PRIZREN SOCIAL SCIENCE JOURNAL
VOLUME: 6
ISSUE: 3
SEPTEMBER- DECEMBER, 2022

ISSN: 2616-387X
DOI: 10.32936/PSSJ

www.prizrenjournal.com
info@prizrenjournal.com

DRAWING EXPERIENCES ON PARTICIPATORY FORESTRY EXTENSION APPROACHES: IMPLICATION FOR FORESTRY EXTENSION IN ETHIOPIA

SCAN ME

Omer HINDE

Ethiopian Forest Development;, Socio-Economic Policy, Extension, and Gender Research Program, naaftoli@hotmail.com

Article history:

Submission 19 July 2022
Revision 15 October 2022
Accepted 17 November 2022
Available online 31 December 2022

Keywords:

Forestry Extension,
Technology Development,
Participatory Approaches,
Ethiopia.

DOI:

https://doi.org/10.32936/pssj.v6i3.350

Abstract

Forestry extension in Ethiopia has been mirrored in the agriculture extension package as one aspect commonly to address land and forest degradation. In contrast to the top-down approach, the participatory extension has given momentum to promote afforestation and rehabilitation of degraded land for transferring sufficient knowledge and addressing growers' choices to raise tree species for various purposes. However, the research on forestry-related participatory technology development, adaption, and extension seems overlooked. The purpose of this review was to draw on the experiences of countries with low economic development on participatory forestry technologies development and extension. Hence, I reviewed good practices of various selected countries where forestry participatory extension approaches have been effective. The result of the review shows that participatory extension approaches like group training, demonstration trial, farmer's field school, and community-based extension approaches have been effective in forest management and livelihood development in the forest sector. Therefore, the review implies that key forestry stakeholders engaging in research, technology development and extension should prioritize participatory approaches to address both community needs and ecological aspects.

1. Introduction

Ethiopia is rich in diverse natural resources, particularly in forest resources (Amogne, 2014). Forest provides various socio-economic and ecological benefits, which are related to the overall economy, and combat land degradation and desertification (Million, 2011). In light of this Ethiopia emphasized sustainable forest sector development for better socio-economic and environmental outcomes (Abab, 2018). Environment, Forest and Climate Change Commission (EFCCC) then the Ministry of Environment, Forest and Climate Change (MEFCC) initiated National Forest Sector Development Program (NFSDP) for strategic policy interventions. The goal was to provide strategic directions for natural resources management and forestry actions in particular (MEFCC, 2018). However, Malmer & Sollander (2019) viewed stakeholders' uncertainties about the implementation of NFSDP as a need to take measures like extension services for increased efficiency of the sector.

Forestry extension has been mirrored in the agriculture extension package as one aspect commonly to address land and forest degradation. According to Turner & de Satge (2012), tree planting has been emphasized in the last several decades to address land degradation. In light of this, the promotion of degraded land restoration has been practiced within forestry in a non-participatory approach. Thus, natural resource utilization and conservation were considered forest-related extension packages (Carlsson et al., 2005). This approach had been criticized for transferring insufficient knowledge and lack of planting materials particularly for growers' choices to raise tree species for various purposes (Achalu et al., 2003).

It is noted that extension has to envisage building local capacity and innovation based on an understanding of forest producers' circumstances. Thus, there should be an understanding of the local target group's sensitivities to constraints and livelihood opportunities (Turner & de Satge, 2012). The promotion of agroforestry through tree planting and participatory forest

management has given attention to forestry extension (Ibid). In the last decade, the strategy of tree planting to reverse forest degradation has been conducted each year seems to increase forest coverage in Ethiopia (Kilawe and Habimana, 2016). However, the literature indicates that it lacks the active participation of local people and a sense of ownership. According to Wassie et al. (2014), non-participatory approaches were bottlenecks to the dissemination of NRM technologies. They suggested the need for greater participation and empowerment of communities for the accelerated dissemination of NRM technologies. Different participatory rehabilitation strategies in Ethiopia are constrained mainly due to the absence of uniform participation and unfair benefit-sharing (Zewdu & Beyene, 2018).

According to Alemayehu et al. (2017), there was a discrepancy between the institutional participatory forest management (PFM) principles and local forest management practices. They put forward, the need to understand and fix PFM according to the local context. Duguma et al. (2019) found lack of local communities' participation in forest resource use and its management was among the major factors, which undermine the sense of community ownership and in turn lead to the illegal exploitation of forest resources. Kassahun & Omer (2019) recommended in their study that PFM needs the active participation of relevant stakeholders from the local community, and religious leaders, including government and non-government agencies to create enabling environment for forest conservation. They further put forward that the local community still needs knowledge and skill as well as the confidence to exercise PFM.

