36. Dissemination pathways for scaling up agroforestry options in eastern Zambia

G. Kabwe¹*, R. Katanga¹, P.L. Mafongoya¹, I.M. Grundy², D. Phiri³ and F. Kwesiga⁴

¹Zambia-ICRAF Agroforestry Project, P. O. Box 510046, Chipata, Zambia; ²University of Stellenbosch, School of Agricultural and Forestry Sciences, Private Bag XI, Matieland, 7600, South Africa; ³World Vision Integrated Agroforestry Project, P.O. Box 510948, Chipata, Zambia; ⁴Southern Africa Regional Programme, P.O. Box MP128, Mt. Pleasant, Harare, Zimbabwe; * Author for correspondence (e-mail: gkabwe@yahoo.co.uk or gkabwe@zamtel.zm)

Key words: Extension, Farmer trainers, Networks, Partnership, Traditional leaders

Abstract

Since 1987 the Zambia–ICRAF agroforestry project has been working on agroforestry solutions to address the problems of soil degradation and shortages of food, fodder, timber and fuelwood. Among the various technologies developed, improved fallows to replenish soil fertility are being adopted by farmers. The lack of an effective dissemination pathway, however, has been an obstacle for scaling up this technology. An umbrella body ‘Adaptive Research and Dissemination Network (ARDN)’ was formed involving a number of stakeholders. It provided a coordinating and analytical mechanism for participatory evaluation of promising technologies on-farms and served as a catalyst for their widespread dissemination in eastern Zambia. The project has also examined the effectiveness of different dissemination pathways, namely the government agricultural extension service, farmer-trainers and the traditional leaders for scaling up agroforestry technologies. Seventy six percent of the farmers interviewed felt that farmer-trainers were more effective for extension of improved fallows than the other channels. About 92% of the farmers interviewed felt that the improved fallow technology, but only 41% of the source of initial information to the extension service and traditional leaders were farmer-trainers. It can be concluded that farmer-trainers are very effective in the dissemination of agroforestry innovations.

Introduction

In Zambia, severe land degradation over years has led to the decline of land productivity, which in turn has led to the shortages of food, fuelwood and timber (Kwesiga et al. 1999). Traditional farming systems that relied on the use of natural fallows for restoring soil fertility have become impractical to practise due to increased population pressure on land. Fallow periods have become shorter and continuous cropping without substantial nutrient replenishment is the prevalent practice in many areas. This has resulted in low crop yields and nutrient mining. Inorganic fertilizers are out of reach for most smallholders because of their exorbitant costs. Deforestation is accelerated as farmers clear woodlands for fuelwood and expansion of agriculture. Deforestation of watersheds is causing serious environmental problems in the form of soil erosion, silting of rivers and dams, and loss of biodiversity. All these changes are adversely affecting the welfare of rural families.

Agroforestry research in Zambia has, therefore, focused on the problems mentioned above. Technologies such as improved fallows, mixed cropping with trees, and biomass transfer have been tested on farms to address the problem of declining soil fertility; fodder banks using leguminous trees have been developed to overcome the shortage of dry season fodder; rotational woodlots have been proposed to address fuelwood shortage; and domestication of indigenous fruit trees is considered as an option to reduce loss of biodiversity in miombo ecosystems. These technologies are at different stages of the ‘development cycle’, from on station testing to dissemination among farmers.

The overall goal of developing different agroforestry options for farmers in the region is to make a positive impact on the livelihoods of rural people, particularly in terms of food security, poverty alleviation and reversing the degradation of the natural resource base. In Africa, there are very few examples of successful adoption of tree legumes for multiple uses in land use systems (Scherr and Franzel 2002). Recent
attempts to achieve adoption of complex agroforestry technologies such as alley cropping have been only partially successful because of unrecognized failings in approach (Gutteridge 1998). Difficulties for achieving high levels of adoption of *Leucaena* were reported in Africa (Dzwewela et al. 1998), South America (Argel and Lascano 1998) and Asia (Moog et al. 1998). Although fodder banks were found to be feasible in tropical Africa, rate of their adoption has been slow because of socioeconomic constraints such as insecure land tenure and lack of infrastructure support (Cromwell et al. 1996).

