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Distribution and germination of wild and cultivated *Ensete ventricosum* in Ethiopia

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Abstract

Enset (Ensete ventricosum (Welw.) Cheesman) is a traditional staple crop that is economically significant for over 20 million people in the central, southern and southwestern regions of Ethiopia. This study provided updated information on where wild and cultivated enset grow and how well their seeds can germinate. Purposively, six study sites were selected based on factors that affect the socioeconomic significance, diversity, and distribution of enset. Data gathered included socioeconomic values, types of landraces, seeds, and conservation status for each site. Different methods were used for testing enset seed germination in the lab. The analysis of data was done using Microsoft Excel and SPSS, and the relationship between diversity, distribution, and environmental factors was examined using correlation and linear regression. The general distribution pattern of wild enset was most frequent in Sheka zone compared to other study sites. The number of individuals in each sample population was also seen to increase with increasing altitudinal rang. The germination date varied from 7 to 30 days. Out of 170 enset seeds tested for germination, eighteen of them efficiently germinated and the suckers have been numbered, tagged and transplanted to soil. There were several factors that threatened the sustainability of enset, such as changing environmental temperatures, societal perceptions, and increased population pressure attributing to soil degradation. Since genetic diversity remains to be vital for current and future needs of humankind, there should be a concerted effort towards the safeguarding of wild enset in the country.

Keywords: *cultivated, distribution***,** *enset*, *germination*, *wild*

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1. Introduction

An essential component of nearly all life on Earth, plants are priceless. Humans can use them for a variety of purposes, including food, medicine, clothing, shelter, and utensils, as well as for religious and ritual purposes (Balick & Cox, 2020). Plants also maintain soil fertility, create soils, and protect water catchment areas by recycling essential nutrients for ecosystems (Zhao & Riaz, 2024). Furthermore, through evaporative transpiration, they aid in controlling rainfall and preserve the climate and environmental balance (Katul *et al*., 2012). When there is a food shortage or surplus production, people use wild plants as food (Bharucha & Pretty, 2010). To improve the use and preservation of the diversity of wild plants, knowledge about them is essential. People in rural areas of Ethiopia, particularly elders, have a deep and time-tested indigenous knowledge concerning the availability, management and use of wild plants. Enset is one of the plants with many uses (Andarge *et al*., 2015).

In the review of the ensete history, taxonomy, and nomenclature, Bruce (1790, as cited in Demissew & Friis, 2018) originally described enset, also known as ensete, false banana, Ethiopian banana, or Abyssinian banana, during his travels in Ethiopia. In the 13th edition of Systema Naturae, Gmelin (1791) categorized it under the genus Musa. Noting that the species was significantly distinct from Musa, Horaninow (1862) renamed it *Ensete edule*. With roughly 50 species indigenous to Africa, Asia, and Australia, Enset (*Ensete ventricosum* [Welw] Cheesman) is a perennial herbaceous crop that is monocarpic and monocotyledonous (Tsegaye, 2002). It is a member of the family Musaceae, order Zingiberales, and order type Basal angiosperms-monocots. Growing mainly between 1500 - 3100 meters above sea level; and is one of the most significant crop plants in Ethiopia. For optimum growth, the crop requires an average rainfall of 1100 - 1500 mm per year and average monthly temperature of 16 - 20 °C (Minaleshewa, 2007). Enset feeds roughly 20 million people and plays a significant role in the nation's food security (Yemataw *et al*., 2016). It is well integrated into the culture of the people and is a typical multipurpose crop, of which every part is thoroughly utilized, not only for food but also for several cultural applications; including medicinal and ritual values (Olango, *et al*., 2014).

Two wild enset species are found in Asia and four wild species in sub-Saharan Africa and Madagascar (Yemataw *et al*., 2018) and out of which, *Ensete ventricosum* (Welw.) Cheesman is the only known wild species in Ethiopia. The country is both the center of origin and diversity for enset and there are many clones and farmers’ varieties of the crop (Gemechu *et al*., 2021). Since enset cultivation has mostly been limited to Ethiopia, identifying and utilizing Ethiopian enset genetic resources is necessary to improve enset genetics through breeding in order to address production constraints (Dilebo, 2025). Birmeta *et al.* (2004) demonstrated that wild enset populations show higher genetic variability with potentially useful traits for cultivated/domesticated enset, making them prime candidates for an enset breeding program.