Ethiopian Forest Development is mainly mandated nationally to import and adapt relevant technologies; conduct rigorous research; disseminate technologies, knowledge, and skills related to forest protection, its management, and appropriate utilization. Having different research programs established for different research themes, it has also a role to advise and provide forestry-related research output in matters of technology generation, adaption, and dissemination. Hence, this piece of review literature focuses on forestry-related participatory extension approaches in technology development and dissemination. It picks up on good practices where participatory extension approaches of different projects contributed to the livelihood of the community as well as sustainable ecological goals mainly in developing countries.

2. Methods

A narrative review was employed to draw the experiences of selected countries on participatory technology development and extension approaches related to the forestry sector.. Countries were selected mainly from Africa and Asia to relate the context of economic development status to Ethiopia. Hence, different kinds of literature through google and google scholar search engines mainly journals including conference papers, dissertations, reports, and project works were collected and reviewed. The review analysis picks on approaches and synthesized themes for this specific topic. Thus, the reviewed literature was based on the theory and empirical research papers as well as successful practices of participatory technology development, adaption, and extension in the projects.

Table 1. Major selected countries on participatory forestry extension approaches

Selected countries	Topics	Extension Approaches	Theme	References
Vietnam, Laos, and Indonesia	Forest restoration and sustainable management	Forest landscape approach	Addressing the needs of forest users	Nguyen *et al*., 2017
Tanzania	Dissemination of agroforestry innovations	Participatory training	Active participation	Matata *et al*., 2013
Malawi	Forest protection	Demonstration trials and farmer-to-farmer extension	Women's inclusion and considering local knowledge	Jafry *et al*., 2014
Indonesia	Agroforestry technologies	Method and result demonstrations	Farmer's involvement through the practice	Martini *et al*., 2016
Uganda	Forest conservation	Group training	Community involvement	Buyinza *et al*., 2015
Indonesia	Development of sustainable landscapes	Farmers Field School	Agroforestry as the primary basis for livelihood	Martini *et al*., 2017
Ghana, Malawi, and Uganda	Agriculture yield increase	Community-based extension approach	Participatory community approach	Wellard, 2011
Bangladesh	Innovation and expansion of garden floating	Community-based extension approach	Engaging key stakeholders	UNFCC, 2014

Viet Nam	Community-related forestry programs	Community-based extension approach	Involvement of ethnic minorities forest users	ADB, 2014b
Philippines	Land restoration project	Community-based extension	Matching the needs and interests of the community	Gregorio *et al*. 2020

3. Review Literature Finding

3.1. Concept of Technology

In academic literature, technology generally refers to both physical tools and information as it advances previous material functions as well as a system of institutional actions (Thomas and Muthukumara, 2008). Likewise, United Nations Framework Convention on Climate Change (UNFCCC, 2014) and Christiansen et al. (2011) classified the technology into three major aspects, which refer to physical tools; processes, knowledge, and skills; and institutional arrangements relating to technology respectively. They noted that similarities and differences between various technologies nature need to consider for their adaptation. Interchangeably used to technology, innovation could be knowledge or a tool as it advances new adopter's practices (Everett, 2003). Thus, various socio-economic and environmental challenges can be addressed, and also vulnerabilities of climate change can be alleviated by applying technologies (ADB, 2014b).

Technology transfer includes aspects of the movement of knowledge and networking which needs communication between the producer organizations and recipients. It has also an aspect of deliberate economic and social goals (Maeve et al., n.d). Thus, technology transfer requires the acquisition of tools as well as knowledge and skill transfer to run or manage for further independent innovation by the community to local conditions (Third World Network, n.d.). Innovation needs to be translated and validated in perspectives of local socio-economic and agroecological conditions in target areas (Cramb, 2000). According to ASARECA (2014), technology or innovation has to be tested and validated to local aspects before dissemination for wider adoption.

3.2. Participatory Technology Development

In the review literature, Participatory Technology Development (PTD) has commonly been interchangeably used with Participatory Innovation Development (PID). Here, in this review, PTD is used for the sake of suitability to terminology, which our institute adapted. PTD basis on the internal capacity of rural communities linking research with extension to meet the desires of farmers and communities for innovation in natural resource management (Bao Huy et al., 2002). They further noted that the participatory approach empowers the community at the local level; which technically and innovatively improves organizational or management systems. According to Cramb (2000), the approach has been proven to be appropriate to address farmers' needs and local circumstances. He puts forward participatory technology development process should be stimulated within the context of participatory extension.

