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Community-Led Adaptation for Climate Resilience and Green Income Opportunities in Ethiopia

**A Case Study Report in the East Bale
and Waghimra Area**



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Addis Ababa

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Lists of Abbreviations

AFD	Action For Development
ATET	Average Treatment Effect on The Treated
CSA	Central Statistical Agency
DCA	DanChurchAid
ETB	Ethiopian Birr
FCS	Food Consumption Score
FGDs	Focus Group Discussions
KIIs	Key Informant Interviews
MGD	Mixed Group Discussion
NGOs	Non-Government Organizations
PSNP	Productive Safety Net Program
TLU	Tropical Livestock Units
WFP	World Food Programme
WRI	World Resources Institute

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This report is a testament to the collective journey undertaken by everyone mentioned, and their combined efforts have been indispensable in realizing the objectives of this project and producing this comprehensive case study report.

Executive Summary

The problem at hand centers on the multifaceted challenges confronting rural communities in Ethiopia's East Bale and Waghimra zones, stemming primarily from the far-reaching impacts of climate change. Unsustainable agricultural practices, rampant deforestation, overgrazing, and erratic weather patterns have collectively woven a web of vulnerability, threatening the very fabric of these communities' existence. This case study delves into the heart of these issues to provide a comprehensive examination of how innovative, locally-led climate change adaptation approaches have the potential to not only enhance the resilience of these communities but also empower them as active agents of change in the face of climate-related adversities in Dawe Kachen and Dahena woredas of East Bale and Waghimra zones, respectively.

A mixed-methods approach was employed to assess the impact and effectiveness of a project aimed at enhancing the resilience of local communities. Quantitative analysis involved a random sample of 155 households of project beneficiaries and 148 non-beneficiary households. Qualitative analysis included interviews, focus group discussions, and case stories, gathering insights from knowledgeable individuals and beneficiaries. Data collection tools encompassed document review, questionnaires, key informant interviews, focus group discussions, and case stories. Data analysis involved qualitative coding, categorization, thematic analysis, and treatment effects models for quantitative measurements. This comprehensive approach provided a holistic understanding of the project's outcomes, community perspectives, and effectiveness in the local context.

The demographic characteristics of respondents in the East Bale and Waghimra zones reveal interesting differences. The mean age of household heads is relatively close in both zones, with East Bale at 39.2 years and Waghimra at 38.6 years, suggesting a predominantly working-age population. However, the family size is notably larger in East Bale, with a mean of 6.3, in contrast to Waghimra's mean of 3.9. Additionally, the educational levels vary, with East Bale having a slightly higher mean educational level of 2.4 compared to Waghimra's 2.2. Notably, both zones display a significant portion of respondents with no formal education, with around 60% lacking basic literacy skills. The experience in farming is higher in Bale, with a mean of 23.8 years, whereas Waghimra shows a mean of 19.7 years, indicating a potential difference in agricultural expertise between the two zones.

Socio-economic characteristics illustrate variations in household assets and livestock ownership. Waghimra exhibits a higher household asset index (0.831), suggesting greater economic well-being, while East Bale has a lower index (0.466). However, when it comes to livestock ownership (measured in Tropical Livestock Units, TLU), East Bale surpasses Waghimra, indicating a higher concentration of livestock in East Bale. These findings suggest that households in Waghimra may have more diverse economic assets, while those in East Bale rely more on livestock for their livelihoods. These distinctions highlight the importance of understanding the socio-economic context when evaluating adaptation practices and resilience strategies in the two zones.

The provided information highlights the significant impact of locally-led adaptation practices on climate resilience in the East Bale and Waghimra zones. Figure 3 illustrates the varying degrees of adoption of these practices in response to environmental challenges, particularly drought and climate change. The findings reveal that Waghimra and East Bale zones (despite disparities) embrace many of these practices compared potentially due to greater environmental pressures and/or successful awareness and advocacy campaigns done by the project. In fact, further efforts are needed to encourage broader adoption of certain practices, especially in the East Bale zone, to build a more resilient and sustainable future in the face of recurrent drought and ongoing environmental challenges.

Among the specific adaptation practices discussed, tree planting, soil and water conservation, water harvesting and irrigation, climate-resilient crop production, and green jobs through beekeeping have been examined in detail. The data underscores the disparities between the two zones. It is evident that environmental conditions, awareness, and access to resources play a crucial role in shaping the adoption of these practices.

The analysis of food consumption patterns among beneficiary and non-beneficiary households in East Bale and Waghimra zones reveals significant differences in their dietary habits and food security status. In both zones, beneficiaries tend to consume more of certain food groups such as vegetables, fruits, and milk, while consuming less of main staples, sugar, and oil in comparison to non-beneficiaries. These disparities are statistically significant, indicating the project's impact on dietary choices. Furthermore, the data shows that beneficiaries exhibit higher food consumption scores, affirming their improved food security status due to project

participation. The resilience index is also higher among beneficiaries in Waghimra, suggesting a potential positive effect on their capacity to withstand shocks. However, it is essential to acknowledge potential confounding factors that may contribute to these differences. Employing a treatment effects model, the study substantiates the project's positive influence on food consumption scores in both zones, reinforcing its effectiveness in enhancing the food security of the target populations. Qualitative data from case stories further support these findings, underscoring the multifaceted benefits of the project, including improved income, sustainable energy sources, and diversified livelihoods, all of which contribute to enhanced well-being and resilience.

While the project has had positive impacts on the livelihoods of beneficiaries in both zones, it is also evident that recurrent drought in East Bale has posed significant challenges, underscoring the need for continued resilience-building efforts. Furthermore, the promotion of diversified vegetable and fruit production, climate-resilient crop production, and fuel-saving stoves has led to improvements in food security, income generation, and environmental conservation. These findings highlight the importance of tailored approaches to address local factors and preferences, ultimately contributing to more sustainable and resilient agricultural systems and livelihoods in these zones.

In the face of the numerous challenges and complex environmental issues faced by the East Bale and Waghimra zones, it is clear that a multifaceted and adaptable approach is required to navigate the path towards climate resilience and environmental sustainability. The recommendations derived from the experiences in these zones underscore the need for flexibility in project design and implementation. Designing projects with inherent flexibility, which allows for adjustments in response to changing local conditions such as droughts or unforeseen challenges, is crucial. This ensures that initiatives remain effective and resilient in the face of unpredictable environmental factors. Moreover, active community involvement remains a linchpin for the success of sustainability initiatives. Encouraging and supporting community-led projects and smaller, focused groups for specific environmental and agricultural tasks not only empowers local residents but also fosters a sense of ownership and responsibility for their environment. This approach not only enhances environmental stewardship but also ensures that projects are tailored to the specific needs and conditions of each zone.



Continuous awareness campaigns about climate change and conservation practices are essential for building informed and proactive communities. Integrating environmental education into local school curricula is also an effective way to instill a sense of responsibility and knowledge about the environment in the younger generation. It ensures that the lessons learned from these projects are passed on to future generations, creating a lasting impact on the zones' environmental sustainability. Furthermore, encouraging collaboration among various stakeholders, including government offices, non-governmental organizations, and experts, is vital to pool resources, expertise, and knowledge for more effective and comprehensive initiatives. By embracing these recommendations and tailoring them to the specific needs of each zone, the East Bale and Waghimra zones can continue their journey toward climate resilience and environmental sustainability while serving as inspirational models for similar zones facing similar challenges.

1. Introduction

The case study offers a deep and insightful exploration of the contribution of the project including lessons, critical challenges faced by rural communities and best practices, with a specific focus on the East Bale and Waghimra zones. These communities grapple with a complex web of interconnected issues stemming from climate change. In these areas, unsustainable agricultural practices, deforestation, overgrazing, and erratic weather patterns have created a daunting landscape of vulnerability. The significance of this case study lies, therefore, in its examination of how innovative, locally-led climate change adaptation approaches can serve as a lifeline for these vulnerable communities. The study highlights the potential to not only enhance the resilience of these communities but also empower them to become active agents of change in the face of climate-related challenges.

The geographical scope of this case study, the East Bale and Waghimra zones in Ethiopia, is emblematic of the broader issues faced by rural communities in the zone. In this regard, the findings of the case study have implications for similar future interventions. The challenges and innovative approaches discussed herein resonate with vulnerable communities grappling with the consequences of climate change. Locally-led adaptation strategies have the potential to offer a ray of hope for countless individuals and communities who, like those in East Bale and Waghimra, are on the frontlines of climate-induced hardships. By harnessing data from different sources, this case study underscores the importance such strategies can have on improving livelihoods and safeguarding the environment, ultimately contributing to a sustainable and resilient future for these communities and others facing similar challenges.

1.1 Background

Climate change presents a pressing and complex challenge for rural communities in Ethiopia (Mulat, 2023), particularly in the East Bale and Waghimra zones (Bevan, 2019). These communities are grappling with a multitude of interconnected issues that threaten their livelihoods, food security, and environmental well-being. A combination of unsustainable agricultural practices and the expansion of agriculture has led to severe land degradation, including reduced soil fertility and the loss of soil carbon and water-holding capacity. Overgrazing of the area, exacerbated by climate-induced droughts and erratic rainfall patterns, further exacerbates grassland degradation. In addition to these challenges, the heavy reliance

on firewood for cooking, heating, and lighting has driven deforestation and forest degradation in the study areas.

The consequences of these drivers of vulnerability are far-reaching and interconnected. Grassland and forest degradation, coupled with deforestation, trigger soil erosion, and disrupt natural water cycles. The increasing frequency of droughts, erratic rainfall, and extreme weather events accelerates soil erosion, nutrient runoff, and siltation of waterways. These cumulative effects erode the foundation of communities' livelihoods, especially for those heavily reliant on rain-fed agriculture and pasture. While some livestock-dependent communities have managed to cope to a certain extent by relocating their animals and selling livestock, the intensifying droughts are stretching their adaptive capacities to the limit.

Compounding these challenges are overpopulation, high youth unemployment, and limited access to resources, which result in increased food insecurity, poverty, and vulnerability (Simachew, 2020). Notably, women and youth are disproportionately affected by climate change impacts, yet gender-responsive planning and implementation are notably absent from national climate action frameworks. Furthermore, local authorities face constraints in effectively engaging with these communities, often due to limited resources and a lack of knowledge in implementing federal policies and strategies.

Despite the presence of community institutions, they struggle with limited capacity to address these issues sustainably. While local authorities at the district level express interest in collaborating with communities, they often lack the necessary skills and methodologies. Moreover, the target districts in East Bale and Waghimra are in remote and hard-to-reach locations with low access to basic services, exacerbating the challenges faced by the communities.

The impacts of climate change, from intensified droughts to floods and erratic weather patterns, have extensive consequences on livelihoods, agricultural productivity, and overall well-being. The communities in East Bale and Waghimra bear the brunt of these changes, and their ability to adapt is paramount for their survival and resilience. Urgent and concerted efforts are imperative to address these vulnerabilities and enhance the communities' capacity to safeguard their natural resources and improve their livelihoods in the face of climate change.

Traditional top-down approaches have limitations in effectively addressing these complex and interconnected challenges. More inclusive, participatory, and context-specific solutions are urgently needed. The study zones in East Bale and Waghimra exemplify the need for such an approach. While conventional strategies may not adequately consider the unique circumstances and insights of these rural communities, the “Community-led Adaptation for Climate Resilience and Green Income Opportunities in Ethiopia” project, supported by Danish Church Aid (DCA), signifies a promising shift towards locally-led adaptation practices. By emphasizing community-driven and locally led initiatives, the project recognizes the inherent strengths, knowledge, and resilience within these rural communities. It underscores that these communities are not passive recipients of aid but active agents of change who possess invaluable insights and solutions to tackle climate change impacts. Locally-led adaptation practices consider the specific needs and circumstances of the communities in East Bale and Waghimra.