Field gene banks, or field collections, are currently the conservation method used for enset conservation. The Southern Agricultural Research Institute and the Ethiopian Biodiversity Institute (EBI) both maintain ex-situ collections at Areka and Angacha, respectively. Conservation in the field presents drawbacks (since they are exposed to environmental and human made disasters and diseases) which limits its effectiveness and questions the safety of the resources (Gemeda *et al*., 2023). Therefore, enset seed conservation may offer a way to address this issue. Reliable seed germination techniques are necessary for breeding by crossing and selection as well as for the long-term conservation of enset seeds. Demand exists for new and enhanced enset cultivars that are more resilient to environmental stresses like frost and drought as well as diseases. Genetic variation, which can be produced through seed propagation, is necessary for selection to occur.

Wild populations of *Ensete ventricosum* are primary sources of genetic diversity with potential for improvement of its cultivated counterpart, Abyssinian banana (Vincent *et al.*, 2013), as well as sources of genetic diversity for improvement of the ornamental cultivars. Wild enset germplasm was used for breeding enset genotypes that are vigorous, stress tolerant, high yielding and highly marketable (Yemataw *et al*., 2018). There were different myths and cultural beliefs in relation with enset as a society's narratives, expresses and reflects the origins of natural phenomenon, historical events, social institutions and structures, religious as well as man himself. Thus, it has its own role to play on the perceptive of the society on the wild as well as the cultivated enset. Several studies were undertaken in Ethiopia regarding the cultivated *enset* distribution, landraces diversity, cultivation, processing practices and uses in different localities. However, the information on the wild enset, which is believed to be the origin of the cultivated, is very restricted. Even with cultivated species, farmers' traditional method of burying the field-grown plant in the soil after removing the apical tip, which causes multiple suckers to develop, is time-consuming and labor-intensive and may result in diseased planting materials and a poor propagation rate (Tripathi *et al*., 2017). The ideal clonal propagation system is one that yields pathogen-free planting material. Several research gaps need to be addressed in order to better conserve this diversity in the long run.

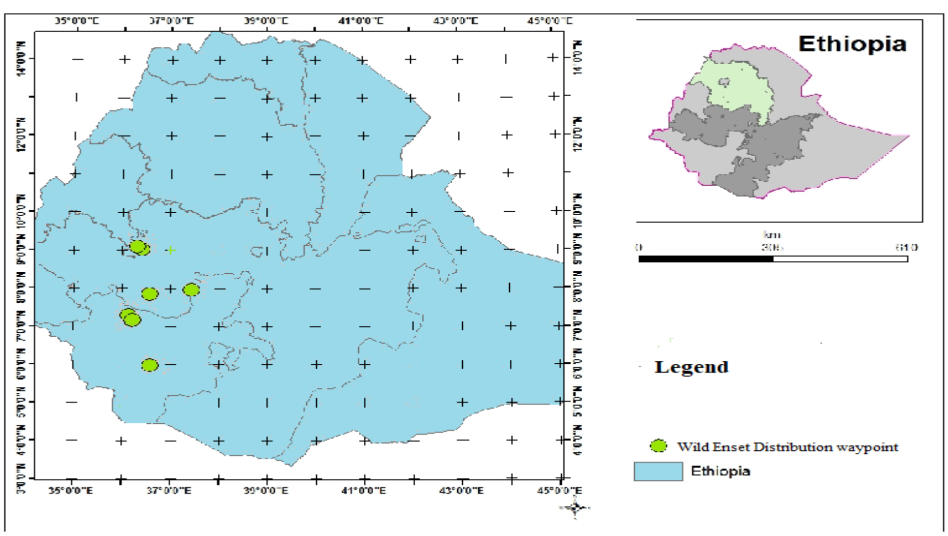
In addition to offering a great chance for diversification, traditional crops also inspire local initiative to support the continuous efforts to slow down climate change. Most of them were ignored by scientific studies, despite their importance and value. This also holds true for enset, which has not been extensively studied and has gotten relatively little scientific attention; in fact, wild enset is the most neglected crop. It is essential to conserve genetic resources and use agro-biodiversity to enhance farming systems (Nyadanu *et al.*, 2016). Enset farming systems are thought to be reasonably resistant to drought, heavy rain, flooding, and frost damage, and they support the long-term sustainability of food production through a number of mechanisms (Zerfu *et al.*, 2018). Enset is a cornerstone of many households' food security in Ethiopia, because it can be harvested at any stage of growth and at any time of a year (Sahle *et al.*, 2018). As a result, this study was intended to attempt adequate information regarding the distribution across different agro-ecological zones and natural vegetation types, morphological characterization, societal perspectives and conservation status of wild enset as well as seed germination test of both wild and cultivated enset in Ethiopia. Thus, this study's main goal was to present data on the distribution of enset landraces as well as a comparison of the seed germination tests of wild and cultivated enset.