According to Nguyen et al. (2016), the main emphasis of PTD is considering both local and scientific knowledge in research by involving relevant stakeholders. The approach empowers local people to discover either new things or ways that work or both, which contribute to improving the livings of the rural community. In PTD, key stakeholders in collaboration test technologies that are suitable to local situations. Thus, farmers and researchers have an experimentation role in technical aspects, while extensionist facilitates the process of interactions (Helvetas Vietnam, 2007). Farmer participatory research is appropriate for developing need-based technology and advantageous for incorporating indigenous knowledge in the process of technology development (Jafry et al., 2014). According to Bao Huy et al. (2002), there are two conditions under which PTD could be applied. The first is When farmers or communities can face difficulties but are unable to find answers to overcome themselves. It serves as an occasion for key stakeholders for working together in a proper mechanism in various trials. In other cases, farmers or communities could have a better idea on different matters but it needs to be tested. This is also an opportunity in which key stakeholders in research propose and facilitate new investigations on different issues.

3.3. Forestry Extension

Forestry extension having organizational character enables people with knowledge, skills, and technologies to solve their problems in forest production to advance their living and welfare (Kumeh, n.d.). According to (Anderson & Farrington, 2012) in an organized process: forestry extension focuses on concepts, information, and procedures sharing, which leads to changes in attitude and behavior aiming at the improvement of forest management and its usage. Thus, forestry extension is intended to address the needs of forestry managers and users with scientific information and technologies regarding biodiversity and forest conservation as well as agroforestry and wood processing (Agbogidi & Ofuoku, 2009). Further, they indicated that forestry perspectives research and extension bridge rural and urban mutual relationships on socio-economic and ecological aspects.

Tesfaye (2011); Kandzior & Rivas (2015) complimented forestry extension should consider the socio-cultural, organizational, and geopolitical circumstances of the region including the context of the local market related to forest products as well as environmental services. They emphasized the need to practice real and effective participatory extension over nominal participatory forestry extension. Davis (2004) advised extension approaches should enable farmers' groups to access information on new practices by assisting them with resource mobilization other than their villages.

3.4. Participatory Extension Approach

The development of technology and its transmission should consider socio-economic, political, and institutional aspects (Olhoff, 2015). Thrupp (1996) cited in Anandajayasekeram et al. (2008) maintains one of the major factors for the achievement of the knowledge and technology transfer process is involvement and building capacity at the local level. Kalim (2011) noted that the motive behind the participatory extension approach is that the concerns of the local people are addressed better in the process of the extension planning exercise. Thus, locally-based community participation before implementation would give impetus to the approach with the facilitation of extensionists. The participation of the community in all stages of forest management is a prerequisite for sustainable forest management and its conservation (Secretariat of the Convention on Biological Diversity, 2009).

There has been growing agreement in the literature that participatory research and technology development is one of the keys to the adaption of technology. According to Cramb (2000), Participatory research and extension activities brings better result in technology development and enhance the problem-solving capacity of farmers as its basis on community needs at the local level. Sustainable land management research and promotion of its technologies could be effective where there is an opportunity for mutual skills and knowledge sharing as well as the active involvement of the local community (Eneku et al., 2013). UNFCC (2014) maintains that community-based participatory approaches enhance the duplications of local innovations, and ensure sustainability and fitness to the local context. They further stress participatory approaches increase stakeholder understanding and build a sense of ownership of technologies as well as improve and sustain adaptation of technologies. Participatory extension methods go beyond farmers' knowledge and concerns. It has more advantages in facilitating the process of action research needed to improve proper technologies and build the capacity of farmers in problem-solving skills (Anderson & Farrington, 2012). According to Egziabher et al. (2013), the participatory extension approach focuses on community empowerment in producer groups better than purely transferring information and improving management practices on new technologies.

3.5. Group Extension Approaches

Extension methods are generally grouped into Individual, group, and media methods. But in terms of cost and effort saving, media and group methods are favored respectively. Media methods lack two-way communication though it has the advantage of more coverage (Anandajayasekeram et al., 2008). According to Darr (2008), communicating the basic technical message of technologies is best popularized through the group extension approaches with similar socio-economic and cultures of the low-income community. It also saves time for development persons to address an easily larger portion of the population (Jafry et al., 2014). The other advantage of group extension approaches is generally need-based and employed as the need arises from locals (Buyinza et al., 2015). Hence, several participatory group extension approaches could be used according to the context of technology for adaptation in the forestry aspect. Some are group training, community-based approach (village level), group visits, Demonstration training, Agroforestry field school, Field day, Farmer tour, etc. (Kabwe, 2010; Jafry et al., 2014; Buyinza et al., 2015).