This project introduces several innovative aspects that promise to bring about lasting change. Firstly, it embraces a holistic approach, acknowledging that the challenges faced by these communities are not isolated but interconnected. The project recognizes that a comprehensive strategy is essential to effectively address food security, water management, and environmental protection simultaneously. Moreover, it promotes multi-stakeholder engagement. It brings together local communities, governmental bodies, and non-governmental organizations to collectively design and implement solutions tailored to the unique needs of the communities in East Bale and Waghimra. This collaborative approach fosters a sense of shared responsibility and ensures that the knowledge and insights of all stakeholders are leveraged to maximum effect.

The project’s cornerstone is community-led integrated watershed management. It empowers rural communities to take the lead in managing their local ecosystems and natural resources. This approach recognizes that these communities possess invaluable knowledge and insights about their environment, making them the most effective stewards of their land. More importantly, by involving local communities in designing and implementing adaptation strategies, the project is tailored to address the immediate concerns of these communities effectively. This approach seeks to build resilience and ensure a sustainable future by promoting sustainable land use, community-based natural resource management, and gender-

responsive interventions. It represents a vital step in the right direction, acknowledging that the communities themselves are best positioned to lead the way in adapting to the challenges of climate change.

Additionally, the project addresses the critical issue of income diversification. By introducing sustainable income opportunities, it lessens the communities' reliance on agriculture and firewood, reducing the pressure on their land and forests. This innovative aspect not only improves livelihoods but also contributes to environmental protection by decreasing deforestation. Lastly, the project places a strong emphasis on social equity. It recognizes that vulnerable groups, such as women and youth, are disproportionately affected by climate change. Thus, it incorporates gender-responsive interventions and strives to ensure that all community members have equal access to the project's benefits.

1.2 Objectives

The main objective of the case study is to document lessons learned, challenges, and scalable locally-led adaptation (best) practices in the target zones. It involves identifying successful adaptation practices; understanding the factors contributing to their success; and documenting any innovative approaches households use.

2. Description of the Study Area, Sampling, Data and Methods

2.1 Description of the Study Areas

The project has been operational in two distinct locations: Dawe Kachen woreda in the East Bale zone of Oromia National Regional State, and Dehana woreda in the Waghimira zone of Amhara National Regional State. The case study was carried out in two kebeles within each of these woredas.

2.1.1. Dawe Kachen Woreda

Dawe Kachen Woreda, situated within the East Bale Zone of the Oromia National Regional State, is located at approximately 060°18'54" North latitude and 041°34'56" East longitude. This woreda is positioned in the southeastern part of the East Bale Zone and shares its borders with Goro and Ginir woredas to the north, Gura Damole woreda to the west and south, and the Somali Regional State to the east (Figure 1). The altitude within this zone varies from 1100 meters to 2500 meters above sea level. The area experiences an average daily temperature ranging between 35-39°C and receives a mean annual rainfall of 500-700 mm. Woreda is characterized by two distinct agroecological zones: the middle land (Woyina Dega) and the lowland (Kolla), which correspond to two distinct rainfall patterns. The first rainfall regime occurs from April to May, while the second type extends from September to October. However, it is important to note that Dawe Kachen Woreda is prone to natural disasters, with repeated droughts affecting the area over the past two to three decades exacerbating natural resource depletion and food insecurity.

The total population of Dawe Kachen Woreda is approximately 47,509, comprising 21,265 males and 26,240 females. According to data from the Central Statistical Agency (CSA) in 2007, nearly 97.5% of the woreda's population resides in rural areas, while the remaining 2.5% live in urban settings. The livelihoods of the woreda's residents primarily revolve around pastoralism and agro-pastoralism, accounting for 80% and 20% of the population, respectively (Figure 1).

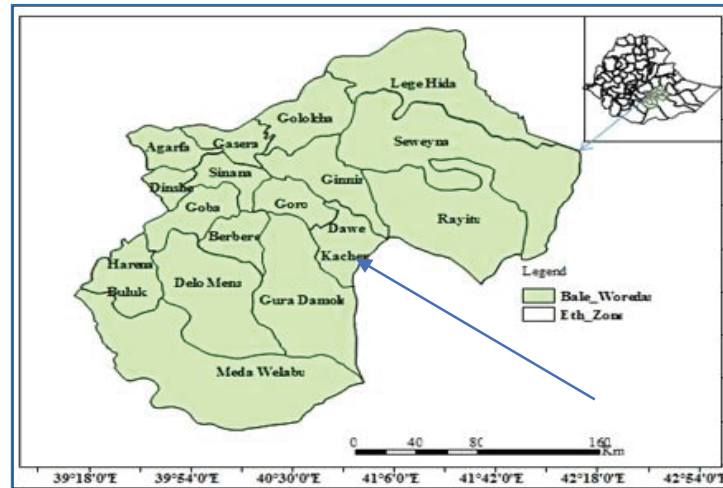


Figure 1. Location map of Dawe Kachen woreda

Source : <https://gadm.org/maps/ETH/oromia/bale/dawekachen.html>

2.1.2. Dehana Woreda

Dehana Woreda is one of the six Woredas in the Waghimra Special Administrative Zone, which is predominantly inhabited by the Agew ethnic group within the Amhara National Regional State. The Woreda is geographically adjacent to several other areas: it shares its northern border with Ziquala Woreda, borders Sekota Woreda to the east, meets Gazgibla Woreda and North Wollo in the south, and has South Gonder to its west. The Woreda consists of 28 kebeles, including one urban and 27 rural kebeles. These kebeles differ significantly in terms of their land area and population. The administrative center of the Woreda is Amdework town, which is 818 kilometers north of Addis Ababa (national capital) and 536 kilometers away from Bahirdar (regional capital) and is situated 78 kilometers to the west of Sekota (zonal capital).

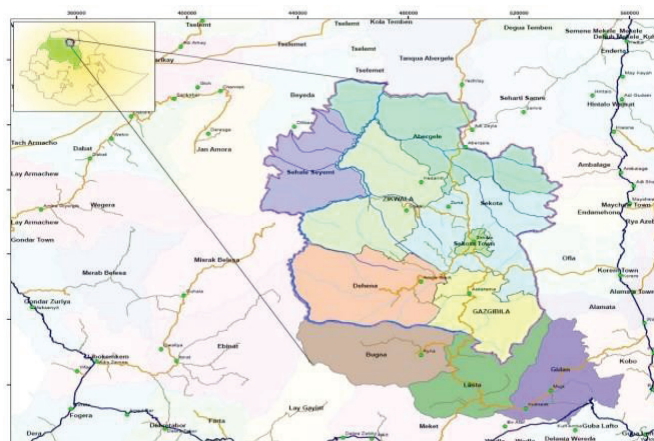


Figure 2. Location of Dehana Woreda

Source: Hellen (2014)

2.2 Sampling

In the quantitative analysis, a sample of 303 households were randomly selected from the project beneficiaries and non-beneficiaries. This approach facilitated an impact analysis to assess the project's contribution to the achieved targets and its role in enhancing the food security level of local communities. For qualitative analysis, five major interventions were identified, and interviews were conducted with knowledgeable individuals and beneficiaries from each category until information saturation was reached. Additionally, focus group discussions, and case stories were collected from each site, taking into consideration women and men groups (Table 1).

Table 1. Sample size

Woreda	Kebele	FGD	KII	Case story	Survey		
					Beneficiary	Non-beneficiary	Total
Dehana	Shimamdan	1	5	2	38	37	75
	Wizaba	2		4	40	35	75
Dawe Kachen	Dibe Kilofta	2	6	4	38	37	75
	Kubi Waldeya	2		3	39	39	78
Total		7	11	13	155	148	303

2.3 Data Collection Tools

To document best practices and lessons learned from the project, a mixed-methods approach that combined qualitative and quantitative techniques was employed. The following methods were utilized:

A. Document Review and Analysis: Project M&E reports, project proposals, and other relevant project documents were reviewed to gather secondary data on project outputs, activities, and targets. These documents were analyzed to assess the alignment of project goals with community needs, the effectiveness of implementation strategies, the extent of community involvement, and results achieved. Qualitative information was also extracted from project reports, case studies, and success stories to enrich the analysis with narratives and real-life examples.

B. Questionnaires: Structured questionnaires were designed to collect quantitative data from project participants, community members, and stakeholders related to green jobs, productivity, income, resilience, and other relevant factors. Questions assessed the level of community engagement, perceptions of project effectiveness, changes in livelihoods, and overall satisfaction with the project.

C. Key Informant Interviews: In-depth interviews were conducted with experts and key stakeholders, including project implementers, community leaders, and beneficiaries. Respondents were selected until information saturation was achieved. A semi-structured interview guide was developed, covering topics such as project objectives, community participation, challenges faced, success stories, lessons, and best practices. The interviews were recorded through notetaking and audio/video recording, with the interviewees' consent, and the data was transcribed and analyzed to identify recurring themes and insights.

D. Focus Group Discussions: Focus group discussions (FGDs) were organized with project participants and community members to gather qualitative data. They were conducted in a participatory and inclusive manner, allowing participants to share their experiences, suggestions, and lessons learned. Detailed notes were taken to capture the richness of the discussions.

E. Case Stories: In-depth case stories were conducted in selected communities to provide a detailed understanding of specific success stories, challenges, and lessons learned. Individuals representing women, youth, and men in each study site were selected to capture a diverse range of experiences and perspectives relevant to the project's impact on sustainable practices, green livelihoods, and locally-led adaptations.

2.4 Data Analysis Methods

The data analysis methods employed included qualitative data coding, categorization, and thematic analysis. Synthesizing qualitative and quantitative findings to identify overarching themes and connections between different aspects of the project. The quantitative data cleaning and management involved several steps of producing indices using factor and principal component analysis, at times when direct measurement was not possible. The case study utilized cross-tabulations (to see the association between participation in the project against variables of interest such as level of undertaking locally-led adaptation practices),

independent samples t-test (to see mean differences in some quantitative variables), and treatment effects models to measure the extent of changes in outcome variables (e.g., food security) attributable to the project while controlling for confounding factors (Abadie and Cattaneo, 2018). This mixed-methods approach, encompassing various data collection and analysis techniques, allowed for a comprehensive and diverse insight into best practices, lessons learned, and impacts of locally led adaptation initiatives. It facilitated both quantitative measurements of project outcomes and qualitative exploration of community perspectives and experiences, ensuring a holistic understanding of the project's effectiveness and relevance in the local context.

3. Key Findings

3.1 Profile of Respondents

3.1.1 Demographic Characteristics

Table 2 provides a detailed overview of the demographic characteristics of respondents from two different zones. It shows that the mean age of the household head in the East Bale zone is 39.2 years, while in the Waghimra zone, it is slightly lower at 38.6 years indicating that the majority are in the working age group. Regarding family size, East Bale exhibits a higher mean of 6.3 in comparison to Waghimra, where the mean family size is 3.9. Table 1 further indicates that the mean educational level of the household head is 2.4 in East Bale and 2.2 in Waghimra. The minimum and maximum values for educational levels in the zones vary from 0 to 13 in East Bale and 0 to 12 in Waghimra, indicating a somewhat diverse range of educational backgrounds among respondents (Table 2). In terms of experience in farming, East Bale showcases a higher mean value of 23.8 years in contrast to Waghimra, where the mean is 19.7 years.

Table 2. Demographic characteristics of respondents

S. No	Variable	East Bale					
		Mean (std. dev)	Min	Max	Mean	Min	Max
1	Age of the household head	39.2 (11.9)	19	80	38.6 (12)	20	75
2	Family size of the household	6.3 (2.5)	2	13	3.9 (1.8)	1	9
3	Educational level of the household head	2.4 (3.5)	0	13	2.2 (3.2)	0	12
4	Experience in farming in years	23.8 (12.1)	0	60	19.7 (11.2)	0	50

From the descriptive statistics (Figure 3), only 36.6% of the respondents in East Bale can read and write, while the corresponding figure in Waghimra is 43%. In fact, approximately 60% of the respondents in each zone do not have formal education. In terms of marital status of respondents, 92.8% are married in East Bale against 79.3% in Waghimra. Similarly, single make up 2% in East Bale and 13.3% in Waghimra. Other categories (such as divorced & widowed) make up the remaining percentage values.

