**INDONESIAN JOURNAL OF SOCIAL AND ENVIRONMENTAL ISSUES (IJSEI)**
Journal Homepage: https://ojs.literacyinstitute.org/index.php/ijsei
ISSN: 2722-1369 (Online)
**Research Article**

| Volume 5 | Issue 1 | April (2024) | DOI: 10.47540/ijsei.v5i1.1021 | Page: 1 – 13 |
|---|---|---|---|---|

# Knowledge, Attitude, and Behavior of Farmers Towards Restoration of Degraded Land; the Cases of Harbo and Adea districts in the Oromia Region, Ethiopia

Hiwot Hailu[1], Omer Hinde[1], Rorisa Midhakso[1], Gizachaw Bayera[1], Beliyu Limenih[1], Alemayehu N. Ayana[1]

[1]Ethiopian Forestry Development, Ethiopia

**Corresponding Author**: Hiwot Hailu; Email: hiwinatht@gmail.com

ARTICLE INFO

*Keywords*: Attitude; Behavior; Degraded Land; Knowledge; Restoration.

*Received* : 08 August 2023
*Revised* : 24 October 2023
*Accepted* : 03 March 2024

ABSTRACT

Land restoration is one of Ethiopia's top priorities for aligning development efforts with a climate-resilient green economy. In Ethiopia, initiatives to rehabilitate degraded land are generally evaluated in terms of the local people's economic and environmental impacts. Farmers' knowledge, attitudes, and actions toward land restoration, on the other hand, have to be taken into consideration for long-term natural resource conservation. As a consequence, this study examines the relationships between farmers' knowledge, attitude, and contributions to behavioral change in the restoration of degraded land. Data were collected from 120 farmers who participated in the restoration of degraded land. Structural equation models and mediation analyses were utilized for path analysis. The findings indicated that farmers had a good understanding of land restoration techniques. Analysis of the causal models revealed that farmers' attitude toward land restoration is highly influenced by their knowledge level of farmers. The outcome also revealed that positive attitudes of farmers resulted in behavioral change towards land restoration. Effective local community participation in the land restoration process and strengthening of their knowledge and attitudes that influence their behavior should be the cornerstones of sustainable land restoration.

## INTRODUCTION

Maintaining development efforts in line with a climate-resilient green economy is one of the priority issues in Ethiopia. To address land degradation problems mostly based on physical measures with little attention paid to priority problems of farmers and their preferences, which led to poor performance. Studies have suggested that all stages of land restoration should engage the local people (Amare et al., 2017; Haregeweyn et al., 2012; Kassa et al., 2017). Local communities most affected by land degradation should be included in the planning and implementation of land restoration (Marques et al., 2016).

Along with local people's participation, farmers' knowledge and attitudes have to be integrated into land restoration for sustainable conservation and utilization of resources across the country. Land restoration in the past years could be assessed only by environmental, ecological, and economic changes (Deribew & Dalacho, 2019; Gebremeskel et al., 2018; Hirpa et al., 2023; Mekuria et al., 2017). Considering the level of understanding of local communities, the incorporation of traditional ecological knowledge and practices was important for the long-term success of rehabilitation efforts (Uprety et al., 2012; Yirdaw et al., 2017). Communities also seek the benefits of adapting and executing sustainable land management practices (Eshetu et al., 2014). Farmers' land management decisions depend on their knowledge and perceptions of degraded land (Tesfahunegn., 2019). The study also noted that land restoration efforts should consider farmers' skills as key contributors to successful implementation. Based on this, assessing farmers' knowledge, attitudes and their relationships with

behavioral change can be relevant for sustainable land use management practices.

The basic premise of KAP (Knowledge, Attitude, and Practice) surveys is that knowledge forms attitude, and knowledge and attitude as the building blocks for behavior (Ahmad et al., 2015). According to Azman et al., (2013), knowledge is organized information that is crucial in any innovation process. Zhang et al., (2014) noted that understanding farmers' knowledge is useful for understanding the changes that occur in the landscape at a local level, especially changes in land use and cultural practices. Attitudes were the powerful determinants of behavior (Arbuckle et al., 2013). Furthermore, Dentzman et al. (2016) understand farmers' thoughts and attitudes while introducing new practices can give information on why farmers choose know-how beyond their economic advantages. Adnan et al., (2018) noted that evaluation of farmers' knowledge and perceptions regarding a new technology is essential for the development of strategies to sustain the new skill. According to Dawoe, et al., (2012) farmers' knowledge and perceptions of land management practices were important for the development of technologies and management interventions.

In Ethiopia, the rehabilitation effort was not primarily assessed in terms of knowledge and attitude toward the local society. Thus, there is little attention was given to the knowledge and behavioral change of farmers toward land restoration. Given this, the Ethiopian Forest Development (then Ethiopian Environment and Forest Research Institute) has launched an initiative to restore degraded land with the active participation of local peoples. The institute has provided theoretical training, technical advice, and practical training on soil and water conservation, selected tree plantation, and area exclosure measures to assist regeneration. As a result, the purpose of this study was to assess farmers' knowledge, attitude, and their relationship with the behavior change of farmers who participated in the restoration of degraded lands.