3.6. Participatory Group Extension Approach

3.6.1. Group training and demonstration trials

Literature review shows in participatory group extension approaches; participants could mobilize resources, labor, and share experiences. Among group extension approaches, farmer field days and farmer groups were preferred hence including farmers' own experience and practices (Adolwa et al., 2012). According to Jafry et al. (2014), the farmer group is a common extension approach with the benefits like group labor and support for each other mutually around common interests. For instance, they put forward that farmers could share experiences and practices through group training and demonstration on selected lead farmers' farms. Group training could also be provided in the form of demonstrations and field days directly on farmer's fields (Nguyen et al., 2016). Thus, farmers in groups met during demonstrations and field days together to test better practices, but also benefit from mutual learning among themselves. In a typical demonstration, different techniques are compared side by side to show the advantages of the new technology at specific extension events (Ibid). Consequently, farmers in the village are invited for training purposes while visiting demonstration sites (Buyinza et al., 2015). It is argued that the group training approach proved to be effective due to peer influence and competition among

members in the group. According to a study conducted by ADB (2014a), group extension approaches have a good output in relation to efficiency and cost-effectiveness in pilot projects in Asia.

3.6.2. Farmer's field school (FFS)

Studies show that Farmer Field School is an effective group participatory extension approach though it required a relatively higher cost. Farmer field schools' concepts using participatory training procedures address farmers' felt need for advanced extension approaches (Martini et al., 2016; Egziabher et al., 2013). It enhances farmers' information and investigative skills through participatory learning in managing their agroforestry farms (Martini et al., 2017). It recognizes that farmers' local knowledge and experience need to be shared. It also acknowledges farmers learn from each other better than from the extensionist (Helvetas Vietnam, 2007). Moreover, FFS with the common objective of groups of farmers is an appropriate way where stakeholders exchange learned lessons, understandings, practices, and any innovative ideas. It also encourages farmers to practice their ideas in their fields (Buyinza et al., 2015). However, Jafry et al. (2014) put farmer field schools incur huge costs to train and support several farmers in the basic principles of testing as per the local context.

3.6.3. Community-based extension approach

Studies show community-based extension approach also uses a participatory learning process, which addresses community needs and acknowledges local knowledge as an alternative to other group extension approaches. According to Anandajayasekeram et al. (2008), joint learning is the key to community-based extension, in which extension staff plays a facilitation role. It considers the integration of indigenous knowledge taking into account opportunities and challenges in the technological adaption process to the acceptable local context (UNFCC, 2014). Agbogidi & Ofuoku (2009) suggest using the village-level extension approach for it considers optimal forest system and forest users' constraints as well as ways of reducing the constraints for better results in forest community's behavior. They implicate the use of numerous communication methods for introducing new techniques into the forest community. According to Cramb (2000), in each step of the community-based extension approach, farmers engage in some degree of the investigation if it applies to adult education. The approach applies in a new context, where extension service was previously not employed by following four steps. The first step is where farmers identify their problems and needs which extensions support with technical options based on the farmer's expressed needs. In the second step, selected farmers trained and implement new technology with the technical information they provided. The third step is following up step for mistakes that arise and provide with additional technical advice. It is also where comparison began with previous practices. In the final step, model farmers appraise their trial output and give feedback about the lessons learned to their respective villages (Ibid).

3.7. Good Practices

There are several pieces of evidence in the literature, which show best practices related to the restoration of degraded lands, agroforestry practices, forest conservation, and utilization as a result of the application of participatory extension approaches. According to Abdo (2014), several projects in the 20th century in the Sahel region succeeded primarily as a result of participatory extension approaches. Also, studies have shown that the collaborative innovation model, information sharing, and innovation development based on community acceptability helped successful forestry extension programs in Catalonia, Slovenia, and Italy respectively (Ewnetu & Bliss, 2010). The Forest landscape approach in Vietnam, Laos, and Indonesia had a better outcome in developing appropriate, long-term restoration and sustainable forest management plans as the result of communications and decision-making platforms that better represent the needs of all forest users (Nguyen et al., 2017).

3.7.1. Participatory training and Demonstration trials

In terms of participatory training and demonstration trials, there are indications in the literature to look at them to draw some lessons. For instance, in western Tanzania, farmer trainers were effective in the dissemination of agroforestry innovations (Matata et al., 2013). In Malawi, demonstration trials and farmer to farmer extension were effective as it allows women farmers to raise their concerns and respect for indigenous knowledge (Jafry et al., 2014). The establishment of a demonstration plot for agroforestry projects enhanced farmers' knowledge in Sulawesi, Indonesia (Martini et al., 2016). Group training was effective in Eastern Uganda during the implementation of forest conservation through a territorial approach under the different programs (Buyinza et al., 2015). Agroforestry farmers field school(AFFS) implementation has also contributed to the development of sustainable landscapes in Sulawesi where agroforestry is the primary basis of livelihood of farmers as the result of better practices was supposed to be the most important feature of motivating farmers (Martini et al., 2017).