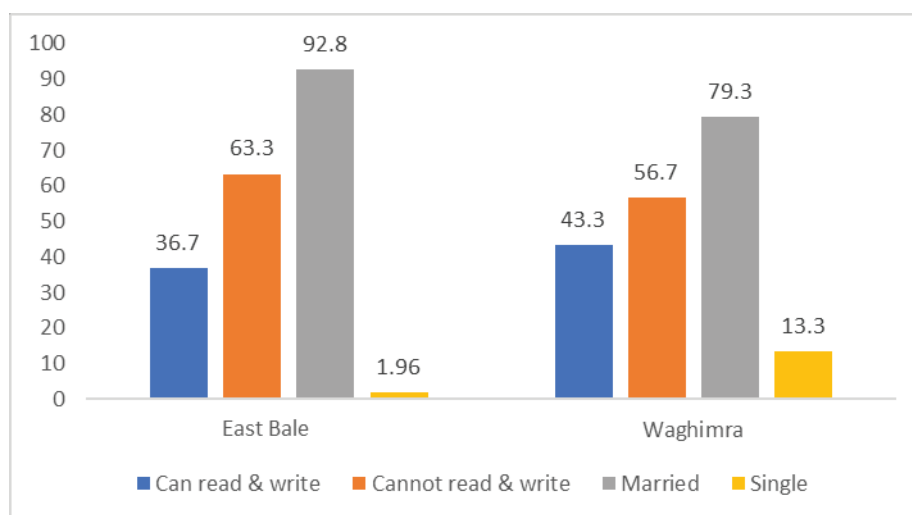


Figure 3. Educational background and marital status of respondents

3.1.2 Socio-economic Characteristics

Figure 4 compares East Bale and Waghimra zones in household assets (hh_asset_index) and livestock ownership. When we look at the hh_asset_index, we find that Waghimra has a notably higher value at 0.831, whereas East Bale has a lower value at 0.466. This suggests that, on average, households in Waghimra have a higher level of assets compared to those in East Bale. However, when we consider livestock (TLU), the results are reversed where East Bale has a higher value of 0.895 in contrast to Waghimra's value of 0.787, indicating that households in East Bale have, on average, a higher number of livestock (TLU) than those in Waghimra.

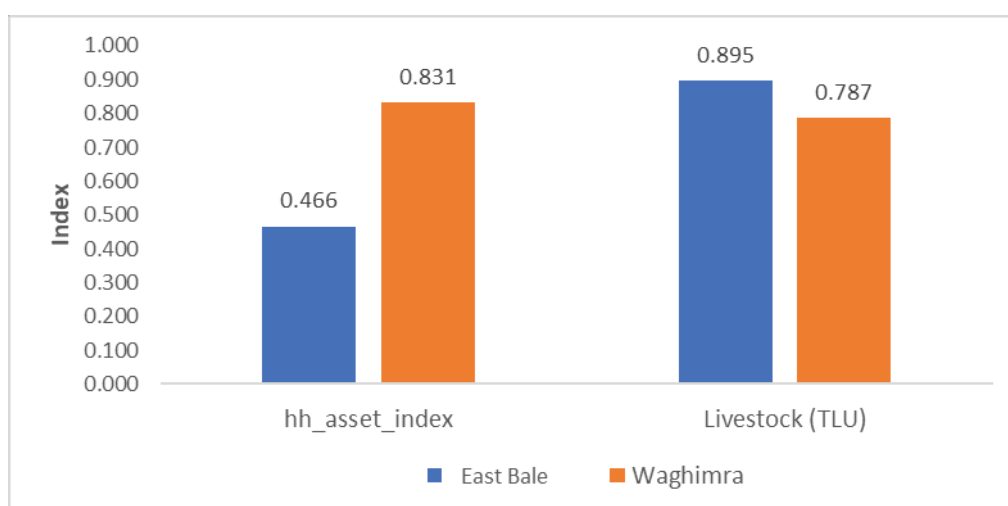


Figure 4. Asset ownership of respondents

3.2 Natural Resource Management for Climate Resilience

Information generated through descriptive statistics reveals that locally-led adaptation practices are vital strategies for climate resilience. In the context of watershed and natural resource management activities in East Bale and Waghimra zones, the percentage achievement from the planned hectare of land provides valuable insight into the effectiveness of these initiatives. In East Bale Zone, with a planned area of 533.33 hectares, the achieved area was 321 hectares, indicating a percentage achievement of approximately 60.2%. On the other hand, in Waghimra Zone, where the planned hectares were set at 750, the achieved hectares amounted to 500. This translates to a percentage achievement of approximately 66.7%, suggesting that about two-thirds of the planned area has been successfully managed for watershed activities. These percentages offer an overview of the progress made in these zones, which can serve as a basis for evaluating the success of the management efforts in each area (Figure 5).

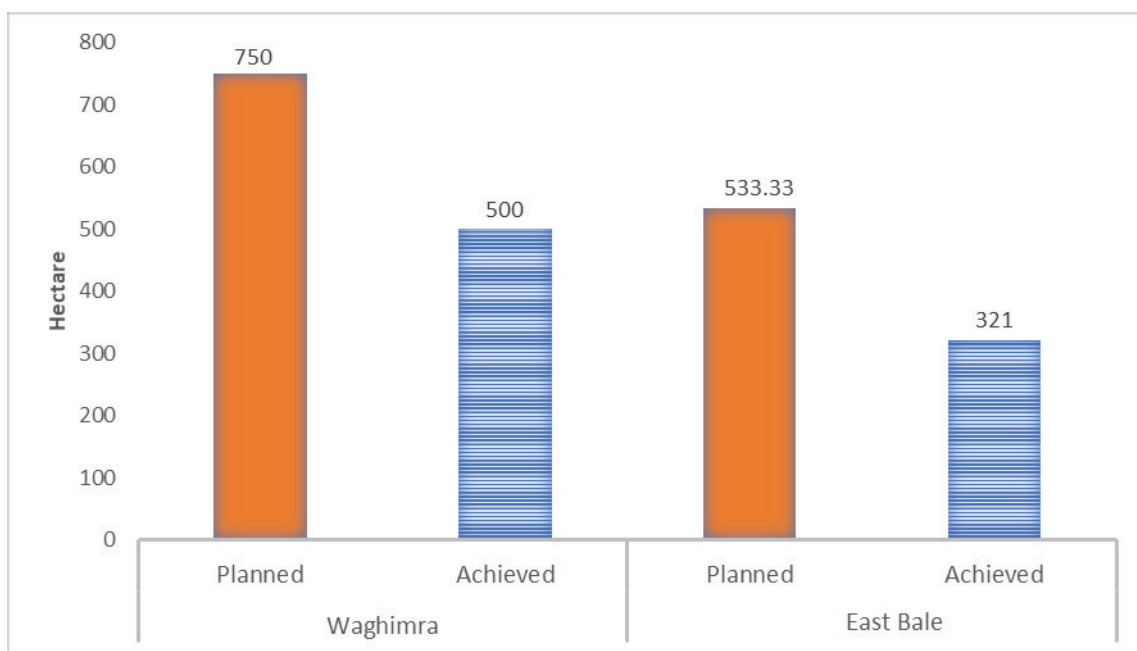


Figure 5. Planned vs accomplished watershed and natural resource management activities

The project has been raising awareness about natural resource management in East Bale, which is a crucial step in the ongoing battle against drought. Drought, a recurring and increasingly severe challenge in many regions including East Bale zone, can have devastating consequences for communities, agriculture, and ecosystems. By informing and educating individuals about responsible and sustainable resource management, the project has

attempted to empower communities to make informed decisions that reduce the risk of drought. This includes practices such as reducing deforestation, among others. Increased awareness fosters a sense of shared responsibility, encouraging communities to collectively work towards preserving their environment. Ultimately, this collective effort not only helps combat the immediate threats of drought but also ensures long-term resilience in the face of a changing climate. Box 1 illustrates the perspectives of community members.

Box 1. Raising awareness about natural resource management is a crucial step in the ongoing battle against drought in East Bale Zone

Rabela Abdo Aliy, a 40-year-old married woman, emphasizes the vital role the project in raising awareness about the devastating impact of drought. Her message is clear: to preserve the environment and mitigate the severe consequences of prolonged drought, she learnt through the project that it is crucial to stop cutting trees for firewood and charcoal production. Instead, the project has advocated for the responsible management of natural resources and the conservation of forests. She notes that this shared commitment to environmental sustainability not only serves as a protective measure against drought but also contributes to the long-term well-being of the community where she belongs. She indicates that this approach underscores the importance of informed environmental practices and the collective effort required to address climate-related challenges, ultimately fostering resilience and sustainability within the community.

The case stories were also equally illuminating despite the huge impact of the drought. Respondents noted that their active involvement in the natural resource management efforts created employment opportunities and financial support, aligning with the narrative of Mixed Group Discussion on Natural Resource Management. In fact, the positive changes in the local ecosystems were not that tangible, particularly due to the recurrent drought. Elaborating this further, Esmael Gale, 63 from Kubi Waldaya says “...because of the drought we did not see any effect on our production. Nonetheless, we have at least learned how to keep our natural resources via this project. Because they have been providing us with different awareness training on how to protect our environment and be resistant to drought in doing watershed management activities. For example, the area closure we did could be the feed for our cattle.”

Turning our attention to Waghimra, insights from key informant interviews unveiled another remarkable narrative of natural resource management. In this zone, the focus was on watershed and environmental conservation practices, which had a similarly positive contribution to the local ecosystem. Mengiste, a key informant, highlighted how the project in Waghimra contributed to the efficient management of crucial resources like water and land. It

championed responsible resource utilization and the establishment of bylaws to ensure equitable access to these resources. Key informants emphasized the project's beneficial influence on environmental preservation, particularly through the identification and protection of watershed areas from human and animal interference, thus significantly contributing to the conservation of natural resources. A case in point is that of Mulu Solomon's, a 35-year-old key informant from Kebele 023 of Dahna woreda. She says *"...the project provides us with seedlings, with a special focus on pregnant mothers and those with young children. Additionally, the youth benefit from improved seedlings like mango, orange, woodwork seedlings, and Gesho. The project also provides us with essential tools like pillow materials, shovels, and diggers."* Figure 6 shows the seedlings distributed to households in Dahena woreda.



Figure 6. Seedling production in Waghimra zone

For ease of elucidation, the natural resource management practices are assessed in terms of tree planting, soil and water conservation activities, and water harvesting for irrigation and other purposes.

3.2.1 Tree Planting

Figure 7 reveals distinct patterns regarding tree planting in East Bale and Waghimra zones. The Figure paints an intriguing picture, highlighting a noteworthy discrepancy in tree planting practices between the two zones. It is evident that a significantly higher proportion of respondent households in Waghimra (83%) engage in tree planting compared to those in East

Bale (49%). This striking contrast in tree planting practices could be attributed to several factors. One key factor is the environmental condition and land degradation that exists in the two zones. In East Bale, the lower prevalence of tree planting is directly related to prolonged drought during project implementation periods (especially in the 1st two years-2021-22). Key informant interviews also strongly argue this to be the case.

