



Plant species diversity and natural regeneration under semi-forest coffee and natural forest in Diga district, Western Ethiopia.

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Abstract

While contributing to local livelihoods, conversion of natural forests to semi-forest coffee (SFC) has significantly threatened forest biodiversity and the associated ecosystem services. Although traditional coffee farming maintains indigenous trees for shade, empirical evidence is missing on how selective canopy management and understory removal are impacting species diversity and natural regeneration. Hence, this study examined species diversity and natural regeneration in SFC systems of Diga district. Vegetation data were collected from 20 quadrats from the NF and 20 quadrats within the SFC system, totaling 40. Key informants were interviewed to explore shade tree preferences and coffee forest management. Species diversity indices were computed for each quadrat, and regeneration status was assessed from proportions of juvenile and adult trees. Overall, 55 plant species were recorded, 52 in the NF and 27 in the SFC. Five of these are endemic to Ethiopia. Fabaceae was the most represented family. Higher diversity was observed in NF (2.19) than in SFC (1.32) ($p < 0.001$). Similarly, there were more seedlings in the NF (1950 ha^{-1}) than in the SFC (750 ha^{-1}), asserting the negative impact of coffee management practices on biodiversity and natural regeneration. Thus, revisiting coffee farming practices so as to balance biodiversity conservation is vital.

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INTRODUCTION

Coffee is among the vital crops of the globe. It is primarily produced in areas that are rich in biodiversity. According to Boreux et al. (2013) and Martínez-Salinas et al. (2016), the complex vertical structure of coffee forests provides habitats suitable for diverse flora and fauna. As shade trees provide additional ecological niches, they serve as a vital biogeographic center for biodiversity conservation (Aerts et al., 2011), enhancing overall ecosystem productivity (Jha et al., 2014).

A shift in land-use patterns to promote agricultural intensification negatively impacts species diversity (Philpott et al., 2007). While coffee-based agroforestry has been considered to serve biodiversity conservation, intensified coffee forest management and the continued expansion into natural forest are significantly threatening the diversity and natural regeneration of indigenous plant species (Aerts et al., 2011; Gurmessas et al., 2025). The negative impact of coffee cultivation and the associated land-use change on species

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richness, composition, and ecological processes has been frequently reported in Ethiopia (Hundera et al., 2013; Schmitt et al., 2010; Zewdie et al., 2022; Gurmessa et al., 2025). Likewise, Carsan et al. (2013) indicated a reduction in biodiversity and a shift in tree species composition from coffee plantations in Kenya. The study also revealed that shade tree composition and structure influenced carbon sequestration in coffee forests.

Statement of the problem

In a semi-forest coffee system, native shade trees are integrated with coffee plants. Farmers' preference for shade trees depends on the diverse ecological and economic benefits they obtain from these trees. Shade tree composition determines microclimates, soil fertility, and carbon sequestration (Denu et al., 2016; Martini & Riyandoko, 2017). Shade tree preference, together with frequent slashing of understory vegetation and canopy management in the SFC, is posing a major threat to plant species diversity and significantly disrupting their natural regeneration. These activities reduce shade tree composition and abundance, which compromise long-term forest sustainability (Hundera et al., 2015; Koelemeijer et al., 2021; Gurmessa et al., 2025).

Given these contrasting views about coffee-based agroforestry, a clear understanding of how traditional coffee farming practices influence plant species diversity and natural regeneration is essential for sustainable forest conservation efforts. Despite the growing body of literature on the impact of traditional coffee farming on species diversity, natural regeneration, and shade tree management in Ethiopia (Hundera, 2016), similar studies are limited for Diga district. Therefore, this study addresses the gap by assessing plant species diversity and regeneration dynamics in coffee farming areas of Diga district by comparing plant species diversity and regeneration dynamics of the SFC with the relatively pristine NF. This study tested the hypothesis that SFC and NF in Diga

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District exhibit similar levels of species diversity and natural regeneration potential.

Research questions

1. Does coffee agroforestry maintain woody species diversity in the district?
2. How do coffee-farming practices affect woody species diversity?
3. Is natural regeneration the same in both the NF and SFC?

MATERIALS AND METHODS

Study area

Diga District lies between 8°56'00"–9°10'00" N latitude and 36°09'00"–37°31'00" E longitude (Figure 1). It is in western Ethiopia, about 346 km from Addis Ababa. Diga district was previously covered with moist montane forest and *Combretum–Terminalia* woodlands. However, the area experienced extensive deforestation due to population growth and farmland expansion. As a result, native forests and the associated indigenous trees have significantly dwindled, and the soil has experienced severe erosion. The district exhibits a warm, moist climate, with a mean annual temperature and precipitation of 19.5°C and 1,866 mm, respectively (Figure 2).

Data collection

Field data were collected from four sites in two kebeles, *Gudisa* and *Firomsa*. In total, 40 quadrats, each with a 20 m × 20 m area, were systematically laid, following line transects. Out of the 40 quadrats, 20 were in SFC, while the remaining 20 were in the adjacent NF. In order to minimize the edge effects, the first quadrat of each transect was placed 50 m inside the forest. The distance between subsequent quadrats was 100 m, while it was 200 m between transects. Twenty-six (14 SFC and 12 NF) and 14 (6 SFC and 8 NF) quadrats were obtained from *Gudisa* and *Firomsa* kebeles, respectively. The adequacy of the sample size for each forest type was determined by the species–area curve.