3.7.2. Community-based extension Approach

Literature evidence shows that the community-based extension approach could be successful if appropriately apply participatory methods in different projects. The approach has proven in

agriculture yield increase at the same time food secured in rural areas of Ghana, Malawi, and Uganda (Wellard, 2011). The other example was a successful technological innovation replicated through a community-based extension approach that came from the innovation and expansion of garden floating in Bangladesh. It is pointed out that the experience implicated the importance of engaging local government in the promotion of the technique, which ensures access to the resources (UNFCC, 2014). According to (ADB, 2014b), the approach has also shown sustainability, especially among ethnic minorities of forest users and local people in Viet Nam, also in different Asian countries and the Pacific region. Key lessons in locally based projects for restoration in the Philippines and other developing countries have shown that the need to match the community's demands through the participatory process during project design, proved the success of the project. Moreover, they found financial earnings and ensuring food security are major determinants of smallholder farmers' involvement in the management of forests (Gregorio et al., 2020).

3.8. Forestry extension in Ethiopia

Government advocates forestry extension activities for the community to take responsibility for forest restoration and its management. For community support: one of the three DAs in farmer's training centers(FTC) is responsible to address the conservation of natural resources; which include forests, irrigation at the village level, and bunds for conservation of soil and water purpose (Turner & de Satge, 2012). However, the challenges in forestry extension like the operation of forestry activities in the longer time frame; publicly owned and common property forest resource nature; mostly as its secondary activity; and forestry ecological consideration seems to have been affecting its extension (Anderson & Farrington, 2012). After the first Growth and Transformation Plan (GTP), agroforestry and participatory forest management have gained emphasis (ATA, 2014). Its basis is on FTC with a full extension package by organizing farmers into development groups and social networks. But among the key challenges for the inadequate performance of FTCs were the lack of farmers' involvement in FTC management and limited farmers' training as the focus is on model farmers (ATA, 2017).

Studies show there was a notable achievement in natural resource conservation through community mobilization. But lack of genuine participation and a sense of ownership resulted in low adoption of natural resource practices (ATA, 2017). It further put low farmers' participation in technology development attributed to low adoption of new technologies and practices. For instance, according to Birhane (2014), one of the reasons for the low adoption of agroforestry technologies was weak farmers' participation and research-extension linkage. He suggested participatory approaches of farmers in the management of agroforestry practices and technologies for better land management practices and productivity. Moreover, the need for coordination among stakeholders involved in natural resource management. According to Genanew et al. (2018), public agricultural extension advisory and its system are criticized for being nominal participatory, which is top-down. Dufera (2018) further explained participatory extension system in Ethiopia was constrained due to the extension staff's lack of knowledge and facilitation skills gaps as well as isolated resource-poor farmers in the planning and implementation process among other factors, which limit stakeholder technology adaption and extension. He put forward the need for farmers' active participation to develop farmers' sense of ownership through realistic decentralization at the local level.

5. Conclusions and Recommendations

Ethiopia's attention to forest conservation and management as well as utilization should give due consideration to participatory technology development and extension. Research on participatory extension approaches has to be given attention to promote afforestation and rehabilitation of degraded land for transferring sufficient knowledge and addressing forest managers' and users'concerns. Experiences in different countries in Africa and Asia show the application of various participatory forestry extension approaches has been effective in forest-related technology development and extension.

For Forestry extension to be effective, there should be consideration of different participatory extension approaches. Different stakeholders engaged in forestry-related research, technology development and adaption and dissemination need to address social aspects and livelihood through participatory approaches. Moreover, the review indicates the need for research on whether institutional factors affect forestry extension from Ethiopian perspective.

Acknowledgment

I wish my credit go to all authors for their substantial contribution to the studies reported in this paper.

References

1. Abab, S. A. (2018). Understanding the Emerging Dynamics in Forest Governance in Ethiopia. Land Governance in an Interconnected World. Paper presented at the World Bank Conference on Land and Poverty. The World Bank - Washington DC, March 19-23, 2018.

