Ethiopian Biodiversity Institute

Biodiversity and Ecosystem Services Network (BES-Net) Phase II Project

"Implementation of Component I in Ethiopia of Post-National Ecosystem Assessment Results Framework"

Assessment on "the Status of Awareness of key Stakeholders on Biodiversity and Ecosystem Services in Ethiopia"

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Summary

Community awareness have played an important role in nature conservation and have received increased attention in biodiversity conservation. However, studies on the knowledge, attitude and practice (KAP) of local people towards biodiversity conservation are limited. Therefore, we investigated the community KAP towards biodiversity conservation in Ethiopia. We collected the data from 525 households interviews using a semi-structured questionnaire. The findings suggest a widespread perception among local communities that biodiversity is facing challenges. This implies that engaging with local communities and incorporating their perspectives in biodiversity and ecosystem conservation strategies is crucial for the effective protection and restoration of biodiversity. There is a high level of awareness and shared concerns among the public regarding biodiversity degradation, loss and ecosystems service decline. This include declining wild life population and their habitats. One of the impressive findings of this survey is that overall consensus reached by the respondents on the environmental responsibility of the current generation. The respondents agreed that generation must discharge its environmental responsibility. There is also a strong agreement on the need for promoting local knowledge and local varieties for maintaining healthy and productive environment at over 92% among which 60.6 % strongly agreed while the remaining 31% agreed. From these finding we can conclude that the community does not have a serious problem of awareness on biodiversity conservation rather the increasing human population pressure and associated needs lead to the degradation of the resources.

1. Background

Biological diversity is defined as the variety and variability among the living organism from terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part (Heywood and Bates, 1995). Biodiversity includes genetic diversity, species diversity and ecosystem diversity (Swift et al., 2004). In other words, biodiversity is the variety of life on earth and includes variation at all levels of biological organization from genes, species and ecosystems (Gaston and Spicer, 2004). However, researches indicated that biodiversity encompasses more than variation in appearance and composition, and includes diversity in abundance, distribution and in behavior, and incorporates human cultural diversity (Chivian, 2002).

Benefits from biodiversity to humans are various, and essential services provided to the society includes material goods such as food, timber, medicines, and fiber; as well as various services appreciated to underpin ecological functions such as flood control, climate regulation, nutrient cycling, maintaining hydrological cycles, cleaning water and air, soil formation and soil storage (MEA, 2005), added to the cultural, social, aesthetic and ethical values (Swift et al., 2004), pollination and pest control, carbon sequestration and storage (Hooper et al., 2005; Barton and Pretty, 2010). These functions are appreciated to secure long-term flows of benefits from nature by providing resilience to disturbance and environmental change (Hooper et al., 2005) and other economic and social contributions which are essential to human being (Gallai et al., 2009). Increasing domination of ecosystems by humans is steadily transforming them into poor systems (Sala et al., 2000). Humans have extensively altered the global environment, changing the global biogeochemical cycles, transforming land and enhancing the mobility of biodiversity, while fossil-fuel combustion and deforestation increased the concentration of atmospheric carbon dioxide (Stuart et al., 2000). Changes in biodiversity and its links to ecosystem properties affect the cultural, intellectual, aesthetic and spiritual values that are important to society; in addition to economic impacts related to the reduction of food resources, fuel, structural materials, medicinal or genetic resources as well as abundance of other species that control ecosystem processes, leading to further changes in community composition and vulnerability to invasion (Stuart et al., 2000). The imperative to reduce human impacts on biodiversity has wide political recognition in various countries. There is an increasing array of national, regional, and international policy mechanisms aimed at biodiversity conservation (Rands et al., 2010). Creation of protected areas, species protection and recovery measures for threatened species, ecosystem restoration, ex situ and in situ conservation services, incorporating consideration of biodiversity conservation into

management practices in sectors such as agriculture, forestry and fisheries, capture of benefits by local communities, public awareness, communication and education, integration of biodiversity conservation and development are some of the action taken for biodiversity conservation (MEA, 2005) cited among others. Ethiopia is one member of mega biodiversity like-minded countries with an incredible potential of endemic flora and fauna species. Conservation efforts are based on the creation of protected areas, integration of communities in conservation activities, revenue sharing and establishment of various laws such as the Access and benefit sharing proclamation governing biodiversity. Biodiversity conservation education has been a priority of the government, the Ministry of Education and MEFCC introduces climate change education strategy of Ethiopia 2017-2030, where conserving, preserving and restoring ecosystems as well as protecting biodiversity and ensuring sustainable use of natural resources were given the priority (climate change education strategy of Ethiopia 2017-2030) https://www.uncclearn.org/wp-content/uploads/2020/10/Ethiopia-Strategy-Final-Document-Digital.pdf

Lack of public awareness of biodiversity conservation is the leading cause of biodiversity loss. This needs to be emphasized by stakeholders in the conservation effort. As a result of threats such as deforestation, pollution, poaching, and uncontrolled urbanization and farm land expansion or population growth biodiversity is degraded due to a lack of emphasis on awareness of the importance of the biological resources. However, it is still limited information on to what extent is the public aware of the importance of biodiversity conservation in Ethiopia and its relationship to their well-being.

The Ethiopian Biodiversity Institute (EBI) has a power and duties related to the conservation, promoting the sustainable utilization of Ethiopia's biodiversity and ensuring fair and equitable sharing of the benefits accrued from the use genetic resources. This includes maintaining and developing international relations with bilateral and multilateral bodies having the potential to providing technical assistance. The Institute, on the basis of national legislation, has the responsibility and duty to implement international conventions, agreements and obligations on biodiversity to which Ethiopia is a party.

The Biodiversity and Ecosystem Services Network (BES-Net) is a collaborative effort among UNDP, UNEP-WCMC, and UNESCO, supported by the Government of Germany's Climate Initiative (IKI) and SwedBio, aiming at promoting the conservation of biodiversity and sustainable use of diverse ecosystem services which will translate into strengthened resilience for

the planet and human welfare. BES-Net builds on the latest assessments of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) to offer transformative solutions for biodiversity on the ground. This runs in parallel with the collaborative platform for scientists, policymakers, and practitioners that foster effective BES management and multi-stakeholder knowledge sharing. Thus, the study aims to examine the level of awareness (knowledge, attitude, and practices) among local community and experts towards biodiversity and its ecosystem services in Ethiopia.

2. Methodologies of the Assessment

The main purpose of the study is to reveal the knowledge, attitude and practices of communities towards biodiversity and its ecosystem services. The mixed-method research design was used to analyze the community's responses. This design is efficient in using both qualitative and quantitative methods to assert meanings by using words and numbers. Responses were gathered through the survey/questionnaire method. According to Kahraman (2019), the survey method is versatile, generalizable, and efficient. The survey collected data using both quantitative and qualitative method. Majorly, quantitative data is collected from households and experts through quantitative questionnaire whereas qualitative data is collected from Key informant (KI) interview