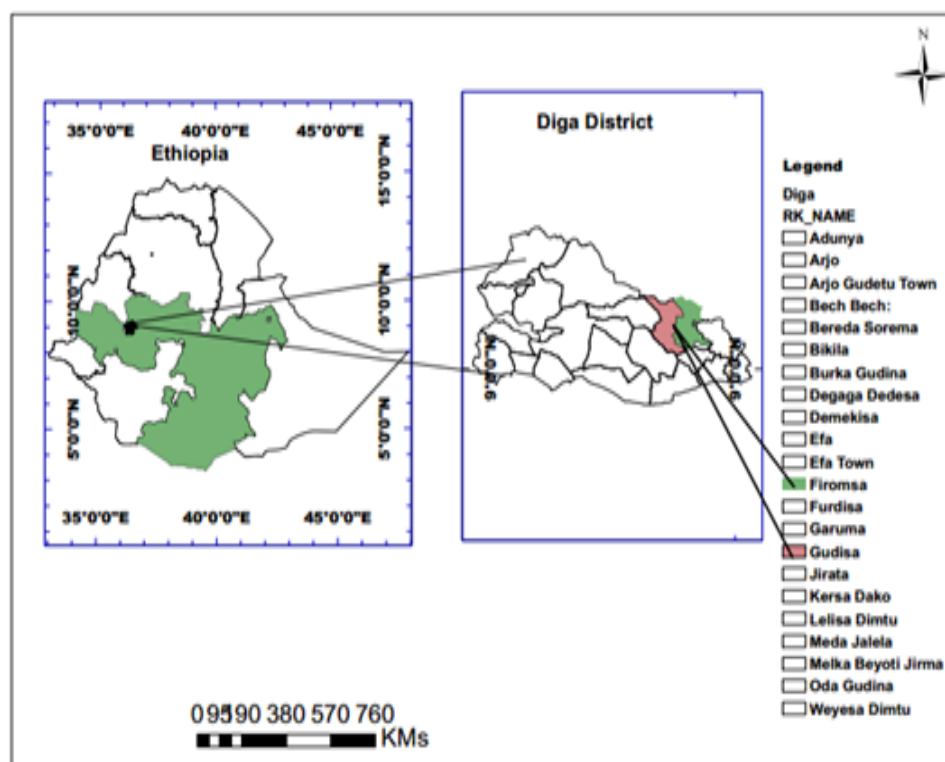


Figure 1. Map of the study area.

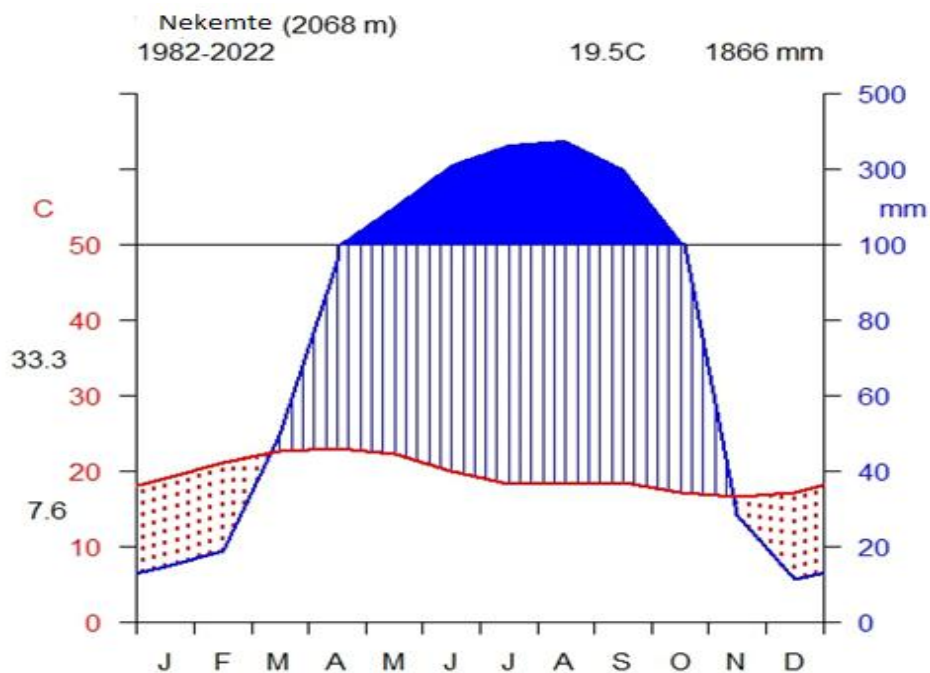


Figure 2. Climatic diagram of the study area

Within each quadrat, individual trees and shrubs that attained a DBH of 2.5 cm and a height of 1.5 m and above were recorded. In addition, sapling and seedling density were counted in subplots of 5 m × 5 m and 1 m × 1 m, respectively, to assess natural regeneration. For floristic richness, non-woody plants were also recorded in the 1 m² subplots. Taxonomic identification and nomenclature followed Flora of Ethiopia and Eritrea. Information on shade tree preferences and traditional coffee farming practices was obtained from key informants using semi-structured interviews.