Simple innovations such as a new variety that overcome specific problems may be adopted relatively easily. Complex innovations such as new agroforestry systems, however, would require sustained high profile intervention. Despite intense promotion, farmer adoption could be lower than anticipated because of many reasons (Smith 1992; Cromwell et al. 1996; Larsen et al. 1998). To achieve greater impact, our strategy focused on working through existing government, non-government and other development organizations, and farmer groups. It aimed at influencing partner organizations and their policies through networking, lobbying and collaboration (Scarborough et al. 1997). While collaborating with contrasting partners, potential for successes and failures, and transaction costs are assessed to better understand the effective ways of scaling up of agroforestry technologies. The objectives of this synthesis are to review different dissemination pathways used to scale out agroforestry options in eastern Zambia and assess their regional relevance.

**Lessons learnt**

Agroforestry systems would have to be adopted widely across the landscape to have any positive impact on rural poverty, food security and environmental resilience. The ICRAF’s southern Africa regional programme aims to reach 400,000 farmers by 2006 regarding the improved fallow technology. To achieve this target needs networking with other developmental organizations and stakeholders (De Herveskerk et al. 2003). Collaborative partnerships and networking facilitate continuous two-way learning process for organizations and farmers, help share responsibilities, and execute the work cost effectively.

**Agroforestry Research and Dissemination Network**

The Zambia-ICRAF agroforestry project has facilitated the establishment of an informal network ‘Agroforestry Research and Dissemination Network (ARDN)’ to coordinate and streamline on-farm research, training, and dissemination of improved fallows. This network was formed against the background of consistent positive results due to improved fallows on farms and the interest shown by increasing numbers of farmers and agencies in testing the technology. It was open to members with a wide range of background, and had a membership of 34 partners until 2001. Partners included government departments, schools and colleges, local and international NGOs, farmers’ groups and local leaders (Table 1). The network was expected to act as a catalyst and action-oriented group for widespread dissemination of agroforestry innovations in pilot areas and to provide coordinated and analytical mechanisms for participatory evaluation of the new technologies. The ARDN has facilitated identification of the right technical and socioeconomic issues in adapting agroforestry options.

The network held eight workshops between April 1996 and May 2001. The first workshop was hosted by the Zambia-ICRAF project in April 1996 and 57 representatives of extension services, NGOs and farmer groups attended the workshop (Kwesiga et al. 1997). Participants planned for wider testing of improved fallows, reviewed problems and the state of knowledge about them and developed a draft extension manual. Since then the network has been meeting once or twice every year, chaired by the provincial agricultural officer, who is responsible for the government agricultural programs in the province. In these workshops, representatives of extension services and NGOs present progress of their work and problems encountered in disseminating agroforestry options, farmers present their experiences, and researchers report the results of on-station and on-farm trials. Participants also plan training activities and strategies for germplasm production and distribution. Development practitioners exchange views on methods for scaling up of agroforestry options. During the workshops, partners report the research highlights, the status of agroforestry activities in their respective organizations, assessment of technologies and research issues. Farmers also presented their experiences on agroforestry technologies. This is followed by a synthesis of main issues emerging and plans for the following season. Two workshops were devoted to developing a dissemination strategy for 1999-2001 and designing monitoring and evaluation tools. The participants from different partners in each of the past eight workshops ranged from 26 to 69.
for their active participation in the network, sharing their time, knowledge and views, and showing patience with us. We sincerely thank staff of MAFF in Eastern Province for their support during the fieldwork; the Canadian International Development Agency, Swedish International Development Agency and KEPA–Zambia for providing funds for network workshops. We are also grateful to Dr. Sileshi Gudeta for reviewing the first drafts of the manuscript.

