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Examining the Impact of Lead Farmer Approach on Follower Farmers' Knowledge and Practice of Conservation Agriculture: A Case Study in Kalira Extension Planning Area, Ntchisi District, Malawi

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Abstract

The Lead Farmer Approach (LFA) has emerged as a vital strategy for agricultural extension services in developing nations like Malawi, aiming to disseminate new technologies and practices among smallholder farmers. This study investigates the impact of LFA on follower farmers' (FFs) knowledge and practice of Conservation Agriculture (CA) in Malawi. Employing a mixed-methods research design, the study conducted household surveys and focus group discussions in the Kalira Environmental Protection Area, Ntchisi district. Results indicate a significant improvement ($p < 0.05$) in FFs' knowledge of CA post-LFA, with notable advancements in crop rotation and minimum soil disturbance understanding. The LFA also positively influenced FFs' CA practices, particularly in minimum soil disturbances, permanent ground cover, and integration of agroforestry trees. While intercropping and crop rotation showed no significant change, the overall impact underscores the effectiveness of LFA in enhancing FFs' understanding and adoption of sustainable agricultural practices. The findings contribute valuable insights for governments, development agencies, and researchers working toward promoting CA and sustainable agriculture through the LFA approach, emphasizing its potential scalability and long-term sustainability.

1. Introduction

Lead farmers (LF) have been a common feature of agriculture extension service strategies to diffuse new technology or practices among smallholder populations in the developing world (Okori *et al*., 2022). The Government of Malawi (GoM) defines LF as an individual farmer, trained in good and smart agricultural practices/technologies that are enterprise-specific (Bhatti *et al*., 2021). This agriculture extension approach is referred to as the lead farmer approach (LFA) and Osumba *et al*. (2021) asserts that the effective performance of a LF relies on technical support from subject matter specialists and frontline extension workers from public and private sector organisations. These institutions or organisations build the capacity of a LF through training, provision of resources, and technical backstopping. Local leaders and farming communities provide moral support and initiate mechanisms for rewarding a LF in their communities (Kahsay *et al*., 2023). Taylor and Bhasme (2018) reported that LFs envisaged to play a dual role. First, LFs provide an entry point into a community for the diffusion of a new practice or technology in agriculture. By creating observable field-level demonstrations to be witnessed in real-time by other farmers in the locality, LFs provide a practical example of the innovations and their purported benefits (Hermans *et al*., 2021). Second, LFs also play a direct educational role in which they instruct community members in the new technology and potentially help troubleshoot problems that arise in the implementation of such agriculture technologies. Finca *et al*. (2023) further explained that LFs, therefore, serve as community repository of knowledge while also helping to translate and embed an agricultural innovation into local contexts.

The Lead Farmer Approach (LFA) has become an important element of Malawi's public agricultural extension system as a way to extend the reach of agricultural extension services in the face of limited budgets for employing more agricultural extension officers (Thobejane, 2022). The Government of Malawi currently works with more than 12,000 LFs country-wide who train and promote agricultural technologies, including conservation agriculture (CA) technologies/practices, through their networks of follower farmers (FF) and demonstrations (Fisher et al., 2018). National policy support is essential for effective and sustainable farmer-to-farmer extension (F2FE) programmes. In this whole process, having LFs that are motivated, knowledgeable in new technologies, and have good communication skills is very critical in improving agricultural production including CA (Ragasa, 2020).

The Food and Agriculture Organization (FAO) defines CA as a climate-resilient technology and management system that has demonstrable potential to secure sustained productivity and livelihood improvements for millions of climate-dependent farmers (FAO, 2019). According to FAO (2019), in Africa, the simultaneous application of the three principles of CA namely; minimum tillage and soil disturbance, permanent soil cover and crop rotation and intercropping started recently and has emerged in several places, most notably in South Africa, Zimbabwe, Zambia, Kenya, Tanzania, and Malawi. CA is promoted for the positive benefits of increased soil organic matter, improved soil water retention, Improved soil fertility, and increased crop yields (Gadzirayi *et al*., 2014). The introduction of CA aims at enhancing agriculture to achieve improved and sustained agricultural productivity, increased profits, and ensure food security, while preserving and enhancing the resource base, through the application of new agriculture technologies (FAO, 2019).