2.1 Status of Awareness Survey

Knowledge was considered to be the level of understanding of stakeholders on NBP and activities and tactics of works. Attitude was considered to be a way of being; it refers to the feelings and perceptions of the stakeholders about the conservation activities. Attitude was an intermediate variable between the local communities' knowledge of the situation of biodiversity and conservation efforts and their response to this situation. Practice was considered to be the observable response of an individual or community to a situation and refers to how individuals or communities demonstrate their knowledge and attitudes through their actions and behaviors. In this study, we were interested in their knowledge, actions and practices regarding the situation of biodiversity conservation and ecosystem services. The indicators were interactive and shown in Figure 1. We considered factors such as their participation related to conservation activities and any related activities that local communities had implemented. The KAP survey will be conducted by designing a questionnaire and conducting interviews. In total, the interview questionnaire contained 25 questions related to the respondent's background (6 questions), as

well as their knowledge (9 questions), attitudes (6 questions), and practices (4 questions). We determined sample size of survey respondents based on a convenience sampling. Surveyed households were randomly chosen from lists provided by village heads.
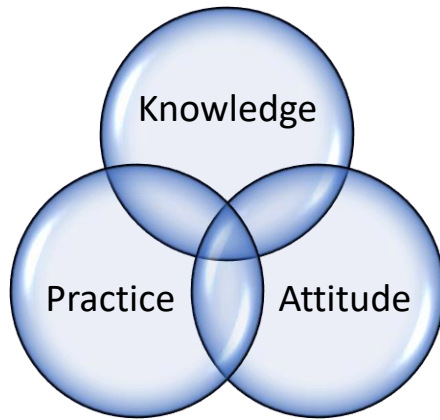

Figure 1: "Awareness of biodiversity" sub-indicators

The survey covers 5 regions and 1 city administration namely (Addis Ababa city administration, Oromia, Sidama, Somalia, Southern Ethiopia and South West Ethiopia). Data collected for this baseline survey will serve as a benchmark for indicators; by doing this as a baseline information on output and outcome indicators could be computed at ease for future comparison studies. This baseline survey was made use of the following methods and instruments for data collection.

i. Desk Reviews

The desk review has the following purposes. First, the desk review were gave opportunity to our research teams orient themselves to obtain the general background and specific project dynamics so that they are able to guide the survey. The main review includes reading project documents and other relevant documents afterward the team becomes familiar with project goals, objectives, and design. Second, the desk review facilitated the production of a brief survey instrument which incorporates all relevant information to as stipulated by the client. Third, the desk review was also allowing the research team to sharpen the methodology and design to be adapted for subsequent phases of the study.

ii. Survey questioners

The household level survey data were incorporate information, among others, socio-economic characteristics of the household, knowledge, attitude and practices on biodiversity conservation and ecosystem services. However, the usefulness of survey data depends heavily on the quality

of the survey instrument, in terms of both questionnaire design and actual implementation in the field. Good questionnaire designed allows us to obtain information in such a way that survey respondents understand the questions and can provide the correct answers easily in a form that is suitable for subsequent processing and analysis of the data.

iii. Key Informant Interviews

Key interviews are very important tools for gathering in-depth qualitative data. Key informants were individuals who are articulate and knowledgeable about the issue under discussion. Key actors play a pivotal role in the theater of qualitative research, providing in-depth understanding of the topic of interest. The data generated from Key informants represent an efficient source of invaluable information. They generally answer questions comprehensively about the situations and demand of the communities, and available development programs and the importance of planned interventions in the conservation of BD in the area.

The competency of key informants is often measured by length of time they have been in the sector, knowledge of the program and knowledge about the specific conditions in the society

Therefore, the key informants were all have first-hand information and knowledge on activities directly or indirectly related to biodiversity and ecosystem services. Based on the above stipulated qualifications, the survey team leader identified and communicated a number of key informants from Woreda/Zonal level government authorities, PFMCs and PRMCs representatives, gender experts, pastoral/agricultural livelihood experts and BD and Natural resource experts working in the area. We were also considered others who can provide invaluable information related to issues on our key informant interview checklists and the information is used as a support for the quantitative information.

2.2 Data Analysis

A survey questionnaire was used to obtain information from the respondents. Accomplished survey forms were encoded in Microsoft Excel and imported to SPSS software. The following statistical tests and analyses were computed: descriptive statistics, chi-square, and correlation. Descriptive statistics were used to describe the knowledge, attitude and practices of the communities. Descriptive statistics simply summarize and describe the data for a better understanding of the readers through mean, frequency and percentiles. We used simple descriptive analysis. All analysis was performed using

the Statistical Package for Social Science (SPSS) Statistics ver. 23 for Windows. Results were presented through tables, graphs and charts.

3. Results and Descriptive Analysis

3.1 General Information About respondents

This study included five regions of the country and one City Administration. A total 525 randomly selected respondents from 25 villages were included in the conduct of the study (Table 1). Among the respondents, 370 (70.5%) were males and 155 (29.5%) were female (Table 2).

Table 1. Number of respondents

Region	Number of respondents			Percentage
	Male	**Female**	**Total**	
Addis Ababa City Administration	59	28	87	16.57
Oromia	46	25	71	13.52
Sidama	75	25	100	19.05
Somali	73	27	100	19.05
Southern Ethiopia	54	32	86	16.38
South West Ethiopia	63	18	81	15.43
Total	**370**	**155**	**525**	**100**

The mean age of the participants was 36.3 years old ranging from 15 to 80 years old. Above 30 % of the respondents were graduates. Seveny five percent married and above 57% were dwellers in the area for more than 25year s in their locality. Details of the respondent's information were shown in Table 2 below.

Table 2. Demographic characteristics of respondents.

Categorical Variable		Frequency	Percent
Sex	Male	370	70.5
	Female	155	29.5
	Total	**525**	**100**
Age	15-30	200	38.1
	31-45	230	43.8
	46-60	75	14.3
	>60	20	3.8
	Total	**525**	**100**
Educational Level	Non literate	44	8.4
	Primary (1-4)	56	10.7
	Second cycle (5-8)	110	21.0
	High school (9-12)	147	28.0
	Diploma/Degree	161	30.7
	Others	7	1.3
	Total	**525**	**100**
Marital Status	Married	398	75.8
	Single	109	20.8
	Widowed	11	2.1
	Divorced	7	1.3
	Total	**525**	**100**
Living in the area	$\leq$ 5 Years	59	11.2
	6-15 Years	86	16.4
	16-25 Years	79	15.0
	$\geq$25 Years	301	57.3
	Total	**525**	**100.0**

Respondents' education level across regions shows a variation. Majority of the respondents from Somali Region and Addis Ababa city administration were high school and above graduates while respondents from Southwest Ethiopia region were majorly non literate or attend classes up to
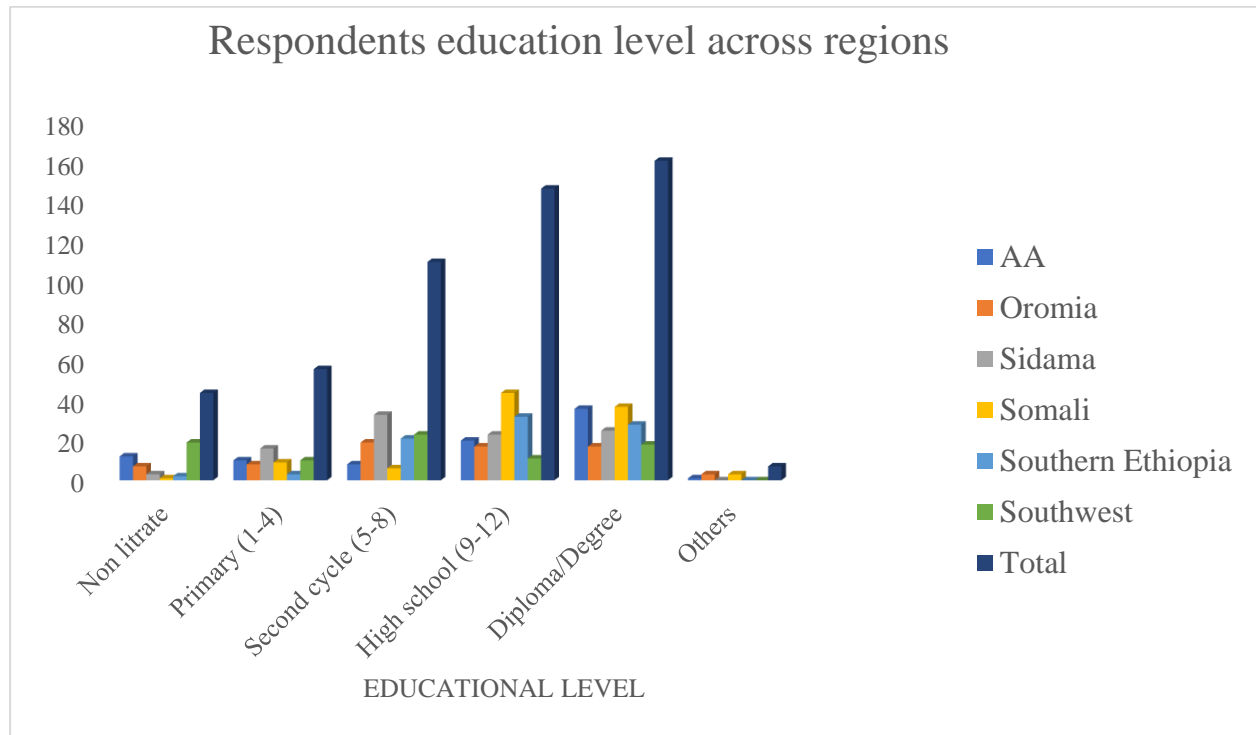
grade 8 (Figure 2).