References


with capability to mobilise people for meetings. As improved fallows contribute to improving people’s livelihoods, it is hoped that such gatherings could provide opportunities for disseminating agroforestry technologies. Our study, however, revealed that 77% of the farmers were against involving local leaders as up-front extension agents for fear of misusing their authority (Kabwe 2001). Even the local leaders admitted that they can only help mobilise farmers to attend meetings and cannot actually disseminate the technologies. They saw themselves more as facilitators and not disseminators.

Disseminators should be accessible to farmers at all time. The government extension staff and farmer-trainers could therefore collaborate with the local leaders wherever they work and not necessarily involve them in activities that would jeopardize their authority. However, traditional leaders could contribute in disseminating improved fallows by themselves taking up the new technology so that their subjects could emulate them with confidence. A case in point is Senior Chief Nzamane and Chief Mbangombe. While farmers appreciated the involvement of traditional leaders in decision-making by virtue of their authority over the land, their role as disseminators was considered less effective, while their role as facilitators was rated very highly (Kabwe 2001).

**Conclusion**

The ongoing work on dissemination of improved fallows in eastern Zambia emphasizes the importance of communication, training, extension and follow-up research. The formation of ARDN network, frequent meetings and workshops involving all the stakeholders superbly served the purpose of achieving greater scaling up. Farmers and other institutions were involved as partners in the research process from the inception of the programme. Scientists spent a lot of time interacting with farmers during on farm research activities, which allowed them to respond quickly to farmers’ needs.

In disseminating complex agroforestry technologies, there should be continuous and accurate flow of technical information among collaborating partners. The ARDN workshops and meetings facilitated to articulate clearly the needs of farmers, extension staff and other partners. This high access to technical information has enabled most partners to disseminate agroforestry options to farmers with confidence.

The agricultural extension system in Zambia is faced with many challenges, the foremost being its inability to meet the demands of the field staff due to limited budgets. The strength of the government extension system, however, lies in its spread throughout the country from national to camp level, with staff working at different levels. NGO that can compensate for the government’s shortfalls should take advantage of the existing system to benefit as many farmers as possible.

Demonstration of the new technologies by farmer-trainers proved to be more convincing and meaningful to farmers than by professional extensionists because of similar background and farm conditions in which both groups live and work. Farmer-trainers should therefore be the first ones to experiment new technologies on their farms for others to see their benefits. They should work towards building local foundations such as groups and associations, which would allow them to continue pursuing agroforestry even when there is no external support. The local leaders are not effective disseminators as they are not easily accessible to the farming community. However, when participatory approaches are adopted, they will have a role to play in encouraging full participation of their subjects in development activities and planting seed orchards.

From this study, we conclude that farmer-trainers are very effective in dissemination of agroforestry innovations. However, local leaders, NGOs, collaborating partners, and government departments all need to be closely involved in the process and there is a need for frequent contacts among all players. All the participating partners should assume ownership and have to be respected for their contribution and innovation. The ARDN provided a forum for participatory evaluation of on-farm research, and acted as a catalyst and action-oriented group for widespread dissemination of the technologies in the Eastern Province of Zambia. This ARDN model could be adopted elsewhere within the southern Africa region for dissemination of agroforestry technologies.

**Acknowledgement**

The first author is grateful to the Government of Zambia for granting her study leave and to ICRAF for financial support through the African Network for Agroforestry Education (ANAFE) programme. We are indebted to the farming community, local leaders, District Women Development Associations of Chadiza, Chipata and Katete Districts in eastern Zambia, and other member organizations of the ARDN.
workshops, they could be held more accountable for their work. However, trainers are normally committed to serve their people in order to alleviate poverty of fellow farmers.