Data analysis

Descriptive statistics were used for preliminary comparisons, and an independent t-test was applied to compare species richness, diversity, and evenness between SFC and the adjacent NF.

Species diversity analysis

Species diversity, richness, and evenness were computed using the Shannon Diversity Index as follows.

$$H' = - \sum_{i=1}^S P_i * \ln P_i$$

$$E = \frac{H'}{H'_{\max}}$$

$$Ss = \frac{2c + a + b}{2c}$$

Where: Ss = Sørensen's similarity index; c = common species to NF and SFC; a = unique to NF; b = unique to SFC;

Shapiro-Wilk and Levene's tests were used to check for normality and homogeneity of variance. Results indicated that species diversity across all quadrats is normally distributed ($p = 0.235$) and has homogeneous variance ($p = 0.117$). Hence, an independent t-test was employed in order to assess the difference in species diversity between NF and SFC. All the analyses were done with the R statistical package version 3.1.1 (R Development Core Team, 2014). The natural regeneration status of a species was said to be *good* when seedling > sapling > adult; *fair* when non-zero values of seedlings and saplings are less than that of adults; *poor* when the sapling is missing; and *not regenerating* (NR) when either seedling or both seedling and sapling are missing. Qualitative data on coffee forest management practices and shade tree preference obtained from key informants were analyzed using a thematic approach, following Hundera (2016) and Tazebew & Asfaw (2018).

RESULTS AND DISCUSSION

Results

Species accumulation curve

Adequate and unbiased sampling is important to obtain a representative sample. In this study, the adequacy of sampling efforts to capture the plant species diversity of the area was evaluated using a species accumulation curve (SAC). As shown in Figure 3, the curve levels off, indicating sufficient sampling efforts to capture the diversity in the area. However, the SAC for SFC levels off just before that of NF, indicating that all the species in the SFC were recorded even before all 20 plots were laid.

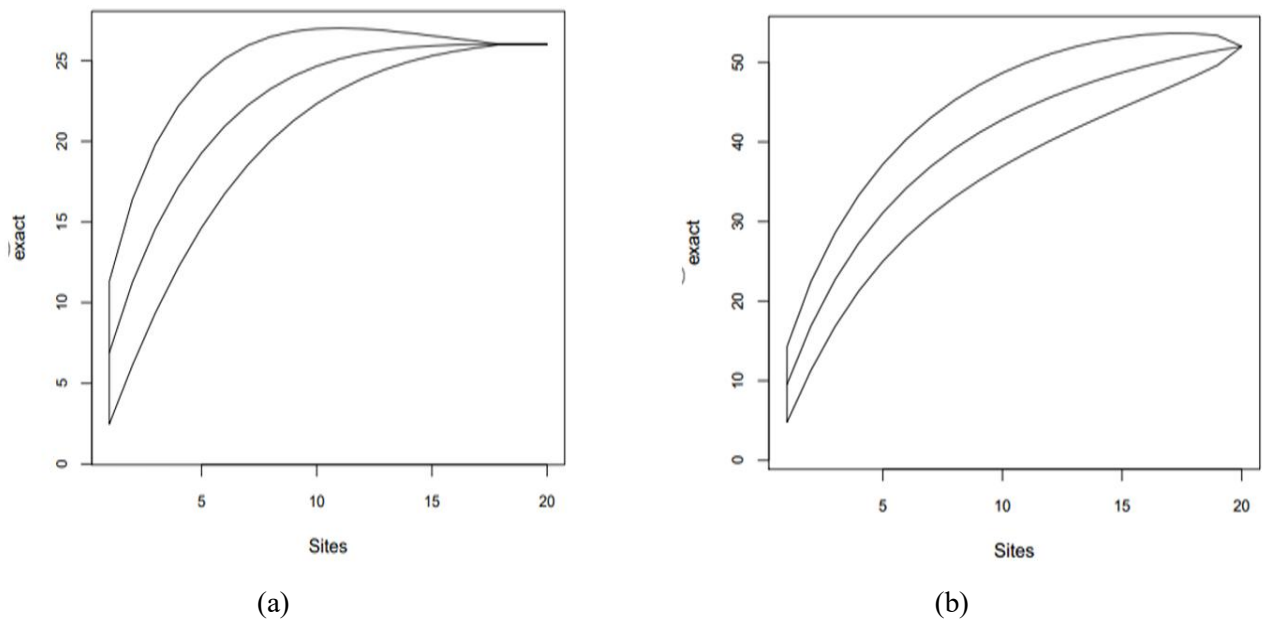


Figure 1. Species accumulation curve for SFC (a) and Natural Forest (b)

Floristic composition and species diversity

This study documented 55 species of vascular plants in 53 genera and 37 families (Appendix 1). Twenty-seven of these species were recorded in the SFC, while 52 species occurred in the NF. Among the 27 species of the SFC, 16 (59.26%) were trees, 8 (29.62%) were shrubs, 2 (7.40%) were herbs, and 1 (3.70%) was a liana. In the natural forest, 23

species (44.23%) were trees, 14 (26.92%) were shrubs, 7 (13.46%) were herbs, and 8 (15.39%) were lianas (Figure 4). Additionally, six plant species, namely *Vachellia abyssinica*, *Cordia africana*, *Cayratia gracilis*, *Ficus ovata*, *Ficus vasta*, and *Pterolobium stellatum*, were collected outside the sampling plots and were included solely to complete the floristic checklist of the area.