## MATERIALS AND METHODS

### Research Framework and Hypotheses Development

Early theories regarding environmental protection relied on a logical process of information-changing attitudes, which was then supposed to affect behavior. These theories claimed that increasing people's knowledge about environmental protection would inevitably lead to an increase in behavior (Kollmuss & Agyeman, 2002). Knowledge has the power to influence the element of attitudes, which results in either positive or negative behavior of farmers towards environmental protection. Although knowledge does not directly affect behavior, it is an essential variable because farmers' action toward protecting land is only possible if individuals are aware of what they can or could do. According to Schahn & Giesinger (1993), who were cited in (Kitzmüller (2013) Without knowledge, there won't be any opportunity to behave sustainably. A tiny proportion of farmers' behavior can be connected to the environmental knowledge of farmers (Kollmuss & Agyeman, 2002). A person's attitude can affect their behavior, including how they restore their land. According to (Latif et al., 2012), environmental values have a considerable impact on behavior. Theoretically, behavior is the endogenous variable while knowledge is the external variable. In this study, it is postulated that attitude mediates or intervenes in the relationship between knowledge and behavior related to land restoration.

Based on the literature the following hypotheses have been proposed.

H1: Knowledge has a significant and direct effect on the attitude of farmers.

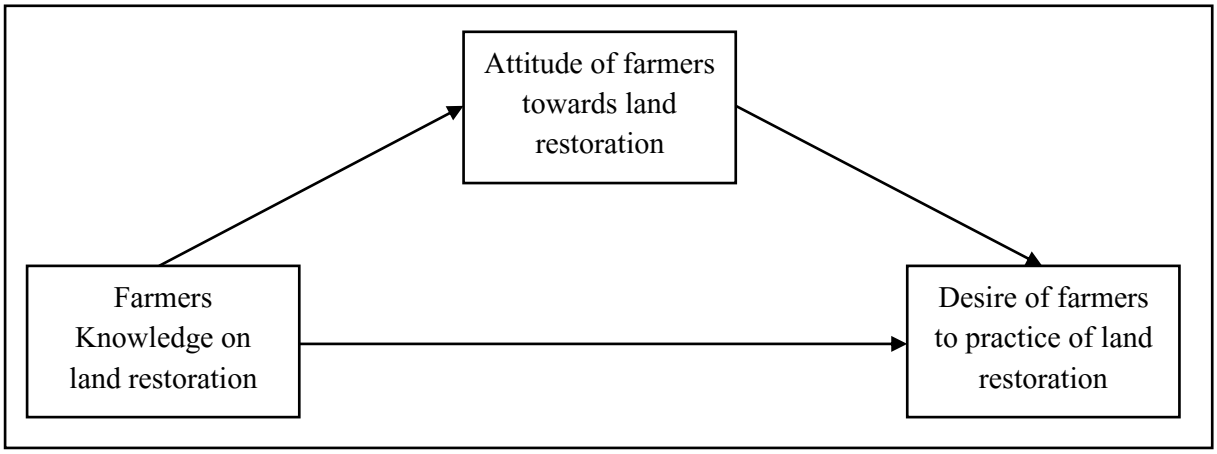
H2: Knowledge of land restoration has significant and direct effects on the behavior of farmers.

H3: Attitude has a significant and direct effect on farmers' behavior regarding land restoration

H4: Attitude mediates between knowledge and behavior of farmers towards land restoration.

The study attempted to assess the relationships between these three variables by developing a conceptual model. Figure 1, shows the relationships among farmers' knowledge, attitude, and behavior regarding land restoration using a path diagram. Knowledge is an exogenous variable in this paradigm, whereas attitude and behavior are endogenous factors that are influenced by one another. These three variables are assumed to be latent variables. A mediator of (attitude) is used in the analysis to explain the influence of the independent variable (knowledge) on the dependent variable behavior of farmers (desire to practice).

Figure 1. Proposed model for farmers' knowledge, attitudes, and desire to practice land restoration.




**Population and Sample Size**

The study intended to investigate how knowledge affects attitude and how attitude influences the behavior of farmers in land restoration practice. An explanatory research framework was proposed that was aimed at examining how one variable affects the other (Creswell & Creswell, 2017). The study employed a quantitative technique to propose a framework that involved farmers associated with the restoration of degraded land. Farmers from the Habiro and Adea districts who were near the project sites were used in the research population. The sample size was also determined purposively based on the rehabilitation of degraded land project intervention. Totally 120 households 70 from Lagbera and 50 farmers from Dire were interviewed. Cohen (1992) Suggested that the minimum sample size requirement for a Partial Least square structural equation Model (PLS-SEM) analysis should be 103. The sample size of the present study (i.e., 120 farmers) fulfills this requirement satisfactorily.

**Method of Data Collection and Analysis**

The data was collected through a structured questionnaire. Before the start of the main survey, all enumerators were oriented to collect relevant data from selected farmers, on how to record the responses, and on detailed contents of the questionnaire, The questionnaire was refined and finalized after incorporating the inputs of the pilot survey. The reliability of the questionnaires for knowledge, attitude, and desire to practice was tested through Cronbach's alpha coefficients. Data were analyzed by using statistical package software version 26 (SPSS) and Smart partial least square (PLS 4.0).

The demographic characteristics of the respondents are described by frequency and percentages. To Measure the Knowledge of farmers, there were 13 questions related to the rehabilitation of degraded land. The responses were categorized by the scale, 5 scores for ‘very high, 4 scores for ‘High’, 3 scores for ‘moderate’, 2 scores for ‘Little’, and 1 score for ‘Very Little’ responses. Then, responses were then analyzed and overall knowledge scores were produced. The attitude of farmers towards the rehabilitation of degraded land was also measured using a Likert scale based on the six statements provided. Similarly, the desire of farmers to practice land restoration was measured using a Likert scale on six statements. The Likert scale was categorized by the scale, 5 scores for ‘Strongly agree’ 4 scores for ‘Agree’, 3 scores for ‘Neutral’, 2 scores for ‘Disagree’, and 1 score for ‘Strongly disagree’ responses. The study was to determine the role of attitude in the relationship between knowledge and behavior of farmers on the restoration of degraded land.