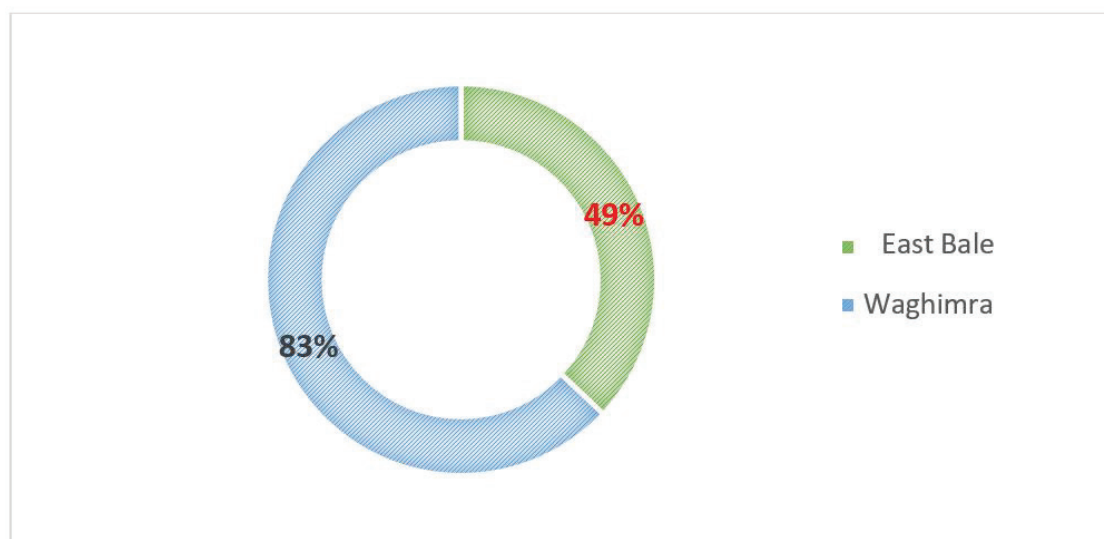


Figure 7. Tree Planting in East Bale and Waghimra

3.2.2 Soil and Water Conservation Practices

Soil and water conservation practices demonstrate a clear distinction between the two zones. In the East Bale zone, a smaller share of households has implemented these practices, while in Waghimra, a significantly higher proportion have adopted such measures. That a relatively smaller share of households have embraced these measures in East Bale could indicate a potential need for increased awareness, education, or support to encourage more households to engage in such practices. On the other hand, Waghimra zone boasts a remarkably higher adoption rate, suggesting that the community, the project coordinators, or local authorities in this zone may have successfully promoted and implemented effective soil and water conservation initiatives.

Information generated through interviews and FGDs indicate that community level engagements of natural resource management practices were encouraging in both zones. In the East Bale zone, community members shared their inspiring journey towards responsible natural resource management. They vividly recalled a time when their land was marred by destructive practices like deforestation and charcoal production. However, the intervention of

DCA and the AFD projects, as underscored in focus group discussions, played an important role. Through initiatives like forest preservation, they have attempted to rejuvenate their landscape to foster biodiversity and safeguard critical ecosystems. Despite the challenge they face due to severe and recurrent drought which offsets what they have done, the mixed group discussions underscored the pivotal nature of this shift in mindset, with participants recognizing the essential role of soil and natural resource conservation in mitigating the impacts of climate change (*Women's Focus Group Discussion in Kubi Waldaya Kebele*).

3.2.3 Water Harvesting

Based on information from key informants and observation of the actual work on the ground, the project's construction of water harvesting structures, including ponds, in the East Bale Zone, has had a profound contribution in making water readily available to the local community. These initiatives have significantly increased the accessibility of water resources, particularly in a region frequently affected by water scarcity due to drought. The construction of ponds and other water harvesting structures provides a reliable source of water for both agricultural and domestic use. By bringing water closer to the community, the project has not only quenched the immediate thirst but has also sowed the seeds of a more sustainable and resilient future for the people of East Bale Zone (Figure 8).



Figure 8. Pond construction for water harvesting in East Bale

Findings obtained from qualitative data indicate that irrigation is the most important activity in both zones. In East Bale, the case stories highlighted the pivotal role of irrigation in mitigating water scarcity issues (Box 2).

Box 2. Water Harvesting provided hope for a more sustainable future in East Bale

Fatuma Abdi, a 60-year-old from Kebele Dibe Kilefiota, shared her experience with a water harvesting practice, which aimed at combatting severe drought and food scarcity, by excavating ponds to collect rainwater. Initially, she was met with resistance due to resource scarcity. Later, the project coordinator's active involvement and support helped her and the community embrace pond construction. She got compensation based on the amount of work contributed, offering income to feed her family. She used the rainwater from the ponds for cultivating vegetables, like onions, cabbage, carrots, and tomatoes. The project integrated traditional and modern farming methods. While limited by prolonged drought, it taught her sustainable practices and water conservation. Fatuma believed that with support and more rain, the community could enhance their livelihoods. In summary, the project in Fatuma's community focused on water conservation, diversified crops, and collaboration.

Figure 9 provides information about the proportion of households adopting water conservation measures based on survey data. The result shows that 33% of households in East Bale zone and 88% of households in Waghimra zone have implemented water conservation measures. The fact this significant portion of households in East Bale that do not actively participate in water-saving efforts could be due to various factors, including awareness, access to information, or economic constraints. It highlights a potential need for increased awareness campaigns and incentives to encourage more households to conserve water. On the other hand, Waghimra zone stands out with a relatively higher adoption rate for water conservation measures, which could be the result of effective awareness programs that have successfully promoted water-saving practices.

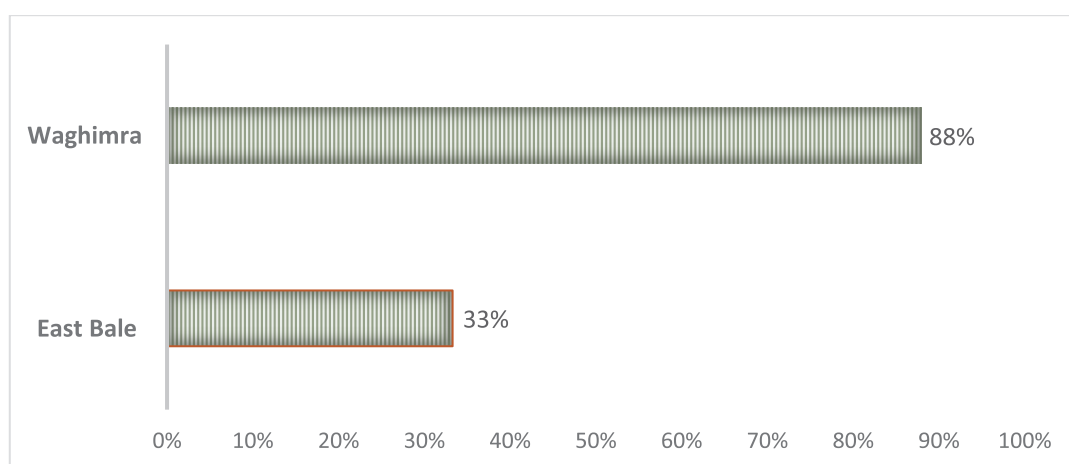


Figure 9. Water conservation practices in East Bale and Waghimra zones

These narratives depicted how water harvesting practices enabled community members to cultivate crops even in areas with insufficient rainfall. This not only generated income for the community but also bolstered food security. From the case stories, irrigation emerged as a

critical component in sustaining agriculture. The mixed group discussions in East Bale also echoed the significance of water conservation efforts, emphasizing the transformative impact of well-digging and pond construction in addressing water scarcity. Community members expressed a strong desire for the development of water infrastructure, such as boreholes for irrigation, to enhance agricultural practices and ensure consistent access to water. These discussions aligned seamlessly with the case stories, reinforcing the importance of water harvesting and irrigation in East Bale.

In Waghimra, key informants shared their insights on how irrigation has played a central role in modernizing traditional farming methods, reducing the community's dependence on seasonal rainfall. Biferd, the project's coordinator, emphasized the success of initiating effective irrigation practices in Waghimra, which enabled the community to harness available water resources for agriculture. The construction of a high-quality irrigation canal, combined with the allocation of lands around it to organized youth groups, facilitated sustainable farming practices. Previously untapped water resources were transformed into valuable assets.

Mengiste's case in Waghimra provided further evidence of this trend, indicating that the project facilitated the construction of an irrigation dam in the area. This dam has become a crucial water source for agriculture, benefiting approximately 100 individuals. Importantly, the establishment of bylaws and a system for monitoring water usage helped prevent significant conflicts. The dam has been instrumental in supporting crop production and improving agricultural outcomes. From the case stories, key informants and focus group discussions, the utilization of water resources for agriculture (for both crop production and livestock) has come out as a common theme in both zones, contributing significantly to their agricultural sustainability and resilience.

3.3 Climate-Smart Agricultural Practices

3.3.1 Climate resilient crop production activities

As per key informant interviews and focus group discussions, the project's focus on drought-resistant crop seeds has been instrumental in helping local farmers adapt to the changing climate conditions in the East Bale Zone. As drought has adversely affected the zone, these climate-resilient crop seeds have proven to be a lifeline for the agricultural sector. Farmers now have access to seeds that can thrive in water-scarce environments, offering them a buffer

against the devastating impact of drought. This initiative has not only contributed to food security but also strengthened the community's economic stability by promoting the cultivation of resilient crops. The project's efforts in providing support for drought-resistant crop seeds have become a symbol of hope in a challenging environment, highlighting the vital role of sustainable agriculture in addressing the pressing issues of our time.

Findings from the qualitative data analysis substantiate the aforementioned claims. In East Bale, for instance, the case stories portray a transformation in agricultural practices. Community members describe how they adopted climate-resilient techniques, such as pond construction and the cultivation of early maturing crops. These stories showcase the community's ability to adapt to changing climate conditions and reinforce the idea that agricultural practices have become more sustainable (Case Stories - Agricultural Production). Findings from observations corroborate these results (Figures 10).



Figure 10. Crop production in Dahna woreda, Waghimra zone

The focus group discussions, particularly among women in Kubi Waldaya Kebele, offer deeper insights into the challenges and resilience strategies related to agriculture. The women emphasize the need for adaptation to climate challenges and share innovative farming techniques, such as no-till farming. These discussions also shed light on the persistent challenges posed by prolonged drought and the necessity for further resilience-building efforts, consistent with the case stories (*Women's Focus Group Discussion in Kubi Waldaya Kebele, Mixed Group Discussion*). However, despite their best efforts, the women acknowledge that crop yields and livestock productivity have not seen significant improvements. Prolonged drought and resource limitations continue to hinder agricultural progress, necessitating further strategies to address these challenges (*Women's Focus Group Discussion in Kubi Waldaya Kebele*). They indicated that although they were provided with early maturing seeds of teff and

mung beans, their growth was stunted by the persistent lack of rainfall. They argued that if they had received adequate precipitation, they would have witnessed remarkable transformations in their agricultural endeavors.

In Waghimra, key informant interviews reveal a significant transformation in crop production due to the project's interventions. Activities like seedling fermentation and fruit tree seedling distribution have significantly boosted crop yields, especially for papayas and mangos. Diversification of crops has provided a stable income source for farmers, reducing their reliance on rain-fed agriculture. Lessons from these interviews underscore the importance of introducing climate-resilient crops and community involvement in modern farming techniques. However, challenges include the need to expand activities to cover a broader range of crops beyond papayas and mangos (Mixed Group Discussion).

Biferd Alemayehu, the project coordinator in Waghimra, notes that the project has led to a substantial increase in agricultural productivity within the community, shifting from an annual crop cycle to producing two or even three times a year. This boost in productivity has empowered farmers who previously struggled to meet their families' food needs, enabling them to sell surplus crops in the market. Additionally, traditional crops like wheat and sorghum have diversified to include the cultivation of vegetables, significantly enhancing food security in the zone.