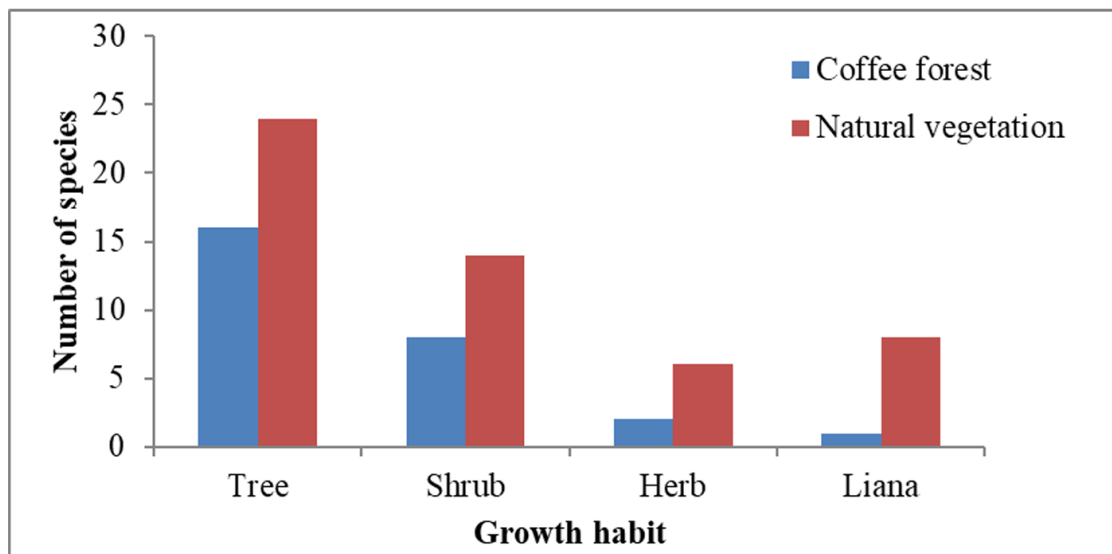


Figure 4. Growth form of plant species in the study area

Five of the plant species obtained in this study are endemic to Ethiopia, with *Vepris dainellii* Near Threatened (NT) and *Rubus aethiopicus* Endangered (EN) in the IUCN red data list (Table 1). Analysis of plant families in the SFC showed a clear dominance of Fabaceae represented by 4 species (14.81%) and Euphorbiaceae with 3 species (11.11%). The remaining 18 families had 2 or fewer

than 2 species (Table 2). Similarly, Fabaceae with 4 species (7.69%), Euphorbiaceae, Rubiaceae, and Rutaceae with 3 species each were the most represented families in the natural forest. While Rosaceae, Myrsinaceae, Meliaceae, Celastraceae, Urticaceae, Acanthaceae, and Asteraceae had 2 species each, the remaining 25 families had only one species each.

Table 1

Endemic plant species in the study forest: EN: Endangered, NT: Near threatened

No.	Scientific name	Family	Status
1.	<i>Millettia ferruginea</i>	Fabaceae	
2.	<i>Rhus glutinosa</i>	Anacardaceae	
3.	<i>Solanecio gigas</i>	Asteraceae	
4.	<i>Vepris dainellii</i>	Rutaceae	NT
5	<i>Rubus aethiopicus</i>	Rosaceae	EN

Table 2

Families with more than one species in natural forest and SFC

Forest type	Family	Species	%
Natural Forest (NF)	Fabaceae	4	7.69
	Euphorbiaceae	3	5.77
	Celastraceae	2	3.85
	Asteraceae	2	3.85
	Acanthaceae	2	3.85
	Meliaceae	2	3.85
	Myrsinaceae	2	3.85
	Rosaceae	2	3.85
	Rubiaceae	3	5.77
	Rutaceae	3	5.77
	Urticaceae	2	3.85
	Others	25	48.07
	Total	52	100
Semi-Forest Coffee (SFC)	Fabaceae	4	14.81
	Euphorbiaceae	3	11.11
	Rubiaceae	2	7.41
	Rutaceae	2	7.41
	Others	16	59.26
	Total	27	100

Species diversity

In the SFC, the mean number of species per plot was 4.20, while it was 9.55 in the NF, with the SFC having significantly lower species richness than the NF ($p < 0.001$). The Shannon diversity index (H') of 1.32 in SFC is much less than 2.19 in the NF,

Sci. Technol. Arts Res. J., July–Sep, 2026, 15(3), 139-153 indicating the difference was significant between NF and SFC ($p < 0.001$) (Table 3). In contrast, SFC and NF did not show a statistically significant difference with respect to species evenness ($p = 0.706$).