A study by Fisher *et al.* (2018) on awareness and adoption of CA in Malawi revealed that LFs play a more critical role in increasing awareness of the CA practices. Nakano *et al.* (2018) reviewed LFA in diffusing agriculture technologies in rice farming, and concluded that ordinary farmers who were a relative or residential neighbours of LFs were more likely to adopt new technologies than those who were not. As a result, while the LFA technology adoption rates rise immediately after the training, those of the non-trained FFs catch up belatedly (Nakano *et al*. 2018). Their results further suggest the effectiveness and practical potential of F2FE programs for smallholders in Sub-Sahara Africa as a cost-effective alternative to the conventional farmer training approach (Nakano et al*.*, 2018). Nakano et al. (2018) agree with Chirwa et al. (2008) and Karuhanga et al. (2012) who reviewed the effectiveness of the LFA in technology dissemination in the East African Dairy Development Project in Uganda, and Chabata (2013) who looked at the effectiveness of the LFA in the dissemination of soil fertility management technologies in Zimbabwe. Despite the recorded success of LFA in the dissemination of technologies and the adoption of technologies by FFs particularly in rice farming, dairy cattle production, and soil fertility management technologies in Tanzania, Uganda, and Zimbabwe respectively. The approach has recorded a low or limited rate in CA practices practiced by FFs in Malawi (Fisher et al, 2018).

Studies (Chinseu *et al*., 2022; Ward, 2018; Franzel *et al*., 2014; Oyelami *et al*., 2018) conducted in Malawi have consistently demonstrated low rates of CA principles being practiced, despite the government's efforts, such as the development of the National Agriculture Policy of 2016, aimed at promoting the application of LFA as a strategy for enhancing effective and sustainable agriculture production. While the literature extensively documents the role of LFAs in promoting CA (Franzel *et al*., 2014; Khaila *et al*., 2015). Other studies (Fisher *et al*., 2018; Ragasa, 2020) has revealed that LFs not only organize community meetings and raise awareness about CA but also play a crucial role in facilitating its adoption. However, a comprehensive understanding of their contribution beyond meetings and awareness creation is necessary. Therefore, this study was conducted to assess the impact of LFAs on follower farmers' levels of knowledge and practice of CA, both before and after the implementation of the LFA. The significance of this research lies not only in documenting its findings for future reference but also in contributing to the existing body of literature. Furthermore, it serves as a foundation for exploring how cultural factors influence the role played by LFAs in facilitating CA. The anticipated outcomes of this research are expected to provide valuable insights for government and development agencies working towards agricultural and rural development. Additionally, the study's findings are envisaged to inform and enhance the implementation of LFAs in promoting CA.

2. Materials and Methods

The study utilized a mixed methods research design, combining field household surveys and focus group discussions (FGDs). The research was conducted in Kalira EPA, located in Ntchisi district, Malawi's central region. The EPA consists of 17 sections and four traditional authorities. The area practices subsistence and commercial farming, with maize as the main crop. The study site was chosen due to limited extension workers, relying on Lead Farmers LFs. Sample size determination followed Yamane's formula, resulting in 394 FFs and 104 LFs selected for interviews. Quantitative data was collected through semi-structured questionnaires, assessing FFs' CA practice and understanding using a Likert scale. Qualitative data was gathered through FGDs with LFs and FFs. Data analysis involved the Wilcoxon signed-rank test and Chi-Square analysis using SPSS. The Wilcoxon test assessed the difference in FFs' CA practice and understanding before and after implementing LFAs. The study aimed to investigate the impact of LFAs on CA dissemination in the study area.

