGRI, 2012).

In 2009, the ‘Burundi vision 2025’ was developed and approved in 2010. The document focuses on sustainable development strategies by 2025 which include poverty reduction (from 67% to 50% in 2025), increase in the country’s GDP, reduction of population pressure and improvement of agricultural development (MINAGRI, 2011). Vision 2025 represents a strategy for sustainable development in Burundi through economic growth and poverty reduction by 2025. It comprises of eight pillars: governance, human capital, economic growth, regional integration, population growth, social cohesion, land-use planning and urbanization, and partnership (IFAD, 2012).

2.2 Agriculture and Extension in Burundi
Agriculture in Burundi is coordinated by the Ministry of Agriculture and livestock (MINAGRI) which oversees agricultural development programmes in the country. Under the ministry are four general directorates: The General Directorate of Agricultural and Livestock Planning; General Directorate of Mobilization for Self-Development and Agricultural Extension; General Directorate of Agriculture and General Directorate of Livestock (MINAGRI, 2011) and 16 provincial directorates. MINAGRI also oversee three national institutions: Institut des Sciences Agronomiques du Burundi (ISABU), which is responsible for agricultural research; Centre National de Technologie Alimentaire (CNTA), which supports food processing technical innovations and Autorité de Régulation de la Filière Café au Burundi (ARFIC), Burundi’s regulatory authority for coffee. The directorates and sub-directorates under MINAGRI are shown below:
Figure 2: Structure of the Ministry of Agriculture and Livestock
2.3 Agricultural Extension in Burundi

Public extension in Burundi is under the General Directorate of Mobilization for Self-Development and Agricultural Extension in the Ministry of Agriculture and Livestock. The Directorate contains two main sub-directorates: Directorate of Agricultural Training and Animation and the Directorate of Agriculture and Livestock (Figure 2). The directorate was established after a major reform in the government in 1992 where extension services were decentralized to the lower administrative levels, to make them more accessible to the local communities (IFAD, 2008).

Extension agents are based in each province while technicians are deployed in the commune, zone and colline levels. Agricultural and livestock service providers (in charge of extension) have been deployed in each of the 129 communes and 2912 collines; therefore extension services such as supply of inputs, advice on crop production, fish and livestock are held at the provincial level with branches in the communes, zones and colline levels (GoB, 2006). Extension agents at the commune level are agricultural technicians, usually diploma holders while the agents at the colline level have completed primary school and only received moderate training (Collins et al., 2013).

Challenges faced in extension (World Bank, 2010; Curtis, 2013; Collins et al., 2013)

- Ineffective communication systems
- Lack of harmonization of approaches to technological interventions
- Ineffective linkage of research results with extension in that research findings are not transmitted to the intended beneficiaries
- Lack of operational participatory approach and non-functioning farmer organizations
- Low motivation of extension managers and technicians- lack of effective capacity development and low salaries
- Training is not tailored to specific farmer needs especially women farmers
- Inadequate resource allocation to extension services
- The colline extension agents ought to seek guidance from commune technicians, however, based on farmers’ observations, the commune technicians are rarely seen
- Little interaction between farmers, colline and commune extension agents
- Delayed response in cases where commune extension agents seek guidance from the province or national level experts

According to Curtis (2013), the government is making efforts to improve extension services but there is a long way to go to make them more focused on farmers’ real needs, and there is currently very little attempt to reach women farmers. A major focus on improvements across the board is needed. A reorientation of agricultural education towards training to meet national agricultural policy objectives is necessary.
3.0 METHODS

3.1 Study site
The ‘Trees for Food Security’ project in Burundi works in Muruta commune, Kayanza province. Kayanza is located north of Burundi and is bordered by the Republic of Rwanda to the North, Cibitoke province to the West, Ngozi province to the East, Muramvya province to the south and Gitega province to the south east. Muruta is one of the nine communes in the province. It covers an area of approximately 147.08km$^2$ (11.92% of the province). It is bordered by Kabarore commune on the North, Matongo to the south, Kayanza to the east and Musigati commune in Bubanza province to the west.

Muruta commune has two distinct regions: Mugamba and Buyenzi which have varying agro ecological characteristics. Mugamba lies at an altitude of 1900m-2500m covering the largest part of the commune. Mugamba area has a temperate climate experiencing rainfall between 1300-2000mm and temperatures ranging from 14$^0$C to 15$^0$C. The topography is mountainous with slopes of up to 50$^0$. Buyenzi has a tropical humid climate of temperatures between 17$^0$C -20$^0$C and rainfall ranging from 1200-1500mm. The area is relatively sloppy with an altitude of between 1500-1900m. The ‘Trees for Food security’ (T4FS) project sites fall in Mugamba region. Muruta is further divided into 3 zones: Muruta, Rwegura and Nkonge. Specifically the project activities will target Yanza, Rwegura and Ruvumu collines in Muruta, Rwegura and Nkonge zones respectively.

The major crops grown in Muruta include maize, wheat, irish potatoes, beans, and tea. Common tree species include *Eucalyptus spp* and *Grevillea robusta*.