Table 3

Shannon diversity indices of SFC and NF

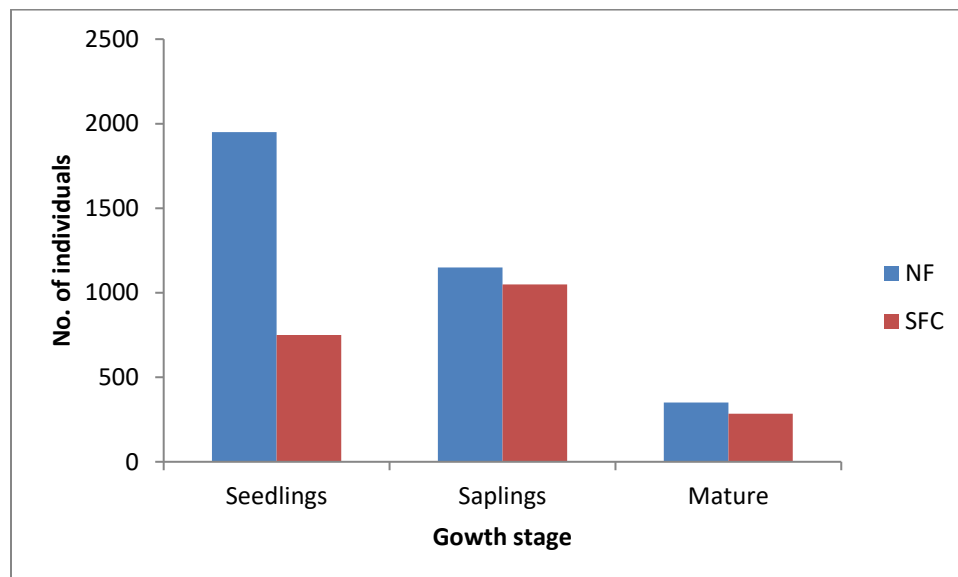
Diversity parameter	SFC	NF	t-value	Df	p-value
H'	1.32	2.19	7.49	38	<0.001
Richness	4.20	9.55	7.86	38	<0.001
Equitability	0.98	0.98	-0.38	38	0.706

Floristic similarity

Of the 55 plant species recorded in this study, 28 species were unique to the natural forest, while only 3 species were exclusive to the Semi Forest coffee (SFC). Based on these data, SFC and the natural forest shared 24 species (61%), reflecting a moderate level of floristic similarity. The moderate similarity suggests notable differences in their overall species composition.

Regeneration status

Seedling and sapling density provides a clear indication of future forest sustainability. The natural forest exhibited good regeneration status, with 1,950 seedlings, 1,149 saplings, and 350 mature trees ha^{-1} (Figure 5), indicating continuous recruitment and stable regeneration dynamics. In the SFC, however, seedlings are fewer (750 ha^{-1}) than saplings (1,050 ha^{-1}) and mature trees (285 ha^{-1}), suggesting a poor regeneration pattern.

**Figure 5.** *Density of seedlings, saplings, and adults in NF and SFC*

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Analysis of natural regeneration revealed that 10 species in the SFC demonstrated good regeneration, while six species, namely *Dracaena afromontana*, *Ehretia cymosa*, *Euphorbia abyssinica*, *Schefflera abyssinica*, *Teclea nobilis*, and *Millettia ferruginea*, were represented only by adult individuals, indicating the need for targeted conservation

Sci. Technol. Arts Res. J., July–Sep, 2026, 15(3), 139-153 measures (Figure 6). On the contrary, 19 species in the NF showed good regeneration, with only 2 species, namely *Ekebergia capensis* and *Olea capensis*, not regenerating. This result indicates a more balanced and self-sustaining structure in NF, while the SFC showed regeneration constraints.

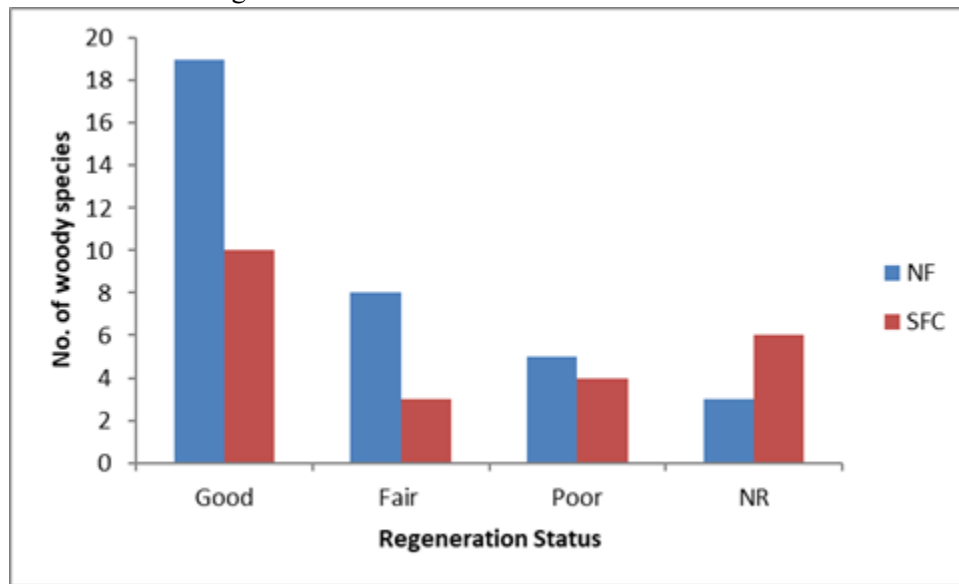


Figure 6. Regeneration status of woody species in the study area (NR: not regenerating)