During the mixed group discussion (MGD), participants shed light on the myriad advantages associated with crop production. Notably, they underscored how it leads to improved soil fertility and serves as a crucial tool in preventing soil erosion, ultimately culminating in enhanced agricultural productivity. Equally compelling, the case stories, notably featuring the experiences of individuals like Mengiste Worku, serve as vivid illustrations of the project's profoundly positive impact on crop production.

3.3.2 Irrigation Activities

In addition to their commendable efforts in natural resource management, households in both East Bale and Waghimra zones have prioritized irrigation practices, addressing water scarcity challenges in their respective zones. Figure 11 presents findings on the adoption rate of irrigation in both East Bale and Waghimra considering both project beneficiary and non-beneficiary households. In East Bale, only 6.6% of households have adopted irrigation, while

the majority, comprising 93.4%, are non-adopters. In stark contrast, Waghimra zone exhibits a substantially higher adoption rate, with 70.5% of households practicing irrigation, leaving only 29.5% as non-adopters. This difference in association between zone and adoption of irrigation is statistically significant at the 1% level, highlighting the need for further investigation and policy considerations to address this disparity. In fact, irrigation should be done in an efficient and sustainable way to avoid maladaptation and siltation.

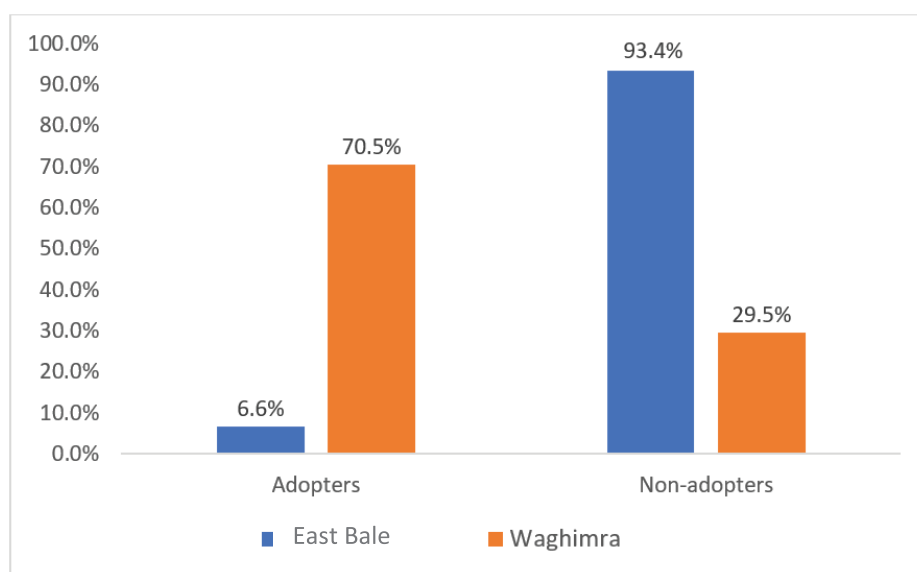


Figure 11. Adoption of Irrigation in East Bale and Waghimra Zones based on project participation status

3.3.3 Vegetables and Fruit Production

In both East Bale and Waghimra zones, a common theme emerged regarding the importance of diversified vegetable and fruit production in enhancing food security and providing income-generating opportunities. In East Bale, the case stories brought to light the significant impact of diversifying vegetable and fruit production. Community members in this zone recounted their experiences of successfully cultivating a variety of vegetables and fruits, even in arid areas. These narratives exemplified how diversification contributes not only to creating income-generating opportunities but also to food security for the local population (Case Stories - Vegetable and Fruits Production).

The focus group discussions in Kubi Waldaya Kebele, particularly among women, shed more light on this aspect. These discussions highlighted their active engagement in vegetable cultivation and their recognition of the potential of these practices to improve food security. Additionally, they expressed a desire to further expand their cultivation of fruit and vegetable

crops. Mixed group participants echoed these sentiments, emphasizing the project's adaptability to local ecological conditions, particularly regarding increased fruit and vegetable production (Women's Focus Group Discussion in Kubi Waldaya Kebele, Mixed Group Discussion 3 - Sustainable, Diversified, and Climate-Resilient Agriculture). Substantiating these assertions, key informant interviews also indicated that the fruit and vegetable seedlings support project in the East Bale Zone has made a remarkable contribution to the local community. Despite the persistent challenges brought about by drought, the project has been a beacon of hope for local farmers. By supplying a diverse range of high-quality fruit and vegetable seedlings, it has enabled farmers to enhance their agricultural practices and significantly improve food security.

In Waghimra, insights obtained from key informants underscored the positive impact of prioritizing the distribution of fruit tree seedlings in advancing both vegetable and fruit cultivation. According to these sources, these initiatives have brought about substantial positive changes in the lives of the local communities, indicating that the introduction of vegetable and fruit production was a pioneering concept within the zone. In this regard, the project effectively championed and integrated these practices, leading to heightened awareness regarding the significance of fruits and vegetables. This heightened awareness is making a substantial contribution to enhanced nutrition and improved livelihoods. The project's distribution of papaya, lemon, and orange trees among the community played a pivotal role in this transformative process, encouraging local residents to wholeheartedly embrace fruit production (Mixed Group Discussion 3 - Sustainable, Diversified, and Climate-Resilient Agriculture).

Similarly, case stories highlighted the project's support in distributing fruit and vegetable seedlings in Dahna woreda, potentially encouraging the cultivation and consumption of diversified foods while beautifying the landscape (Box 3).

Box 3. Provision of fruits and vegetable seeds boasts income of farmers in Waghimra

Mengiste Worku, a 30-year-old resident of Shemela 026 kebele in Daha Woreda, Shimela, highlighted the pivotal role played by the project during our interview. He stressed the project's significance in providing seeds for papaya and avocado, which have now become lucrative sources of income for both himself and the local community. In his own words, Mengiste affirmed, "The availability of these fruits will significantly improve our economic well-being, as a single papaya is currently fetching a considerable price in the local market." Mengiste's account paints a vivid picture of the transformative effect of the DCA project on crop production in his area. Prior to the project's intervention, he, and his fellow community members primarily focused on cultivating crops like papaya and onions. However, since the project's intervention, a remarkable shift has taken place. They were provided with seeds for a diverse array of fruits and vegetables, including avocado, papaya, and mango. These new crops have seamlessly integrated into their farming activities, resulting in a substantial increase in income generation.

From the case stories, FGDs and Key Informant Interviews (KIIs), it is clear to observe that both East Bale and Waghimra have recognized the importance of diversifying vegetable and fruit production as a means to improve food security, create income opportunities, and enhance nutrition. These efforts have been instrumental in transforming the local communities' livelihoods and have highlighted the adaptability of agricultural practices to local conditions, ultimately contributing to more sustainable and resilient agricultural systems in both zones.

However, recurrent drought in East Bale has reversed the efforts the community has put into these practices. To emphasize this point, Fatuma, a 60-year-old from Dibe Kilefiota kebele stated, *"The project provided us with mango, avocado, papaya, and shade trees in our households. But as there was not sufficient rain, it was burnt by drought"*, as the zone has been grappling with a nearly three-year-long absence of rainfall. The production of vegetables using ponds constructed was also minimal. Fatuma noted that by producing onions around the pond, they got 7000 ETB for a group of 50 individuals. In her opinion, the project introduced various novel initiatives, such as the cultivation of vegetables in the community, which was previously unfamiliar to them. Unfortunately, due to the prolonged drought, the project's effectiveness fell short of their expectations (Figure 12).



Figure 12. The effect of drought on vegetable production in East Bale

3.4 Other Environmentally Friendly Practices

3.4.1 Green jobs: Beekeeping

Information from a key informant (Mengistu Bira, 35) indicates that the project has provided beehives to households in the East Bale zone, Dawe Kachen woreda. According to experts coordinating the project, the project's initiative of providing a total of 60 beehives to 100 households (30 beehives to 50 women/youths in Dibe Kilefiota Kebele and 30 beehives to 50 women/youths in Kubi Waldiya Kebele), is a significant step towards promoting sustainable agriculture and economic empowerment. By distributing these beehives, the project is not only supporting local families but also contributing to environmental conservation through pollination and honey production. This targeted distribution empowers women and youth with an opportunity to engage in beekeeping as a means of income generation. Beekeeping not only diversifies their livelihoods but also encourages them to actively participate in local economic activities, fostering a sense of self-reliance and self-sufficiency.

Furthermore, the allocation of beehives to different Kebeles within the East Bale region demonstrates the project's commitment to equitable distribution and reaching various communities. By doing so, the project ensures that multiple areas benefit from the economic and environmental advantages of beekeeping, promoting a more balanced and resilient local economy. Additionally, the increased bee population will contribute to improved pollination in the region, benefiting agricultural productivity and local ecosystems. This strategic allocation of beehives exemplifies the project's comprehensive approach to addressing **economic stability, environmental conservation, and community empowerment in East Bale (Figure 13).**



Figure 13. Beekeeping in East Bale Zone

In terms of its potential for income generation, the focus group discussions brought out the significance of beekeeping as a sustainable income-generating activity. This activity not only provides a valuable source of income but also supports environmental conservation, contributing to their overall well-being. The women's focus group discussion in Kubi Waldaya Kebele highlighted how beekeeping has become an integral part of their income-generating activities (Figure 14). They described that beekeeping could contribute to biodiversity and crop pollination, aligning with the idea that beekeeping is an essential aspect of natural resource management (Women's Focus Group Discussion in Kubi Waldaya Kebele).

In Waghimra zone, both focus group discussions and key informant interviews revealed that beekeeping emerged as an economically and environmentally friendly practice, with successful establishment and support. Despite the small number of adopters in the target kebeles (11.4%), the project has successfully encouraged beekeeping, creating a favorable environment for bee colonies, and thereby increasing honey production in the targeted kebeles. Key informants indicated that proper training has been provided to community members to enhance their beekeeping skills, leading to the establishment of a relatively growing beekeeping activity in the area. This was substantiated by mixed group FGD participants who emphasized the benefits of beekeeping.

According to Mengiste, a key informant from Dahna woreda, the project provided support for beekeeping where he and his group received 60 modern and 30 local beehives. Mengiste currently owns and maintains five beehives. Beekeeping has the potential to further enhance their income and diversify their agricultural activities. Assefa's case also showcased the value of beekeeping in generating income, where his beekeeping activities indirectly supported crop production through pollination, enhancing yields of fruits and vegetables in the community (Box 4).

Box 4. Beekeeping has the potential to boost incomes while protecting the environment

Chale, residing in 031 kebele, Dahna Woreda of Waghimra zone, is engaged in beekeeping, inspired by family experience. He started with one traditional and two modern hives from the project, yielding 25 kg of honey last year, which he sold for 10,000 ETB. He gained valuable knowledge from the organization on how to take care of bee colonies and received in-kind support from the project. He uses gloves and gown while harvesting the honey. In the future, he plans to expand his beekeeping activities. He did not keep the knowledge he gained from the project only to himself. Instead, he has trained five individuals and shared knowledge on environmental protection and forest conservation. He is actively involved in soil and water conservation and environmental protection. He advocates for government awareness efforts and is motivated to form associations to enhance beekeeping practices.

3.4.2 Fuel-saving Stoves

In addition to their dedicated efforts in resource management and agriculture, the project has made significant strides in advancing sustainable energy sources within the community, particularly in East Bale. The introduction of fuel-saving stoves and solar energy systems marked a substantial improvement in the overall quality of life for residents. Fuel-saving stoves not only curtailed the demand for firewood but also alleviated health issues linked to smoke exposure, rendering cooking far more manageable. Furthermore, the solar energy systems offered students a vital opportunity to study at night without being exposed to the harmful effects of traditional lighting methods.

