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MINISTRY OF AGRICULTURE

NATIONAL ENSET DEVELOPMENT FLAGSHIP PROGRAM (NEtDFP)

2024 - 2030

December 2024
Addis Ababa, Ethiopia

NATIONAL ENSET DEVELOPMENT FLAGSHIP PROGRAM (NEtDFP)

2024 - 2030

*PROMOTING ENSET AS A STRATEGIC CROP FOR
RESILIENCE BUILDING*





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The Federal Democratic Republic of Ethiopia
Ministry of Agriculture (MoA)
P.O. Box 62347
Addis Ababa, Ethiopia
Tel: 251-11-646 07 46; +251-11-646 19 41
www.moa.gov.et

The Federal Democratic Republic of Ethiopia, Ministry of Agriculture (MoA) acknowledges the following contributing institutions:





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**Message from HE Dr. Girma Amente
Minister, Ministry of Agriculture**

Enset, cultivated in Ethiopia for over 10,000 years, is a vital indigenous crop known as the “Plant Against Hunger.” Its remarkable climate resilience makes it essential for food security, biodiversity, and sustainable livelihoods for millions. Despite its significance, Enset remains underutilized due to traditional labor-intensive cultivation and inefficient processing methods.

The National Enset Development Flagship Program (NEtDFP) aims to transform Enset into a commercially viable commodity, creating jobs and strengthening local economies. By introducing advanced processing technologies and supporting micro, small, and medium enterprises (MSMEs), the program will reduce postharvest losses, improve product quality, and foster entrepreneurship. It will empower women (key Enset processors) by reducing their workload and expanding economic opportunities, promoting gender equality and societal equity.

This transformative initiative will enhance productivity through improved farming techniques and quality inputs, establish robust value chains, invest in research and innovation, and drive inclusive community engagement. Public-private partnerships and collaboration with universities, research institutions, and engineering firms will be pivotal in scaling up technology and market access.

I call upon all stakeholders, partners, and donors to join our collective effort to elevate Enset as a symbol of food security, innovation, and resilience for Ethiopia and beyond.

“Join us in championing Enset for a sustainable future!”



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Message from HE Dr. Meles Mekonen State Minister, Agriculture and Horticulture Development Sector

Agriculture is the backbone of Ethiopia's economy, serving as the cornerstone of our food and nutrition security, job creation, industrial growth, and foreign currency generation. Over the years, with the support of favorable policies and concerted national efforts, significant progress has been made in the production of both grain and horticultural crops. While grains continue to dominate, horticultural crops such as Enset are also increasingly recognized for their critical role in diversifying and strengthening Ethiopia's food systems.

Enset, affectionately known as the "Tree Against Hunger," is a unique crop that sustains the livelihoods of more than 20 million Ethiopians, particularly in the southern and southwestern highlands. Its exceptional resilience to drought and adaptability to Ethiopia's diverse agroecological zones make it a key component of climate-smart agriculture. A single mature Enset plant can yield up to 60 kilograms of food (kocho), sufficient to feed a family of five for several days.

Despite its immense significance, Enset's potential remains largely untapped. Its production and value chains have seen limited investment, and its cultivation is predominantly reliant on traditional methods, which altogether constrain the productivity and efficiency of the crop. Yet, Enset holds vast untapped opportunities not only as a source of food but also as livestock feed and raw material for various products, making it a truly multifaceted crop. In fact, it is a plant of which nothing is thrown away!

Cognizant of these challenges and opportunities, the National Enset Development Flagship Program (NEtDFP) for 2024–2030 was thoughtfully prepared through



the engagement of several stakeholders from research, development, academia and private sector to serve as bold step towards transforming Enset farming and its value chain. The program focuses on four strategic components: 1) enhancing production and productivity, 2) improving processing and value addition, 3) promoting marketing and utilization of Enset products, and 4) ensuring transparent program management. Through these pillars, we aim to commercialize Enset cultivation, strengthen its value chain, and establish it as a robust and commercially viable venture. To this effect three important prongs of development are sought: expansion, intensification and commercialization of Enset production around the existing enset growing regions and beyond.

As a state minister, I am confident that this flagship program will serve as a catalyst for unlocking the full potential of Enset, and turn it into a cornerstone of sustainable agriculture in Ethiopia. Realization of this vision, however, requires the collective efforts of farmers, researchers, development partners, private sector actors, and the public at large. Global and national growing interests for the crop depict that together, we can transform Enset into a powerful tool for food security, income generation, and climate resilience for Ethiopia and beyond.