3. Results and Discussion

Follower farmer's level of knowledge of conservation agriculture

In this study, knowledge was operationalized as the level of familiarity, awareness, and comprehension of facts and skills pertaining to CA. A Likert scale was employed as a data collection tool to capture FFs perceived knowledge before and after the intervention of LFA. FFs were requested to rate their knowledge levels pre-and post-LFA intervention on various aspects, including crop rotation, integration of agroforestry trees within CA systems, intercropping maize with grain legumes, and the establishment of permanent ground cover through the utilization of crop residues and minimizing soil disturbances. These rankings were recorded on the Likert scale. Figure 1 presents the outcomes illustrating the FFs' CA knowledge before and after the implementation of LFA.

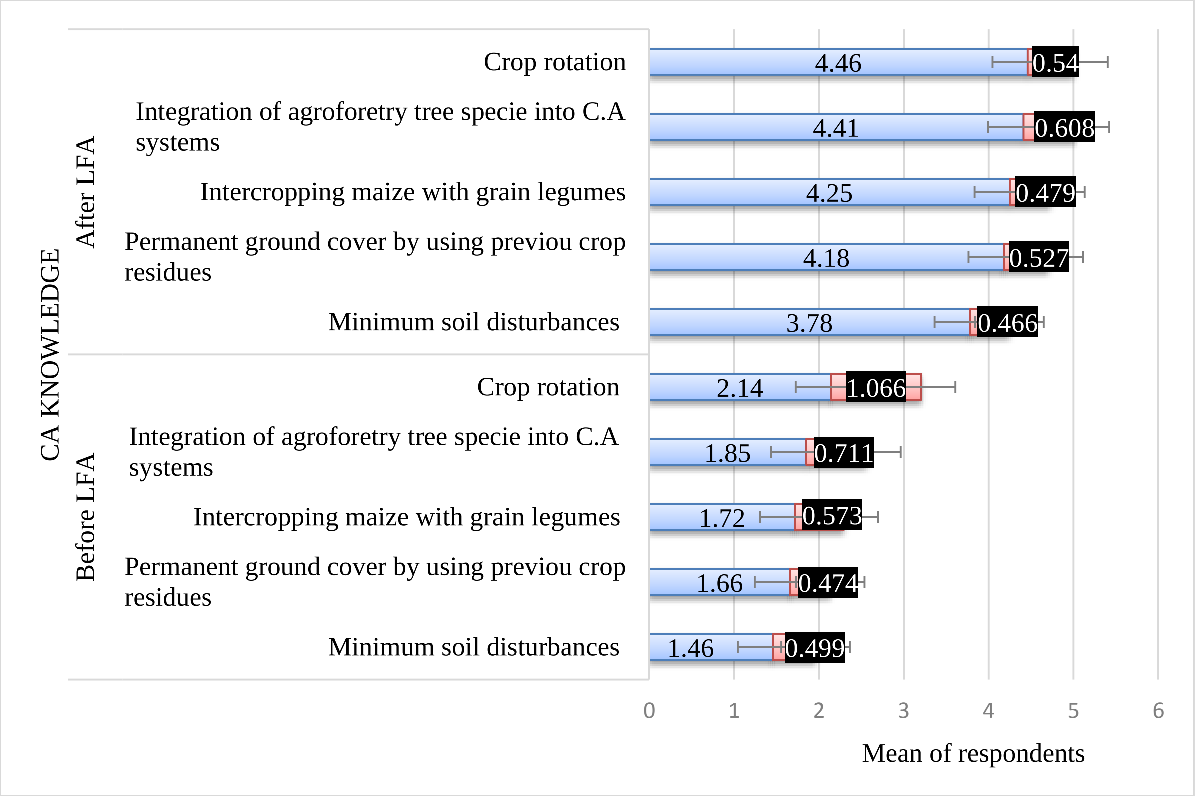

Figure 1. Follower farmer's knowledge of Conservation Agriculture

The results revealed significant differences ($p < 0.05$) in the level of knowledge concerning Conservation Agriculture (CA) among FFs between the period prior to and after the implementation of the LFA. This implies that the knowledge acquired by FFs regarding CA after the introduction of LFA was significantly higher compared to the pre-LFA phase ($p = .001$). Before LFA, the lowest knowledge acquisition by FFs was observed in relation to minimum soil disturbance (1.46 ± 0.49), while the highest knowledge acquisition was recorded for crop rotation (2.14 ± 1.06). Conversely, after LFA, the lowest knowledge acquisition by FFs was still observed for minimum soil disturbance (3.78 ± 0.46), while the highest knowledge acquisition was reported for crop rotation (4.46 ± 0.54).

Level of follower farmers' practice of conservation agriculture

The practice of CA in this study was defined as the repeated engagement in CA activities with the aim of improvement and mastery. To assess the practice of CA before and after the intervention of LFA, a Likert scale was employed. FFs were requested to rate their CA practices, including minimum soil disturbances, permanent ground cover using previous crop residues, intercropping maize with grain legumes, integration of agroforestry tree species into CA systems, and crop rotation. The rating scale ranged from 1 to 5, where 1 represented very poor practice and 5 denoted very good practice. The results of the assessment are presented in Table 1.

Table 1. Follower farmers' level of conservation agriculture practice

Conservation agriculture		Mean	SD	p-value
Minimum soil disturbances	Before	1.00	.000	
	After	3.32	.627	.001
Permanent ground cover by using previous crop residues	Before	1.04	.201	
	After	3.97	.175	.001
Intercropping maize with grain legumes	Before	3.00	.000	