All three constructs involved in this study are latent and they were measured using a set of questionnaires. The knowledge was measured using thirteen statements; Attitude was measured using six statements, while a desire to practice(behavior) was also measured using six statements. Conformity Factor Analysis (CFA) was performed simultaneously on the entire set of measurement items before testing the structural equation model. The process of evaluating the measurement model resulted based on factor loadings. In addition to that Cronbach’s Alpha measures would be done on the reliability coefficient, which indicates the consistency of the entire scale. Analyzing the

mediation effect; once the latent constructs passed the Conformity Factor Analysis (CFA) stage, the study modeled the structural model for further analysis. According to Zainudin (2012), there are two effects involved in mediation analysis namely direct effect and indirect effect. Firstly, the direct effect of knowledge on behavior must exist and be significant. After the mediator attitude entered the model, the direct effect was reduced. If it reduces but is still significant, then partial mediation occurs. However, if it is no longer significant, then the full mediation occurred (Zainudin, 2012).

## RESULTS AND DISCUSSION

### Socio-demographic Characteristics of Households

The sociodemographic features of farmers indicated that 75% of respondents were from male-headed households, while 25% of them were from female-headed households. In terms of education, 17% of respondents had received a basic education, 37% had no formal education, 26% could read and write, 15% had secondary school, and 5% had a university education. This finding shows that farmers were still illiterate. The majority (82%) were married, (11%) were single and (and 4%) were divorced. Disaggregation data on-site reveals that; more female household heads and young people participated in the Dire site than the Lagbera site. Although the majority of respondents in both sites, were married, more single participants are on Dir*e* sites. Concerning educational status, illiteracy was higher at the Dire sites than in Lagbera. Similarly, participants in Dire sites have lived more years than farmers at the Lagabera site. The majority of participants of the Lagbera site have more land access than the Dire site.

Table 1. Socio-demographic characteristics

| Variables | | Sites | | Total |
|---|---|---|---|---|
| Variables | Category | Dire | Lagbera | |
| Sex of household head | Male | 64 | 82 | 75 |
| | Female | 36 | 17 | 25 |
| Age of household head | Mean | 37.8 | 44.65 | 41.8 |
| Marital status of household head | Single | 18 | 5.71 | 10.83 |
| | Married | 68 | 91.43 | 81.67 |
| | Divorced | 8 | 1.43 | 4.17 |
| | Widow/er | 6 | 1.43 | 3.33 |
| Educational status of the household | Illiterate | 48 | 28.57 | 36.67 |
| | Read and write | 14 | 34.29 | 25.83 |
| | Primary | 24 | 11.43 | 16.67 |
| | Secondary | 12 | 18.57 | 15.83 |
| | Tertiary | 2 | 7.14 | 5 |
| Number of years lived in the Village | Mean (SD) | 36.42 | 33.61 | 34.78 |
| Land for crop and pasture | Yes | 62 | 90 | 78.33 |
| | No | 38 | 10 | 21.67 |

Source: field survey, 2021

### Farmers' Knowledge of Rehabilitation of Degraded Land

Knowledge is a crucial component for farmers in deciding to accept or reject technology. The result revealed that the majority of the respondents had a medium and high level of knowledge of the provided knowledge statements. The study shows that the majority of respondents know the cause and effects, the importance of rehabilitation of degraded land, and the technical part of how to rehabilitate the degraded land. The finding also indicates that even if farmers become familiar with land restoration practices, the perceived knowledge level in activities such as which plant can be planted with infiltration and without infiltration pits and differentiating of species was perceived as a

medium. These practices were relatively new to the farmers although they may have received instruction on how to handle matters relating to soil and water conservation activities. Average respondents were aware that protecting land from livestock and human interference can help to reduce land degradation. Furthermore, farmers are more aware that restoration can provide services such as pasture, wood, and good air.

Table 2. Farmer's knowledge according to the various components of land restoration

| Knowledge statements | Mean* | SD |
|---|---|---|
| K1: Land degradation is mainly caused by human activity (deforestation, agriculture, fire) | 4.03 | .864 |
| K2: Severe land degradation can result in desertification, which could affect overall human life | 4.15 | .923 |
| K3: Plantations can assist restoration of degraded lands | 4.16 | .870 |
| K4: Soil and water conservation practices can reduce runoff and keep moisture for a longer period | 4.18 | .935 |
| K5: Soil and water conservation work should consider the rainy season | 4.13 | .916 |
| K6: The spaces between tree species could be 3 to 5 meters during the plantation | 4.09 | .935 |
| K7: Soil and water conservation structures need periodical maintenance | 4.08 | .931 |
| K8: Area exclosures can reduce land degradation | 4.04 | .864 |
| *K9: Acacia abyssinica* can be planted in an infiltration pit | 3.96 | .911 |
| *K10: Acacia tortilis* on higher slopes can be planted infiltration pit and on the lower slope, it can be planted without an infiltration pit. | 3.88 | .891 |
| *K11: Dodonaea Angustifolia* can be planted without pits regardless of its location across the slope. | 3.50 | .745 |
| K12: Protection of the degraded land from livestock and human | 4.00 | .850 |
| K13: Rehabilitation of degraded land can provide services like pasture, wood, good air, | 4.06 | .863 |

Source: Field survey, 2021

**Farmers' Attitude towards Rehabilitation of Degraded Land**

The result indicated that the land restoration intervention project has brought a positive change in the attitude of the local people. The result in Table 3 shows the majority of local people agreed that the rehabilitation of degraded lands had value in terms of increasing productivity and a means for employment opportunities. The result also shows the majority of respondents agreed and strongly agreed on the importance of rehabilitation of degraded land. The result also implies that local communities have developed a positive attitude towards the restoration of degraded lands after they grow and benefit from collecting grass or fodder for livestock free of charge. Thus, the majority of respondents agreed and strongly agreed that all farmers have equal responsibilities to rehabilitate the degraded land. This implies that after practicing soil and water conservation measures, participants established a good attitude toward the rehabilitation of degraded land.