Figure 2. Respondents education level across regions.

3.2 Identifying the current levels of understanding of biodiversity

The perception of local people on biodiversity changes in various regions reveals interesting trends (Table 3). Among the surveyed individuals, the majority of the respondents have knowledge of the term "Biodiversity," with a significant proportion (69.8%) being aware of it, as opposed to those who are not familiar with the term.

In the capital city of Addis Ababa, a significant number of respondents, 56%, expressed concern over decreasing biodiversity, while only 22% noticed an increase. The majority, 57%, in respondents in Gamo Zone of Southern Ethiopia region reported a similar sentiment, indicating a prevalent perception of biodiversity decline. On the contrary, the Bale Zone Oromia region stands out with a majority (62%) perceiving an increase in biodiversity, showcasing a positive outlook. The increasing trends of public perception in this area could be due to geographic proximity of respondents to Bale national parks, one the UNESCO world heritage sites. However, it's noteworthy that there are variations within regions, as evidenced by the 61% in the Gamo Zone

perceiving a decrease trends.

Table 3 Community perception on the Biodiversity changes

			Trends			Total
		Increasing	Decreasing	No change	Increasing only for some habitats	
Region	Addis Ababa	22	56	7	0	85
	Oromia	62	10	1	0	73
	Sidama	42	55	0	3	100
	Somali	30	61	4	5	100
	Southern Ethiopia	29	56	1	0	86
	Southwest Ethiopia	14	61	6	0	81
Total		199	299	19	8	525
%		38	57	4	2	100

Local people perception on the Biodiversity Changes in the study areas

Additionally, in Sidama, 42% noticed an increase, but a sizable 55% observed a decline, suggesting a more mixed perception in this region. Overall, the data underscores the diversity of opinions on biodiversity changes, emphasizing the importance of considering regional nuances and specific habitats.

The total aggregated data for respondents from all regions highlights a concerning trend, with 57% of respondents perceiving a decrease in biodiversity, while only 38% noted an increase. The remaining 4% reported no change, and 2% observed an increase only in certain habitats (Figure 3). These findings suggest a widespread perception among local communities that biodiversity is facing challenges. Efforts to address and mitigate these concerns should take into account the varying regional contexts and habitat-specific issues. Engaging with local communities and incorporating their perspectives in biodiversity and ecosystem conservation strategies is crucial for the effective protection and restoration of biodiversity.
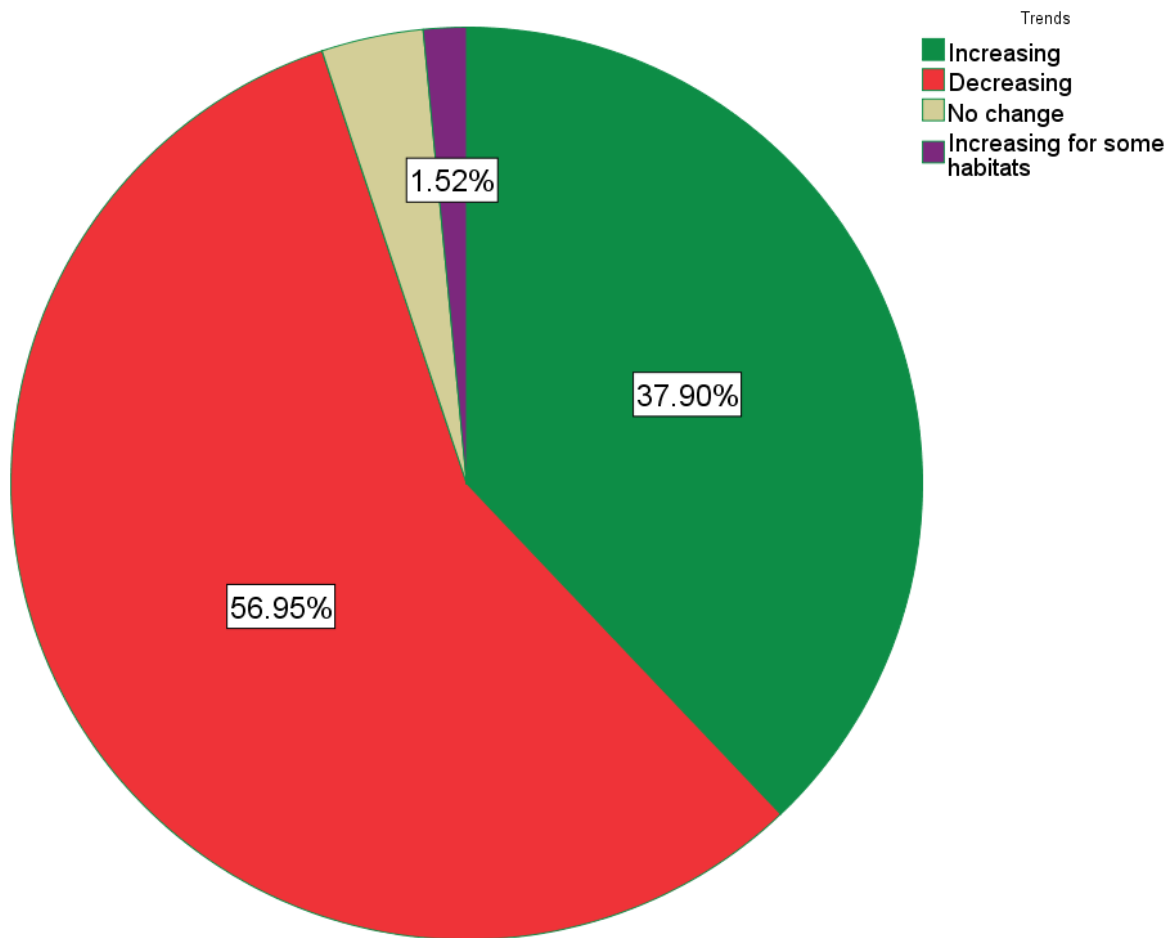
Figure 3. Community perception about the biodiversity changes in the study areas

3.3 Public perception on the habitat loss and degradation

Table 4 reveals public perception on habitat loss and degradation in various study areas provides valuable insights into the environmental concerns faced by local communities. Across the board, a significant majority of respondents express worry about the decreasing trends in biodiversity in different regions (Table 4). The data highlights a high level of awareness and shared concerns among the public regarding biodiversity and ecosystem services loss. The findings from the public perception regarding the status of biodiversity are elaborated below:

3.4 Perception and attitudes towards wildlife animals trends in the study areas

A significant majority (73.33%) of respondents in the study areas perceive a decline in the population of wild animals over time (Table 5). This suggests a widespread concern about the

loss of biodiversity and wildlife habitats. The finding that a substantial majority of respondents, with percentages ranging from 67% to 77% in different regions, perceive a decline in the population of wild animals over time is indicative of a noteworthy trend and raises significant concerns about the state of biodiversity and wildlife habitats in the surveyed regions. This perception reflects the collective awareness and observation of the local population regarding environmental changes and their impact on the wildlife ecosystem.