Tibebu Regasa, a 35-year-old project expert in East Bale, recalled their initial ambitious plans to train local youth in the production of these energy solutions. However, due to the challenging environmental conditions, they were compelled to purchase 1500 fuel-saving stoves through open bids. These stoves played a crucial role in conserving local forests and reducing dependence on firewood and charcoal. The women lauded the practicality and

efficiency of these solutions, expressing a strong desire to expand such practices. Their expressed needs resonate around extending the provision of stoves and solar energy systems to more households. The consensus among women emphasized the continued importance of training and awareness-building for sustainable community development.

Similarly, information obtained through key informant interviews and case stories underscored that the distribution of fuel-saving stoves has yielded a multitude of benefits. These stoves have significantly curbed firewood demand, thereby reducing pressure on local forests and mitigating deforestation. The enhanced efficiency of these stoves allows households to cook multiple dishes simultaneously while generating minimal smoke, contributing to the well-being of residents by reducing respiratory issues and eye irritation. Additionally, the shift to fuel-saving stoves has made daily cooking more accessible and enjoyable. Importantly, these benefits extend beyond individual well-being to encompass environmental preservation, promoting cleaner, healthier homes and a reduction in the adverse effects of traditional cooking methods on the ecosystem (Box 5).

Box 5. Fuel-saving stoves changes lives in East Bale

Rabela Abdo, a 40-year-old married woman from Bale, shared her experience with the project that provided her with fuel-saving stoves and solar solutions. According to her, the fuel-saving stove has proven to be a crucial addition, significantly reducing the workload for women like herself. With this stove, she said that she can now cook multiple dishes simultaneously, and the absence of smoke ensures a more enjoyable and healthier cooking experience. Moreover, it requires only a small bundle of firewood, making it a sustainable choice for her and the community. She notes that their homes have become cleaner and free from smoke, and they no longer need to cut down excessive trees or produce charcoal for cooking. The solar solution has also been a game-changer for students in her community, doing homework much more accessible and efficient, without the smoke and environmental impact associated with firewood.

3.4.3 Green Incubation

The initiative for green incubation was underway during the data collection process. We interviewed the participants as to what they intend to do and what they expect from the project. The participants seek to bring forth a range of unique innovative ideas and have diverse expectations. They are driven by the desire to successfully implement their ideas, bring beneficial solutions to the community, and contribute to addressing the challenges presented by climate change and agricultural needs. With the unwavering support of Green Incubation,

they aspire to transform their visions into reality, improve livelihoods, and foster a more sustainable and resilient future.

For instance, Tofik Ahmed (20) indicated that his and his colleague's (Shambel Girma, 22) innovative approach focuses on developing an application that can accurately detect crop diseases and provide customized solutions. He notes that by utilizing drones and a mobile application, he expects farmers to be able to capture images of affected plants and receive real-time remedies. He indicates that he and his colleague strongly believe that this system will greatly benefit farmers, agricultural bureaus, and all stakeholders in the agricultural sector. Their project aims to successfully implement and launch this application, provide comprehensive training to farmers, and generate income by offering installation services. His colleague, on his part indicates that they will first create awareness about the application among farmers, especially those who are considered model farmers, and provide them with the training. Additionally, they are designing the application to be user-friendly by offering support in at least two or three languages. Through proper training, they hope to create a revenue stream by offering installation services for this application.

Another participant of the training, Mamile Ahmed (24) focuses on designing a cost-effective bread-making machine and transforming a two-wheeled motor into a three-wheeled one. He argues that this innovative solution aims to make bread production accessible and affordable for farmers. Additionally, he hopes that the conversion of the motor will offer efficient transportation capabilities. His project's objective is to successfully manufacture these machines, promote their usage in the community, and contribute to food security and improved livelihoods. This is one of the innovative ideas the project would like to support.

Tegegn Taweke-30 works on innovation, which is centered around enhancing the capacity of water pump generators. He argues that currently, the purchased motors have limitations, as they are only capable of supplying water to fields within a radius of three meters. Seeing this limitation, he seeks to overcome this constraint by upgrading the motors, enabling them to irrigate areas up to eight meters away. This advancement will empower farmers to maximize their agricultural outputs and mitigate the adverse effects of climate change. His project aims to successfully improve the traction capacity and accessibility of these generators, provide

comprehensive training to farmers, and contribute to sustainable agricultural development in the East Bale zone and beyond.

Mebratu Fana (34), on his part, indicates that his inventive work revolves around the creation of a versatile heating machine, designed to enhance the lives of individuals in many ways. He explains that this machine has the potential to provide warmth during cold weather conditions, as well as support various industries that rely on heating. His expectation is to successfully develop and commercialize this heating machine, create employment opportunities, and significantly improve the quality of life within his community.

3.5 Impact of the project on livelihood outcomes

Respondents indicated that the project brought significant changes to their life and livelihoods. For instance, in Waghimra, Bayush Adugnaw, 28 years old, from kebele 023, indicated that she has benefited from the irrigation activities of the project. Speaking on behalf of her family, she says:

“We have got significant benefits from the irrigation program. In the past, we didn’t have nearly as much, but now we not only meet our consumption needs but also supply to the market. For instance, last year, we earned 35,000 ETB from sugarcane, 28,000 ETB from cabbage, 15,000 ETB from garlic sales. The potential area we are currently cultivating is 0.25 hectare (አንድ ሺህ አምስት). Additionally, we managed to harvest two quintals of wheat in the dry summer season through the irrigation project.

Another case story from Dahna woreda indicates that the project has the potential to boost incomes of beneficiaries (Box 6).

Box 6. Alternative Income sources are the way out of poverty in Dahna Woreda

Alene Mengiste, 30, completed grade 10. He lives in Shemele kebele, 020 of Dahna woreda. He is one of the ten group members selected by the kebele. He received papaya seeds and plastic containers to produce seedlings. Based on the training he received on the whole process of papaya cultivation production including compost preparation and application, he started mass seedling production in a group using plastic containers. Together with his group members, he produced around 7000 seedlings. Of these, he and his group members sold 1000 to the project. If all sold, he forecasts the total income for the group to be about 200,000 ETB (which means 20,000 ETB per individual).

The project has also benefited households in terms of introducing new farming practices (Box 7). Key informants indicate that such practices are new to the households in the area. Key informants from community members also indicate that the project has been empowering women by creating them job opportunities in working in different watershed activities. It has also offered them training and shared different experiences, knowledge, technology, and lessons to protect their environment.

Box 7. The project contributed to adoption of modern farming and agronomic practices in East Bale

Solomon Sebsibe, 35, field office coordinator from Dawe Kachen indicated that the project has introduced several improved and modern farming practices to enhance agricultural productivity and sustainability in the kebele. One significant innovation is the implementation of rainwater harvesting, enabling the capture and storage of water during the rainy season for use in the dry summer months. This approach promotes year-round farming and reduces dependence on unpredictable rainfall. Additionally, the project has encouraged the cultivation of vegetables in the area, diversifying crop production and improving local nutrition. Another valuable initiative involves Rangel and activities that have transformed 184 hectares of land, enhancing its potential for sustainable livestock grazing. A notable improvement is the introduction of "bush thinning" instead of complete clearing, preserving essential plant species for the ecosystem. Furthermore, the project supports beneficiaries by providing drought-resistant seeds, such as teff and mug bean, to multiple kebeles, although challenges with unpredictable weather have posed hurdles for successful harvests. These modern farming practices not only contribute to increased agricultural resilience but also help to protect the environment and promote food security in the zone.

In terms of variety of foods respondents consume, Figure 14 reveals that main staples, pulses, and oil show relatively higher consumption levels. On the other hand, there is low consumption of meat, milk, and vegetables in both East Bale and Waghimra zones. Meat and milk consumption are notably low, suggesting that these protein sources are not prominent in the diets of the population in these zones. Additionally, the consumption of vegetables is also low, indicating a potential lack of essential vitamins and minerals in their diets. Figure 15 also shows that sugar and fruit consumption fall somewhere in between, but not particularly high. These findings emphasize the need for promoting more balanced and diverse diets to improve the overall nutritional well-being of the populations in East Bale and Waghimra zones.

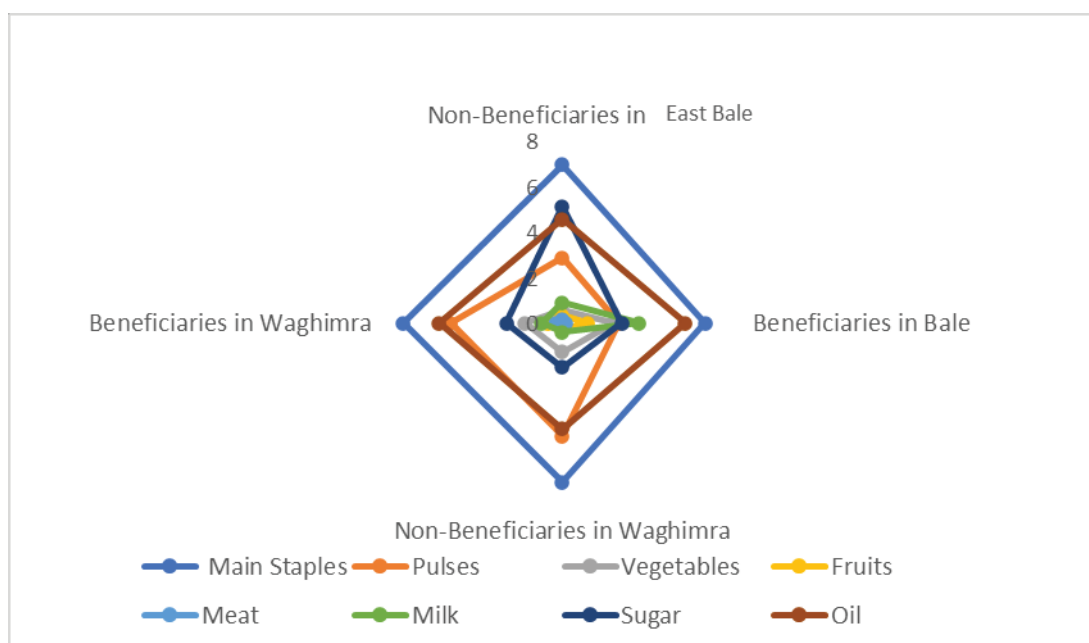


Figure 14. Comparison of food consumption patterns of households in the study areas

Further analysis was done to analyze mean differences between beneficiaries and non-beneficiaries in terms of food consumption score using independent samples ttest. The result is presented in Table 3.

Table 3. Comparison of consumption of food groups between beneficiary and non-beneficiary households of the project in East Bale and Waghimra

S. No	Food Group	East Bale			Waghimra		
		Non-Beneficiaries	Beneficiaries	Difference	Non-Beneficiaries	Beneficiaries	Difference
1	Main Staples	6.934	6.26	0.674***	6.945	6.974	-0.03
2	Pulses	2.869	2.454	0.414	4.931	4.885	0.046
3	Vegetables	0.566	2.234	-1.668***	1.250	1.641	-0.391**
4	Fruits	0.355	1.091	-0.736***	0.278	0.616	-0.338***
5	Meat	0.144	0.13	0.015	0.084	0.308	-0.225**
6	Milk	0.908	3.364	-2.456***	0.389	0.897	-0.509***
7	Sugar	5.119	2.598	2.521***	1.917	2.462	-0.545*
8	Oil	4.553	5.39	-0.837***	4.611	5.398	-0.786*

In East Bale, beneficiary households exhibit certain patterns in food group consumption compared to non-beneficiary households. Specifically, beneficiaries consume main staples, sugar, and oil less than non-beneficiaries, with a statistically significant difference of 0.674, 2.521 and -0.837 at the 1% level. The consumption of pulses, however, shows only a small and statistically insignificant difference between the two groups. Beneficiaries in this zone tend to consume more vegetables, fruits, milk, and oil compared to non-beneficiaries, with differences

being statistically significant at 1% level. Similarly, beneficiaries consume more milk, with a statistically significant difference at the 1% level.