Table 3. Farmer's attitude towards the restoration of degraded land

| Attitude statements | Mean* | SD |
|---|---|---|
| A1: All farmers have equal responsibilities to rehabilitate the degraded land | 3.90 | .883 |
| A2: Rehabilitating the degraded land is important to increase productivity | 4.06 | .863 |
| A3: Rehabilitation of the degraded land provides employment opportunities and generates income for the rural population | 3.99 | .90.3 |
| A4: Rehabilitation of degraded land technology is not technically sophisticated and difficult to put into practice | 4.01 | .855 |
| A5: Rehabilitation of degraded land technology does not cost | 4.05 | .839 |
| A6: Rehabilitating the degraded land is playing a crucial role in addressing our priority problems (land degradation) | 4.03 | .859 |

Source field survey, 2021

**Farmer's Desire and Willingness to Practice Land Restoration**

The result in Table 4 shows that based on the training/information provided, the majority of respondents were willing to apply land restoration practices. However, few respondents believe that the practices were done on communal land, the possibility of applying the same practices on their private land is low as it requires public share land.

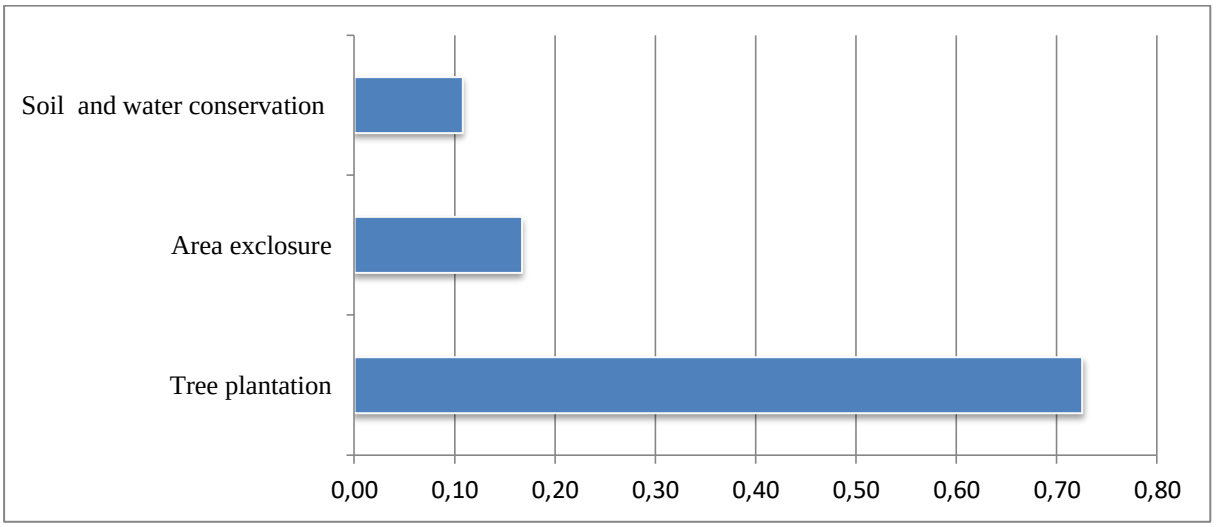
Table 4. Farmer's desire to practice land restoration

| Desire to practice RDL statements | Mean* | SD |
|---|---|---|
| B1: willingness to practice land rehabilitation based on training/information provided | 4.08 | .904 |
| B2: Inclusiveness of the local people in the process | 3.92 | .913 |
| B3: Selection of species for rehabilitation | 3.83 | .886 |
| B4: Soil and water conservation structure | 3.83 | .882 |
| B5: Practicability of introduced technologies | 3.84 | .870 |
| B6: Introduction of bylaws | 3.81 | .886 |

Source: Field survey, 2021

Since large numbers of bunds have been established on community land, farmers did not choose to establish bunds because they were focused on their private land. Figure 2 below depicts respondents' interest in approaches for rehabilitation of degraded land, and farmers' impressions on the approaches. The result indicated that the majority of respondents were interested in tree planting. The finding also implies farmer's primary concern was to maximize the value of return from tree planting. Farmers may pursue more intense tree care and cultivation for sale to generate income when there are commercial markets for wood or other tree products. Conversely, some farmers choose area exclosure and soil and water conservation to restore degraded land. This implies that farmers have different opinions about replicating the same approaches on the same scale of land. Thus, it is unlikely that these practices could not be applied on a small plot of private land particularly establishing a large number of bunds and infiltration pits as it requires more land size and effort.

Figure 2. Farmers' approach towards land restoration techniques




The rehabilitation interventions have resulted in biophysical changes within three years. Good performance of introduced species with the natural regeneration of native woody species from the soil seed bank was observed. The enclosed area was fully covered by grasses that could serve cattle. Farmers have observed that there is a reduction in runoff in their area. In general, the site is positively changed substantially compared to pre-rehabilitation intervention conditions.