3.2 Data collection
Subsequent to a literature review, twelve key informants were approached for interviews. They represented the officers in charge of extension in Muruta commune –T4FS project working site. They comprised of 3 monitors from the collines, 2 agronomists from the zones, 1 forest technician at the commune, 1 veterinary officer at the commune, 3 NGO representatives, 1 official from ISABU, the chief of training and extension at the province and the director of extension at the national level (Appendix 1). The key informants were identified based on the government administrative structure under which extension services are disseminated. Additional information was obtained from the NGOs working in Muruta site which were perceived to be versed with agricultural/ agroforestry extension activities. Information from the NGOs and the government institutions would suffice in an in depth understanding of the extension structure in the area.
4.0 FINDINGS OF THE KEY INFORMANT INTERVIEWS

4.1 Extension at the national level in Burundi

Extension in Burundi is under General Directorate of Mobilization for Self-Development and Agricultural Extension– Direction Générale de la Mobilisation pour l’Auto-développement et la Vulgarisation Agricoles (DGMAVA) whose headquarters are in Gitega province. The Directorate is headed by the General Director who is in charge of all the provincial directorates. At the provincial level, agriculture and extension is under the Provincial Directorate of Agriculture and Livestock– Direction Provinciale de l’Agriculture et de l’Elevage (DPAE). The provinces in Burundi include: Bubanza, Bujumbura Mairie, Bujumbura Rural, Bururi, Cankuzo, Cibitoke, Gitega, Karuzi, Kayanza, Kirundo, Makamba, Muramvya, Muyinga, Mwaro, Ngozi, Rutana, and Ruyigi where a Provincial Director is the overall head of the Directorate of Agriculture and Livestock (DPAE). He is in charge of six major services: Crop production, livestock production, water (shed) management, finance and administration, monitoring and evaluation, and training and extension. Each of these services is headed by a chief official who reports to the provincial director. Extension service is particularly coordinated by the chief of training and extension who works closely with the chiefs in charge of crop and livestock production.

The provinces are further subdivided into communes. Extension at the communes is spearheaded by three main officials: Agronomist – in charge of crop production, veterinary officer – in charge of livestock production and a watershed management officer. The three officers work together in disseminating crop, livestock and water management technologies to the communities. They are mainly involved in training and advisory services. A commune is comprised of several zones. Extension at the zones is headed by two officers: an agronomist and a veterinary officer. The lack of a water management specialist at the zone level is attributed to inadequate skilled personnel in this field. Therefore, the zonal agronomist is also in charge of water (shed) management.

At the colline level, agronomists in charge of extension are referred to as ‘Monitors’. Colline (French name meaning hill) is the lowest level of administration and usually the extension officers have no formal training, hence the title. They are selected based on long term farming experience, outstanding performance and willingness to train other farmers on behalf of agronomists. As a requirement, the monitors should own at least one demonstration plot. Currently there are about 2,803 monitors in the collines.
Role of the General Directorate of Mobilization for Self-Development and Agricultural Extension

The national directorate of extension is mandated to coordinate agricultural extension in the country. The major functions include:

- Overall coordination of the extension activities in the country
- Preparation of annual work plans and budgets
- Recommendation of new (site-specific) technologies based on research results
- Development of training curriculum based on specific technologies
- Overseeing development and translation of training/reading materials
- Capacity building of extension staff in form of trainings, exchange visits, etc.
- Liaising with partners and NGOs working with the farming communities to ensure their objectives are anchored to the national priorities
- Reviewing national policies relating to agriculture and extension

Successes and opportunities of extension at the national level

The national extension directorate has endeavored to package research results on improved agricultural methods in such a way that farmers can easily comprehend and implement. This, coupled with favourable climatic conditions in most parts of the country has resulted to a proliferation of agricultural growth. Further, improved productivity has motivated farmers in adopting the improved technologies. Efforts are still underway to improve smallholder farmers’ capacities (finances, knowledge, skills) to take up the upgraded farming techniques.

Extension advisory services are adapted to specific areas with the aim of addressing contextual needs. For example in Kayanza province, the kitchen garden technology has been widely promoted. The technology is suitable for vegetable production and is preferred because it requires a small area of land. Other technologies that have been given precedence include, rice irrigation, improved varieties of Irish potatoes, wheat, beans, improved livestock breeds, and soil and water conservation.
Innovative agricultural methods will be essential in ensuring sufficient food production for the rapidly increasing population (2 million people in 1960 to 8 million in 2015), therefore the national extension directorate has laid out strategies to intensify both crop and livestock production. As a prerequisite, participatory research will be conducted to characterize the areas and identify farmers’ needs then research results will be disseminated through participatory extension approaches.

The farming methods should be suited to maximize productivity in the highly fragmented land parcels while still maintaining the land’s productivity potential. Practices such as agroforestry, kitchen gardens and irrigation have been successfully applied in some areas. The directorate also proposes to harmonize extension training materials from different NGOs and donor-funded programmes to ensure appropriate methods are used. This will also be a quality assurance measure ensuring that their objectives are aligned towards national goals.

4.2 The Institute of Agricultural Sciences of Burundi- *Institut des Sciences Agronomiques du Burundi* (ISABU)

The Institute of Agricultural Sciences of Burundi (ISABU) is the principal research institution in Burundi under the Ministry of Agriculture and Livestock. Research at ISABU is focused on crops, livestock, farming systems and rural socio economics. Additionally there is a support department at ISABU that is mainly involved with ‘pre-extension’ activities. The term ‘pre-extension’ is used in this context to refer to the whole process of documenting and disseminating research findings from the institute.

**Pre-extension services at ISABU**

Despite ISABU’s main research mandate, the institute further disseminates research results to the beneficiaries. The support team at ISABU makes the necessary follow-ups with the specific research sections to obtain the results. The results are documented mainly in bulletins, brochures and posters. These publications are prepared using relatively simple terms for easy comprehension and interpretation by the intended users. In some instances they are translated into the local language for better understanding at the farmer level.