Impacts of traditional coffee farming practices on species diversity and regeneration

In Diga district, a few tree species such as *Albizia schimperiana* and *Croton macrostachyus* are preferred for shade due to their multiple ecological and economic values. Farmers in the study area perform traditional practices, such as understory slashing and selective thinning for optimum light availability and increased coffee yield. But the long-term ecological impacts of these practices remain a question. Intensified management via frequent understory clearance may also lead to impoverishment of native tree species and overall biodiversity, which may ultimately affect coffee productivity itself. Moreover, limited awareness of the ecological benefits of biodiversity contributes to inadequate conservation efforts within coffee forests. Overall, traditional coffee farming, while considered eco-friendly agriculture, intensified management may pose threat of local species extinction and hampered natural regeneration.

Discussion

Species composition and diversity

The coffee-growing landscape of Diga district serves as an important reservoir of plant diversity, although fewer species are recorded in the SFC than in the NF. Lower species richness in coffee agroforests was also reported elsewhere in Ethiopia (Gamachu & Jegora, 2019; Beyene et al., 2022). The impact of coffee forest management practices is also manifested by the variation in growth forms, with fewer herbaceous species in SFC compared to NF. Coffee forest management often removes understory vegetation and herbaceous plants (Senbeta & Denich, 2006; Rossi et al., 2011). Fabaceae, Euphorbiaceae, and Rubiaceae are more represented in both NF and SFC, due to their overall abundance in the flora area and their ecological dominance due to nitrogen-fixing ability and efficient seed dispersal (Yasin et al., 2018). Although fewer endemic species are documented in

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this study, it still emphasizes the need for conservation priority.

The significantly lower species diversity in SFC (mean = 1.32) compared to the NF (mean = 2.19; $p < 0.001$) could be attributed to habitat homogenization and species loss (Aerts et al., 2011), asserting the impact of traditional coffee forest management practices on species diversity and overall ecosystem functioning. The significantly reduced species richness in the SFC (mean = 4.20) compared to the NF (mean = 9.55; $p < 0.001$) shows the ecological cost of coffee production (Zewdie et al., 2022; Dinsa, 2019; Senbeta & Denich, 2006). While species richness drops significantly in the SFC, the high evenness implies that farmers are intentionally managing and spacing out the remaining few shade canopy species with high uniformity.

Floristic similarity

The Sorenson similarity coefficient of 0.61 indicates a moderate species overlap between the SFC and the NF, which is in line with previous studies by Ramalakshmana et al. (2023) and Mengistu & Asfaw (2016). The significant floristic overlap between coffee and natural forests could be attributed to geographical proximity, similar environmental conditions, and previous land use history. For example, GurMESSA et al. (2025) demonstrated that most of the shade trees retained in the SFC were originally part of the natural forest. But 28 species of the NF were missing from SFC, reflecting the negative impact of traditional coffee farming practices on species diversity, which is in line with the study by Hundera et al. (2013). The negative impact of coffee cultivation on species diversity was also reported by Schmitt et al. (2010) and GurMESSA et al. (2025).

Regeneration status

A difference in seedling and sapling density in the SFC and NF, primarily shaped by management intensity, shows a clear difference in natural regeneration. A balanced *inverted J-shaped* size class distribution, with more seedlings followed by saplings, was observed in NF. Higher density of the juveniles (seedlings and saplings) reflects better

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recruitment and stable demographic processes, suggesting effective regeneration for long-term stand structure. In a relatively undisturbed Afromontane forest, similar patterns have been widely documented (Deressa et al., 2023; Awoke et al., 2025). In the SFC, however, saplings are better represented than seedlings, indicating recruitment limitations. The higher number of saplings in the SFC must be carefully interpreted, as *Coffea arabica* shrubs were intentionally retained and managed to optimize production (Kebebew & Ozanne, 2024; Perfecto et al., 2009). As a result, greater sapling density in the SFC does not necessarily denote good regeneration and ecological stability but rather reveals anthropogenic-induced structural alteration.

While there is substantial tree cover in the SFC, natural regeneration assessment for the indigenous species displayed regeneration bottlenecks for numerous native species. Traditional coffee forest management practices might have caused mechanical damage to the newly sprouting seedlings and depletion of the soil seed bank. Understory clearance, selective weeding, canopy regulation, and disturbance of microhabitats also limited seed germination and early seedling establishment for some species (Kebebew & Ozanne, 2024; GurMESSA et al., 2025). It was also reported that increasing management intensity often reduces regeneration of some native species in tropical agroforestry systems (Perfecto et al., 2009). Although it was widely believed that the coffee agroforestry system is eco-friendly, maintaining diversity while supporting rural livelihoods, it shows lower diversity and poor natural regeneration than those of natural forests. Hence, minimizing excessive disturbance, conserving understory vegetation, and promoting enrichment planting of poorly regenerating species would enhance ecological resilience and sustainable biodiversity conservation in SFC areas of Diga district.