2. Material and Methods

2.1. Study Area

Figure 1

The GPS coordinate points of wild enset in study sites



The study was conducted in different districts of the Central, South and Southwestern parts of Ethiopia. The study sites lay in different elevation ranging from 1600m to 1972m. These sites include some districts and kebeles of South Ari, Guragie, Yeme special district, Gera, Kafa, and Sheka areas (figure 1).

2.2. Data Collection

Conservation, research, sustainable use, access and benefit sharing of the country's biodiversity are the responsibilities of the Ethiopian Biodiversity Institute. Informed consent for the collection of data on wild and cultivated enset was obtained by presenting the local community with a letter from a responsible institute explaining the purpose of the data collection. In light of this, the study sites were selected purposively on the basis of the two major variables that were believed to affect diversity, distribution and socioeconomic significance of enset (both cultivated and wild). The variables are agro-climatic zones *(Dega, Woinadega and Kola)* and elevation. The gathering of information on seed and socioeconomic data of e*nset* from wild and cultivated was assisted by the experts from each locality of all study areas. Group discussions were held with the officials and the farmers of the localities on both cultivated and wild enset use and conservation status.

Figure 2

Seeds of cultivated enset plants collected from study sites

Data collection for cultivated enset. The socioeconomic values, landrace types, matured seeds, and conservation status of enset plants were all thoroughly examined and documented.

Six enset seed accessions were thus gathered from the six sites that were investigated. Guragie, South Ari, Gera, Yem special district, Kafa and Sheka areas of Ethiopia are the sites of one accession each. After recording all of the passport information for each site's collections, the seeds were dried, cleaned of pulp, placed in tiny cheesecloth bags, and transported to Ethiopian Biodiversity Institute (figure 2).

Semi-structured interview. With the assistance of agricultural officers from the kebeles and districts, five key informants were purposefully selected from each kebele to obtain comprehensive data on the diversity, distribution, socioeconomic values, and current conservation status of both wild and cultivated enset. Prior to the semi-structured interviews, the owners of enset home gardens were visited to observe the general plant conditions as well as the surrounding riverbanks and valleys for wild enset. Following the translation of the semi-structured interview into the relevant study area languages by the field guides, discussions were held in accordance with the objectives. In each site, the enset landrace composition, conservation status, future threats, and overall use (including food values and socio-economic significance) of cultivated and wild enset crops were recorded. Furthermore, the informants were asked to list the landrace varieties they cultivate on their farms, as well as preparation techniques, management practices, and the limitations that lower enset crop productivity. Subsequently, pictures of enset gardens featuring their farmer varieties were taken (figure 3).

Figure 3

Processing enset products in the garden

Group discussion. One group of five key informants or elder farmers was established in each site, and they discussed every aspect of enset, both cultivated and wild. This group discussion was used to understand the perception of farmers on overall use and distribution patterns of wild enset as well as the socioeconomic and cultural importance of enset crop in each Kebele. In addition, the researcher forwarded some important questions to key informants regarding to numbers and kinds of enset landraces and the socioeconomic, cultural importance and morphological similarity and differences within enset crop (both wild & cultivated) in the study areas. Farmers were also asked to rank the use of enset in general in 1-5 levels; excellent (5) very important (4), important (3), less important (2), not known (1) the crop for their livelihood and agricultural system. Furthermore, in order to demonstrate the existing morphological variations between wild and cultivated species and as well as the variation within the wild with agro-ecological and altitudinal difference, was discussed and taken into account.

Data collection for wild enset seed. Every study sample site was thoroughly explored for mature wild enset seeds. In the process, the matured enset plants in the valleys and riverbanks of each study site were inspected using field guides who were either key informants or older farmers who are more familiar with their surroundings. While gathering the seeds, GPS coordinates and images of wild enset were captured. All passport information was documented for each site collection, and the seeds and fully ripe fruits were taken to the EBI laboratory for germination testing (figure 4).