The content published includes: recommendations for new crop varieties, recommendations for the ideal fertilizer/compost quantity application for different crop varieties, improved farming techniques and improved livestock breeds, guidelines for crop management, from planting to harvest stage. Additionally, ISABU notifies the communities of any upcoming programmes and the partner organizations. Some of the technologies and key findings are aired through television and radio programmes. The official ISABU website is also used to communicate research activities to the public mainly targeting donor and partner organizations. Some of the partner organizations/donors include the Belgium Cooperation – funds the publication and dissemination process, Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), International Center for Tropical Agriculture (CIAT), Food and Agriculture Organization (FAO), International Food Policy Research Institute (IFAD), World Bank, *Gesellschaft für Technische Zusammenarbeit* (GTZ), Caritas, Action aid and the national university.
Being a research institute, ISABU does not fully engage in dissemination of information at the farmer level. After publication, the reading materials are handed over to the provincial authority in charge of agriculture and livestock who then ensure that the information reaches the farmers at the lowest administrative level. Departmental heads in charge of specific technologies at ISABU are called upon to further clarify the technical aspects for the provincial and commune agronomists. ISABU only makes follow ups with farmers whose farms have been used for establishing experimental trials by the institute.

**Successes of pre-extension and the proposed way forward**

Despite the challenges encountered in dissemination of research information to the public: Inadequate budget, weak personnel, collating results from various departments and commitment of partners, pre-extension services have resulted in notable improvements. More farmers have gained access to information on higher yielding crop varieties. An increased production yield has been observed where the technologies have been introduced. The Belgium Cooperation has funded the private enterprises to facilitate them in production of better farm inputs for use by the farmers. International Food Policy Research Institute (IFAD) has partnered with ISABU to train communities on management of swamps for rice production using farmer-field schools. A joint effort by FAO and World Bank to distribute cows to the local communities has also led to improved livelihoods.

Use of publications has been effective in disseminating research results to the farmers. Some of the recommendations for improvement of pre-extension services include: increased funding for publications to enhance wide access to information and appointment of more skilled communication personnel to ensure production of high quality materials. Plans are underway to ensure all regions in the country are covered and specific needs identified for necessary action. Also, the pre-extension department intends to update the existing information and store it in easily accessible formats and modern devices that can be shared to the provincial authorities.

**4.3 Extension at the province level-Kayanza province**

Agriculture and extension in Kayanza is under the Provincial Directorate of Agriculture and Livestock–Direction Provinciale de l’Agriculture et de l’Elevage (DPAE). The directorate is headed by the provincial director who is the overall in charge of seven major departments:

- Finance and Administration
- Human Resource Development
- Crop Production
- Livestock Production
- Watershed Management
- Monitoring and Evaluation
- Training and Extension

Each of these departments is headed by a Provincial departmental head. Extension is under the Training and Extension department. The departmental head in Kayanza is in charge of nine communes: Butaganzwa, Gahombo, Gatara, Kabarore, Kayanza, Matongo, Muhanga, Muruta and Rango.
Extension activities at Kayanza province

Extension activities in Kayanza are focused on introduction of improved varieties of crops such as wheat, Irish potatoes, bananas and beans; establishment of kitchen gardens mainly for planting vegetables; compost preparation/ application and improved methods of banana farming. The provincial extension officers are mainly involved in:

- Creating awareness on any new technologies to the agronomists, farmers and the NGOs
- Training agronomists on modern crop and livestock production methods following directives from the national level
- Disseminating publications such as bulletins, brochures to agronomists training farmers and colline monitors. These materials are obtained from ISABU and from the national level.
- Coordinating crop surveys – a national requirement to determine performance of agricultural technologies
- Field visits to determine adoption and implementation of technologies. The field visits are also aimed at assessing the agronomists
- Monitoring NGO activities by reviewing their progress reports

Methods of extension

Training- the chief of training and extension organizes for the training sessions. Usually the provincial extension officers train officers at the commune and colline levels as well as the lead farmers. Different experts are sought to conduct the trainings based on the specific areas of expertise. At the province level the officers in charge of crop and livestock production are mainly called upon to provide technical training. Publications such as bulletins, brochures, posters, newsletters are distributed to the agronomists as reference materials. However it was noted from the discussions that these trainings are not regularly conducted.

Demonstration plots- this was highlighted as the most effective extension method since most farmers are unable to understand the written materials due to the high illiteracy levels. Therefore use of demo plots was described as a pragmatic approach for introducing new technologies. Demo plots are established at
the office field and on farmers’ land. Use of demo plots in promoting the kitchen garden technology has resulted to high rates of adoption.

**Meetings**- the provincial office convenes regular meetings with the agronomists and NGOs mainly to give feedback on progress of the activities. These meetings provide an apt platform to discuss emerging needs, challenges encountered and plan for future activities specific to each commune.

**Exchange visits**- though not common, the provincial authority organizes for visits to different provinces where a specific technology has been successful. The provincial officers and agronomists visit the areas of interest and report the findings to the wider group. Through these visits, both agronomists and farmers observe the expected results which motivate them to adopt the technologies.

**Benefits of extension**

General improvement of livelihoods has been reported in Kayanza and has been attributed to the improved farming methods. The chief of extension highlighted that these technologies have been introduced to the farmers through extension services. Training sessions and demonstrations at the farm-level have enabled most farmers access the technological information and have resulted to adoption of the technologies.

Increase in crop yields has been attributed to extension activities. Farmers have particularly increased production of vegetables such as Amaranthus, onions, carrots and cabbages.

Improved production of fodder for livestock has been observed in Kayanza. Farmers have adopted zero grazing system which has resulted to planting of fodder grasses and fodder trees such as *Calliandra* and *Leucaena*. These trees are usually planted on the embankments and contours, in this way they serve the dual purpose of fodder provision and soil erosion control.