Impacts of coffee forest management on species diversity and regeneration

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The primary objective of coffee growers in Diga district is to increase coffee yield rather than protecting the existing diversity. They selectively remove all tree species which they consider to be of little demand. Suitable shade trees such as *Albizia schimperiana* and *Croton macrostachyus*, however, are retained for their multiple benefits, including shade provision, soil fertility improvement, provision of fuelwood and timber (Hundera, 2016; Denu et al., 2016). Selective thinning, pruning, and understory slashing are frequently practiced (at least twice annually) to suppress competing weeds and enhance coffee yields (Hundera et al., 2013; Gamachu & Jegora, 2019). Such intensified management, although frequently practiced, reduces diversity and constrains natural regeneration of indigenous plant species (Hundera, 2016; Kewessa et al., 2017; Dinsa, 2019; Koelemeijer et al., 2021). Lack of awareness of the ecological benefits of biodiversity and an increasing global market for coffee promote further expansion of coffee plantations, exposing the remaining natural forest to further degradation. Although participatory forest management (PFM) initiatives demonstrate a balance between sustainable coffee production and biodiversity conservation, similar initiatives are lacking in Diga district. While integrating shade trees into coffee systems is vital, agricultural intensification has negatively affected species diversity, natural regeneration, and sustainable agroforestry systems. Hence, this study suggests optimum coffee farming practices that integrate sustainable biodiversity conservation in Diga district.

CONCLUSION

Despite the widely held belief that coffee agroforestry systems maintain biodiversity, this study revealed considerably lower plant species diversity and hampered regeneration in SFC. NF, however, exhibited higher diversity and a healthier regeneration profile, showing stronger ecological resilience and long-term sustainability. The variation between NF and SFC is primarily attributed to frequent clearance of understory vegetation and selective tree canopy management

Sci. Technol. Arts Res. J., July–Sep, 2026, 15(3), 139-153 in the SFC. Although intensification of coffee forest management provides short-term economic benefit, it may simultaneously pose a significant risk to native plant species diversity and natural regeneration if left unabated.

Recommendations

Coffee agroforestry systems have been widely believed to maintain plant species diversity while contributing to local livelihoods. But intensive coffee forest management for increased coffee yield may impoverish the natural ecosystem beyond its natural rehabilitation potential. Hence, coffee growers and the district agriculture office should design and introduce novel coffee production techniques in which minimum canopy cover is set for optimum coffee production and biodiversity conservation. In addition, minimizing the frequency and intensity of understory slashing and canopy thinning is important to maintain the diversity of native species in SFC. Protecting naturally regenerating seedling and sapling populations of indigenous tree species is also vital during coffee forest management. Enhancing farmers' awareness of the ecological benefits of native woody species in soil conservation, carbon sequestration, and habitat provision for wildlife and pollinators may also deter them from indiscriminate understory slashing. Additionally, policies and extension services that promote organic coffee production and coffee quality certification methods should be implemented in the district.

CRedit Author Statement

Abdi Geleta: Conceptualization, Data curation, **Fekadu Gurmessa:** Investigation, Formal analysis, and writing the original draft. **Alganesh Melesse:** Methodology, Validation. **Tena Regassa:** Visualization, Project administration

Declaration of Competing Interest

The authors declare that there are no institutional, financial, or personal conflicts of interest related to this study.

Ethical Approval

Not applicable

Data Availability Statement

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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Appendices

Appendix 1

List of plant species collected from Diga district (x: indicate species presence)

S/N	Scientific Name	Family Name	Local Name (Afaan Oromoo)	Voucher No	Habit	NF	SFC
1	<i>Acanthus polystachius</i> Delile	Acanthaceae	Sokorruu Booyyee	AG-003	Sh	x	x
2	<i>Acanthus eminens</i> C. B. Clarke		Sokorruu	AG-002	Sh	x	
3	<i>Crinum abyssinicum</i> Hochst. Ex A. Rich.	Amaryllidaceae	Qullubbii Waraabessaa	AG-016	H	x	x
4	<i>Rhus glutinosa</i> A.Rich.	Anacardiaceae	Xaaxessaa	AG-043	T	x	
5	<i>Landolphia buchananii</i> (Hall.f.) Stapf	Apocynaceae	Hidda Geeboo	AG-033	L	x	
6	<i>Schefflera abyssinica</i> (Hochst. ex A. Rich.) Harms	Araliaceae	Gatamaa	AG-047	T		x
7	<i>Asparagus africanus</i> Lam.	Asparagaceae	Sariitii	AG-008	L	x	
8	<i>Vernonia auriculifera</i> Hiern	Asteraceae	Reejjii	AG-054	Sh	x	x
9	<i>Solanecio gigas</i> (Vatke) C.Jeffrey		Jirma Jaldeessaa	AG-048	H	x	
10	<i>Ehretia cymosa</i> Thonn.	Boraginaceae	Ulaagaa	AG-019	T	x	x
11	<i>Maytenus arbutifolia</i> (A. Rich.) Wilczek	Celastraceae	Acaacii	AG-036	Sh	x	x
12	<i>Hippocratea goetzei</i> Loes.		Hidda Gafarsaa	AG-031	L	x	
13	<i>Combretum paniculatum</i> Vent.	Combretaceae	Hidda Baggee	AG-015	L	x	
14	<i>Kalanchoe petitiiana</i> A. Rich.	Crassulaceae	Bosoqqee	AG-032	H	x	x
15	<i>Dracaena afromontana</i> Mildbr.	Dracaenaceae	Afarfattuu	AG-018	T	x	x
16	<i>Croton macrostachyus</i> Del.	Euphorbiaceae	Bakkanniisa	AG-017	T	x	x
17	<i>Erythrococca trichogyne</i> (Müll.Arg.) Prain		Caakkoo	AG-023	Sh	x	x
18	<i>Euphorbia abyssinica</i> J.F.Gmel.		Adaamii	AG-024	T	x	x
19	<i>Albizia gummifera</i> (J.F. Gmel). C.A. Sm.		Ambabbeessa	AG-004	T	x	x
20	<i>Albizia schimperiana</i> Oliv.		Mukarbaa	AG-005	T	x	x
21	<i>Millettia ferruginea</i> (Hochst.) Bak	Fabaceae	Sootalloo	AG-037	T	x	x
22	<i>Calpurnia aurea</i> (Ait.) Benth.		Ceekaa	AG-011	Sh		x
23	<i>Vigna unguiculata</i> (L.) Walp.	Flacoutiaceae	Hidda Hantuutaa	AG-055	H	x	
24	<i>Flacourtia indica</i> (Burem.F) Merril		Akuukkuu	AG-026	T	x	
25	<i>Apodytes dimidiata</i> E.Mey.ex Am.	Icacinaceae	Wandabiyyoo	AG-007	T	x	
26	<i>Abutilon figarianum</i> Webb.	Malvaceae	Hincinnii gurraacha	AG-001	Sh	x	