2. Abdo, M. (2014). Practices, techniques, and technologies for restoring degraded landscapes in the Sahel. African Forest Forum, Working Paper Series, Vol. (2)3, 42 pp.
3. Achalu, N., Uibrig, H., & Weisshahn, G. (2003). Status and Prospects of Farm Forestry Practices in Central Ethiopia, a Case of Western Guraghe Highlands. International Conference on African Development Archives. Available at: https://scholarworks.wmich.edu/africancenter_icad_archive/81.
4. ADB (Asian Development Bank) (2014a). Scaling Up Payments for Forest Environmental Services in Viet Nam: Lessons and Insights from Quang Nam. Mandaluyong City, Philippines.
5. ADB (Asian Development Bank) (2014b). Technologies to support climate change adaptation in developing Asia. Available at: https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf
6. Adolwa, I. S., Okoth, P. F., Mulwa, R. M., Esilaba, A. O., Mairura, F. S., & Nambiro, E. (2012). Analysis of Communication and Dissemination Channels Influencing the Adoption of Integrated Soil Fertility Management in Western Kenya. Journal of Agricultural Education and Extension, 18(1), 71–86. https://doi.org/10.1080/1389224X.2012.638782
7. Agbogidi, O. M., & Ofuoku, A. U. (2009). Forestry Extension: Implications for forest protection. International Journal of Biodiversity and Conservation, 1(5), 98–104. https://doi.org/10.5897/IJBC.9000064
8. Amogne, A. E. (2014). Forest resource management systems in Ethiopia: Historical perspective. International Journal of Biodiversity and Conservation, 6(2), 121–131. https://doi.org/10.5897/ijbc2013.0645
9. Anandajayasekeram P, Puskur R, Sindu Workneh and Hoekstra D. (2008). Concepts and practices in agricultural extension in developing countries: A source book. IFPRI (International Food Policy Research Institute), Washington, DC, USA, and ILRI (International Livestock Research Institute), Nairobi, Kenya. 275 pp.
10. Anderson, J., & Farrington, J. (2012). Forestry extension: facing the challenges of today and tomorrow. Available at: http://www.fao.org/docrep/v9122e/v9122e02.
11. ASARECA [Association for Strengthening Agricultural Research in Eastern and Central Africa] (2014). ASARECA Strategy for Scaling Up Agricultural Technologies and Innovations: 2014–2018. ASARECA, Entebbe.
12. ATA (Agriculture Transformation Agency) (2017). Ethiopia's s Agricultural Extension Strategy: Vision, Systemic Bottlenecks and Priority Interventions. 63. Available at: http://compendium.g-fras.org
13. ATA (Agriculture Transformation Agency) (2014). National Strategy for Ethiopia's s Agricultural Extension System. (December). Available at: http://extwprlegs1.fao.org/docs/pdf/eth190334.pdf
14. Alemayehu N. Ayana, Nathalie Vandenabeele & Bas Arts (2017). Performance of participatory forest management in Ethiopia: institutional arrangement versus local practices, Critical Policy Studies, 11:1, 19-38. https://doi.org/10.1080/19460171.2015.1024703
15. Bao Huy, Vo Hung, Hoang Huu Cai (2002) Handbook of Participatory Technology Development (PTD). Social Forestry Training Network. Available at: https://cupdf.com/document/handbook-of-participatory-technology-development-ptd-ptd-is-an-innovative-approach.html
16. Birhane, E. (2014). Final Report Agroforestry Governance in Ethiopia. 1–50. Available at: https://www.worldagroforestry.org/sites/default/files/outputs/Birhane,%20E.%202014.%20Agroforestry%20Governance%20in%20Ethiopa%20Report%20WP%205.pdf
17. Buyinza J, Sekatuba J, Agaba H, Kinuthia, R and Kiptot, E. (2015). Analysis of Extension Systems in Uganda for Identification of Suitable Extension Approaches for Scaling-up “Trees for Food Security Project” in Eastern Uganda. NaFORRI, Kampala, Uganda/ICRAF, Nairobi, Kenya, 64. Available at: worldagroforestry.org
18. Carlsson, F., Köhlin, G., Mekonnen, A, & Yesuf, M. (2005). Are Agricultural Extension Packages Really What Ethiopian Farmers Want? A Stated Preference Analysis. Working Papers in Economics no. 172. Department of Economics; Göteborg University. Available at: http://hdl.handle.net/2077/2747
19. Christiansen, L., Olhoff, A., & Trærup, S. L. M. (2011). Technologies for Adaptation - Perspectives and Practical Experiences. Roskilde: Danmarks Tekniske Universitet, Risø Nationallaboratoriet for Bæredygtig Energi. (Technology Transfer Perspectives Series).
20. Cramb, R. A. (2000). Processes Influencing the Successful Adoption of New Technologies by

Smallholders. Conference Paper/ Presentation. Australian Centre for International Agricultural Research (ACIAR) > ACIAR Proceedings Series. https://doi.org/10.22004/ag.econ.135365