Finally, would like to call upon all stakeholders to join hands in this important endeavor. Let us work collaboratively to make the National Enset Development Flagship Program a success and elevate Enset's role in driving Ethiopia's sustainable development and national prosperity.

“A National Commitment to Unlocking the Potential of Enset”



ACKNOWLEDGEMENTS

The Federal Democratic Republic of Ethiopia, Ministry of Agriculture (MoA) acknowledges the invaluable contributions of key stakeholders in the agricultural sector in the development of the National Enset Development Flagship Program (NEtDFP). These stakeholders include the Ethiopian Institute of Agricultural Research (EIAR), Feed the Future Ethiopia Transforming Agriculture (USAID), National Enset Development Flagship Technical Committee (NEtDFTC); comprising experts from the Ministry of Agriculture (MoA); Arba Minch University (AMU) and Sidama Agricultural Research Institute (SARI).

We are indebted to the EIAR for providing both technical and financial support during the preparation of the Flagship document. Moreover, Sidama Agricultural Research Institute (SARI) and Arba Minch University (AMU) have made immense contributions to the development of the NEtDFP for which we owe them a huge round of appreciation from the bottom of our hearts.

Our special thanks go to H.E. Mr. Osman Surur, Head, Bureau of Agriculture Central Region of Ethiopia, for his active engagement throughout every stage of the NEtDFP document preparation.

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Finally, we sincerely thank the Feed the Future Ethiopia Transforming Agriculture (USAID) and the SNV Horti-Life Project for their generous financial support in covering the costs associated with the validation workshop and the publication of the NEtDFP document, respectively.



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EXECUTIVE SUMMARY

Enset belongs to the family Musaceae and its species are found in the wild form across most of the central, eastern, and southern Africa as well as Asia. However, its domestication and usage as a food and fiber crop are limited to Ethiopia. Notably, enset has been domesticated and grown in Ethiopia since the history of mankind for food and/or feed. More than 80% of the nation's production is centered in the south and southwest Ethiopia.

Enset which could currently feed far more people due to its starch-rich corm and pseudo stem, is a staple food for nearly 20 million people. Every part of the plant is utilizable either as a source of food, feed, medicine or construction materials. The leaves are used as a wrapping material for vegetables, butter and cottage cheese. Fibers are used for making bags, mat, rope and construction of houses and fences. To date, famers in the south and southwestern Ethiopia have reliably maintained coffee-enset-livestock farming for sustainable intensification. However, Enset, with its starch-rich corm and pseudo stem, has the potential to nourish even more people than it currently does.

Enset plant takes four to five years to mature, at which time a single root will yield about 60 kg of food. When combined with other nutritional components, often such as meat, dairy, and vegetables, approximately 40 to 60 enset plants occupying 250–375 m² can provide enough food for a family of 5 to 6 people throughout an entire year in the right conditions. The crop has an energy yield of 1,450 kcal m⁻²year⁻¹, which is significantly higher than that of other major Ethiopian staples including grains, potato, sweet potato, and banana. In light of this, in some areas enset has been recognized as “most efficient Ethiopian crop” in respect of energy yield per unit of space and time. Through an insightful



analysis of historical production data, it has been revealed that enset has become the second most cultivated crop species in Ethiopia. Over the past two decades, the acreage dedicated to enset production has surged by an impressive 46%, while its yield has skyrocketed twelvefold.

Enset farming systems support the long-term viability of food production. Enset tolerate drought rather well, high rain, flooding, and frost damage. It can be harvested at any time of the year, at any development stage for several years. Because of the extended time from planting to harvest, plantings need to be staggered over time, to ensure availability of crop for harvest in every season. With its remarkable human carrying capacity than other crops and cropping systems for the same agro-ecology and inputs, enset-based agriculture is regarded as one of the most sustainable indigenous farming systems in Ethiopia.

Albeit its widespread adaptation and significance, enset-based agriculture remains relatively unfamiliar beyond the limited cultivation zones in southern, southwestern, and central Ethiopia. Furthermore, the rich indigenous knowledge linked to enset cultivation faces threats- such as the substantial indigenous knowledge associated with this crop is in risk of being lost owing to acculturation, urbanization, climate change, developing pests, and the introduction of new crops, that jeopardize the future food security and livelihoods of millions of Ethiopians.