	After	4.12	.327	.061
Integration of agroforestry tree species into C.A systems	Before	2.96	.350	
	After	4.15	.355	.001
Crop rotation	Before	4.00	.163	
	After	4.97	.175	.093

The results presented in Table 1 indicate significant differences ($p < 0.05$) in the practice of Minimum soil disturbances, Permanent ground cover using previous crop residues, and Integration of agroforestry tree species into CA systems between the period before and after the intervention of Lead Farmer Approach (LFA). However, no significant differences were observed in the practice of intercropping maize with legumes and crop rotation. Prior to LFA, the lowest CA practice reported by Farming Families (FFs) was related to minimum soil disturbance (1.00 ± 0.00), whereas the highest practice was observed in crop rotation (4.00 ± 0.163). After LFA, the lowest CA practice by FFs was still observed in minimum soil disturbance (3.32 ± 0.627), while the highest practice remained in crop rotation (4.97 ± 0.175).

Discussion

The findings of the study indicate that LFA had a significant influence on the level of knowledge and practice of CA among FFs. Prior to the LFA intervention, FFs exhibited limited knowledge in areas such as minimum soil disturbances, permanent ground cover using previous crop residues, intercropping, and integration of agroforestry trees, except for crop rotation. However, after the LFA intervention, there was a noticeable change in FFs' knowledge levels, as depicted in Figure 1 and as also reported by Obazi et al. (2022). This suggests that the LFA played a role in improving FFs' understanding of CA, aligning with the findings of Nyathi et al. (2020), who observed similar increases in FFs' understanding of agricultural innovations through their engagement with knowledgeable farmers.

The study revealed an improvement in the practice of CA among FFs following the LFA intervention. Significant differences ($p < 0.05$) were observed in various CA practices before and after the LFA, including minimum soil disturbances, permanent ground cover using previous crop residues, intercropping maize with grain legumes, integration of agroforestry tree species, and crop rotation as also discussed by Jewa (2020). These findings suggest that the LFA approach effectively contributed to the positive changes in CA practices among FFs. This aligns with the perspective of Cerf et al. (2012), who emphasized the role of farmers as change agents in promoting sustainable agriculture within their communities.

Overall, the study highlights the positive impact of the LFA on FFs' knowledge and practice of CA, underscoring the effectiveness of this approach in promoting sustainable agricultural practices and knowledge sharing among farmers.