**Agricultural extension service**

Dissemination of new technologies has traditionally been the government’s responsibility through MACO. Agricultural extension officers based at camp level execute the extension tasks. They are capable of disseminating agroforestry innovations considering that they are well trained and experienced in working with farmers. However, lack of resources limited the work of extension staff. A survey conducted in Chadiza, Chipata and Katete revealed that extension staff experienced many constraints in their daily operations such as lack of transport, spare parts, stationery, teaching aids, fuel and finances. These limitations increase the time taken by them to pass on information on new technologies to farmers (Mitti et al. 1997; Katanga et al. 1999). Similarly, Hedden-Dunkhorst and Mollle (1999) reported on how the unfavourable structures and lack of financial resources, skills and motivation of extension personnel negatively affected agricultural development in southern Africa.

The survey further highlighted the negative perceptions of farmers against extension officers, although they do acknowledge the difficult conditions under which these officers operate. The extension officers lack of resources and support, and are therefore de-motivated. Reporting has become more of a routine task than addressing issues emanating from their work. As the government is unable to fully fund the extension service, it has been collaborating with NGOs to scale up agroforestry options. For example, MACO is a partner with WV-IAP, Lutheran World Federation, and Reformed Church in Zambia. These partners provide support to MACO staff in the form of fuel for transport, meal allowance, training, and tree germplasm for their work with farmers.

**Traditional leaders**

The ARDN identified local leaders as being influential...
be attributed to the involvement of farmer-trainers.

The greatest strength of farmer-trainers is their ability to experiment the technologies with farmers to determine their suitability to local conditions. Farmer-trainers have become more convincing to farmers than extension staff. In a monitoring exercise in Chipata District, it was observed that farmer-trainers who had prior experience of planting improved fallows on their farms had influenced more farmers to plant fallows compared with the newly trained farmers (Katanga et al. 1999). So, personal involvement with the technology could be used as one of the criteria for selecting farmers as trainers.

The use of farmer-trainers for dissemination is much more economical than government staff as there are no salary costs for farmer-trainers. They can reach more farmers as they are widely spread out, even in areas where agricultural extension services have not been able to reach. Their word carries more weight than government staff as they live with farmers and speak the same language as their colleagues, facilitating easy communication (Scarborough et al. 1997). Farmers and trainers face the same constraints, and they both have similar potentials and aspirations. This makes the job of farmer-trainers to understand the difficulties of fellow farmers easier compared with the extension staff. As the farmer-trainers live with other farmers, it is likely that farmers will approach them whenever they face problems. Some of the agricultural extension officers live far from the areas they are expected to operate. This makes it difficult for farmers to reach them except at planned meetings. Some of the challenges that farmers face may require immediate attention and if trainers are available to farmers at all times they will more useful than the extension staff.

One of the limitations of farmer-trainers is that it is difficult to hold them responsible for non-performance. If the farming community contributes at least to their working costs, for example through provision of a bicycle or meeting travel costs to attend
improved fallows (Kabwe 2001). Labor is critical at the establishment and management stages, especially for coppicing fallows which need continuous cutting back of the coppices and applying them as mulch to the associated maize crop. The period of labor requirement for fallows coincides with other farm activities such as production of food crops. Therefore, species that can be sown directly using seeds such as T. vogelii and Cajanus cajan, and intercropping of trees with maize were suggested as labour saving techniques. Labor studies were initiated to quantify labor use in different soil fertility management options and determine returns to labor and other farm inputs in coppicing and non-coppicing fallows.

The magnitude of fallow effect is an important determinant for continued use of fallows by farmers. Farmers requested ICRAF to come up with ways to prolong the residual effects of fallows. This has led to new experiments on mixed fallows to develop systems for efficient resource capture and prolonging residual effects. In these experiments, mixtures of coppicing + non-coppicing shrubs and trees + herbaceous species were examined.