In addition, the sustainability of enset farming systems is currently endangered by the bacterial wilt disease, so the future of the crop is in question. In a pledge to ensure food security for 40 million Ethiopians and provide the surplus for local industry and the export market by 2031, the National Enset Development Flagship Program (NEtDFP) envisage tri-pronged approaches: expansion to new production areas, promoting commercial enset production and intensification of



the existing smallholder enset production.

Therefore, the general objective of the NEtDFP is to transform Ethiopian enset production, processing and marketing into a robust, competitive, commercially oriented, and sustainably productive enset industry/subsector which, with proper management and support, can sustainably supply quality food and non-food products for both domestic and export markets in fresh and processed forms. By 2031 the program will boost enset production (*Kocho, Bulla & Amicho*) from the current 12.3 million ton to 99 million ton and productivity of enset (*Kocho, Bulla & Amicho*) from 60kg per plant to 120kg; ensure food security of 40 million people through consumption of enset-based food products; reduce enset PHL from existing 34% down to 10%; create job opportunity for 5.11 million women and youth along enset VC; increase export earnings from enset from 3.6 million USD to 4.9 billion USD; conserve 62.1 and 576.15 million tons of soil as compared with land cultivated with cereals.

The overall outcome of the NEtDFP is nested under three different yet interlaced components: (i) Enhanced production and productivity; (ii) Improved processing and value addition; and (iii) Improved marketing and utilization of enset products. Seamlessly coordinated and transparent program management will ensure the realization of these outcomes within the stipulated project period. In a nutshell, these components, and the sub-components are interrelated and must be implemented in an integrated manner. For instance, in increasing productivity, quality planting material is important while quality seed will only have an impact if it is complemented with appropriate inputs and agronomic practices. Moreover, productivity can only be sustainable if enset production is profitable, which is possible if markets are working well. Women and youth empowerment will be a cross-cutting issue for all the components and sub-components of the program.



The total budget of the NEtDFP during the seven-year period (2024/25-2030/31) is estimated to be ETB 13.46 billion. Annually, 1.92 ETB billion will be required. The overall capital cost of implementing the NEtDF initiative will be funded through three different sources. The Ethiopian government and the community will each contribute 10% and 5% of the program's cost. The remainder will be contributed by Development Partners (DP), with 35% and 50% of overall program costs funded through grant aid and loans, respectively.

After the program is completed, the Federal and all Regional States targeted program will fund the NEtDFP's annual running and maintenance costs, which are anticipated to be ETB 240 million. The program is proven for its economic, social and environmental viability and sustainability.



I. BACKGROUND

I.1. Role of Enset in Ethiopia

With the ever-increasing global problem of food insecurity, climate-robust and resilient indigenous farming systems are getting increased attention. The enset (*Ensete ventricosum* (Welw.) Cheesman] farming system is one of the most sustainable indigenous farming systems in Ethiopia. Enset is an indigenous crop that co-existed for millennia with the farming community of the South, Southwest and Central parts of the country where it continues to contribute significantly to food security, sustainable farming system and job creation for millions of Ethiopians. The crop has deep cultural significance in Ethiopia, particularly among the communities in the southern and southwestern regions. It is often referred to as the "Tree of Life" due to its multi-purpose uses. It is intricately woven into the social fabric of these communities and is an essential part of their cultural traditions, ceremonies, and rituals. It plays a vital role in wedding ceremonies, funerals, and religious events. The knowledge and practices associated with enset cultivation, processing, and consumption are passed down through generations, enriching the cultural heritage of Ethiopia.

Enset is an environmentally friendly crop. It is known for its ability to resist drought, pests, and diseases, making it suitable for cultivation in marginal lands. It also helps prevent soil erosion due to its extensive root system and the practice of intercropping with other crops, which helps maintain soil fertility and structure. Additionally, enset plants act as carbon sinks, contributing to climate change mitigation through carbon sequestration. Therefore, it is with vivid rationale that is also one of the crops that leverage the Prime Minister's "Green Legacy" initiative through soil fertility improvement, soil and water conservation, rehabilitation of degraded lands and carbon trade (carbon



sequestration). It beautifies the Ethiopian landscape by its thick, dark green foliage (Brandt *et al.*, 1997).