In Waghimra, the food consumption patterns of beneficiary and non-beneficiary households also differ. There is no statistically significant difference between beneficiaries and non-beneficiaries in the consumption of main staples and pulses. However, beneficiaries significantly consume more vegetables (-1.668) compared to non-beneficiaries, indicating increased vegetable consumption among beneficiaries. Likewise, beneficiaries consume significantly more fruits (-0.736) compared to non-beneficiaries. The difference in meat consumption is minimal and not statistically significant. In contrast, beneficiaries in Waghimra consume significantly more milk (-2.456) compared to non-beneficiaries. For sugar and oil consumption, beneficiaries consume slightly more (-0.545) and (-0.786), which are both statistically significant at the 10% level. These differences in food group consumption reflect the specific dynamics of the projects' impact on households in the zones.

Following WFP (2008), the food consumption score was used to classify households into three: food insecure, borderline, and acceptable. Accordingly, we observe that there is difference in food consumption status between beneficiaries and non-beneficiaries in both zones (Figure 20). This Figure provides a comparative analysis of food consumption categories among project beneficiaries and non-beneficiary households in the East Bale and Waghimra zones.

The result is organized into three categories: "Poor consumption," "Borderline consumption," and "Acceptable consumption," for both East Bale and Waghimra zones. Accordingly, in the "Poor consumption" category, we observe that in the East Bale zone, there are 11.84% of non-beneficiary households and 3.9% of beneficiary households. This suggests that a higher proportion of non-beneficiary households in East Bale are experiencing poor consumption compared to beneficiaries. In the Waghimra zone, we see a similar trend, with 5.56% of non-beneficiary households and 5.13% of beneficiary households falling into the "Poor consumption" category (Figure 15).

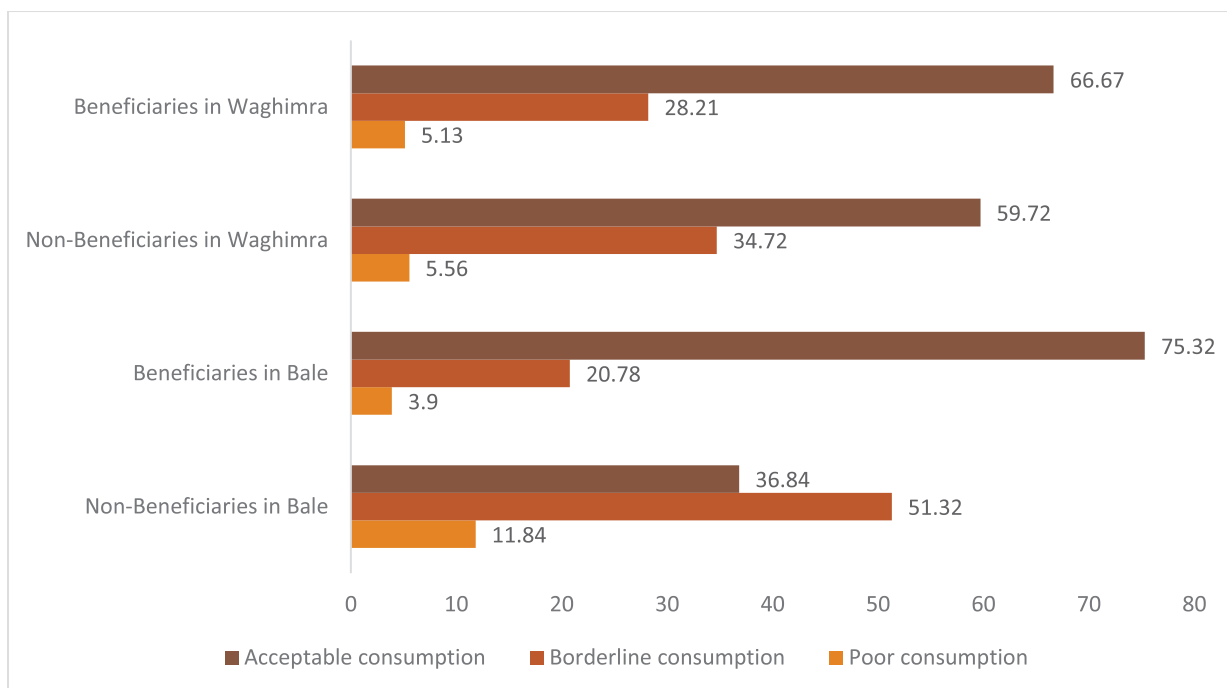


Figure 15. Food security status of households in East Bale and Waghimra zones

Moving on to the “Borderline consumption” category, we can see that in East Bale, a significant proportion of non-beneficiary households, 51.32%, fall into this category, while 20.78% of beneficiary households are also in this category. This indicates a higher prevalence of borderline food consumption among non-beneficiaries in East Bale. In Waghimra, the trend continues, with 34.72% of non-beneficiary households and 28.21% of beneficiary households experiencing borderline consumption. This means that if households in this category encounter shocks, chances are they easily fall into “Poor consumption” category.

In the “Acceptable consumption” category, we find that in East Bale, 36.84% of non-beneficiary households and 75.32% of beneficiary households have acceptable food consumption. This suggests that a larger proportion of beneficiary households in East Bale are experiencing acceptable food consumption. Similarly, in Waghimra, we see that 59.72% of non-beneficiary households and 66.67% of beneficiary households fall into the “Acceptable consumption” category. This implies that the situation in Waghimra is relatively better, but there is still a slight advantage for beneficiary households.

Table 4. Mean differences in food consumption score and resilience index

S. No	Variable	East Bale			Waghimra		
		Non-beneficiaries	Beneficiaries	Difference	Non-beneficiaries	Beneficiaries	Difference
1	Food Consumption Score	32.44	41.18	-8.73***	35.36	39.61	-4.25***
2	Resilience Index	0.93	0.82	0.11	0.55	0.64	-0.08***

Table 4 shows that there is statistically significant mean difference in mean food consumption score between beneficiaries and non-beneficiaries in both East Bale and Waghimra, indicating that project beneficiaries have more food consumption score than their counterparts (which is significant at 1% level). Regarding resilience index, beneficiaries in Waghimra are better off than non-beneficiaries, which is statistically significant at 1% level. But because of selection bias, these differences may not be attributed to the project per se. There could be other confounding factors that should be controlled for. Therefore, to gauge the true effect of the project, we used treatment effects model (Table 5).

Table 5. Impact of the project on food consumption score (FCS)

S. No	Zone	Average Treatment Effect on the Treated (ATET)	Std err	z	p
1	East Bale	4.144	2.004	2.07	0.039
2	Waghimra	4.936	1.615	3.06	0.002

Table 5 presents coefficient values and their associated significance levels from a propensity score matching analysis, assessing the impact of a project on the food consumption score of beneficiaries in the two zones. The coefficient values, which indicate the magnitude of the effect, reveal that the project has brought a positive influence on food consumption scores in both zones. For instance, in East Bale zone, the project has increased the food consumption score of beneficiaries by 4.144 points. Similarly, in Waghimra zone, the coefficient of 4.936 indicates a significant increase in food consumption scores due to the project. The low p-values of 0.039 for East Bale zone and 0.002 for Waghimra zone signify that the observed effects are statistically significant. In other words, the likelihood that these observed effects occurred by random chance is very low, reinforcing the confidence in the project's impact on food

consumption scores in both zones. These findings provide robust evidence of the project's effectiveness in improving food consumption among the target populations in these specific areas. To check the quality of the matching method we used, we did post estimation tests (Figures 16 and 17), whose result shows a perfect match between beneficiaries (Yes) and non-beneficiaries (No) groups.

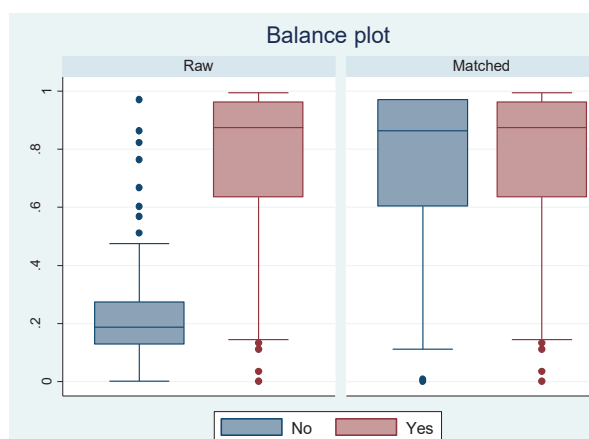


Figure 16. Balancing Property in East Bale

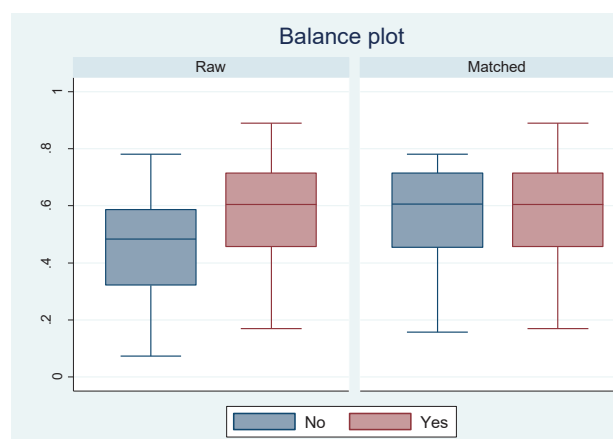


Figure 17. Balancing Property in Waghimra

To corroborate these findings, data from qualitative sources such as case stories are used. For example, in East Bale, the case stories highlighted the multifaceted benefits gained from the project.

Community members spoke of improved income, the distribution of fuel-saving stoves, and the introduction of sustainable energy sources (solar energy). These stories underscored the positive impact on economic development and well-being. The mixed group discussions also elaborated on these benefits. They emphasized how the projects had not only improved income but also played a transformative role in reducing firewood consumption, diminishing health issues related to smoke exposure, and easing the cooking burden through the distribution of fuel-saving stoves and solar energy systems (*Mixed Group Discussion 3 - Sustainable, Diversified, and Climate-Resilient Agriculture*).

Alemayehu's case, for instance, illustrated how the papaya nursery project diversified income sources, emphasizing the significance of diversifying livelihoods beyond traditional crops. His involvement in papaya nursery production showcased the value of having an alternative income source, especially in zones vulnerable to climate change and food insecurity (Box 8).

Box 8. Diversified income sources help ensure household food security in Waghimra

Alemayehu, a resident of Kebele 023 Dahna Woreda, indicated that together with other group members (eight in total), they were involved in the project. The primary focus of the project was forestry, and with the organization's assistance, the area had seen growth and the rejuvenation of plants. He noted that the project aimed to improve the environment and make the land beautiful. They had received seedlings from the organization and were supported by a professional agriculturist. Because of the project, Alemayehu mentioned that he currently has 15 oranges, 3 avocados, and 6 mangoes, which have given him new experiences, such as water harvesting for irrigation purposes. In the past, he used to struggle to produce enough to feed his family. With the irrigation activity, he started to see success with the production of fruits such as mangoes and gesho, which helped him meet his family's food needs. In terms of the contribution of the project, Alemayehu mentioned that he earned 3,700 ETB from the sale of one orange tree, 17,000 ETB from the sale of honey, and 50,000 ETB from selling onion (which he produced using irrigation).

4. Challenges, Lessons, and Best Practices

4.1 Challenges

Pertinent to the challenges faced by the East Bale and Waghimra zones in their pursuit of climate resilience and environmental sustainability, it is evident that these zones grapple with a diverse range of obstacles. In East Bale, the scarcity of rainfall presents a multifaceted challenge. Not only does it affect agricultural productivity, hindering the community's ability to meet market supply demands, but it also underscores the vulnerability of this zone to climate change off-setting the achievements gained through the project. The uncertain and inconsistent nature of rainfall patterns complicates natural resource management and agricultural practices, exacerbating food security issues and economic instability (Box 9).