The different collaborating partners have also recommended for sourcing and distribution of seeds of species such as T. vogelii for direct seeding to reach out more farmers. They therefore requested ICRAF to conduct more research on direct seeded species. In response to this, ICRAF has been evaluating three provenances of Tephrosia candida from Madagascar and eleven provenances of Tephrosia vogelii on 12 farms across a gradient of soil type, rainfall and altitude for their biomass production, quality of foliar biomass and effects on maize yields (Mafongoya et al. 2003). Farmers are already excited with the performance of T. candida provenances from Madagascar, which produced twice the biomass of T. vogelii provenances.

In many workshops, partners mentioned about a beetle Mesoplatys ochroptera defoliating the Sesbania fallows. The follow up activities in response to the pest problem have led to the development of extension materials for field extension staff on the management of the Sesbania beetle and training of farmers in monitoring and managing pests (Silesbi and Katanga, undated).

Farmer trainers

The failure of agricultural extension services to make an impact on the adoption of new technologies has stimulated interest in alternative approaches to extension (Duvel 2000). Farmer participation in agricultural development plans is becoming a central issue of our time (Fraser and Villet 1994). The use of farmers as extension agents has been tried in many developing countries. Scarborough et al. (1997) reports of such cases in Latin America and Asia where farmer extensionists were used not only in areas where agricultural extension has failed but also where there were no such services.

In the case of improved fallows in eastern Zambia, the use of farmer-trainers and local leaders as alternatives has been considered for reaching out more numbers of farmers effectively and in a sustainable manner. The use of farmer-trainers as a dissemination pathway requires that specialists in various aspects of the technology train selected farmers so that they can in turn train fellow farmers.

A study was conducted on 51 farmer-trainers to understand their potential in relation to spreading improved fallows (Kabwe 2001). Of these farmer trainers interviewed, 82% were females and 18% males. They have been working as extensionists for only two years at the time of the survey, yet farmers already talked highly of them. Seventy-six percent of the farmers felt that farmer-trainers were more effective for dissemination of improved fallows than government extension staff. They were the source of information on improved fallows to 41% of the 296 farmers interviewed in comparison with the government agricultural extension officers who provided the first information to only 28% of the farmers. These two sources combined reached 69% of farmers, which was 12% lower than that reported by the Ministry of Agriculture and Cooperatives (MACO) in its survey in Eastern Province (MAFF 2000). Despite being working for only two years, farmers-trainers surpassed the agricultural extension service who had been promoting the technology for over 10 years in spreading the technology. In spite of ICRAF organizing radio programmes in local language for six weeks, only 1% of farmers indicated the radio as their initial source of information on improved fallows (Figure 2). MACO also reported similar results (MAFF 2000). The farmers that identified ICRAF as their source on improved fallows were mainly those that had been involved with on-farm trials.

The period within which farmers could know about improved fallows spanned from 1989 to 2000. Until 1997, only 24% of the farmers had heard about improved fallows (Figure 3). There was, however, a significant increase from 1997 onwards, which could
farmer exchange visits, establishing demonstrations, and working with local chiefs. Courses for training of trainers were conducted and this has resulted in six partners working with a network of approximately 264 farmer trainers or lead farmers. The number of farmers who had planted improved fallows increased from 3000 in 1997 (Kwesiga et al. 1999) to approximately 21000 in 2001 (Figure 1).

The network initiated collaborative work with the World Vision Zambia Integrated Agroforestry Project (WV-IAP). This project was supported by the United States Agency for International Development (USAID) and its main thrust was to reach at least 12 000 small-scale farmers and make them adopt or test improved fallows.

Often farmers and partners lose interest in participating in agroforestry innovation if there is a shortage of seed. The issue of seed supplies needs proper planning in terms of which partner wants what seed, how much and who the supplier is. The ARDN provided a good forum for knowing the demand for tree seed among partners and for discussing modalities of timely supply to them.