Figure 4

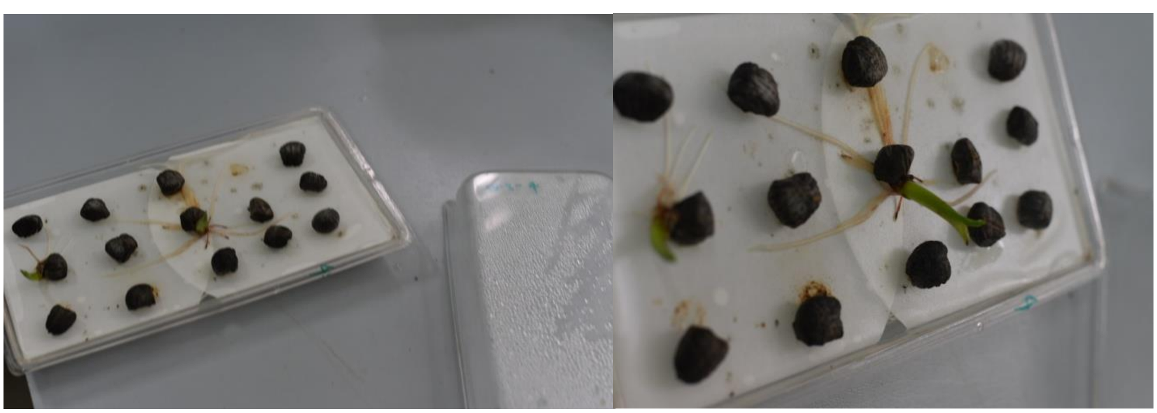
Wild enset seed collection

Methods in the laboratory. The capacity of seeds to germinate in vivo was examined in various settings. To get rid of all the fruit remnants, whole seeds were taken out of ripened fruit pulp and thoroughly cleaned in running tap water and then distilled water. For the experiment, the seeds that were still immersed in water were utilized. Seeds that were broken or damaged were eliminated through visual inspection.

The first round of germination testing on cultivated enset seeds involved a variety of treatments, including scarification and soaking the seeds in water for 48 hours at 40°C in a water bath (the seeds were kept in nylon mesh), followed by germination on filter paper at room temperature. Scarification and soaking seeds in water for 96 hours under 40^{o}C in an incubator with subsequent germination on filter paper at room temperature; soaking non scarified seeds in water for 96 hours under 40^{o}C in an incubator with subsequent germination on filter paper at room temperature; and immersing seeds in concentrated sulphuric acid for 5 minutes, rinsed with distilled water and germinating on filter paper at room temperature. A control group without scarification, temperature or acid treatment was also included with the set. Seeds were checked every three days for any sign of germination. A seed was considered to be germinated if its radicle emerged one millimeter or longer. For wild enset seeds, two treatments: Scarification and incubation at 40 ^{o}c for 7 days and incubation at 40 ^{o}c without scarification were used (figure 5).

Figure 5

Enset seed germination in the laboratory



2.3. Data Analysis

The data was cross-checked with all accessions in the first variable and with a second variable that grouped the data by type (domesticated versus wild). Descriptive statistics were used to analyze the gathered data using Microsoft Excel and SPSS (Statistical Package for Social Sciences) (SPSS Inc., 2007). Furthermore, the Pearson correlation coefficient and linear regression were used to correlate diversity and distribution with various altitudinal ranges. The value of Pearson correlation coefficient (r) lies between -1 and +1. A value of the correlation coefficient close to +1 indicates a strong positive linear relationship (i.e. one variable increases with other). A value close to -1 a strong negative linear relationship (i.e. one variable decreases as the other increases). A value close to 0 indicates no linear relationship; but there could be a non-linear relationship between the variables (Zar, 2010). The vigor seedlings germinated in the laboratory were transplanted to soil in the garden and left to grow freely.

3. Results

3.1. Distribution of Enset

The result determined the distribution, use, and perceptions of the community of both cultivated and wild enset in each study area. The distribution of cultivated enset was reasonably consistent across all sites. However, relatively, most frequently, including in the high forest regions of the Sheka site, wild enset distribution was recognized. Its main habitats at all other locations are inaccessible places like riverbanks, swaps gully, and areas near streams (Figure 6).

Figure 6

Photos showing the cultivated and wild enset

3.2. The Importance of Enset in the Study Areas

The majority of the study sites include homesteads that are visually appealing due to their enset-based aesthetics and a lovely landscape with verdant foliage, according to field research on cultivated enset. No significant differences were found in the enset production, morphology, and use values across the various study sites, according to a thorough evaluation and comparison (figure 7).