3.5 The vegetation/forest covers of the area

Table 4 presents the public perception of the scale of habitat loss in various regions of Ethiopia. A substantial portion (73%) of the surveyed population observes a reduction in vegetation and forest cover in their locality. This indicates a shared awareness of environmental changes impacting the landscape. The discovery that a significant portion (73%) of the surveyed population perceives a reduction in vegetation and forest cover in their locality reveals a collective awareness of environmental changes affecting the landscape. This finding suggests that a substantial segment of the community is attuned to shifts in the natural environment, such as deforestation, urbanization, or land-use changes (Table 9). The shared recognition of decreasing vegetation cover underscores the importance of acknowledging and addressing direct and indirect challenges that may lead to habitat loss, biodiversity decline, and potential consequences for ecosystem services. This shared awareness is a critical foundation for fostering community engagement in conservation initiatives and sustainable land management practices that aim to mitigate the identified threats to the local environment.

Table 4 Public perception of habitat loss and degradation by study areas

Public perception of habitat loss and degradation (Frequency: N: 525)					
Study areas	Wild animals are getting rare and rare from time to time in your locality	The vegetation/forest cover of the area is diminishing from time to time	Soils of farmlands of the area are getting less productive through time	There have been changes in the seasonality of rains and amount of precipitation	Total
Addis Ababa (Yeka, Addis Ketama, Gulele)	44	54	40	47	
Oromia (Bale-Goba)	67	67	64	1	
Sidama (Wondo Genet)	77	70	77	67	
Somali (Fafan- Jigjiga)	75	74	75	85	
Southern (Gamo)	71	76	68	66	
Southwest Ethiopia regions (Kafa-Gimbo)	72	62	65	67	
Total	406	403	389	333	
%	77.33	77.23	74.1	63.43	73

3.6 Community perception on Soil productivity

Furthermore, the respondents were queried about the changes in the farmlands productivity overtimes, reporting percentages that varied from 40% to 77% (Table 4). The majority (74.11%) of respondents express the perception that farmlands in their area are experiencing a decline in productivity (Table 5). This highlight concerns about the sustainability of agriculture and potential impacts on food security. This finding suggests that a substantial portion of the community is appreciate of the challenges facing local agriculture, which could be attributed to factors such as soil degradation, and productivity. Addressing these concerns is pivotal not only for safeguarding the livelihoods of the local population but also for ensuring the resilience of the broader food supply chain.

Table 5 Public perception on the habitat loss

List of questions related to habitat loss	Response (Frequency:N:525)	
	Count	%
Wild animals are getting rare and rare from time to time in my locality	406	73.33
The vegetation/forest cover of the area is diminishing from time to time	403	73
Soils of farmlands of the area are getting less productive through time	389	74.11
There have been changes in the seasonality of rains and amount of precipitation	333	63.43
Total (%)		71%

3.7 The seasonality of rains and amount of precipitation in the study areas

A significant percentage (63.43%) of respondents report changes in the seasonality of rains and precipitation amounts indicates a heightened awareness of climate-related shifts within the surveyed population. This awareness is crucial as it underscores the recognition of ongoing environmental changes that have the potential to profoundly impact biodiversity, water resources, and overall environmental conditions. Changes in precipitation patterns can lead to various consequences, including altered water availability, shifts in agricultural practices, and increased vulnerability to extreme weather events. The acknowledgment of these climate-related shifts suggests a community that may be experiencing or closely observing the effects of global climate change, highlighting the importance of adaptive measures and sustainable practices to mitigate and respond to the identified challenges in the face of a changing climate.

3.8 Assessing willingness to act in protecting biodiversity and nature

Engagement of the Community in Biodiversity and Ecosystem Restoration Initiatives

Table 6 displays the various activities undertaken by respondents. A substantial number of participants (391) have engaged proactively in planting tree seedlings as a contribution to the Ethiopian Green Legacy initiative. This involvement signifies a notable dedication to reforestation and environmental sustainability, aligning with overarching endeavors to address climate change and advocate for biodiversity conservation.

Table 6 Engagement of the Community in Biodiversity Restoration Initiatives

No.	List of activities	Frequency N:525
1	Planting tree seedlings as part of the green legacy initiative	391
2	Involving in the watershed development (soil & water conservation) annual programs	303
3	Participating in local campaigns of eradicating invasive alien species	208
4	Informing the appropriate body about illegal deeds by some that harms the environment and component resources	176
5	Participating in events like exhibitions and trade fares that aim at promoting local products and environmental protection	133
6	Engaging in awareness creation activities like sharing experience about good local practices, educating fellow community members regarding the need to care for the environment and its component resources	181
7	No such involvement so far	45

With 303 respondents mentioned they are actively involved in local watershed development programs. This participation indicates a collective effort to address issues related to water resource management and soil erosion, which are critical components of agricultural productivity and food security. Furthermore, the involvement of 208 respondents in local campaigns targeting invasive alien species reflects a shared concern for conserving native ecosystems. Eradicating invasive species is crucial for maintaining biodiversity and protecting indigenous flora and fauna. While the majority of respondents have actively participated in various environmental activities, a small portion (45) indicated no such involvement so far. Understanding the reasons for non-participation could provide insights into potential barriers or opportunities for increasing community engagement in environmental initiatives. This aligns with several other studies that recognize the involvement of local communities can enhance the management, implementation, and monitoring of habitat restoration efforts (Santini et al., 2022; Pretty).

3.9 Wild plant and animal resource utilization in the study areas

Table 7 present the local community utilization of wild plants and animal resource in the areas. Among the participants surveyed, 207 individuals reported harvesting a single part from the wild, highlighting the selective use of specific plant components for various purposes. Moreover, 189 respondents engaged in a more extensive utilization by harvesting two or more parts, indicating a broader traditional knowledge in utilization of wild plant resource such as medicinal plants, and spices. Interestingly, 99 individuals reported harvesting the entire plant, showcasing a unwise utilization approach to wild plant genetic resources.

Table 7 Utilization of Wild Plant and Animal Resources in the Study Areas, as Identified During the Assessment

No.	List of participants	Frequency Total respondants:525
1	Harvesting a single part	207
2	Harvesting two or more parts	189
3	Harvesting the whole plant	99
4	Planting the seed or other parts of the plants in homestead	106
5	Collecting the useful part	81
6	Killing the wild animal	52
7	Tending/Keeping the wild animal at the enclosure	27

A total of 106 (Table 7) respondents indicated that they cultivate seeds or plant parts from wild plants in their homesteads, demonstrating a balanced perspective that involves both resource extraction and conservation efforts, contributing to the enhancement of the natural environment. On the wild animal resources, 52 individuals admitted to killing wild animals for food and other types of uses, which may have implications for local ecosystems and biodiversity. When we talked to farmers in *Kafa-Gimbo*, we found out that they used to hunt and eat wild animals like *Werebo* and wild beef for food. But things are changing now because people are a bit scared of the local administration, and there's not as much of this wild food available as before.