**Challenges faced in extension**

- Inadequate budget for extension activities
- Climate variability affecting crop yield, some areas experience snow fall which damages crops
- Lack of funds to maintain and fuel transport means such as vehicles, motorbikes hence limiting access to the collines.
- Difficulty in storing farm inputs received from the national government for distribution to the farmers. Some improved crop varieties usually have recalcitrant seeds.
- Reluctance by farmers in adopting some technologies
- Lack of access to some inputs such as pesticides
- Lack of funds to adopt some technologies that require capital for investment e.g. kitchen gardens
- Land scarcity limiting the extent of technology adoption

**Gender**

Both men and women are given equal opportunities to engage in extension activities. However it was noted that more men than women attend trainings and meetings. Conversely, the number of women
engaged in implementation of the technologies at the farms is higher compared to men. The lack of women’s participation in training was attributed to their involvement in household chores such as cooking, fetching firewood, fetching water cleaning among others. Being more open to ideas, women endeavored to learn the introduced technologies from their colleagues and eventually applied them on their farms.

NGOs

DPAE works with NGOs such as Prodefi, Confederation of Associations of Agricultural Producers for Development (CAPAD), Projet d'Appui à l'Intensification et à la Valorisation Agricoles du Burundi (PAIVA-B), Family Health International/Burundi (FHI/Burundi), One Acre Fund (TUBURA)- (Lango commune) and Appui au développement intégral et à la solidarité des collines (ADISCO). The NGOs submit annual work plans, quarterly progress reports and also attend meetings at the province. Feedback from the farmers is obtained through commune and colline extension officers.

Markets

The market structure is not elaborate because most production is consumed at household level. The local market at Kayanza is the main target market. The prices for farm products are generally low due to the underdeveloped market system. Moreover, farmers have limited access to market information thereby limiting their bargaining power. Tea and coffee being the main commercial products, the growers market their products through tea boards and coffee boards respectively. Other commercialized products include Irish potatoes, wheat, maize and vegetables. Value chain development and establishment of farmer cooperatives is encouraged in order to secure suitable market opportunities.

Incentives

Outstanding farmers are awarded with free banana germplasm and free manure. This practice is however not common due to financial constraints.

Recommendations

To improve extension at the provincial level the following recommendations were made:

- Provision of free planting materials to farmers- the government to subsidize costs (allow for more than the current 40% cost subsidies).
- Supply of inputs to farmers to be made on time
- Research organizations to focus on varieties adaptable to the varying climatic conditions
- Introduction of site-specific as opposed to blanket technologies
- More women to be encouraged to attend trainings to enhance their involvement in implementation
- More creation awareness and farmer sensitization to be done on the technologies
- Additional funds to be allocated to extension services
4.4 Extension at the commune level- Muruta commune

Extension at Muruta commune is headed by three officers: the agronomist, veterinary officer and the watershed management officer in charge of crop production, livestock production and watershed management respectively. The three officers cover the three zones in Muruta commune: Muruta, Rwegura and Nkonge zones. For this study, the veterinary officer and a forest technician were interviewed.

Interview with Muruta Veterinary officer

Interview with Muruta Forest technician

Extension activities in Muruta

Cows, goats, pigs, rabbits, chicken and sheep constitute the common livestock in Muruta. Extension activities on livestock are mainly focused on promotion of improved breeds, prevention and control of livestock diseases, use of appropriate livestock feeds- both natural grasses and manufactured feeds. Fodder grasses in the area Include *Penicitum, Setaria, Trypscum, Desmodium* while tree shrubs include *Calliandra, Leucaena* and *Mucuna* tree – relatively new in the area. Zero grazing is encouraged due to small land sizes and also to enhance collection of animal manure. The livestock extension also trains some farmers on bee keeping and use of modern beehives.

The predominant tree species in Muruta include *Grevillea robusta, Eucalyptus spp, Acacia spp, Cedrella spp, Acacia spp, Markhamia lutea, Prunis Africana, Leucaena spp* and *Calliandra calothyrsus*. The technician is in charge of nursery management, management of trees on farm and sensitizing communities on the management of Kibira forest. The forest technician further highlighted that forestry is constrained by inadequate tree germplasm thus limiting the number of trees planted.

Extension approaches

- Meetings with colline monitors and farmers- they are mainly held to obtain feedback from the farmers or to announce major events and new technologies. The commune forest technician organizes for such meetings every week with the colline monitors.
- Training- the livestock officer conducts trainings mainly in form of demonstrations. The trainings are held in farmers’ residences. The forest technician also trains farmers on seeds and seedlings management in the nurseries, recommended space for different trees, specific areas for planting the trees and on-farm tree management.
- Model farmers- most model farmers own livestock where training and demonstration takes place
- Farm visits- extension officers visit individual farmers of farmer groups mainly for demonstrations. This is the most suitable method for livestock management
Demonstration plots- most effective for disseminating tree related technologies

**Specific extension issues in livestock production**

Livestock production has been identified as a potential source of livelihood improvement. Therefore extension efforts have been revamped into integrating crop and livestock production. Farmers in Murutu have been encouraged to keep livestock in order to create additional sources of income through the sale of animal products. In addition to government efforts, NGOs such as Prodefi have established a system where cows are distributed to farmers and later the farmers distribute the first born calves to other households. This initiative has also enhanced production of fodder trees such as *Calliandra* for livestock feeds. Currently efforts are geared towards promoting more productive cattle breeds.

To improve livestock production, farmers should be willing and committed to the course. Livestock keeping can be laborious and farmers should be ready to effectively follow the instructions on ideal livestock management. The veterinary officer further underscored the need for colline monitors to regularly and consistently follow up activities with the assistance of model farmers to ensure that any adverse issues are reported to the commune on time.

**Specific extension issues in (agro) forestry**

The commune forest technician emphasized that tree planting in Murutu was greatly constrained by unavailability of germplasm. He added that the area is sloppy hence in need to plant trees for soil conservation. Most forestry and agroforestry activities are initiated by the NGOs who establish tree nurseries and eventually distribute the seedlings to farmers. This means that tree planting activities are stalled after lapse of NGO programmes. This has been attributed to the low rate of tree planting on farms because the NGOs may take a long time (up to 5 years) before establishing nurseries. As a result, the demand for tree seedlings always transcends the supply and despite the willingness of farmers to plant trees, they are unable to access the seedlings. It was noted that there were no tree nurseries in the three zones at the time of the study because no NGOs were conducting any forest-related activities. Tree seeds are also a major constraint to agroforestry as private seed sourcing is not a common practice and farmers have to rely on seedlings produced by the NGOs.