S/N	Scientific Name	Family Name	Local Name (Afaan Oromoo)	Voucher No	Habit	NF	SFC
27	<i>Ekebergia capensis</i> Sparrm.	Meliaceae	Somboo	AG-020	T	x	x
28	<i>Lepidotrilichilia volkensii</i> (Gurke) Leroy		Halalee	AG-034	T	x	
29	<i>Bersama abyssinica</i> Fresen	Melanthaceae	Lolchiisaa	AG-009	Sh	x	x
30	<i>Tiliacora funifera</i> Oliv.	Menispermaceae	Hidda Liqixii	AG-051	L	x	
31	<i>Ficus sur</i> Forrsk.	Moraceae	Harbuu	AG-025	T	x	x
32	<i>Ensete ventricosum</i> Cheesman	Musaceae	Warqee	AG-022	H	x	
33	<i>Maesa lanceolata</i> Forssk.	Myrsinaceae	Abbayyii	AG-035	Sh	x	x
34	<i>Embelia schimperi</i> Vatke		Haanquu	AG-021	L	x	
35	<i>Syzygium guineense</i> (Willd.) DC. subsp <i>afromontanum</i>	Myrtaceae	Baddeessaa	AG-049	T	x	x
36	<i>Olea capensis</i> L.	Oleaceae	Gagamaa	AG-038	T	x	
37	<i>Phytolacca dodecandra</i> L'Herit.	Phytolaccaceae	Handoodee	AG-039	L	x	x
38	<i>Pteris pteridioides</i> (Hook.) ballard	Pteridaceae	Giixoo	AG-042	H	x	
39	<i>Gouania longispicata</i> Engl.	Rhamnaceae	Hidda reeffaa	AG-029	L	x	
40	<i>Rubus aethiopicus</i> R.A. Grah.	Rosaceae	Goraa nyaatamu	AG-045	Sh	x	
41	<i>Prunus africana</i> (Hook. f.) Kalkm.		Hoomii	AG-041	T	x	
42	<i>Rytigynia neglecta</i> (Hirn) Robyns	Rubiaceae	Mixoo	AG-046	Sh	x	x
43	<i>Coffea arabica</i> L.		Buna	AG-014	Sh		x
44	<i>Galiniera saxifraga</i> (Hochst.) Bridson		Mixoo Qeerransaa	AG-027	Sh	x	
45	<i>Rothmannia urcelliformis</i> (Hiern) Robyns		Buruurii	AG-044	T	x	
46	<i>Clausena anisata</i> (Willd.) Benth.	Rutaceae	Ulmaayii	AG-013	Sh	x	x
47	<i>Teclea nobilis</i> Del.		Hadheessa	AG-050	T	x	x
48	<i>Vepirs dainellii</i> (Pichi-Serm.) Kokwaro	Sapindaceae	Hadheessa dhalaa	AG-053	S	x	
49	<i>Allophylus abyssinicus</i> (Hochst.) Radlkofer		Malqaqqoo	AG-006	T	x	x
50	<i>Pouteria adolfi</i> –friederici (Engl.)Baehni	Sapotaceae	Qararoo	AG-040	T	x	
51	<i>Brucea antidysenterica</i> J. F. Mill	Simaroubaceae	Qomonyoo	AG-010	Sh	x	x
52	<i>Grewia ferruginea</i> Hochst ex A. Rich.	Tiliacea	Dhoqonuu	AG-030	Sh	x	
53	<i>Celtis africana</i> Burm.f.	Ulmaceae	Qayii/Cayii	AG-012	T	x	
54	<i>Girardinia bullosa</i> (Steudel) Wedd.	Urticaceae	Gurgubbee	AG-028	H	x	
55	<i>Urera hypselodendron</i> (A.Rich.) Wedd		Laanqessaa	AG-052	L	x	