While the assessment provides the ways in which people interact with plant and animal resources from the wild, it also reveals the need for a balanced and sustainable approach to ensure the long-term health of ecosystems. The varying levels of utilization, ranging from selective harvesting to uprooting plants or killing wild animals, highlight the complexity of human-wildlife interactions and the importance of promoting practices that contribute to both community well-being and

environmental conservation. This finding aligns with broader concerns in conservation biology and underscores the importance of addressing illegal hunting and its impact on biodiversity conservation (Mekonen et al., 2020).

3.10 Perceptions of the Community Regarding the Involvement of Various Stakeholders in Biodiversity Conservation

The engagement of diverse stakeholders is crucial for the success of development initiatives and community well-being. In the surveyed context, various stakeholders have been identified and ranked by respondents based on their roles and affiliations (Table 8). The assessment findings reveal that the community holds the belief that local administration, and community, as well as individual members of society are the primary entities responsible for ensuring the conservation and sustainable utilization of local biodiversity (Table 8). The respondents ranked the local community (410) as the primary entities responsible for the conservation of local biodiversity Local administration, represented by local government entities, emerges as a significant institution, with 392 respondents indicating their role for any conservation and development initiatives in their respective areas. This reflects the pivotal role of local government agencies in shaping and implementing policies and programs that impact the community.

Table 8 Community Prioritization of Stakeholder Roles in Biodiversity Conservation and Management

No.	List of participants	Frequency N:525	Rank
	Local community	410	1st
	Individual members	344	2nd
	local administration	392	3rd
	Gov't	233	4th
	NGOs	112	5th
	International Development Partners	98	6th

The participation of NGO's (112) and International Development Partners (92) indicates the importance of collaboration and support for local conservation and development efforts. According to the respondents, these partners often bring valuable resources, expertise, and funding to enhance the effectiveness of biodiversity initiatives.

The collaborative efforts of these stakeholders, including government, local administration, NGOs, International partners, local communities, and individual members, could create a dynamic framework for biodiversity conservation and sustainable utilization. This multi-faceted stakeholder approach involving various entities with distinct perspectives and capabilities contributes to a more holistic and sustainable development process, fostering positive change and improvement in the surveyed area. Prior research has also highlighted that a multistakeholder approach is crucial for the success of any conservation-related programs (Carcamo et al., 2014)

3.11   Perceptions of Biodiversity Threats among Respondents

Table 9 shows identified threats to habitats and ecosystems in the study areas. With a frequency of 191, deforestation/decrease in forest coverage tops the list as the most frequently sited threat by respondents. This underscores the collective understating about the widespread clearance of forests for various purposes and the potential consequences for biodiversity loss, decline in wildlife/animals as mentioned during household survey and key informants interview. This aligns with existing literature on habitat conversation impacts on global biodiversity, where deforestation consistently emerges as a major driver of biodiversity loss (Santos et al., 2018; Vieira et al 2008).

Climate change emerges as another significant worry, with 78 respondents acknowledging its adverse effects on overall environmental stability as well as local livelihoods. Survey participants revealed shifts in climate patterns by drawing upon traditional knowledge acquired over their lifetimes. They provide insights into the frequent changes observed in the onset of rainfall, the quantity of precipitation, as well as the occurrence of droughts and floods within their respective regions. The recognition of climate change as a key threat reflects a growing awareness of its pervasive impacts on community livelihoods as well as local and global biodiversity was reported in previous studies (Muluneh, 2021, IPCC, 2021).

Table 9 Identified Drivers and Threats Acknowledged by Respondents

No	Identified threats to habitats and ecosystem	Frequency of Threat Reports by Respondents
1	Deforestation	179
2	Decrease in forest cover	12
3	Climate change	78
4	Drought and erratic rainfall	47
5	Flooding	22
6	Urbanization	26
7	Overutilization of natural resources	23
8	Illegal hunting	22
9	Invasive species expansion	20
10	Charcoal and Timber production	20
11	Agricultural expansion	77
12	Fire	11
13	Pollution	15
14	Population growth	80
15	Urbanization	27
16	Weak governance or administration	4
17	Unemployment	55

Several other threats climate-related concerns, including drought and erratic rainfall (47) and flooding (22), indicate the extent of extreme weather events that affecting their environment. Urbanization (26) and agricultural expansion (77) reported as impact of human activities that affect natural habitats, leading to habitat loss, fragmentation, and altered land use in the study areas. The survey also identified the pressures associated with the overutilization of natural resources (23), illegal hunting (22), invasive species expansion (20), and activities such as charcoal and timber production (20). Fire occurrences (11) and pollution (15) are also identified as direct threats to forest and range land biodiversity in the study areas.

Furthermore, indirect threats such as population growth, unemployment and socioeconomic factors were identified to biodiversity as perceived by respondents. Population growth emerges prominently, with a frequency of 80, underscoring the acknowledgment of its indirect implications on biodiversity through increased resource demands and land use changes.

Urbanization, identified 27 times, reflects the recognition of expanding urban areas as an indirect threat impacting local habitats (e.g., forest, water). Additionally, unemployment, with a frequency of 55, highlights the recognition of socio-economic factors contributing to indirect pressures on forest, potentially influencing unsustainable resource associated with economic activities such as expansion of agricultural lands. These findings collectively emphasize the need for comprehensive conservation strategies addressing both the direct and indirect pressures on biodiversity to ensure the long-term health and sustainability of our natural environments.

3.12 Determining attitudes toward and the relevance of biodiversity to people

16. As there are efforts to increase production to satisfy the needs of the growing human population using environmental resources, comparable attention should also be given to caring for locally available living and non-living components of the environment.

The overall response from the six regions shows that over 53% of the respondent strongly agree that there are efforts to increase production to satisfy the needs of the growing human population using environmental resources with a comparable attention also given to caring for locally available living and non-living components of the environment. An additional 30% respondent agree with the same assertion, which takes the overall positive response to nearly 84% indicating that there is a great awareness among the respondents on the need increasing productivity while ensuring environmental conservation and preservation (Table 10).

Table 10. Frequency of agreement on effort to increase production with attention to the environment

Agreement level	Frequency	Percent	Cumulative Percent
Strongly agree	283	53.8	53.9
Agree	156	29.7	83.6
Disagree	42	8.0	91.6
Disagree	41	7.8	99.4
Difficult to comment	3	.6	100.0
Total	525	100	

This result seems to be consistent among the regions (Figure 4). In Addis Ababa, Somali, Southwest and Southern region, over 50% of the respondents strongly agree with the question while in Oromia and Somali regions, less than 50% responds strongly agree. The overall results shows there is the vast majority of responds in all regions duly recognize the need for increasing