At the start of the network, most partners requested for the seed of Sesbania sesban and Tephrosia vogelii, which was provided by ICRAF. However, as partners became experienced with the technology over years, the issue of labor came up as one of the constraints for establishing the fallows. Consequently, they asked for the seed of species like T. vogelii that can be planted by direct seeding in order to reach out more farmers. The demand for improved seed, especially for T. vogelii, Cajanus cajan and Gliricidia sepium, has increased over the years. Consequently, the Ministry of Agriculture and Cooperatives established seed orchards of G. sepium, S. sesban and T. vogelii at Farmer Training Centers throughout the province. The WV-IAP also contracted farmers to grow T. vogelii and S. sesban for seed production. The Chipata District Women Development Association has established community seed orchards for the above four main species.

Research institutions are often accused of driving research agendas that are not relevant to farmers’ needs and are poorly linked to extension (Denning 2000). However, the most outstanding feature of ARDN has been its ability to provide feedback into the research process, enabling researchers to refine their experiments or designing new ones to answer the needs of the farmers and partners. This was possible as a result of close interaction between researchers and partners during the meetings. The ARDN has provided feedback on several issues, which got incorporated into the research process.

 Farmers brought to the attention of network members at the first two workshops the issue of high labor requirement as one of the constraints for adoption of
Table 1. List of collaborating partners with ICRAF-Zambia agroforestry project on disseminating improved fallows as on 2001.

**Government organisations**
- Ministry of Agriculture, Food and Fisheries: National Agricultural Information Service (Eastern Province)
- Ministry of Education (Eastern Province)
- Ministry of Environment and Natural Resources: Department of Forestry: Extension Division (Eastern Province)
- Ministry of Agriculture, Food and Fisheries: Department of Field Services (MAFF) in different districts
- Department of Research and Specialist Services (Eastern Province)
- Ministry of Environment and Natural Resources: Department of Forestry: Division of Forestry Research (Copperbelt Province)
- Magoye Research Station: Cotton Development Trust (Southern Province)

**Colleges and schools**
- Ministry of Agriculture, Food and Fisheries: Zambia College of Agriculture (Southern Province)
- Chipata Teacher Training College (Eastern Province)
- Kapita Primary School (Eastern Province)

**NGOs and other organisations**
- KEPA Zambia - Finnish NGO Partnership Programme (Lusaka Province)
- CARE (The Livingstone Food Security Project) (Southern Province)
- World Vision International (WVI), Zambia
- PLAN International Zambia (Eastern Province)
- Peace Corps (Lusaka Province)
- District Women Development Association (DWDA) of Chipata, Chadiza, Katete and Chama
- Chinchi wa Babil R.D Project (Catholic Church) (Northern Province)
- Reformed Church of Zambia Development Program (Agriculture Project) (Eastern Province)
- Lutheran World Federation (LWF); Rural Community Development Project (Eastern Province)
- MAFE-SIDA-Soil Conservation and Agroforestry Extension Project
- CLUSA/USAID (Community-based Natural Resources Management Program, Eastern Province)

**Private companies**
- DIMON Zambia - Tobacco Development Company Ltd Zambia & Overseas Tobacco Company Ltd (Chipata + Chadiza)

The benefits of networking are that people and organizations exchange information and share knowledge and skills that are difficult to get through independent works. The ARDN has created a forum for organizations to share their knowledge, skills and assets and assess the state of the art knowledge on agroforestry. The network meetings brought out that the most important constraints to wider adoption of technologies were limited awareness of agroforestry options, inadequate capacities of partners and farmers, and lack of access to adequate germplasm (Bohringer et al. 1999).

During these meetings, partners requested ICRAF to provide extension materials on the improved fallows and training on different technologies. This gave ICRAF and its partners the mandate to develop various training programs for both farmers and extension staff. The number of training programs conducted by different collaborating partners has increased substantially over the years from 29 in 1996 to 501 in 2001, with partners putting in their financial resources.

A major task of the network at each meeting was to plan for scaling up activities for the subsequent season. The planning process included deciding on the type of activities, developing schedules of implementation, assigning responsibilities to partners and exploring resources for the activities. At the meetings, scaling up strategies were also elaborated which included farmer-to-farmer training, field days,