4. Conclusion and Recommendation

The implementation of the LFA exerted a significant influence on the level of knowledge and practice of CA among FFs. The findings demonstrate a notable increase in both knowledge and practice of CA following the LFA intervention compared to the pre-LFA phase. This underscores the effectiveness of the LFA in facilitating knowledge dissemination and capacity-building, thereby enhancing FFs' understanding and adoption of CA practices. Based on the conclusion that the implementation of the LFA has significantly improved the level of knowledge and practice of CA among FFs, one area of further research could focus on the long-term sustainability and scalability of the LFA approach in different contexts.

References:

1. Bhatti, M. A., Godfrey, S. S., Ip, R. H. L., Kachiwala, C., Hovdhaugen, H., Banda, L. J., Limuwa, M., Wynn, P. C., Ådnøy, T., & Eik, L. O. (2021). Diversity of Sources of Income for Smallholder Farming Communities in Malawi: Importance for Improved Livelihood. Sustainability, 13(17), 9599. https://doi.org/10.3390/su13179599

2. Cerf, M., Guillot, M., and Olry, P. (2012) Acting as a Change Agent in Supporting Sustainable Agriculture: How to Cope with New Professional Situations? Journal of Agricultural Education and Extension, 17(1), 7–19.

3. Chabata, I. and de Wolf, J. (2012) 'The Lead Farmer Approach: An effective way of agricultural technology dissemination?', International Centre Tropical Agriculture. Available at: https://www.cgiar.ciat.org

4. Chinseu, E. L., Dougill, A. J., & Stringer, L. C. (2022). Strengthening Conservation Agriculture innovation systems in sub-Saharan Africa: lessons from a stakeholder analysis. International Journal of Agricultural Sustainability, 20(1), 17-30. https://doi.org/10.1080/14735903.2021.1911511

5. Chirwa, E. W., Kumwenda, I., Jumbe C., Chilonda, P., & Minde I. (2008). Agricultural growth and poverty reduction in Malawi: past performance and recent trends. Regional Strategic Analysis and Knowledge Support System. (ReSAKSS) Working Paper No. 8. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), 41. Available at: http://www.sa.resakss.org

6. Finca, A., Linnane, S., Slinger, J., Getty, D., & IgshaanSamuels, M. (2023). Implications of the breakdown in the indigenous knowledge system for rangeland management and policy: a case study from the Eastern Cape in South Africa. African Journal of Range & Forage Science, 40(1), 47-61. https://doi.org/10.2989/10220119.2022.2138973

7. Fisher, M., Holden, S. T., Thierfelder, C., & Katengeza, S. P. (2018). Awareness and adoption of conservation agriculture in Malawi: what difference can farmer-to-farmer extension make? International Journal of Agricultural Sustainability, 16(3), 310-325. https://doi.org/10.1080/14735903.2018.1472411

8. Food and Agriculture Organisation of the United Nations. (2019). Conservation Agriculture Training guide for extension agents and farmers in Eastern Europe and Central Asia. Rome, Italy: FAO.

9. Franzel, S., Sinja, J., & Simpson, B. (2014). Farmer-to-farmer extension in Kenya: The perspectives of organizations using the approach. Nairobi. World Agroforestry Centre. https://doi.org/10.5716/WP14380.PDF

10. Gadzirayi, C. T., Mafuse, N., & Munyati, V. (2014). Enhancing Farmer Productive Capacity: Case of Action Research Based Conservation Agriculture. International Journal of Agricultural Science, Research and Technology in Extension and Education Systems, 4(2), 93-97.