Figure 3. Degraded land before intervention (left side) and rehabilitated land after the intervention (right side) at Dire site

**Structural Equation Modeling Results**

Partial Least Square and Structural Equation Modelling (PLS-SEM) tests were carried out with the aid of the Smart PLS 4 statistical package. The PLS-SEM technique was used because it does not hold any assumption regarding data distribution. According to Goodhue et al., (2012), in the PLS-SEM approach, the results are not confounded by the abnormality of data. Path analysis is essential for the analysis of the model fitness. The path analysis is the causal relationships among the constructs that are examined and identified. The findings suggested that the constructs meet both the measurement as well as the structural model. The measurement model was assessed by establishing the reliability and validity of the constructs. The result of factor loading of all the items was greater than 0.70 which is desirable in social science studies (Vinzi et al., 2010). Reliability was assessed using Cronbach's alpha, rho_a, and composite reliability. The result in Table 5 shows both Cronbach's alpha and composite reliability were greater than the recommended value of 0.70 which shows good reliability (Sarstedt et al., 2017). The result of convergent validity was acceptable because the Average Variance Extracted (AVE) was higher than 0.50.

Table 5. Factor loading, Composite reliability, and AVE of the indicators

| Constructs | Indicators | Indicator reliability | Loading | Alpha | Rho_a | Composite Reliability (CR) | Average variance extracted (AVE) |
|---|---|---|---|---|---|---|---|
| Knowledge (K) | K1 | 0.808 | 0.808 | 0.979 | 0.981 | 0.981 | 0.803 |
| | K2 | 0.929 | 0.929 | | | | |
| | K3 | 0.914 | 0.914 | | | | |
| | K4 | 0.936 | 0.936 | | | | |
| | K5 | 0.937 | 0.937 | | | | |
| | K6 | 0.903 | 0.903 | | | | |
| | K7 | 0.916 | 0.916 | | | | |
| | K8 | 0.925 | 0.925 | | | | |
| | K9 | 0.891 | 0.891 | | | | |
| | K10 | 0.838 | 0.838 | | | | |
| | K11 | 0.822 | 0.822 | | | | |
| | K12 | 0.885 | 0.885 | | | | |
| | K13 | 0.928 | 0.928 | | | | |
| Attitude (A) | A1 | 0.907 | 0.907 | 0.965 | 0.966 | 0.972 | 0.851 |
| | A2 | 0.920 | 0.920 | | | | |
| | A3 | 0.882 | 0.882 | | | | |
| | A4 | 0.929 | 0.929 | | | | |
| | A5 | 0.945 | 0.945 | | | | |
| | A6 | 0.951 | 0.951 | | | | |
| Desire to practice (B) | B1 | 0.846 | 0.846 | 0.968 | 0.968 | 0.974 | 0.864 |
| | B2 | 0.908 | 0.908 | | | | |
| | B3 | 0.948 | 0.948 | | | | |
| | B4 | 0.972 | 0.972 | | | | |
| | B5 | 0.952 | 0.952 | | | | |
| | B6 | 0.946 | 0.946 | | | | |

Source: Field survey, 2021

Similarly, the result of Heterotrait Monotrait ratio of correlation(HTMT) values was below 0.85 which was the discriminant validity was satisfied (Henseler et al., 2015). The result from Fornell-larcker discriminant validity is shown in Table 6 below.

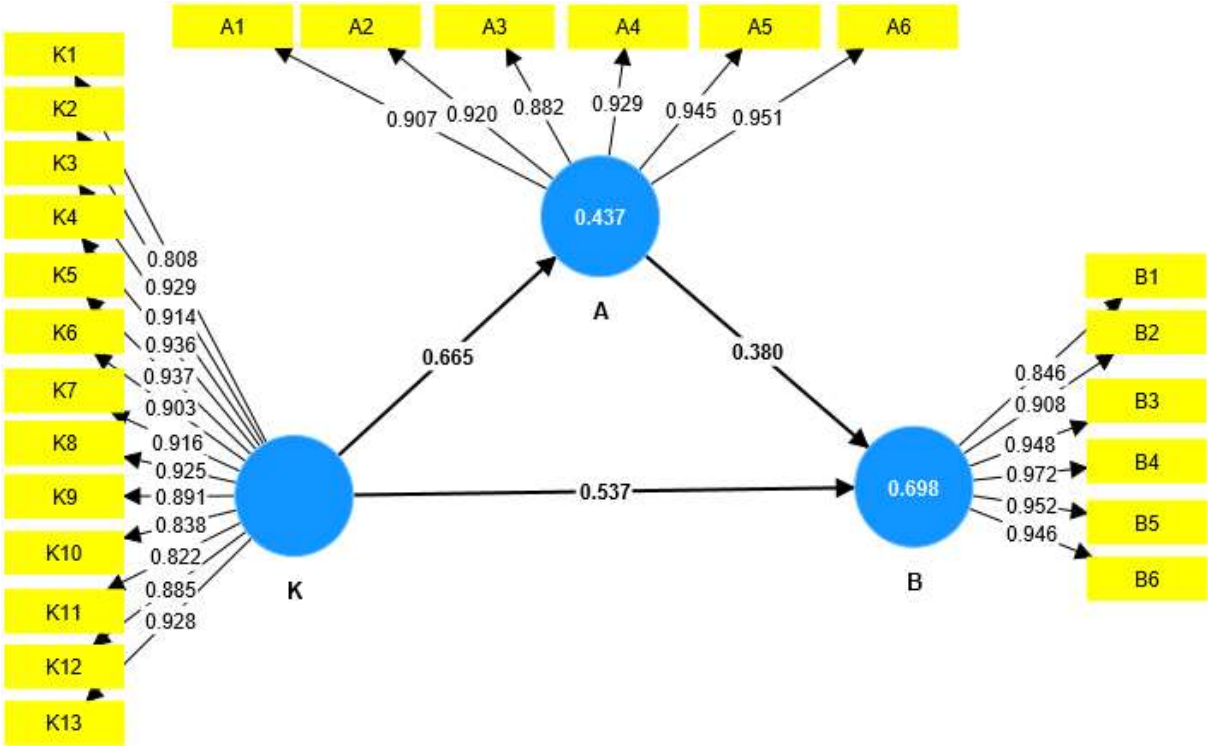
Table 6. r square and adjusted r- square result for discriminant validity