There is a high demand for agroforestry trees hence creating a need for agroforestry technologies. With increased sensitization, more farmers will be able to plant trees on their farms and will also participate in conserving the natural forest, Kibira. Establishment of tree nurseries will be an important step in enhancing access to tree seedlings. Trees should be planted on the steep slopes, embankments and along contours to enhance land protection which is a prima for crop production. The most effective methods for promoting agroforestry techniques highlighted include use of model farmers and demonstrations of success stories from other areas.

### 4.5 Extension at the zone level

The zone is the next administrative level after the commune. Murutu commune is divided into three zones: the Murutu, Rwegura and Nkonge. The agronomists and veterinary officers are in charge of extension at this level. The extension officers at the zone level are in charge of all the collines within the zone. Murutu
zone has 9 collines: Busambo, Buziraghinda, Campazi, Karunyinya, Muruta, Myugariro, Nyamiyogoro, Remera and Yanza. Rwegura zone has 10 collines: Kaserege, Kavoga, Kibakwe, Manini, Mpfunda, Muciero, Muganza, Ruharo, Rwagongwe and Rwegura. Nkonge zone has 6 collines: Gishubi, Mikuba, Mutana, Nkonge, Nyakibari and Ruvumu.

The main objective of extension activities is to disseminate agricultural information which will in turn lead to improved productivity. The zone agronomists are mandated with the task of transferring any acquired agricultural information to the farmers directly or through the colline monitors. The major extension activities include: training on compost preparation and application, soil conservation, facilitating distribution of inputs to farmers such as improved seeds and fertilizers, training farmers on farming methods and post-harvest crop handling, disseminating technologies on livestock production and training farmers on crop and animal disease control. Usually agronomists work with farmer groups.

Extension approaches

- Model farmers- at the zone level, use of model farmers is the most common and effective extension method. The zone agronomist confirmed that model farmers are usually well performing and able to reach more farmers in the collines. The model farmers are mainly ardent in agricultural technologies and are selected based on their willingness to train other farmers and commitment in attending any meetings and trainings that they may be called upon to.
- Training- the zone extension officers call for trainings usually when a new technology/practice is introduced such as the introduction of a new crop variety. Colline monitors and model farmers are first trained, then they train other farmers in the communities.
- Demonstrations- these are held on model farmers’ lands, subsequent to training. They are viewed as a pragmatic way through which farmers can observe the actual application of the technologies on farms.
- Field visits- regular field visits to individual farmers are conducted. These are mainly aimed at assessing the technologies and obtaining any feedback from farmers. Farmers with issues that are too complex for the colline monitors and model farmers, are attended to and their needs addressed.
Meetings- these are mainly discussion forums that are convened whenever need arises. They are also avenues through which announcements are made. Farmers are also apprised of any new model farmers with whom they can consult.

Benefits of extension

- The agronomist attested to increased willingness of technology adoption among farmers. Specifically, farmers had positively taken up the introduced varieties of Irish potatoes and wheat which had resulted in increased yields.
- More farmers are keeping livestock in Muruta. Farmers are now able to obtain alternative sources of products from ale of animal products such as milk, eggs, honey among others. There has also been an improvement in crop production due to the use of animal manure.
- As a result of increased crop productivity, farmers were able to have surplus for sale.
- Farmers have obtained technical skills for selecting seeds from their current harvest for production in the following season.
- Due to improved postharvest techniques, a decline in wastes was reported.
- Increased productivity among the farmers motivated more farmers to adopt the technologies.
- Extension officers partner with NGOs such as Prodefi and CAPAD. Prodefi works in Manini colline where it focuses on training farmers on soil conservation. Prodefi has also initiated the programme of cattle distribution to individual farmers and also providing fodder tree seedlings to them. CAPAD works in Kavaga colline where it facilitates access to seeds by farmer cooperatives from ISABU/ other suppliers. Farmers can therefore access seedlings more easily from the cooperatives.

Challenges faced in extension

- Extension officers are not able to reach the farmers effectively due to unavailability of sufficient funds for fuel and maintenance of transport facilities. Often, the zone agronomists have to walk to the collines.
- Lack of sufficient tree seedlings to satisfy the high demand.
- Some farmers are hesitant to take up the recommended technologies in spite of understanding the benefits through training and demonstrations.
- High poverty level among farmers restrains them from adopting some technologies that require financial commitment.
- Low salaries given to the agronomists.
- Inadequate capacity development among extension officers at the zone and colline level.

Recommendations

Increased farmer sensitization on the benefits of the improved technologies through frequent meetings, trainings and demonstrations.

Strengthened capacity development among extension officers and the model farmers.
Need to establish tree nurseries in the zones to enable farmers easily acquire tree germplasm

**4.6 Extension at the colline level**

The three proposed ‘Trees for Food Security’ project sites are located in Yanza, Rwegura and Ruvumu collines in Muruta, Rwegura and Nkonge zones respectively. Colline is the lowest administrative level; unlike all other administrative levels, only one officer, referred to as colline monitor is in charge of extension. There is no requirement for formal academic qualification to be a colline monitor; however one must be an experienced farmer who has consistently performed well in agricultural activities over a long time. The colline monitors must also own a sizable piece of land where demonstration activities can take place. Colline monitors are usually trained prior to assuming their duties.