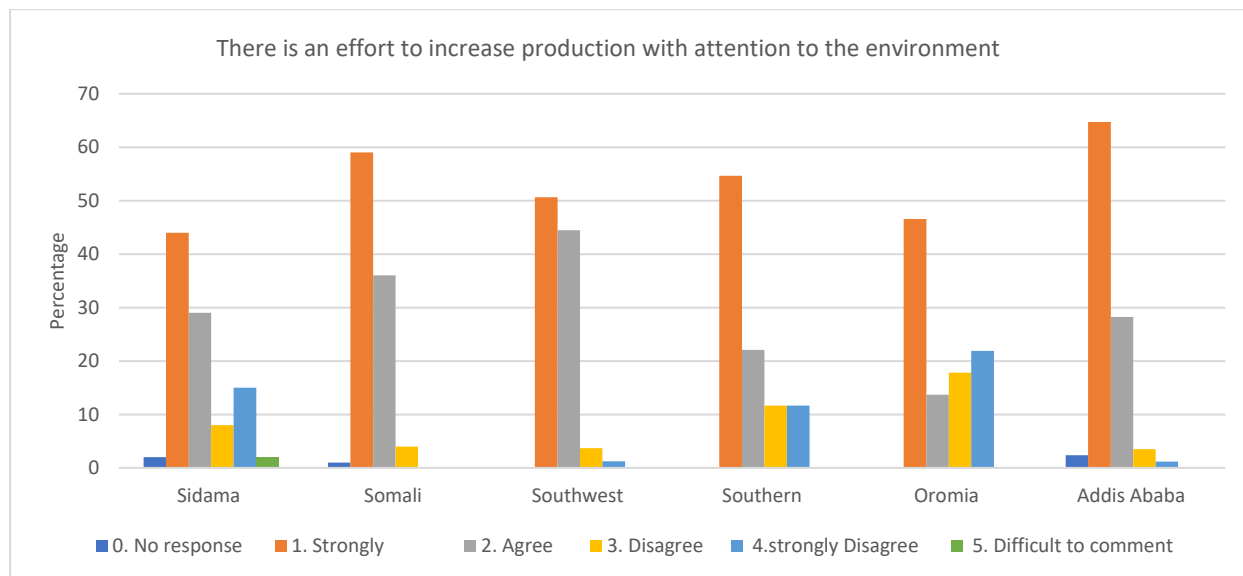productivity while paying attention to the environment.

Figure 4. Respondents response in six regions response on the effort to increase production with attention to the environment.

17. Even if the total harvest/yield may be lower, farmers should opt for growing diverse crops or raising different farm animals instead of cultivating extensively a single crop type/ variety or rearing a single animal type (breed).

Table 11 shows the level of agreement on the need for farming divers crops and raising/rearing diverse farm animals instead of extensive monocrop faming and single livestock breeding. Over 90% of respondents agree on the need for crop and livestock diversity among which over 50% strongly agree while an additional 39 % agree with on the need for diversification of farming and livestock breeding.

Table 11Resources of the environment and pass to the future generation

Agreement level	Frequency	Percent	Cumulative Percent
Strongly agree	265	50.4	51.0
Agree	206	39.2	90.3
Disagree	33	6.3	96.6
Disagree	12	2.3	98.9
Difficult to comment	6	1.1	100.0
Total	525	100	

Over 70% of respondents in Southern region show strong agreement with question on livestock diversity and crop diversity followed by Addis Ababa. Respondents in Oromia and Southwest

also strongly agree (over 50%) with livestock and crop diversity. The respondents in Sidama and Somali region show strong agreement at slightly less than 40% but when combined with the second level response (agree), the vast majority of the respondents show positive attitude toward the need for diversification of livestock and crop diversity on their farm.
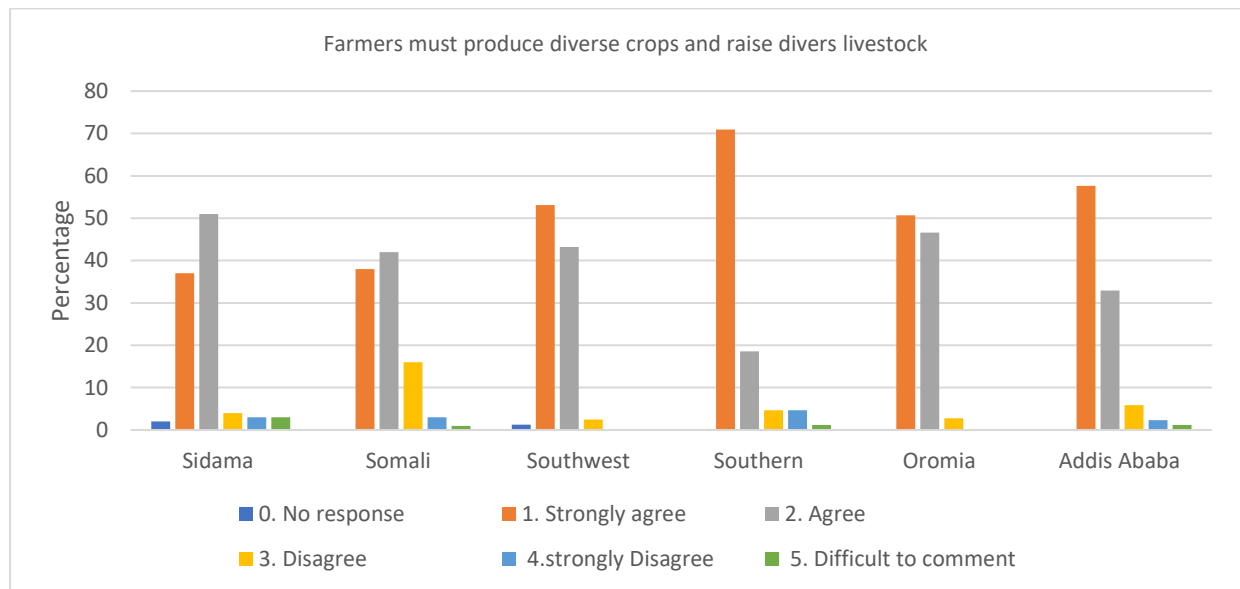

Figure 5. Level of agreements in regions concerning livestock and crop diversity.

18. It is the responsibility of the present generation to care for and protect living and non-living resources of the environment and pass to the future generations. Citizens' contribution to conservation.

Table 12. Respondents level of agreement on citizens' contribution to conservation.

Level of agreement	Frequency	Percent	Cumulative Percent
Strongly agree	364	69.2	69.7
Agree	140	26.6	96.4
Disagree	9	1.7	98.1
Disagree	8	1.5	99.6
Difficult to comment	2	.4	100.0
Total	525	100	

Among all respondents, nearly 70% strongly agree that the current generation must bear responsibility of caring for environment and an additional 26.6% agree that this generation must discharge its environmental responsibility (Table 12) through its contribution to conservation. Combined over 96% responded positively on the need of discharging environmental responsibility as a precondition for living in favorable environment.
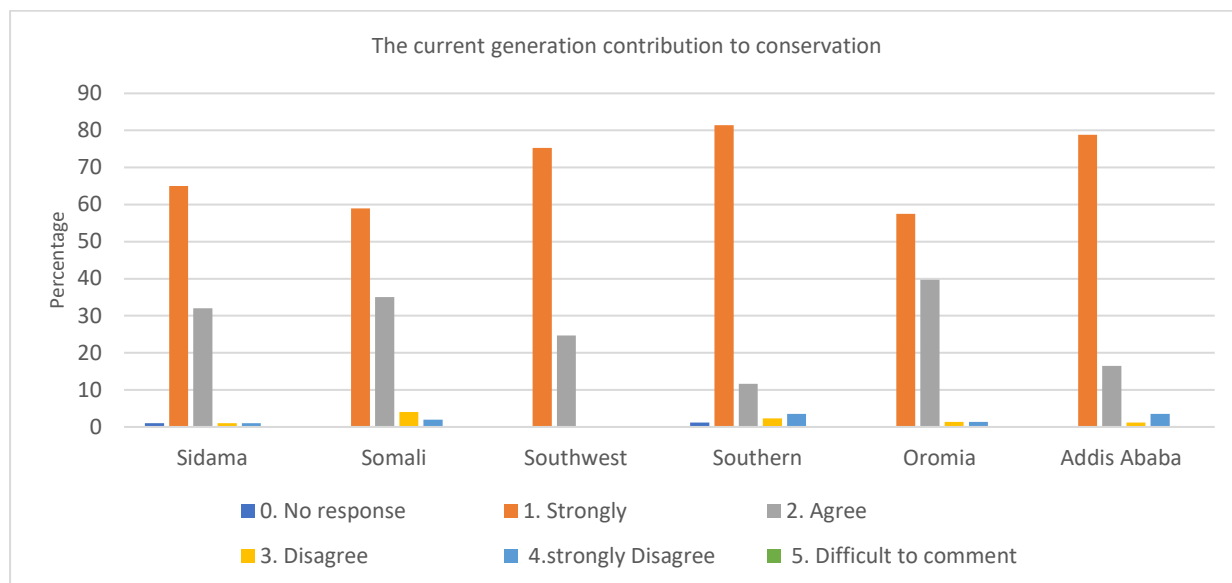
Figure 6. Level of agreement on the contribution of the current generation for environmental conservation.