It serves as a source of income and livelihood for many smallholder farmers. Enset cultivation provides opportunities for local markets, both for fresh consumption and for the production of various traditional food products such as *Kocho* (fermented enset pulp), *bulla* (flour made from dried and ground enset), and *Amicho* (starch extracted from the corm). These products are often sold locally and contribute to the local economy. Moreover, food and non-food products from enset are recently becoming competitive in foreign markets and getting the taste and wallets of consumers.

Currently, products from enset such as *Kocho*, *Bulla* and fiber are being exported and the crop is emerging as one of the potential commodities for earning foreign currencies for the country. In the 2020/21 growing season, enset contributed **12.3 million tons** of food in the forms of *Kocho*, *Bulla* and *Amicho* (CSA, 2021). According to the data obtained from Custom Commission (data unpublished), nearly **3.6 million USD** was obtained from the export of *Kocho* and *Bulla* in 2022. Moreover, it generated **income for 1.7 million households** (MoA, 2023).

It is a multipurpose crop that is used as animal feed, fiber, construction material and most importantly in traditional medicine. Ensuring food and nutrition security for the ever-growing population is one of the key national challenges and according to the report of Brandt *et al.* (1997), enset is a staple food for **20 million Ethiopians and estimated to feed 100 million** people in East Africa (Borrel *et al.*, 2020). Therefore, expanding enset has a significant potential to support the diversification and resilience of global Agri-systems that are under climate change.



1.2. The Issue

Regardless of its substantial importance, however, enset was neglected for centuries by government and non-government institutions concurrently the crop faces multiple challenges that should be addressed; Enset bacterial wilt disease, lack of resistant varieties, absence of efficient system for multiplication and distribution of disease-free planting materials, inadequate number of in-situ and ex-situ germplasm conservation centers, lack of improved enset processing and fermentation technologies that can reduce drudgery of women, high postharvest loss, low food safety, limited value addition, packaging and branding, less diversified utilization of enset food products, poor and inefficient marketing system, and limited political commitment are some of the major challenges. Moreover, the country has lost huge opportunities that could have been exploited from the crop in terms of income, import substitution, export earning, enset based eco-tourism and carbon trade.

Therefore, if we cannot transform the existing production system, with the existing problems, the country could lose genetic resources and production which would directly affect the lives of 40 million and indirectly more than 60 million of the population in Ethiopia via effect on the whole enset based agro-ecosystem.

In order to alleviate the problems and give due attention to the crop, the Ministry of Agriculture, the Ethiopian Agricultural Research Institute and Regional Bureaus of Agriculture took the initiative to organize a national consultative workshop and agreed to transform the enset production system in the country. As part of the initiative, the ex- South Nation, Nationalities and Peoples' Region BoA had declared planting 50 enset at fields of every farmer in a three years' time in a 15:20:15 fashion. Therefore, the current national



initiative plan is to increase enset productivity double. To this effect, three approaches will be followed: 1) expansion to new production areas 2) promoting commercial enset production and 3) intensification of the existing smallholder enset production.

2. SITUATION ANALYSIS

Precedent to the preparation of the strategy to transform enset production system in Ethiopia, it was critical to conduct situational analysis and understand what is on the ground, resource base, achievements made to date, challenges encountered and opportunities untapped.

2.1. Status of Enset production and consumption

Enset cultivation in Ethiopia occurs within a wider altitude range of its climatic requirements. Generally, enset grows well in regions situated between 1,500 to 3,000 meters above sea level. This altitude range provides the ideal combination of temperature, rainfall, and other environmental conditions for enset plants to thrive. However, enset germplasms have been collected a much lower and higher altitudes depicting the potential elasticity of the crop under diverse agroecological conditions. However, future expansion of enset production should rely on a well-established system of multiplying and distributing disease-free planting materials to avoid the undesirable spread of production challenges.

Enset is commonly cultivated in the highland areas of southern and southwestern Ethiopia, where altitudes often fall within this range. Regions such as Sidama, Gedeo, Wolayita, Keffa, Gurage, Hadiya, and parts of Oromia and the ex-Southern Nations, Nationalities, and Peoples' (SNNP) region are known for enset production. These areas possess suitable climate, soil conditions, and cultural practices for successful enset cultivation.