Interviews with Rwegura, Yanza and Ruvumu colline monitors respectively

**Extension activities**

Farmers are trained on:

Crop production- improved farming methods such as contour farming, improved crop varieties, preparation of organic manure, application of both organic manure and inorganic fertilizers kitchen garden technology, disease prevention and control, crop rotation, storage of harvest and selection of seeds for the next season. Major crops in the collines include Irish potatoes, maize, beans, wheat, onions, garlic, peas, bananas, tea and coffee.

Livestock production- improved livestock breeds, prevention of diseases and use of appropriate cattle feeds. Common livestock include cows, goats and sheep.

Agroforestry- though not common, farmers are trained on planting trees on farm mainly to prevent soil erosion. Common trees include *Grevillea, Cedrella, Leucaena, Calliandra, Acacia* and indigenous trees such as *Umwango, umusave, umwuzuzu, umuyove, umuhumure, umushwuati, umuremera, umuvumuvumu*. Farmers are advised on recommended tree spacing for different trees and specific locations. Unavailability of tree seedlings is a major constraint to agroforestry. The problem is prominent in Ruvumu colline where the monitor mentioned that tree planting was not a common practice in the area. He elaborated that farmers were not well versed with knowledge on agroforestry. Farmers were not involved in tree planting activities, but preferred fodder grasses for livestock feeds and erosion control. Furthermore they did not have access to any tree germplasm.
In the three collines, extension approaches include: Training, use of demonstration plots, model farmers, farm visits and meetings. Use of demonstration plots and model farmers was highlighted as the most effective method. The two methods also benefit the large number of farmers who cannot read and write.

**Benefits of extension in the collines**

- Adoption of improved crop yields
- Increased crop yields hence availability of surplus production for marketing
- Enhanced soil conservation initiatives- more trees have been planted on the contours
- Improved farming methods e.g. planting wheat on line as opposed to the traditional haphazard methods of planting
- Increased use of manure and inorganic fertilizers

**Challenges**

- Late distribution of inputs such as seeds and fertilizers from the government
- Climate variability affects crop production
- Low salaries
- Resistance by some farmers to adopt the technologies
- High poverty level among farmers limits them from adopting some technologies
- Low turn up of farmers for meetings, trainings and demonstrations hence low adoption level of the technologies
- Low capacity level of the monitors- capacity development efforts are irregular and limited
- Inaccessibility of tree germplasm is a major constraint to implementation of agroforestry techniques
- Lack of agroforestry knowledge among farmers in Ruvumu colline. As a result farmers do not plant trees

**Recommendations**

- Distribution of inputs to be made on time to avoid late planting
- Increased capacity building initiatives especially to the colline monitors and the model farmers in order to keep abreast with the new and improved technologies.
- More sensitization and awareness creation to farmers on the benefits of the new technologies
- Improvement in the livestock production to create alternative sources of income- this will improve livelihoods and increase ability of farmers to adopt the technologies and also encourage farmers to plant fodder trees and grasses to provide feeds for the livestock while at the same time protecting the soil from erosion
- Intense training and awareness creation on agroforestry technologies among farmers especially in Ruvumu colline
- Establishment of tree nurseries to enhance access to tree seedlings.
• Need for diversification of multipurpose trees in Ruvumu colline where tree density on farms is very low

4.7 Extension by the NGOs

4.7.1 Confederation of Associations of Agricultural Producers for Development (CAPAD)
Confederation of Associations of Agricultural Producers for Development (CAPAD) is a confederation of producers whose main objective is training and building farmers’ capacity on various technologies based on needs and specific agro ecological conditions. It has 106 cooperatives and 86,000 producers.

CAPAD is managed by an executive committee in each of the levels. The executive committee comprises 7 members who are democratically elected by other members as their representatives. CAPAD has technicians on the ground who support implementation of activities and dissemination of information to the farmers.

Main activities at CAPAD

CAPAD is mainly operative at the cooperative level which consists of farmers with similar agricultural interests such as vegetable production, wheat farming, Irish potatoes etc. Farmers in these cooperatives identify their needs and the management committee assists in looking for viable solutions e.g. by seeking expert advice. Despite having different priority crops for different products, all cooperatives aim at value chain development and commercialization of products.

Value chain development involves transformation of raw products into refined products of higher value. For example manufacture of fruits into juice which is more valuable or transformation of maize/wheat into flour. Through this method, farmers are able to obtain more income hence increase their profit margins. Additionally farmers within the cooperatives are harnessed to focus on quality of their products because production is not only for household consumption but also for commercial purposes. Therefore the cooperatives set quality standards that the cooperative members have to meet in order to ensure that the quality is not compromised. This has also played an important role in ensuring the prices of commodities remain high.
Farmer cooperatives provide suitable avenues through which new technologies can be introduced to the farmers. The management organizes for trainings and demonstrations following which farmers are further guided during actual implementation. Being a confederation of farmers, CAPAD works with farmer groups which grow into cooperatives. These cooperatives are also beneficiaries in some donor funded projects.

**Extension methods**

- Training farmers on improved technologies. Trainings are mainly conducted during farmer meetings. Materials such as brochures, pamphlets, leaflets, posters and newsletters are used for training.
- Demonstration plots - this is a common approach used for the new technologies
- Use of farmer field schools - these are designated farms for learning purposes where farmers convene and implement the technology then assess its performance later. For example farmers have a farmer field school where they test new varieties of Irish potatoes. With the guidance of an agronomist, farmers participate in all the production processes i.e. from planting to harvesting. Farmers replicate the same activities on their individual farms after learning from the FFS. Some FFSs are owned by individual farmers, others by the cooperative.
- Use of media such as television and radio programs and newspapers
- CAPAD official website which mainly targets partners and donor organizations such as IFAD, the government, Agriterra-Netherlands agency, and Belgium Cooperation.