21. Darr, D. (2008). Effective Even When Neglected: Farmer Groups and the Diffusion of Agroforestry Innovations in Rural Communities of Eastern Africa. Dissertation. Available at: http://nbn-resolving.de/urn:nbn:de:bsz:14-ds-1227250287917-45148
22. Davis, K. E. (2004). Technology Dissemination among Small-scale Farmers in Meru central district of Kenya: Impact of Group Participation. Dissertation, University of Florida.
23. Duguma, Lalisa A., Joanes Atela, Peter A. Minang, Alemayehu N. Ayana, Belachew Gizachew, Judith M. Nzyoka, and Florence Bernard (2019). "Deforestation and Forest Degradation as an Environmental Behavior: Unpacking Realities Shaping Community Actions" Land 8, no. 2: 26. https://doi.org/10.3390/land8020026
24. Egziabher, K. G., Mathijs, E., Gebrehiwot, K., & Bauer, H. (2013). The Economic Impact of a New Rural Extension Approach in Northern Ethiopia. Working or Discussion Paper. https://doi.org/10.22004/ag.econ.146558
25. Eneku, G. A., Wagoire, W. W., Nakanwagi, J., & Zonal, B. (2013). Innovation platforms: A tool for scaling up sustainable land management innovations in the highlands of eastern Uganda. 21(1), 751–760. African Crop Science Journal. eISSN: 2072-6589.
26. Everett M. Rojers (2003). Diffusion of Innovation, 5 th ed . Free Press: A Division of Simon & Schuster, Inc. New York.
27. Ewnetu, Z., & Bliss, J. C. (2010). Small Scale Forestry in a Changing World Opportunities: Opportunities and Challenges and the Role of Extension and Technology Transfer. Proceedings of the Conference on Small Scale Forestry in a Changing World, (June), 880. Available at: https://www.iufro.org/fileadmin/material/publications/proceedings-archive/30800-et-at-bled10.pdf
28. Genanew, A., Sisay, Y., Asegid, D., & Abebe, D. (2018). Technological gaps of agricultural extension: Mismatch between demand and supply in North Gondar Zone, Ethiopia. Journal of Agricultural Extension and Rural Development, 10(8), 144–149. https://doi.org/10.5897/jaerd2018.0954
29. Gregorio, N., Herbohn J., Tripoli T., and Arturo P., (2020). "A Local Initiative to Achieve Global Forest and Landscape Restoration Challenge—Lessons Learned from a Community-Based Forest Restoration Project in Biliran Province, Philippines" Forests 11, no. 4: 475. https://doi.org/10.3390/f11040475
30. Helvetas Vietnam (2007). Forestry and Agriculture Extension in Vietnam: Five years of experience of the Extension and Training Support Project for Forestry and Agriculture in the Uplands, ETSP, 2003-2007.
31. Jafry, B. T., Moyo, B., & Mandaloma, L. (2014). Assessment of Extension and Advisory Methods and Approaches to reach Rural Women – examples from Malawi –. (March). Available at: https://agrilinks.org/sites/default/files/resource/files/EAS%20Reaching%20Rural%20Women%20-%20Report%20Malawi%20-%20published%20March%202014.pdf
32. Kabwe, G. (2010). Uptake of Agroforestry Technologies among Smallholder Farmers in Zambia. Lincoln University Digital Thesis. http://dspace.lincoln.ac.nz/handle/10182/2970
33. Kalim Qamar (2011). Introducing Demand-Driven Extension Approach in a Traditional Region: A Case Study from Pakistan. Available at: https://www.fao.org/uploads/media/i2354e00%20-%20Introducing%20Demand-Driven.pdf
34. Kandzior A., Rivas E. (2015) Application of a Participatory Approach to Forestry Extension Activities. In: Pancel L., Köhl M. (eds) Tropical Forestry Handbook. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-41554-8_270-1
35. Kassahun Gashu & Omer Aminu (2019). Participatory forest management and smallholder farmers' livelihoods improvement nexus in Northwest Ethiopia, Journal of Sustainable Forestry, https://doi.org/10.1080/10549811.2019.1569535
36. Kilawe, E. and Habimana, D. (2016). Forestry Contribution to National Economy and Trade in Ethiopia, Kenya, and Uganda. FAO. Available at: https://www.fao.org/documents/card/en/c/627ebca3-7716-474c-a385-21cbed1fbbbc/
37. Kumeh Mensah Eric (n.d.). Forestry Extension Services in Ghana and How They Are Currently Organised in Ghana. Kwame Nkrumah University of Science and Technology Faculty of Renewable Natural Resources.
38. Leta Dufera, Gerba(2018). The Ethiopian Agricultural Extension System and Its Role as a Development Actor: Cases from Southwestern

Ethiopia. Dissertation, Rheinische Friedrich-Wilhelms-Universität Bonn. Online-Ausgabe in bonndoc: Available at: https://nbn-resolving.org/urn:nbn:de:hbz:5n-51766