Box 9. Drought compounded with other factors creates a formidable challenge in Bale

Wariyo Naro, a 20-year-old student from Kubi Waldaya kebele, is acutely aware of the challenges facing the youth in his community. The project has made a significant impact by instilling a sense of environmental responsibility, discouraging deforestation, and creating job opportunities through watershed activities and sustainable agriculture. Despite these positive changes, the community grapples with formidable issues, primarily drought and high school dropout rates due to resource constraints and waterborne diseases caused by limited access to clean water. Wariyo believes the key to addressing these challenges lies in prioritizing youth empowerment, job creation, awareness-building, and access to clean water, especially for those in need. His perspective sheds light on the aspirations of young individuals eager for positive change in their community.

From the focus group discussions, it was also clear that the persistent threat of drought in East Bale represents a recurring challenge that poses a significant risk to the community's efforts. Drought not only impacts agriculture but also affects the availability of water resources, which are essential for various aspects of life. Coping with drought and devising strategies for drought resilience require long-term planning and resource management, which are not without their difficulties.

In contrast, the Waghimra zone faces a different set of challenges, including project delays. These delays can hamper progress and affect the timely implementation of sustainability initiatives, potentially causing setbacks in achieving environmental and climate resilience goals. The shortage of essential materials and resources further complicates the situation, requiring careful resource allocation and potentially creating budgetary constraints. Additionally, conflicts that disrupt project stability in Waghimra introduce an additional layer of complexity.

The focus group discussants also highlighted that there is lack of sustainability of the watershed and natural resource management practices, as some people cut trees or breach the newly agreed upon practices of protecting and managing the watershed. The difficulties in raising awareness and educating community members about climate change and sustainable practices, compounded by the zonal instability, highlight the need for effective communication strategies.

In sum, both the East Bale and Waghimra zones face complex challenges in their pursuit of climate resilience and environmental sustainability. These challenges include climatic vulnerabilities, resistance to change, drought, project delays, resource shortages, conflicts, and difficulties in education and awareness-raising. Tackling these multifaceted challenges necessitates a holistic and adaptable approach, combining community engagement, effective resource management, and innovative strategies to build resilience and foster sustainability.

4.2 Lessons

The lessons gleaned from the experiences in both the East Bale and Waghimra zones offer valuable insights applicable to broader efforts in pursuing climate resilience and environmental sustainability. A central lesson underscores the pivotal role of community involvement and collaboration. These zones recognized that communities must actively engage in decision-making and project implementation, fostering ownership, accountability, and alignment with local contexts.

- Raising awareness and educating communities about climate change, sustainable resource management, and alternative agricultural practices emerged as a transformative lesson. It underscores the power of knowledge-sharing and education in empowering communities to adapt and change their behaviors, emphasizing the ongoing need for educational efforts to ensure informed decision-making regarding the environment.
- Empowering marginalized groups, especially women and youth, was another key lesson. Providing job opportunities and income-generating activities not only enhances their livelihoods but also promotes sustainability and inclusivity. This emphasizes the importance of gender equity and youth engagement in environmental initiatives.

- Responsible natural resource management, including soil and water conservation, was underscored as an essential lesson. These gradual yet indispensable practices for mitigating drought and preserving local ecosystems are deeply ingrained in the collective consciousness of both zones, highlighting the importance of sustainable resource management for ecological balance and resilience.
- Adaptation and resilience-building were emphasized as ongoing processes that require flexibility and adaptability in the face of unpredictable weather patterns and environmental changes. These lessons underscore the need to incorporate adaptability into long-term planning and project design.
- The importance of collaboration and inclusivity that respects local knowledge and practices consistently yielded superior project outcomes. These lessons underscore the significance of inclusivity and respect for diverse perspectives and traditions in addressing complex environmental challenges effectively, emphasizing the power of collaborative efforts with various stakeholders.
- Incorporation of innovative technologies, such as fuel-efficient stoves and solar energy solutions, was highlighted to significantly reduce the environmental impact of communities. This lesson emphasizes the importance of integrating sustainable and environmentally friendly technologies into community projects for a more sustainable and healthier future.
- The youth can provide creative solutions to their communities' problems provided they get support (financial and technical). The participants of the green tech incubation provide an insight into this.
- Lastly, the promotion of crop diversification and the introduction of drought-resistant crop varieties as strategies that enhance food security and resilience to climate change further emphasized the need for agricultural diversification to mitigate the adverse effects of climate variability on food production. These lessons collectively provide a comprehensive roadmap for zones seeking to navigate the intricate path toward environmental sustainability and climate resilience.

4.3 Best Practices

In both zones, active community involvement remains a linchpin of success. This participation goes beyond decision-making and implementation to include active engagement in

environmental stewardship. For instance, community-led reforestation efforts have been successful in both zones, whereby community members plant and care for trees, combating deforestation while creating a sense of responsibility for the environment. In Waghimra, these efforts may also extend to watershed restoration, with communities taking an active role in rehabilitating water catchment areas and water sources.

- Empowering marginalized groups, particularly women and youth, takes on nuanced forms in each zone. In East Bale, women and youth may be engaged in agroforestry programs, diversifying their income sources, and enhancing resilience. Meanwhile, Waghimra might focus on youth-led initiatives for eco-tourism, showcasing the potential for sustainable livelihoods through environmental conservation. These zone-specific approaches underscore the adaptability of empowering marginalized groups to local contexts.
- Education and awareness-raising efforts extend to practical skills training in both zones. East Bale may offer training on sustainable agriculture practices, helping community members make informed decisions regarding crop selection and farming techniques that are resilient to erratic rainfall. In Waghimra, community-based training programs might encompass effective watershed management techniques, which not only raise awareness but also provide tangible skills for better resource management.
- Addressing zone-specific challenges, crop diversification in East Bale could involve the introduction of drought-resistant crop varieties to mitigate the impact of water scarcity. In Waghimra, it may entail promoting the cultivation of indigenous, water-efficient crops to enhance food security. Both practices aim at making agricultural practices more climate-resilient while tailoring solutions to each zone's agricultural landscape.

Alternative Energy Sources: Introducing fuel-efficient stoves and solar energy solutions, aligned with the forward-thinking insights of beneficiaries, has reduced pressure on forests for firewood, improved indoor air quality, and provided access to clean energy. The choice between fuel-efficient stoves and solar energy solutions may be linked to resource availability and local conditions. East Bale might focus on the distribution of efficient cookstoves to reduce wood consumption, combat deforestation, and mitigating indoor air pollution. In Waghimra, the introduction of solar energy solutions could include community-based solar power generation, reducing dependence on non-renewable energy sources, and improving access to clean energy, particularly in remote areas.

5. Conclusions and Recommendations

5.1 Conclusions

In conclusion, the amalgamation of case stories and focus group discussions provides a comprehensive panorama of the profound impact these projects have had on natural resource management, beekeeping, vegetable and fruit production, agricultural practices, water harvesting/irrigation, as well as the associated benefits, lessons, challenges, and best practices. Through the narratives and discussions, a consistent narrative emerges, emphasizing the transformative changes within the community, the paramount importance of sustainable practices, and the persistent challenges encountered as they strive to build resilience in the face of a changing climate.

A common thread that weaves through both East Bale and Waghimra Zones is the pivotal role of community engagement. Actively involving the local community not only generates employment opportunities but also cultivates a deep understanding of the fundamental significance of preserving natural resources. This heightened engagement fosters a profound sense of ownership, an indispensable pillar for the long-term sustainability of these initiatives. Besides, diversifying agriculture, hand in hand with the cultivation of climate-resilient crop varieties, has proven to be a robust strategy for enhancing economic stability and fortifying food security. Moreover, the introduction of income-generating activities, such as beekeeping, further bolsters livelihoods and augments the community's resilience. The employment of sustainable practices, spanning from soil and water conservation to afforestation and modern farming techniques, has resulted in notable improvements in soil fertility, erosion reduction, and heightened agricultural productivity. These practices serve as the bedrock for sustained success and resource preservation.

The consistent provision of timely support, particularly considering climate variability and resource dependency, emerges as a linchpin for resilience and overall project success. Ensuring both consistency and adaptability in support mechanisms remains pivotal. The empowering of women within agricultural and environmental initiatives has rendered substantial impacts on project outcomes. Gender inclusivity and the empowerment of women represent indispensable facets for fostering enduring success and equitable development. Despite the gradual nature of the process, the continuous endeavor to raise awareness about climate

change and conservation practices has begun to bear fruit, signifying an increasingly aware and conscious community.

5.2 Recommendations

The findings indicate that expanding upon best practices reveals the adaptability and specificity of strategies in response to the unique challenges faced by the East Bale and Waghimra zones. Community involvement, empowerment, education, crop diversification, and clean energy remain core strategies, as they customized to each zone's distinct environmental and social contexts, underlining the importance of tailoring sustainability efforts to local conditions. For future and similar interventions, it is recommended for Non-Government Organizations (NGOs), governments, and donors, to:

Recommendations to the Government (Local or Regional):

- Allocate resources and support community-led initiatives, helping empower local residents in sustainable agriculture and natural resource conservation. Create a framework for the formation of smaller, focused community groups for specific projects.
- Integrate climate change and conservation education into local school curriculum. Collaborate with local schools to ensure that environmental education becomes part of the core curriculum.
- Establish a government-led platform for collaboration among various stakeholders, including government offices, NGOs, and experts. Encourage regular meetings and dialogues to foster coordination and information sharing.
- Support the youth in green tech innovations by providing them with work premises and other administration support so they can benefit the communities.
- Promote the introduction of diverse, climate-resilient crops and income-generating activities within the region. Provide incentives or subsidies to farmers adopting modern agricultural practices aligned with these crops. Ensure that government resources are allocated for water harvesting and irrigation activities to support economic stability and food security through diversified livelihoods.

Recommendations to NGOs:

- NGOs can actively engage with local communities and support community-led initiatives for sustainable agriculture and conservation. Provide funding, training, and technical expertise to help these initiatives succeed.
- Collaborate with local schools to implement environmental education programs. NGOs can organize workshops, seminars, and awareness campaigns to keep communities informed about climate change and conservation practices.
- NGOs can facilitate workshops and training sessions to build the capacity of community members in modern agricultural practices, water harvesting, and irrigation. This will help promote diversified livelihoods.
- NGOs should actively collaborate with government offices and other NGOs to create a network of support for the region's sustainable development initiatives.
- NGOs should support the green tech innovations benefiting the communities solve the problems they grapple with.
- Seek donor funding and grants to support local projects that align with these recommendations. NGOs can also help local communities access these funding opportunities.

Recommendations to Donors:

- Donors can provide financial resources to help the government and NGOs implement the projects, including those focused on flexible project design, community empowerment, education, and awareness campaigns.
- Fund training programs that enhance the capabilities of local communities in sustainable agriculture and natural resource conservation.
- Support research initiatives that focus on climate-resilient crops and innovative agricultural practices. Encourage projects that promote biodiversity and crop resilience.
- Encourage collaboration among different stakeholders by providing grants or resources that facilitate joint efforts between the government, NGOs, and local communities.
- Emphasize the importance of long-term sustainability in all funded projects. Ensure that projects have built-in flexibility to adapt to changing conditions and promote a holistic approach to resilience and conservation.

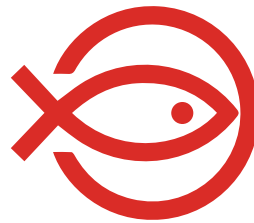
- By tailoring these recommendations to the specific roles and capacities of each stakeholder group, it is possible to create a more effective and collaborative approach to addressing climate change and sustainable development in each zone.

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