According to MoA (2023), enset is now cultivated in 208 woredas distributed mainly in four major regions. The number of enset plants, though may vary frequently, has been reported as 997.5, 671.2, 463.2, 211.4 million in Oromia, SNNP, Sidama and Southwest Ethiopia regional states respectively. In 2020/21, a total of 12.3 million tons of food in the forms of *Kocho*, *Bulla* and *Amicho* (CSA, 2021) has been produced.

In all regions of enset production, women take the lion's share of the processing, packaging, transportation, marketing, and the ultimate preparation and serving of the food. As a result of this drudgery, young women are refraining from shouldering the traditional processing and subsequent tasks. This justifies why processing, value addition, marketing, and utilization have been picked as key intervention areas of NEtDFP.

Most of what has been produced has been consumed locally and the demand for *Kocho*, *Bulla* and *Amicho* is unmet. The food products, *Bulla* and *Kocho*, are now consumed throughout the country and even several other countries in Africa, Europe and America. Better packaging and branding would make enset products more acceptable to consumers and fetch better value-added benefits to VC actors.

2.2. Research

Enset research and development in Ethiopia since 1985 by EIAR, though not as it should have, has received some attention due to the importance of enset as a staple food and a versatile crop with various potential applications. The National Enset Research Program is led by Areka Agricultural Research Center that is responsible for coordination of enset research across the country.



Through this program, in collaboration with various institutions, germplasm collection, maintenance, variety development, development of production packages and dissemination of technologies has been realized. Here are some key areas of enset research and development in Ethiopia:

Genetic Diversity and Breeding: Research efforts have focused on understanding the genetic diversity of enset and identifying desirable traits for improved cultivars. This includes characterizing enset landraces, identifying genetic markers, and developing breeding strategies to enhance disease resistance, fiber quality, and productivity. Currently, over 700 accessions of germplasm have been collected & maintained which however should be strengthened. To date, six varieties have been released and two additional recommended for production. However, given the genetic resource we have, diversified agro-ecologies and multiple-use value, more varieties adapting to high, medium, and low production areas should be developed.

Agronomy and Crop Management: Enset agronomy research has aimed to optimize cultivation practices, including planting techniques, spacing, fertilization, and pest and disease management. Studies have investigated the effects of different agronomic practices on crop growth, yield, and resilience to various environmental conditions.

Enset Diseases and Pest Management: Enset is susceptible to several diseases and pests that can significantly impact yield and plant health. Research has focused on identifying and understanding diseases (Belachew Garedew and Aklilu Ayiza, 2018; SARI, 2013) such as bacterial wilt (*Xanthomonas campestris* pv. *musacearum*), root rot (*Fusarium oxysporum*f.sp. *enseete*), and pests like the

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enset weevil (*Cosmopolites sordidus*). Efforts have been made to develop integrated pest and disease management strategies, including cultural practices, biological control, and resistant varieties. This was possible through the Bacterial Wilt Management Program, a seven-year program (2012-2019) led by the McKnight foundation and Southern Agricultural Research Institute on “Integrated Management of Bacterial Wilt of Enset (*Ensete ventricosum* (Welw.) Cheesman) caused by *Xanthomonas campestrisp v. musacearum* in Ethiopia” (EBW-11-283, EBW-15-529). Some of the lessons learnt from this program are:

- i. Community-based integrated disease management approach is recognized as the best option to control enset bacterial wilt disease.
- ii. Multiple stakeholders’ engagement is identified as a key approach for successful implementation of enset disease and insect pest management control of the disease.
- iii. Promising results have been brought in controlling the devastation by EBW in major enset growing areas of the country.
- iv. Given that clean planting materials are available, it is learnt that enset can easily be expanded to new areas where the crop has not been produced before. Production of disease-free planting materials via tissue culture started at Areka, Jimma, and Holeta biotechnology center research centers should be capacitated to enhance the availability of clean planting materials.

Postharvest handling, Processing and Utilization: Research has explored various aspects of enset processing and utilization, including fiber extraction methods, fermentation techniques for edible products (*kocho and bulla*) and the potential use of enset by-products for animal feed and biogas production.