19. Promoting/encouraging the use of local knowledge and inputs like locally made fertilizers and local varieties of crops is important for maintaining a healthy and productive environment.

Table 13. Respondents level of agreement on the uses of local knowledge

Level of agreement	Frequency	Percent	Cumulative Percent
Strongly agree	319	60.6	61.3
Agree	163	31.0	92.4
Disagree	22	4.2	96.6
Disagree	10	1.9	98.5
Difficult to comment	8	1.5	100.0
Total	525	100	

The vast majority of the respondents in all regions combined (Table 13) respond positively on the need for promoting local knowledge and local varieties for maintaining healthy and productive environment at over 92% among which 60.6 % strongly agreed while the remaining 31% agreed. This result reveal that there is a consensus on the much needed effort to encourage the inclusion of local knowledge and local varieties in sustainable production.

When this is disaggregated among regions, except Somali region, all five regions strongly agreed on the need for including and promoting local knowledge and local varieties for healthy and sustainability productive environment (Figure 6 The vast majority of respondents in Southern region, Oromia and Addis Ababa showed a strong agreement at over 60% with the Southern region being the highest in terms of strong agreement at nearly 80%. The overall result indicate

the wide acceptance and recognition of local and traditional knowledge contribution for sustainability.
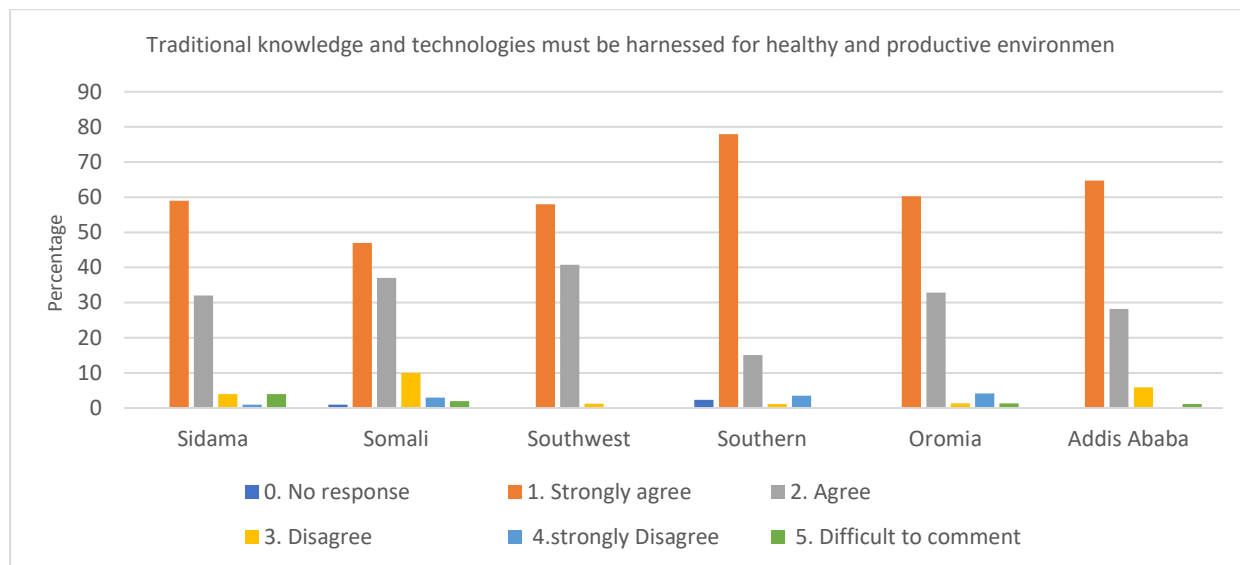

Figure 6. Level of agreement on the role of local knowledge and local varieties for healthy and productive environment.

20. Promoting/encouraging the use of local knowledge and inputs like locally made fertilizers and local varieties of crops is important for maintaining a healthy and productive environment.

According to respondents, traditional knowledge and technologies must be harnessed for healthy and productive environment. The vast majority of the respondents strongly agree (55.7%) and agree (34%) that the farmer better utilize locally sourced farm inputs such as organic fertilizers for increasing productivity (Table 14).

Table 14. Level of agreement on the uses of local technologies and farm inputs for production.

Level of agreement	Frequency	Percent	Cumulative Percent
Strongly agree	293	55.7	56.0
Agree	179	34.0	90.2
Disagree	21	4.0	94.3
Disagree	15	2.9	97.1
Difficult to comment	14	2.7	100
Total	525	100	

When this result is disaggregated among the regions (Figure 7), there is a strong agreement at over 50% in all six regions with the highest agreement level recorded in Southern and Sidam region. This clearly show that there is a strong attitude towards the uses of locally sources and sustainable farm inputs such as organic fertilizers among all regions assessed.
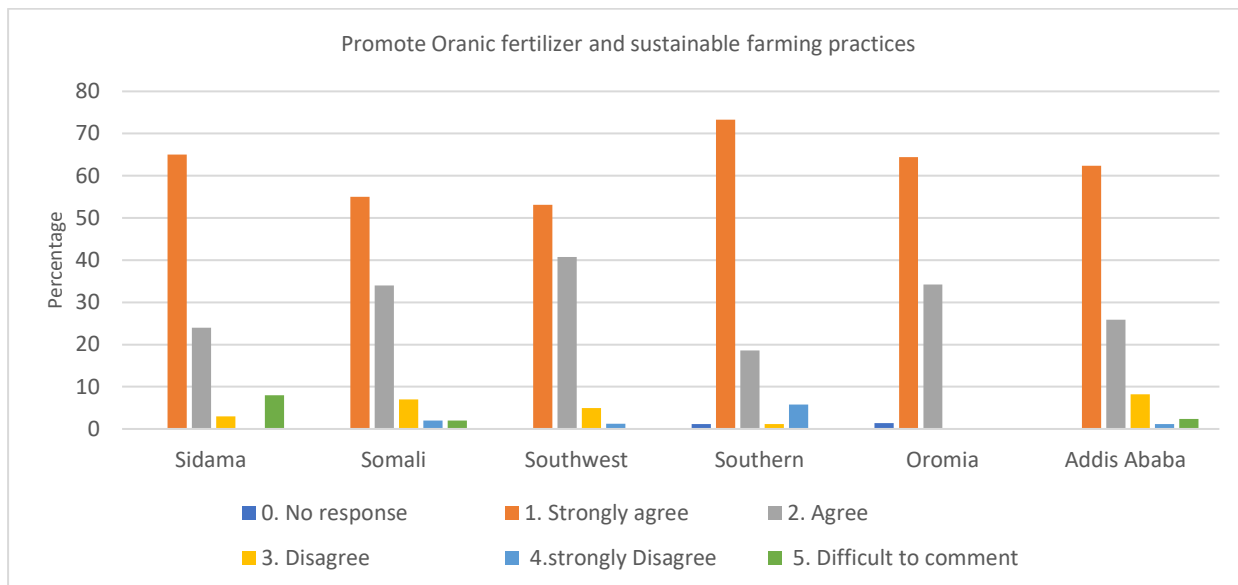
Figure 7. The attitude of regional respondents on the need to promote organic fertilizer and local technologies.