39. Maeve Henchion, Marie Buckley and Paul O'Reilly (n.d.). The Toolbox Project ' Development of a technology commercialization toolbox for publicly funded food research '. 1–48. Available at: https://www.dit.ie/media/dittoolboxproject/REPORT
40. Malmer, A., & Sollander, E. (2019). National Capacity Gap analysis for governance, research, information, and networking for transforming the Ethiopian forest sector. 1(October), 1–25. Report; Swedish Forest Agency.
41. Martini E, Roshetko JM, Purnomosidhi P, Sabastian G. (2016). Agroforestry extension needs for land rehabilitation in East Sumba, East Nusa Tenggara, Indonesia. Working Paper no. 232. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program. http://dx.doi.org/10.5716/WP16078.PDF
42. Martini, Endri and Roshetko (2017). Agroforestry farmer field schools: informed farmers for sustainable landscapes, Bonn, Germany September 20-22. Available at: https://www.worldagroforestry.org/publication/agroforestry-farmers-field-schools informed-farmers-sustainable-landscapes
43. Matata, P. Z., Masolwa, L. W., Ruvuga, S., & Bagarama, F. M. (2013). Dissemination pathways for scaling-up agroforestry technologies in western Tanzania. 5(2), 31–36. Journal of Agricultural Extension and Rural Development. https://doi.org/10.5897/JAERD12.099
44. MEFCC (Ministry of Environment, Forest and Climate Change) (2018). National Forest Sector Development Program. Volume I: Situation Analysis. Available at: https://www.et.undp.org/content/dam/ethiopia/docs/2018
45. Million B. (2011). Forest Plantations and Woodlots in Ethiopia. Available at: https://www.researchgate.net/publication/303197829_Forest_plantations_and_Woodlots_in_Ethiopia
46. Nguyen, T., McFarland, W., Tran, D., Trieu, H., & Nguyen, C. (2017). Initiatives in forest restoration: Lessons and policy perspectives from recent experience in Vietnam, Laos, and Indonesia. Drug Delivery, 3–11.
47. Nguyen Duc Trung, Elizabeth Hoffecker and Laurens van Veldhuizen (2016). Participatory Technology Development and its impacts on farmers' livelihoods in Hoa Binh Province, Vietnam. Development Outcomes of Local Innovation (DOLI) research project.
48. Olhoff, A. (2015). Adaptation in the context of technology development and transfer. Climate Policy, 15(1), 163–169. Climate Policy. https://doi.org/10.1080/14693062.2014.873665
49. Secretariat of the Convention on Biological Diversity. (2009). Sustainable Forest Management, Biodiversity and Livelihoods: A Good Practice Guide. Montreal, 47 + iii pages. Available at: https://www.cbd.int/development/doc/cbd-good-practice-guide-forestry-booklet-web-en.pdf
50. Tesfaye, Yemiru (2011). Participatory forest management for sustainable livelihoods in the Bale Mountains, Southern Ethiopia. Diss. (sammanfattning/summary) Uppsala: Sveriges lantbruksuniv., Acta Universitatis Agriculturae Sueciae, 1652-6880, 64.
51. Third World Network (n.d.). Climate Change & Technology Transfer: Addressing Intellectual Property Issues. Available at: https://www.twn.my/title2/climate/pdf/TWN_submission_to_TECfinal.pdf
52. Thomas L. Brewer and Muthukumara M., (2008). Climate Change, Trade and Competitiveness Technology Transfer and Climate Change: International Flows, Barriers, and Frameworks; pp. 93-119. Brookings Institution Press.
53. Turner, S., & de Satge, R. (2012). Key trends in international agriculture, forestry and fisheries extension and advisory services. (September). Available at: https://d1wqtxts1xzle7.cloudfront.net/38676843/de_Satge_and_Turner_2012_Key_trends_in_international_extension-with-cover-page-v2.pdf?
54. UNFCCC (2014b). Report of the workshop on technologies for adaptation. Langer Eugen, Bonn, Germany, 4 March 2014. Available at: http://unfccc.int/ttclear/pages/ttclear/pages/ttclear/pages/ttclear/pages/ttclear/templates/render_cms_page?s=events_workshops adaptation techs
55. Wassie Haile, Genene Tsegaye, Shifraw Boke, Waga Mazengia, Daniel Dauro, Anteneh Fekadu, Zemede Mulushewa, Simayehu Tafesse, Assefa Chekol and Zewdie Afework (2014). Review of the Extension Systems, Constraints, Progresses, Gaps and

Technology Needs in Natural Resources Management in Southern Ethiopia. Available at: https://www.researchgate.net/publication/280624871_11th_ESSS_-conference-wassie

56. Wellard, K. (2011). Knowledge Transfer: The Role of Community Extension in Increasing Food Security. Available at: http://www.selfhelpafrica.org/downloads/CBE-Report-Final.pdf

57. Zewdu, A., & Beyene, F. (2018). Factors affecting smallholder farmers ' participation in degraded forest rehabilitation practices; the case of Gemachis District, West Hararghe Zone, Oromia. 10(November), 234–244. https://doi.org/10.5897/JAERD2018.0975