The majority of these studies have aimed to improve processing efficiency, product quality, and value addition to enset products. Very recently, Innovative Enset Project was led by Arba Minch University implemented an exemplary intervention program to develop user friendly and cost effective enset processing machines, introduced new enset fermentation vessels to replace fermentation in a soil pit, to develop a well standardized enset starter culture, to establish community based enset processing pilot plant, introduce value-added enset-based food products including *Kocho* flour. The lessons learnt from this program includes:

- i. Improving the existing laborious and time consuming enset processing and fermentation practices with introduction of effective technologies, it was feasible to reduce drudgery of women, improve nutritional value, reduce postharvest losses and minimize food safety risks.
- ii. By organizing women and youth, enset processing and fermentation can create a good entrepreneurship opportunity.
- iii. Proper packaging and Branding of enset products can enhance competitiveness of the enset products in the local and global markets.
- iv. Building the capacity of farmers, women, youth groups and others along the value chain is vital for successful program implementation and sustainability of the outcomes.

Socioeconomic Studies: Enset research has also examined the socioeconomic aspects of enset farming systems, including the role of enset in household food security, income generation, and cultural practices. Studies have explored the gender dynamics of enset production, market access, and value chain analysis to identify opportunities and challenges for smallholder farmers.



Climate Change Adaptation: Given the importance of enset for food security in Ethiopia, research has investigated the impact of climate change on enset cultivation and identified adaptation strategies which includes assessing the effects of changing rainfall patterns, temperature, and pests and diseases on enset productivity and exploring resilient farming practices.

Knowledge Transfer and Capacity Building: Efforts have been made to develop and disseminate packages and technologies to end users and build the capacity of farmers, extension workers, and other stakeholders. This includes training programs, workshops, field demonstrations, and the development of extension materials to promote improved enset cultivation, processing, and utilization practices.

Overall, enset research and development in Ethiopia have contributed to a better understanding of the crop, improved cultivation practices, enhanced disease management, and increased utilization of enset products. However, there is still a need for further research and investment in areas such as genetic improvement, value chain development, and sustainable production systems to fully harness the potential of enset for food security, livelihoods, and industrial applications.

2.3. Stakeholder Analysis

Several stakeholders have been involved directly or indirectly in the production, processing, transportation, marketing and utilization of food and non-food products. Smallholder farmers are the key stakeholders that have played an indispensable role in not only production, processing, and marketing but also in genetic conservation and improvement. Capitalizing on the effort of



smallholder farmers, a number of past and present-day researchers under the regional (Bako Agricultural Research Center, Oromia and Southern agricultural research institute) and federal research institutes (Areka Agricultural research center) have played immense role in improving the crop, production management, combating diseases and insect pests, improving processing and utilization of the crop. Around 13 universities have been involved in different aspects of enset crop improvement. Worth mentioning are Hawassa University, Arba Minch university, Wolkitie University, Jimma University, Debre Markos University, Bonga University, Mizan Tepi and others. Ethiopian Biodiversity Institute has been playing in the collection of enset germplasm in-situ and ex-situ.

By its virtue of being food and industrial crop, enset was a concern of several sectors namely Agriculture, industry, trade, regulatory institutions, and NGOs like Farm Africa. However, there has been weak coordination among the different stakeholders and VC actors. Very recently, Enset has become the interest of the international community for reasons such as resilience to drought and its gluten-free food products. However, better packaging and branding remain important issues to promote export marketing of enset food products.

2.4. Gaps and Challenges

The SWOT analysis on the enset value chain indicated that some strengths and opportunities need to be capitalized. However, there are several challenges and threats potentially affecting not only production and productivity but also the existence of enset germplasm by in large. The drivers, causes and effects as well as impacts of enset underutilization have been identified professionally (*Fig.1 and Fig.2*).