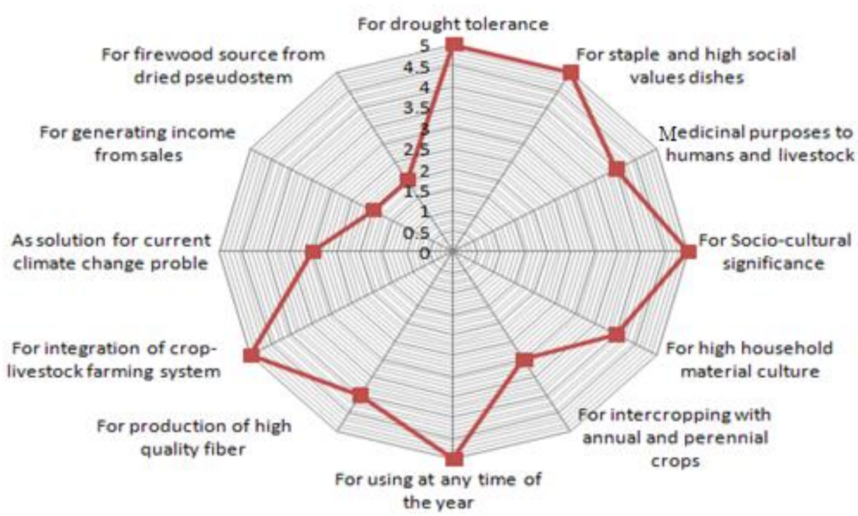
Figure 7

Morphological difference of enset

Most of the farmers interviewed about the importance of enset, in different localities, indicated that enset to be a multipurpose crop used whole a year-round. Thus, the selection of enset landraces also fit different needs and constraints of their family. The selection criteria for household use include the quality and quantity of food products, maturity period, disease and drought tolerance, fiber quality, medicinal value and quality of corm were among others. The general use and value of the crop in livelihood and agricultural system was laid within the ranks from highest (level 5), to less important (level 2) (figure 8).

Figure 8

The rank of different use value of enset in study areas



However, the informants in all the survey sites stated that there was a decreasing cultural use of enset, production and a reduction in enset landrace diversity. Most of them believed that the reason for the reduction was the preference of different food staffs, the less interest of younger people for its production, laborious preparation, pests and diseases. Nowadays, climate change was also mentioned to be a major cause for the declining production and productivity of enset in the areas.

3.3. Morphological Traits Used to Identify the Wild and Cultivated Enset Landraces

Based on observation made during the field work, *Ensete ventricosum* was one of the main crops cultivated at the backyard of the home in most of the study sites. There were different characteristics that farmers used to identify each variety in the study areas. Mostly the identifying characters were color of pseudo-stem, midrib strength, leaf and petiole color, maturity time, disease resistance, and *Kocho* yield among the cultivated enset verities. Based on these identification characteristics the informants from different study site mentioned the verities they cultivate and all the landrace types they have. The number of landraces grown is closely related to the importance of the landrace/ variety for the specific ethnic group. Similar landrace types were seen having different vernacular names depending on the linguistic groups. Their naming was associated with the traditional uses; knowledge and habits of the community in a specific study site and the selection could also be based on the adaptation to specific sets of field conditions as well as particular uses within the food system. The community in the study sites had the knowledge and practice of identifying the wild and cultivated enset by using different morphological traits (table 1).

Table1

Morphological traits used to identify the wild and cultivated enset

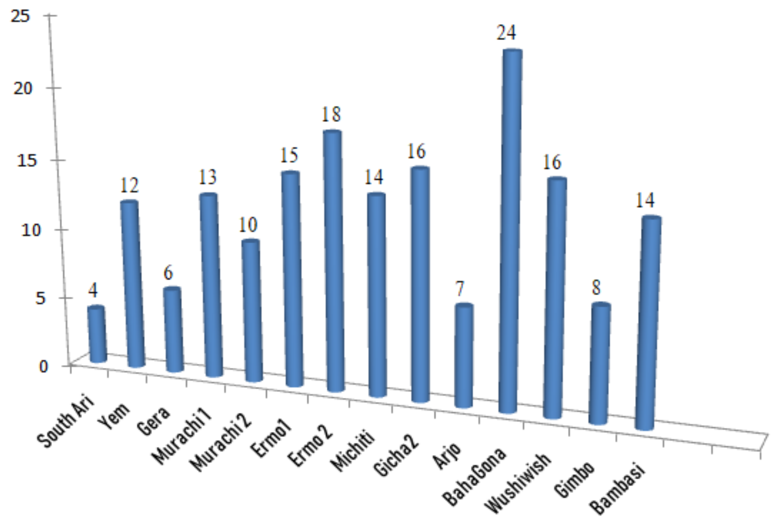
Traits	Cultivated	Wild
Pseudo-stem color	Green, black, white, red, purple	Green
Pseudo-stem strength	Tough	Weak
Leaf color	Green, red	Green
Midrib color	Green, red , purple	Green
Midrib strength	Tough	Weak and easily breakable
Reproduction	By corm	By seed

3.4. Diversity of the Wild Enset in Study Sites

There was some variation in diversity from place to place depending on the altitudinal discrepancy and agro-ecology of the study sites. Generally, there exists the increasing abundance of the wild enset with increasing altitudinal range. However, physically very huge and thick individuals were recorded in lower altitude than in the higher areas. The reason for the decreasing number in lower altitude could be its obliteration for animal feed during the dry condition of the environment (figure 9).