| Constructs | Knowledge | Attitude | Behavior | R square | R square adjusted |
|---|---|---|---|---|---|
| Knowledge | 0.896 | 0.665 | 0.789 | | |
| Attitude | | 0.923 | | 0.442 | 0.437 |
| Behavior | | 0.737 | 0.930 | 0.703 | 0.698 |

Source field survey,2021

Fig.4 represents the results of SEM on farmers' knowledge, attitude, and desire to practice land restoration. Accordingly, knowledge has a significant influence on the farmers' attitude toward land restoration. Similarly, attitude has a significant influence on the behavioral change of farmers on land restoration.

Figure 4. Path analysis




**Direct Effects**

The hypothesis of this study was tested by using smart PLS 4. The final SEM model is provided in Table 7 below. The results show that knowledge (K) has a significant degree of association with attitude (A) ($\beta$ = 0.683, t = 8.941). Knowledge also has a positive link with the behavior change of farmers ($\beta$ = 0.542, t = 5.76). Attitude has a positive influence on behavior ($\beta$ = 0.392, t = 3.945).

**Mediation Effect (Indirect Effect)**

The mediation effects of attitude were also assessed through bootstrapping techniques. According to Preacher & Hayes (2008), bootstrapping is "a nonparametric resampling procedure and it does not impose the assumption of normality of the sampling distribution. It is an intensive computational method that involves repeatedly sampling from the data set and estimating the indirect effect in each resampled data set. In this study, bootstrapping was done by taking 2000 resamples and a 90% confidence interval level. The mediating effect was tested by calculating the variance account for (VAF) approach, VAF was calculated by dividing the indirect effect by the total effect. The strength of the mediation can be determined from the values of variance accounted for (VAF).VAF value represents the ratio of the Beta coefficient of the indirect effect to the total effect. A VAF value bigger than 80% represents full mediation, A VAF value between 20% and 80% means partial mediation, while a value below 20% means no mediation(Sarstedt et al., 2014). The calculated value was 33% which indicated partial mediation. The results supported the mediation role of attitude between knowledge and behavior of farmers. It was found that attitude mediates between knowledge and behavior. The results of the main hypothesis about mediation are provided in Table 7.

Table 7. The direct and indirect effect

| Hypothesis | Hypothesis path | Beta | T | P-value | Remarks |
|---|---|---|---|---|---|
| H1 | K -> A | 0.683 | 8.941 | 0.00 | Supported |
| H2 | K -> B | 0.542 | 5.76 | 0.00 | Supported |
| H3 | A -> B | 0.392 | 3.945 | 0.00 | Supported |
| Hypothesis | Hypothesis path | Indirect effect | Total effect | VAF | Remarks |
| H4 | K -> A -> B | 0.267 | 0.810 | 33% | Supported |

Farmers have obtained diverse skills and knowledge directly relevant to the restoration of degraded land as a result of the training delivered over the last three years (concept and approach, techniques, and importance of land restoration). The result demonstrated that farmers' understanding of how to rehabilitate degraded land has improved. It was clear that the concept of restoring damaged land was not new to all farmers. These days, farmers have become more aware of the causes and impacts of land degradation, as well as the significance of restoring degraded land. This is consistent with a study made by (Tadesse & Teketay, 2017); currently, farmers are aware that deforestation, overgrazing, habitat destruction and fragmentation, and agricultural land expansion are the primary drivers of land degradation. Similarly, farmers had a better understanding of land restoration, strategies, and their interactions that might help to recover the damaged land. According to Tesfaye et al., (2012), farmers' understanding and perception they develop, influence their desire and commitment to implement community-based forest management.

Furthermore, the study implies that there was a shift in farmers' thinking and attitudes regarding the restoration of damaged land. Participants acknowledged the relevance of degraded land rehabilitation in transforming the environment. Farmers, on the other hand, feel that restoring damaged land can help boost agricultural output. The result is consistent with (Mekoya, 2008) and (Tadesse & Teketay, 2017). According to Mekoya (2008), Farmers had positive attitudes toward multipurpose fodder trees. Likewise, (Tadesse & Teketay, 2017), found that Positive attitudes developed in the communities, help to preserve soil fertility and reduce the land's vulnerability to wind and water erosion which leads to increased agricultural productivity. The result also shows that farmers' interest and willingness to rehabilitate degraded land increased as a result of positive attitude of farmers towards land restoration. Tesfaye et al., (2012), found that farmers had a positive attitude and expressed a desire to participate in tree planting. The result of the study also shows that most important element for sustainable resource utilization and continuous site preservation was trying the community to generate socio-economic benefit. This is consistent with studies made by (Mulema et al., 2017) which found fodder development was valued by farmers because it immediately solves land degradation and animal feed shortages while also providing additional advantages to families. The result of our study also indicates that the majority of respondents perceive that women are equally active in the building and maintenance of soil and water structures, as well as tree planting. The findings revealed that the developing and implementing bylaws is critical for the rehabilitation site's long-term viability. Clear land tenure and secure property rights for land and trees were critical to the success of restoration of degraded land (Muys et al., 2006).