11. Hermans, T. D. G., Whitfield, S., Dougill, A. J., & Thierfelder, C. (2021). Why we should rethink 'adoption' in agricultural innovation: Empirical insights from Malawi. Land Degradation & Development, 32(4), 1809-1820. https://doi.org/10.1002/ldr.3833

12. Jewa, E. K. K., Whitfield, S., Dougill, A. J., Mkwambisi, D. D., & Steward, P. (2020). Farming systems and Conservation Agriculture: Technology, structures and agency in Malawi. Land Use Policy, 95, 104612. https://doi.org/10.1016/j.landusepol.2020.104612

13. Kahsay, G. A., Bulte, E., Alpizar, F., Hansen, L. G., & Medhin, H. (2023). Leadership accountability in community-based forest management: experimental evidence in support of governmental oversight. Ecology and Society, 28(4), 20. https://doi.org/10.5751/ES-14469-280420

14. Karuhanga, M., Kiptot, E., & Franzel, S. (2012) 'The effectiveness of the farmer trainers' approach in technology dissemination in the East African dairy development project in Uganda: A study of volunteer farmer trainers. Uganda: University of Uganda.

15. Khaila, S., Tchuwa, F., Franzel, S., & Simpson, S. (2015). The Farmer-to-Farmer Extension Approach in Malawi: A Survey of Lead Farmers. Nairobi. World Agroforestry Centre, 1–17.

16. Nakano, Y., Tsusaka, T. W., Aida, T., & Pede, V. O. (2018). Is farmer-to-farmer extension effective? The impact of training on technology adoption and rice farming productivity in Tanzania. World Development, 105, 23–37.

17. Nakano, Y., Tsusaka, T.W., Aida, T., & Pede, V.O. (2018) Is farmer-to-farmer extension effective? The impact of training on technology adoption and rice farming productivity in Tanzania. World Development, 105, 23–37.

18. Nyathi, P., Moyo, T., Posthumus, H., & Stevens, J. (2020) 'Impact of Social and Institutional Factors on the Uptake of Conservation Agriculture: A Case of Zambia and Zimbabwe', Sustainable Agriculture Research, 9, 67. doi:10.5539/sar.v9n1p67.

19. Obazi, S. A., Dimelu, M. U., & Chukwueze, M. (2022). Access and Usefulness of Agricultural Information among Poultry Farmers. International Journal of Agricultural Science, Research and Technology in Extension and Education Systems (IJASRT in EESs), 12(2), 65-74. Retrieved from http://ijasrt.iau-shoushtar.ac.ir

20. Okori, P., Munthali, W., Msere, H., et al. (2022). Improving efficiency of knowledge and technology diffusion using community seed banks and farmer-to-farmer extension: experiences from Malawi. Agriculture & Food Security, 11(1), 38. https://doi.org/10.1186/s40066-022-00375-4

21. Osumba, J. J. L., Recha, J. W., & Oroma, G. W. (2021). Transforming Agricultural Extension Service Delivery through Innovative Bottom–Up Climate-Resilient Agribusiness Farmer Field Schools. Sustainability, 13(7), 3938. https://doi.org/10.3390/su13073938

22. Oyelami, B., Akinwale, J., & Ladele, A. (2018). Lead farmer extension approach and sustainable extension service delivery in Oyo State, Nigeria. Contemporary Agriculture, 233. https://doi.org/10.1515/contagri-2018-0034

23. Ragasa, C. (2020). Effectiveness of the lead farmer approach in agricultural extension service provision: Nationally representative panel data analysis in Malawi. Land Use Policy, 99, 104966. https://doi.org/10.1016/j.landusepol.2020.104966

24. Taylor, M., and Bhasme, S. (2018) Model farmers extension networks and the politics of agricultural knowledge transfer. Elsevier Ltd, https://doi.org/10.1016/j.jrurstud.2018.09.015. [Accessed on 30/12/2021].

25. Thobejane, M. K. (2022). The Impact of Empowering Women Farmers Towards Sustainable Agriculture in the Gauteng Province of South Africa (Doctoral dissertation). University of Free State, Bloemfontein, South Africa. Department of Sustainable Food System and Development, Faculty of Natural and Agricultural Sciences.

26. Ward, P. S., Bell, A. R., Droppelmann, K., & Benton, T. G. (2018). Early adoption of conservation agriculture practices: understanding partial compliance in programs with multiple adoption decisions. Land Use Policy, 70, 27–37.