Figure 9

The number of individuals in a population of wild enset in each site



3.5. Relationship Between Diversity of Wild Enset and Altitude in Each Site

In this study, the altitude of the study areas correlated extensively with the number of wild enset in a population (0.91). The result of this study indicated that as the altitudes increase, the number of individuals in a population also increases. That is, the independent variable showed the most relationship with the dependent variable (above 0.3 preferably) as shows in table 2.

There was a direct correlation between altitude and the variation in wild enset abundance across sites. This implies that the number of wild enset in a population rises with altitude. There existed significance ($p < 0.05$) and strong positive linear relationship (r = 0.91) between the abundance of wild enset in a population and altitude with ($R^2 = 0.827$) as shown in figure 10.

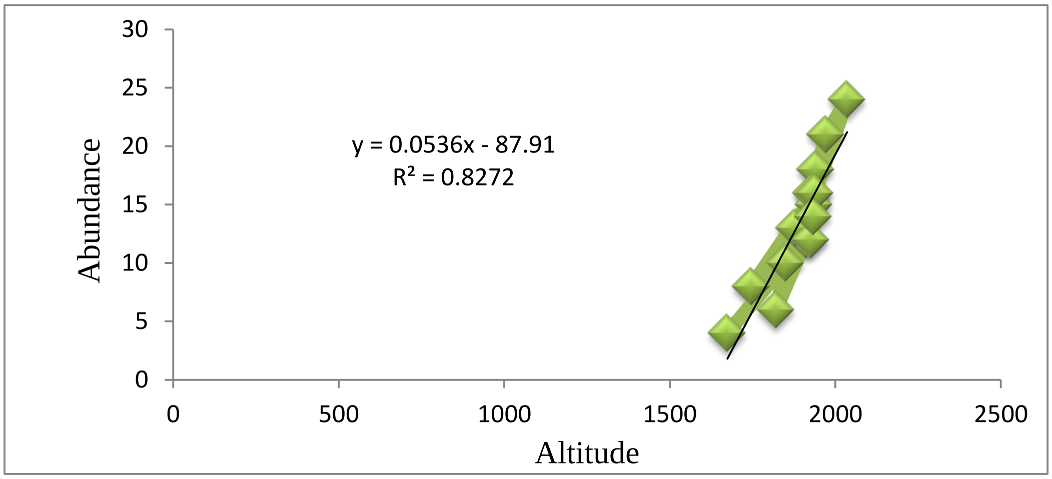
Table 2

Correlations showing number of wild enset individuals and altitude per each site

		Number of wild enset in a population	Altitude of the study areas
Pearson Correlation	Number of wild enset in a population	1.000	.910
	Altitude of the study areas	.910	1.000
Sig. (1-tailed)	Number of wild enset in a population	.	.000
	Altitude of the study areas	.000	.

Figure 10

Correlation between altitude and abundance of wild enset in a population of each site



In table 3, the R^2 value shows the extent to which the independent variables (each site's altitude) can account for the dependent variable (the number of wild enset individuals in a population). In the study, the value of R^2 for linear function was 0.827, the dependent variable explained best by the independent variable). The R^2 = value (0.827), this means that the current model which includes altitude of each site, $R^2 = 0.827$ or 82.7% of the dependent variable can be explained by the independent variable.

Table 3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.910a	.827	.813	2.3863	.827	57.453	1	12	.000

a. Predictors: (Constant), Altitude of the study areas

b. Dependent Variable: Number of Wild Enset in a population

3.6. Perception of the Community on Wild Enset

According to their myths, beliefs, and the religious backgrounds of a particular community, the informants answered the questions intended to determine their perspectives on the wild enset. In the majority of the study areas, there was a myth regarding the origin of enset: "*The enset plant was created as wild and cultivated types during the creation of the world*." The wild was created along the forest out of human reach in inaccessible places like river valleys, gorges, and deep forests, while the cultivated one has been maintained by humans. It is, therefore, 'the wild enset is referred to as the devil's enset because nature/the devil/has maintained and controlled it'. Owing to these beliefs, some of the people in the study areas mentioned that the wild enset was used as "adbar" in the past, meaning that sacrifices and gifts were offered close to it. The purpose of the sacrifices was to boost the yield and efficiency of cattle and cultivated enset. In general, the wild enset was dubbed "Enset of the devil" at every study location. This belief led to the wild enset (known locally as "Eppo") in Kafa, for example, being disregarded for any crop use. On the other hand, children in few of the study sites consume the mature fruits, while some parts were used for cattle and human medicine.