**Benefits of extension**

Farmers in cooperatives are more skilled on improved farming methods because of constant capacity development. They are also able to obtain farm inputs easily through the cooperatives. Farmers in the cooperatives can obtain suitable markets and sell their produce at favorable prices. For example the rice growers are currently selling their produce to World Food Programme (WFP). Local markets are mainly targeted for subsistence crops. CAPAD also organizes for agricultural shows where farmers market their produce.

**Challenges of extension**

- Organizing meetings and trainings is expensive
- Lapse of project time before completion of the activities and follow up during this time is challenging due to lack of funds
- Some farmers do not implement the activities even after undergoing training
- Obtaining suitable land for demonstrations is sometimes difficult
- Producing extension materials such as posters, bulletins, newsletters is expensive
- Challenge in obtaining high quality seeds on time
Recommendations

- Strengthen the manufacturing units/processing firms to enhance value chain development. This will enhance commercialization of products.
- Have a strong platform for all actors involved in extension especially the government and research centers.
- Have harmonized extension objectives to ensure that farmers receive consistent information.
- Encourage participatory form of extension where farmer knowledge and ideas are considered while designing and disseminating technologies.

4.7.2 A Cooperation Agency for Research and Development (ACORD)

A Cooperation Agency for Research and Development (ACORD) is an NGO under IFAD funded programmes-PRODEFI and PAIVA-B. These programmes focus on agriculture intensification and value chain development. Major activities include: Management of marshlands for rice production, rice intensification, banana intensification, livestock intensification, crop intensification, manufacturing agricultural produce, land management-soil conservation, land space optimization e.g. by using kitchen gardens and agroforestry techniques. ACORD is headed by a country director at the national level and team leaders at the province level.

Interview with ACORD’s Team Leader-Kayanza Province, Mr. Donatien Bizimana

Technicians are deployed at the colline level to foresee implementation of the technologies by the farmers. ACORD’s major components include Food security, local governance, Gender and HIV. Agriculture production and land management are integrated in the food security component.
Methods of extension

ACORD works with farmer groups for dissemination of extension services through the following extension approaches:

Training- mainly focused on value chains, crop and livestock intensification. Materials used for training are prepared at the province level focusing on area specific technologies. Publications such as newsletters, brochures, posters and leaflets are mainly used.

Model farmers- assist in transferring technology skills as well as providing farms for demonstration purposes

Demonstration plots- ACORD technicians demonstrate the new technologies practically to enable farmers observe the actual implementation methods. After a while, the demonstration plots are converted into farmer field schools. This was mentioned as the most effective extension method

Radio programs-used mainly for technologies targeted for a wider audience throughout the country.

Exchange visits- farmers visit other areas where similar technologies have been successful so that they can envision the expected results and also learn more from the experienced farmers who have already applied the technologies.

Open days- these are held once a year where farmers show-case different technologies.

Successes of extension

- ACORD introduced farmers in Mabai zone-Chitogi province to planting beans. Initially there was no beans production in the area
- Growth of cooperatives into micro finance institutions, farmers can access credit facilities in these institutions
- Increased production due to improved farming methods
- Increased income due to value chain development hence improved livelihoods
- Increased adoption of livestock keeping and zero grazing technique
• Conversion of wetlands/marshlands into rice plantations

Challenges faced in extension

Due to the high illiteracy levels, educating farmers on the new technologies becomes a challenge. Most of these farmers cannot comprehend the procedures and guidelines of the technologies in the publications that are supposed to guide them.

The rate of adoption remains low. Most of the crop intensification technologies such as rice production require farmers to commit much time and finances which is challenging for most households.

Agroforestry techniques in Muruta are mainly initiated by NGOs and discontinue when the projects are completed. Usually agroforestry technologies require a longer time thus are not fully implemented.

Monitoring/follow-up

ACORD technicians are in charge of monitoring the progress of activities at the collines. Provincial team leaders also visit the farmers regularly. The technician works with local committees comprised of lead farmers from different groups who give regular feedback from farmers. Additionally, rudimentary data is collected to monitor progress and performance of the technologies.

In its activities, ACORD collaborates with the DPAE in meetings and joint implementation of activities. For example the cattle distribution initiative by ACORD is monitored by a DPAE official. Prior to any activity ACORD reports to DPAE through submission of work plans, further quarterly reports are submitted to report on the progress.

Recommendations

• Need for more training and sensitization to create awareness on the importance of agricultural and agroforestry technologies
• Administration units to assist in mobilizing farmers and advocating for the technologies
• Harmonization of technologies at national level to have clear cut guidelines applying to extension
• Establishment of nurseries in every colline to provide tree germplasm to the farmers
• Introduction of (agro)forestry programmes with long project duration that can be enough to fully implement the technologies
• Facilitate nursery operators with nursery inputs to produce more seedlings
• Provision of incentives to farmers and government agronomists to motivate them adopt the improved technologies.

4.7.3 NGO ‘Twitezimbere’
The NGO adopts the local term ‘Twitezimbere’ which literary means ‘We are moving forward’. It is currently working on the second phase of an International Fertilizer Development Center (IFDC) funded project referred to as Catalyst II (2014-2015). Twitezimbere’s main activities include training farmers on crop production focusing on integrated soil fertility management-use of organic manure and inorganic
fertilizers, soil analyses to determine fertilizer requirements, crop spacing, crop varieties, positive seed selection, disease control, seed multiplication and soil erosion control- planting trees and fodder grasses on the contours. Farmers are organized into farmer groups and cooperatives in various communes in which they are trained and provided with inputs such as seeds and fertilizers, more than 4,000 farmers have been engaged. The NGO covers 70% of the cost.

The agronomist in Twitezimbere is in charge of extension. He also works with the government agronomists who assist in mobilizing and training farmers. Monitoring and follow up of activities is done during farm visits. The agronomist further collects rudimentary data that guides in eliciting farmer opinions and willingness to continue with the technologies.