21. Practices like avoiding the use of artificial agricultural inputs and proper management of wastes like plastic bags and bottles are key either to reduce or halt environmental pollution.

Table 15 below shows the response of respondents on the question of avoiding the uses of artificial agricultural input and on the need for proper plastic and bottle wastes to avoid pollution of the environment. Overall, 92% of the respondents show strong agreement (62%) and agreement (29.3%) on the urgent need of avoiding or minimizing the uses of artificial fertilizers and on the need for averting pollution through waste plastic bottles management practices.

Table 15. Level of agreement on avoiding the use of artificial agricultural inputs among all respondents.

Level of agreement	Frequency	Percent	Cumulative Percent
Strongly agree	326	62.0	62.5
Agree	154	29.3	91.8
Disagree	22	4.2	96.0
Disagree	8	1.5	97.5
Difficult to comment	13	2.5	100.0
Total	525	100	

There is also strong agreements among the regions (Figure 8). The highest positive response was obtained from Southwest region (at 78%) followed by Southern Region at nearly 70% who strongly agreed with the question. The least response at a little under 50% was obtained from Sidama region. Despite these variabilities, the overall result indicate that there is a strong understanding and agreement among all respondents on the question of avoiding artificial farm inputs.
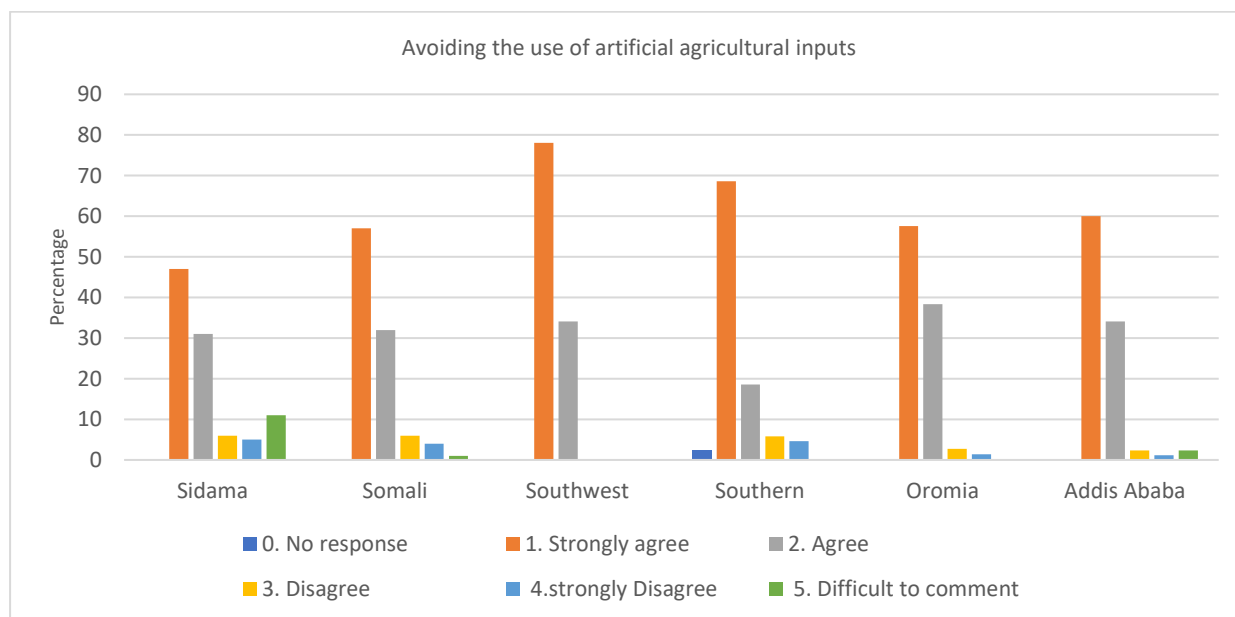

Figure 8. Respondents level of agreements on the need of avoiding the uses of artificial agricultural inputs among all regions assessed.

In addition, there was no significant differences due to gender and educational status among the respondents in terms of determining the level of agreement on these questions. The overall result shows that there seems to be high level of awareness and positive attitude among all respondents on the relevance of biodiversity for the people.

4. Key takeaways and implications

Overall, the result obtained underscores the diversity of opinions on biodiversity changes, emphasizing the importance of considering regional nuances and specific habitats. These findings suggest a widespread perception among local communities that biodiversity is facing challenges. This implies that engaging with local communities and incorporating their perspectives in biodiversity and ecosystem conservation strategies is crucial for the effective protection and restoration of biodiversity.

The following points are the major take away messages for conservation efforts:

- There is a high level of awareness and shared concerns among the public regarding biodiversity degradation, loss and ecosystems service decline. This include declining wild life population and their habitats.

- The respondent show a substantial agreement on the causes of these changes which include shifts in the natural environment, such as deforestation, urbanization, or land-use changes. Climate change also came out as a major worry for the local community. The shared recognition of decreasing vegetation cover underscores the importance of acknowledging and addressing direct and indirect drivers that lead to habitat loss, biodiversity decline, with a potential consequence for ecosystem services. This shared awareness could serve as a critical foundation for fostering community engagement in conservation initiatives and sustainable land management practices that aim to mitigate the identified threats to the local environment.

- There is high concerns about the sustainability of agriculture and its potential impacts on food security. The respondents show their worry about soil degradation and declining productivity caused due to changes in the seasonality of rains and the amount of precipitation indicating a heightened awareness of climate-related shifts within the surveyed population.

- In terms of the engagement of the respondents in conservation activities, s substantial number of participants have engaged proactively in planting tree seedlings as a contribution to the Ethiopian Green Legacy initiative. In addition, the participation of the respondents in watershed development programs and soil and water conservation activities are widespread among regions. This active engagement of the respondents substantiate the overall awareness of the people on the state of the environment and

biodiversity. This involvement signifies a notable dedication to reforestation and environmental sustainability, aligning with overarching endeavors to address climate change and advocate for biodiversity conservation.

- In terms of the need for increasing productivity of the land, the vast majority of responds in all regions duly recognize the need for increasing productivity while paying attention to the environment. In addition, over 90% of respondents agree on the need for crop and livestock diversity for diversification of farming and livestock breeding. This results clearly show the awareness of respondents on genetic diversity of local varieties of crops and livestock showing the need to pay attention to them.

- One of the impressive findings of this survey is that overall consensus reached by the respondents on the environmental responsibility of the current generation. The respondents agreed that generation must discharge its environmental responsibility. There is also a strong agreement on the need for promoting local knowledge and local varieties for maintaining healthy and productive environment at over 92% among which 60.6 % strongly agreed while the remaining 31% agreed.

- The vast majority of the respondents agree that the farmer better utilize locally sourced farm inputs such as organic fertilizers for increasing productivity and must avoid or minimize the uses of artificial fertilizers and on the need for averting pollution through waste plastic bottle management practices.

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