3.7. Seed Germination

Six out of the 120 cultivated enset seeds tested were germinated within seven to fourteen days. Nevertheless, out of the fifty wild enset seeds, twelve germinated within the 7 to 30 days range. Compared to the non-scarified group, more seeds from the scarified group germinated earlier. As a result, reflected in figure 11, out of 170 enset seeds tested for germination, eighteen of them efficiently germinated and the suckers have been numbered, tagged and transplanted to soil.

Figure 11

Seed germination in the laboratory and transplantation to soil in the garden

However, since this is only a preliminary assessment and the number of seeds used in the test may not be abundant; more research is required to ensure a statistically sound sample size and a sufficient number of seeds.

3.8. Conservation Status of Enset

According to reports, a number of factors, such as soil degradation, changing climatic conditions, and increased population pressure linked to more intensive cultivation of other cash crops, pose a threat to the sustainability of enset. Specially, cultivated enset was at risk from a number of bacterial, viral, and fungal diseases. The current devastation and reduction of natural forests, the reason for the loss of wild enset, and societal perception were identified as the main influencing factors. It is destroyed because it is thought to be the "enset of the devil". Even if someone uses any part of the wild enset for anything, it is still viewed as the poorest and most disregarded part of society's culture. One of the primary causes of the negligent destruction of wild enset has been this understanding and perspective. The respondents further stated that no institutions or stakeholders were informing them of its potential use, unlike cereal and other cultivated crops. The devastation of wild enset may also be exacerbated by this ignorance.

4. Discussion

4.1. Crop Wild Relatives

Since crop wild relatives might serve as a source of genetic variation, they have been recognized as an important group for agriculture and environmental sustainability. They possess several desirable adaptive traits, such as drought and other abiotic stress tolerance and pest and disease resistance that can be bred into crops to meet market demands and the effects of global climate change (Heywood & Dulloo, 2006). According to Rubenstein *et al*. (2005), agricultural production is becoming more and more dependent on temporal diversity, changing varieties more frequently to maintain resistance to pests and diseases. Furthermore, this demand is probably going to rise as a result of the shifting conditions and surroundings brought about by the different aspects of global change (demographic, disturbance regimes, climatic). The study's findings also showed that all enset-based home gardens as well as the natural habitats are diverse and unaffected by the current climate, witnessing its adaptive capacity. Naturally occurring hybridization has been reported between wild relatives and economically important crops such as wheat (*Triticum aestivum* L.), sorghum (*Sorghum bicolor* L.), rice

(*Oryza sativa* L.), sunflower (*Helianthus annuus* L.), canola (*Brassica napus* L.), and squash (*Cucurbita pepo* L.) (Jenczewski *et al*., 2003). The majority of wild plant species that resembled their cultivated relatives were found in crop habitats and were frequently mixed with other cultivated crops, like sorghum (Tesfaye *et al*., 2008).

4.2. The Origin and Geographic Distribution of Enset

Eset is a plant that is widely distributed throughout tropical Africa, extending from Ethiopia through Kenya, Uganda, Mozambique, South Africa, and the Democratic Republic of the Congo in the west. However, only in Ethiopia the crop enset has been domesticated (Kamar *et al.*, 2000). It has been having a far-reaching impact on the lives of the Southern highland dwellers in Ethiopia for generations. The adaptation of the plant for varying environmental conditions coupled with its diverse functions in the farming system made attractive to establish enset plant husbandry. Although enset is primarily grown at elevations between 1600 and 3100 meters above sea level, it is occasionally found at lower elevations as well. In a number of study locations, the current study also recorded wild enset at elevations lower than 1500 meters. The ideal growing range for it, however, is between 1800 and 2450 meters. The climate at higher elevations hinders the crop's growth, especially from frost and cold temperatures, and it may take twice as long to mature as it would at lower elevations. For enset to reach its full potential, it requires an average of 1100 to 1500 mm of rainfall annually. In established enset plants, drought and frost can be tolerated, but early growth requires a fairly high average rainfall and well-distributed rainfall. In Ethiopia, enset-based farming systems provide greater food security than cereal-based ones. Growth is suitable from 5 to 25°C, but monthly mean temperatures of 16 to 20°C are ideal and it thrives well-drained, fertile soils.