The study discovered that farmers' attitudes and behaviors toward restoring degraded land are significantly influenced by their level of knowledge. The results were in line with the research of (Charnley et al., 2007). The study also demonstrated that farmers 'behavior toward land restoration is significantly influenced by attitudes. The outcome was consistent with studies(Deng et al., 2016; Floress et al., 2017). Deng et al., (2016), found that farmers' behaviors were significantly positively affected by their intention toward conserving ecological achievements, and their intention was significantly influenced by their attitude. Floress et al., (2017) by using a structural equation model found that attitudes were associated with a willingness to enhance water quality. The study

applied a mediation analysis and resulted that there exists a mediation effect of the attitude between the knowledge and behavior of farmers. Therefore, it is believed here that farmers' desire to practice land restoration can be established from their attitude, knowledge, and skills as they develop different life experiences. Greiner (2015), found that farmers' decisions to engage in conservation techniques are influenced by their attitudes and motivations.

## CONCLUSION

The study examines the relationship between knowledge and behavior change of farmers on land restoration in the Adea and Harbo districts of the Oromiya region. The study also looked at the influence of farmers' attitudes on behavior toward restoring degraded land. From the study, it can be concluded that farmers' understanding of the cause, impact, and relevance of degraded land restoration and technical aspects would help to change the behavior of farmers in restoring degraded land. The direct effect of farmers' knowledge on the behavioral change regarding land restoration was significant. On the other hand, the effect of farmers' knowledge on attitude and attitude on behavior were both significant. This shows that attitude was a partial mediator for knowledge and behavior of farmers towards land restoration. It is possible to conclude that farmers' understanding of land restoration has greatly changed by farmers' attitudes. Further, it can be concluded that farmers' practice of land restoration has significantly changed by awareness level. The perceptions of farmers and their capacity to restore degraded land also increase farmers' willingness to put the restoration of degraded land into practice.

The land restoration effort should be focused on involving the local community by consolidating their knowledge and skills. Building the capacity of farmers through theoretical and technical training as well as associating with behavioral change helps with the long-term land restoration process. The study provides information to policy-makers, managers, and implementers to consider increasing the level of farmers' knowledge and changing farmers' attitudes toward effective land restoration practices at the national level.

## REFERENCES

Adnan, N., Nordin, S. M., Rahman, I., & Noor, A. (2018). The effects of knowledge transfer on farmers decision making toward sustainable agriculture practices: In view of green fertilizer technology. *World Journal of Science, Technology and Sustainable Development*. 15 (1), 98-115.

Ahmad, J., Md. Noor, S., & Ismail, N. (2015). Investigating students' environmental knowledge, attitude, practice, and communication. *Asian Social Science*, *11*(16), 284–293.

Amare, D., Mekuria, W., & Belay, B. (2017). Willingness and participation of local communities to manage communal grazing lands in the Lake Tana biosphere, Ethiopia. *Society & Natural Resources*, *30*(6), 674–689.

Arbuckle, J. G., Morton, L. W., & Hobbs, J. (2013). Farmer beliefs and concerns about climate change and attitudes toward adaptation and mitigation: Evidence from Iowa. *Climatic Change*, *118*(3–4), 551–563.

Azman, A., D'Silva, J. L., Samah, B. A., Man, N., & Shaffril, H. A. M. (2013). Relationship between attitude, knowledge, and support towards the acceptance of sustainable agriculture among contract farmers in Malaysia. *Asian Social Science*, *9*(2), 99–105.

Charnley, S., Fischer, A. P., & Jones, E. T. (2007). Integrating traditional and local ecological knowledge into forest biodiversity conservation in the Pacific Northwest. *Forest Ecology and Management*, *246*(1), 14–28.

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Science*, *1*(3), 98–101.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approach*. Sage publications.

Dawoe, E. K., Quashie-Sam, J., Isaac, M. E., & Oppong, S. K. (2012). Exploring farmers' local knowledge and perceptions of soil fertility and management in the Ashanti Region of Ghana. *Geoderma*, *179–180*, 96–103.

Deng, J., Sun, P., Zhao, F., Han, X., Yang, G., & Feng, Y. (2016). Analysis of the ecological

conservation behavior of farmers in payment for ecosystem service programs in eco-environmentally fragile areas using social psychology models. *Science of the Total Environment*, *550*, 382–390.

Dentzman, K., Gunderson, R., & Jussaume, R. (2016). Techno-optimism as a barrier to overcoming herbicide resistance: comparing farmer perceptions of the future potential of herbicides. *Journal of Rural Studies*, *48*, 22–32.

Deribew, K. T., & Dalacho, D. W. (2019). Land use and forest cover dynamics in the northeastern Addis Ababa, central highlands of Ethiopia. *Environmental Systems Research*, *8*(1), 1–18.

Eshetu, E. Y., Tigabu, M., Lemenih, M., Negash, M., & Teketay, D. (2014). Rehabilitation of Degraded Forest and Woodland Ecosystems in Ethiopia for Sustenance of Livelihoods and Ecosystem Services. In *Forests under pressure–Local responses to global issues* (pp. 299–313). International union of forest research organizations.