Interview with the Twitezimbere agronomist

**Extension approaches**

Training- farmers are introduced to a technology and guided on its specifications during the training sessions. Mainly, trainings involve theoretical induction to a technology, mainly at the beginning of a season in which the specific technology will be applied. Training curriculum is developed by IFDC officials in consultation with agronomists in Twitezimbere.

Demonstration plots- this is the most common and effective extension method. ISFM techniques are implemented on demonstration farms following which farmers learn about specificities of the technologies. Further, farmers can compare performance of the technologies prior to making adoption decisions. A total of 28 demonstration plots have been established in Kayanza, Kabarore, Muruta and Gatara communes.

Open days- these are organized mainly to demonstrate implementation of the technologies. For irish potatoes, four open days are organized during planting, fertilizer application, pruning and harvesting. They are held at the demonstration farms.

Model farmers- these are outstanding farmers who work closely with the NGO staff to transfer technologies to other farmers. They also assist in mobilizing farmers for meetings and trainings.

Farmer to farmer extension- this is where farmers train their colleagues on the technologies in the collines. This is mainly encouraged so that other farmers within the colline who cannot make it to the NGO offices for training can access the information.
Exchange visits- the NGO facilitates farmers’ visit to other communes where the introduced technologies have been successful. Farmers are also able to obtain more skills and ideas from the farmers who have already implemented the technologies

**Successes of extension activities**

- Increased quantity and quality of crop yields due to wide use of fertilizers and improved seeds
- Input subsidies have enhanced adoption of the technologies
- Increased household income, main indicators being increased crop production for sale, uptake of livestock keeping and improved livelihoods- renovation of residential houses, purchase of assets such as motorbikes, bicycles etc
- Awareness creation of cropping techniques and appropriate time for different activities for example it has been observed that farmers wait for irish potatoes to reach full maturity before harvesting. As a result farmers obtain quality production
- Organization of farmers into cooperatives has enabled them obtain better pieces for their inputs. Farmers are expected to adhere to the set quality standards of their products so that their products can attract favorable prices in the markets. Farmers can also be able to obtain credit facilities through the cooperatives.

**Challenges**

- High poverty level limits the number of farmers willing to be engaged in activities that require financial commitment such as purchase of seeds and fertilizers
- Low access to quality seeds
- Small land sizes limits the area for production
- Climate variability affects crop yields

**Recommendations**

- Supply of seeds and fertilizers to be made on time to avoid late planting
- Increase the number and distribution of demonstration plots so that more farmers can have access to technological information
- Need to sensitize farmers on the importance of the improved crop varieties to improve production
- Continued research on area- specific best fit technology options
- Continued capacity development for both agronomists and farmers on the new technologies
- Enhance value chain development
- Need to sensitize farmers on alternative income generating activities such as livestock keeping, planting multipurpose agroforestry trees etc.
- Need to establish nurseries for easier access to tree germplasm
5.0 SUMMARY AND CONCLUSION

Government extension services in Burundi run from the national level to the colline level— which the lowest administrative unit. Extension activities at the national level involve planning and coordination, budget allocation, policy development and funds mobilization. Implementation activities are usually at the province, commune, zone and colline levels. However there are more coordination activities at the province level compared to the commune, zone and colline level. At the colline level, model farmers are preferred due to agronomists’ inability to reach all the farmers. Extension approaches are participatory in nature and they include: trainings, demonstration plots, use of model farmers and field visits. The major extension challenge faced by government institutions is inadequate budget which limits the services given to the communities.

Equally NGOs play a vital role in extension work. They focus on improved technologies with the aim of improving community livelihoods. Major extension methods used by the NGOs include trainings, demonstration plots, open/field days, farmer field schools and field visits. The major challenge faced by NGOs is lapse of project time before duly completing the proposed activities. Agroforestry technologies such as establishment of tree nurseries, sourcing for tree germplasm and on farm tree management are mainly initiated by the NGOs. These technologies discontinue when the NGOs operations are halted. As a result, agroforestry techniques in Muruta are still lowly developed.

The findings from this study show that agroforestry technologies are a potential solution to the soil erosion menace, a predominant occurrence in Muruta commune as well as meeting farmers’ fuelwood, construction materials and fodder needs. The study recommends establishment of agroforestry participatory trials subsequent to farmer needs assessments so that best fit agroforestry tree species can be introduced in the area. Further, establishment of tree nurseries will enhance easier access to tree germplasm. Following the findings of this study, use of a combination of model farmers and demonstration plots coupled with regular capacity building initiatives are the most suitable extension methods through which farmers can learn and adopt the technologies.
6.0 REFERENCES


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<td>Peter Sinzobatohana</td>
<td>Male</td>
<td>MINAGRI-DGMAVA</td>
<td>Director General</td>
<td>77773944,722402097</td>
<td>Gitega</td>
<td></td>
<td></td>
<td></td>
<td><a href="mailto:sinzobatohana@yahoo.fr">sinzobatohana@yahoo.fr</a></td>
</tr>
<tr>
<td>13/03/2015</td>
<td>Damien Niyongabo</td>
<td>Male</td>
<td>ISABU</td>
<td>Agronomist</td>
<td></td>
<td>Bujumbura</td>
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<tr>
<td>17/03/2015</td>
<td>Manirakiza Cynelle</td>
<td>Male</td>
<td>MINAGRI-DPAE</td>
<td>Chief of training and extension services</td>
<td>799490102</td>
<td>Kayanza</td>
<td></td>
<td>Muruta</td>
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<tr>
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<td><a href="mailto:Mahayop18@yahoo.fr">Mahayop18@yahoo.fr</a></td>
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<td>Donatien Bizimana</td>
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<td>ACORD</td>
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