4.3. Use Diversity of Enset

Ensete ventricosum leaf sheaths yield high-quality fiber for use in baskets, suitcases, sacks, mats, rope, and twine. The dried leaf sheaths are utilized in the construction of houses, fences, mattresses, mats, and packing and wrapping materials. Shade is provided in nurseries by fresh leaves. Livestock are fed either the entire plant or just portions of it. Certain landraces of *Ensete ventricosum* are thought to have a variety of therapeutic uses. According to reports on enset use in the study areas, enset offers many advantages to society's standard of living, including sustainability in the preservation of biodiversity, in addition to its uses as food, fodder, building material, medicine, and a source of raw materials for material culture. In furtherance of covering the ground and protecting the soil from direct rain damage, topsoil detachment, and transportation, the properties of the leaf and its pseudo-stem enable it to retain water in the pockets of its loose leaf sheath (pseudo-stem). Negash and Niehof (2004) also discussed the importance of enset for livelihood security and its role in biodiversity conservation.

4.4. Vegetative Propagation of Enset

Farmers in the study areas use enset corm, a tissue found in the plant's underground center, for propagation. The corm is then split into 2-4 equal parts and the apical bud is removed to break apical dominance and induce the production of several buds to appear from the mother corm within three months. Geda (2009) also stated that new suckers will give the impression two to three months later from the same propagation method. Notwithstanding the plant is typically propagated by suckers from an immature corm, some regions of Ethiopia occasionally use seed propagation to boost genetic diversity.

4.5. Enset Seed Germination

Despite the small number of seeds that germinated in the current study, which may have been caused by a variety of environmental factors, seed propagation can nevertheless be crucial in enset breeding for variability and germplasm conservation. The findings also support the claim that the germination of whole wild enset seeds varied among harvest lots based on the fruit's maturity at harvest, the seed's post-harvest age, and the storage method (Kibatu *et al*., 2021). The seeds of intact ensets germinated more readily when exposed to daily alternating temperatures, scarified around the micropylar opening, and treated with hot water (40 ºC) for 24 to 48 hours (Kudama *et al*., 2022). Scarification, soaking beforehand, or temperature treatment up to 40°C are necessary to enhance germination process. According to Diro *et al*. (2008), seed propagation can be essential in enset breeding for the sake of variability and germplasm conservation, but it is not a common practice in enset cultivation.

4.6. Conservation Status of Wild Enset

Human interference persists through the raising of domestic animals and the removal of trees and shrubs, despite the fact that areas where wild enset grows are frequently unsuitable for human settlements. The outcome indicates that diversity must be maintained in an environment that naturally preserves variation. It should involve the preservation of genetic resources while taking into consideration the natural ecosystem and allowing evolution to continue. According to Ramya *et al*. (2014), by keeping germplasm resources in the dynamic ecosystems of their original habitat or natural environment, in situ conservation aims to maintain the genetic integrity of these resources. Even though domesticated enset plants are in good conservation status in the study sites, in situ conservation involves continuing to grow crops, especially in a farming system where those crops have evolved. A security measure and a source of desirable genes for a number of traits in crop improvement programs are provided by the diversity of crops kept in situ. Rao (2009) states that on-farm conservation, a subset of in situ conservation, is conservation practiced by farmers who keep growing and managing plant populations in the agro-ecosystems where the crops have evolved. Consequently, a greater conservation effort should be made for the enset plant wild component as well in the areas.

5. Conclusion

The situation of food security in Ethiopia is being impacted by the frequent crop failures brought on by droughts and irregular rain patterns. Utilizing native crops, which are ecologically suited and might be beneficial, particularly with regard to sustainability and food security is still an option. Crop diversity is essential because it reduces risks by providing a manageable degree of flexibility to satisfy different socioeconomic demands and adapt to shifting agro-ecological and climatic conditions. Despite being underappreciated and the subject of little research, enset plays a significant role in the Ethiopian economy. Its broad distribution across a variety of agro-ecological conditions was confirmed by the current study, and its large altitudinal variation may suggest that it is the crop's top contender to address the nation's poorer farmers' socioeconomic and food security issues in the face of climate change. The study documented the local communities' perceptions of wild and cultivated enset, as well as the indigenous knowledge system and sociocultural use of the plant. According to the germination test results, the wild enset suckers grew more vigorously than the cultivated ones. There should be a concentrated effort to protect wild enset in the country since genetic diversity is still essential for meeting humankind's present and future needs. Deeply rooted investigation with a sufficient number of seeds and a statistically sound sample size is required given that this is an initial assessment.

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