Floress, K., de Jalón, S. G., Church, S. P., Babin, N., Ulrich-Schad, J. D., & Prokopy, L. S. (2017). Toward a theory of farmer conservation attitudes: Dual interests and willingness to take action to protect water quality. *Journal of Environmental Psychology*, *53*, 73–80.

Gebremeskel, G., Gebremicael, T. G., & Girmay, A. (2018). Economic and environmental rehabilitation through soil and water conservation, the case of Tigray in northern Ethiopia. *Journal of Arid Environments*, *151*, 113–124.

Goodhue, D. L., Lewis, W., & Thompson, R. (2012). Does PLS have advantages for small sample sizes or non-normal data? *MIS Quarterly*, 981–1001.

Greiner, R. (2015). Motivations and attitudes influence farmers' willingness to participate in biodiversity conservation contracts. *Agricultural Systems*, *137*, 154–165.

Haregeweyn, N., Berhe, A., Tsunekawa, A., Tsubo, M., & Meshesha, D. T. (2012). Integrated watershed management as an effective approach to curb land degradation: a case study of the Enabled watershed in northern Ethiopia. *Environmental Management*, *50*(6), 1219–1233.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135.

Hirpa, G. Y., Letema, S. C., & Ming'ate, F. L. M. (2023). Effect of Forest Landscape Restoration on Ecosystem Services in Ethiopia: Review for Future Insight. *Indonesian Journal of Social and Environmental Issues* (*IJSEI*), 4(3), 327-338.

Kassa, H., Birhane, E., Bekele, M., Lemenih, M., Tadesse, W., Cronkleton, P., Putzel, L., & Baral, H. (2017). Shared strengths and limitations of participatory forest management and area exclosure: Two major state-led landscape rehabilitation mechanisms in Ethiopia. *International Forestry Review*, *19*(4), 51–61.

Kitzmüller, C. (2013). Environmental Knowledge and Willingness to Change Personal Behaviour. *An American-Austrian Comparison of Energy Use. The University of Salzburg*.

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, *8*(3), 239–260.

Latif, S. A., Omar, M. S., Bidin, Y. H., & Awang, Z. (2012). Environmental values as a predictor of recycling behavior in urban areas: A comparative study. *Procedia-Social and Behavioral Sciences*, *50*, 989–996.

Marques, M. J., Schwilch, G., Lauterburg, N., Crittenden, S., Tesfai, M., Stolte, J., Zdruli, P., Zucca, C., Petursdottir, T., & Evelpidou, N. (2016). Multifaceted impacts of sustainable land management in drylands: a review. *Sustainability*, *8*(2), 177.

Mekoya, A. K. (2008). Multipurpose fodder trees in Ethiopia: farmers' perception, constraints to adoption and effects of long-term supplementation on sheep performance. In *Multipurpose fodder trees in Ethiopia: farmers' perception, constraints to adoption and effects of long-term supplementation on sheep performance*.

Mekuria, W., Barron, J., Dessalegn, M., Adimassu,

Z., Amare, T., & Wondie, M. (2017). *Exclosures for ecosystem restoration and economic benefits in Ethiopia: a catalog of management options*. International Water Management Institute (IWMI). CGIAR Research Program on Water, Land and Ecosystems (WLE).. 28p. (WLE Research for Development (R4D) Learning Series 4).

Mulema, A. A., Lema, Z., Damtew, E., Adie, A., Ogutu, Z., & Duncan, A. J. (2017). Stakeholders' perceptions of integrated rainwater management approach in the Blue Nile Basin of the Ethiopian highlands. *Natural Resources Forum*, *41*(4), 244–254.

Muys, B., Gebrehiwot, K., & Bruneel, S. (2006). The environmental, socio-economic, and managerial aspects of dryland forest rehabilitation in Ethiopia. *Environmental Protection*, *1*(2), 95–97.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Treating unobserved heterogeneity in PLS-SEM: A multi-method approach. In *Partial least squares path modeling* (pp. 197–217). Springer.

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair Jr, J. F. (2014). Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers. *Journal of Family Business Strategy*, *5*(1), 105–115.

Schahn, J., & Giesinger, T. (1993). *Psychologiefi'ir den Umweltschutz*. Weinheim: Psychologie.

Tadesse, S. A., & Teketay, D. (2017). Perceptions and attitudes of local people towards participatory forest management in Tarmaber District of North Shewa Administrative Zone, Ethiopia: the case of Wof-Washa Forests. *Ecological Processes*, *6*(1), 1–16.

Tesfahunegn, G. B. (2019). Farmers' perception on land degradation in northern Ethiopia: Implication for developing sustainable land management. *The Social Science Journal*, *56*(2), 268–287.

Tesfaye, Y., Roos, A., & Bohlin, F. (2012). Attitudes of local people towards collective action for forest management: the case of participatory forest management in Dodola area in the Bale Mountains, Southern Ethiopia. *Biodiversity and Conservation*, *21*(1), 245–265.

Vinzi, V. E., Trinchera, L., & Amato, S. (2010). PLS path modeling: from foundations to recent developments and open issues for model assessment and improvement. *Handbook of Partial Least Squares*, 47–82.

Yirdaw, E., Tigabu, M., & Monge Monge, A. A. (2017). Rehabilitation of degraded dryland ecosystems–a review. *Silva Fennica*.

Zainudin, A. (2012). Structural equation modeling using AMOS graphic. *Shah Alam: Universiti Teknologi MARA Publication Centre (UPENA)*.

Zhang, J., Niu, J., Buyantuev, A., & Wu, J. (2014). A multilevel analysis of effects of land use policy on land-cover change and local land use decisions. *Journal of Arid Environments*, *108*,19–28.