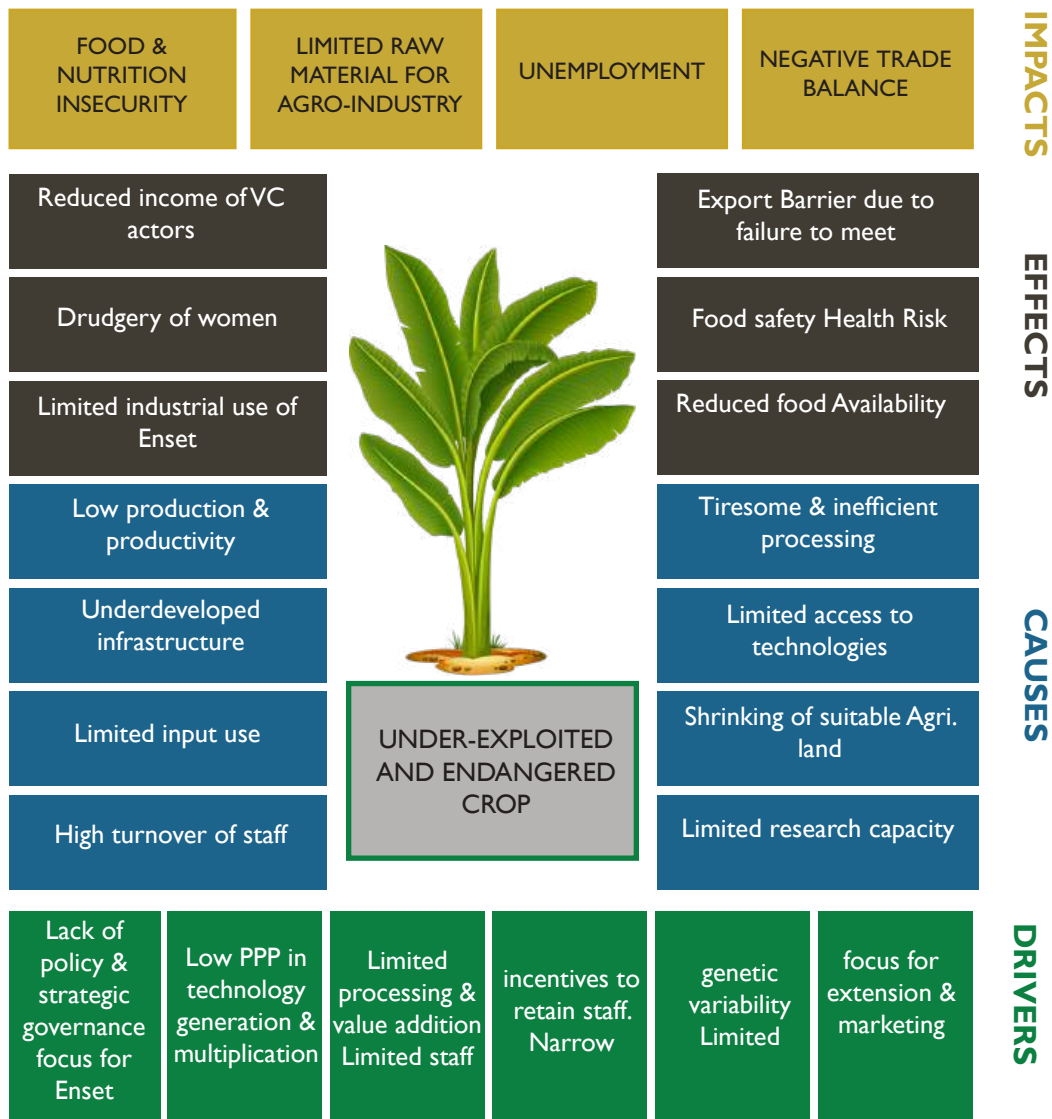


Figure 1. The drivers, causes and effects as well impacts of enset underutilization.



	Input	Production	Processing	Market, Distribution & Utilization
Production & productivity	<ul style="list-style-type: none"> Ethiopian seed system is more focused on grains (cereals) and enset is neglected. Transmission of diseases and pests through planting materials 	<ul style="list-style-type: none"> Limited involvement of commercial producers in enset production Limited popularization and demonstration of enset production in new areas Inadequate infrastructure around the enset hubs Low density planting & conventional agronomic practices specifically related to land preparation, nutrient and water management. 	<ul style="list-style-type: none"> Very tiresome and inefficient processing practice Drudgery of women and children as enset processing is wrongly exclusively ear-tagged to women. Poor availability of access to & awareness on appropriate PHT Limited value added & branded products. 	<ul style="list-style-type: none"> Limited market knowledge of farmers to negotiate prices with traders and processors. Lack of appropriate human centric aggregation and marketing centers for enset food products Lack of branding (geographic or purpose specific) of enset products
Product quality	<ul style="list-style-type: none"> No certified planting material which are disease resistant & provide quality product. No planting materials for varieties of various purposes Limited input use leading to reduced quality. 	<ul style="list-style-type: none"> High incidence of diseases & pests resulting 50-80% yield loss, decreased quality & safety. Poor plant density leading to poor sink formation. Poor farm management leading to inferior quality. Wrong Harvest-maturity affecting quality. 	<ul style="list-style-type: none"> Limited awareness on appropriate PHM driving youth away from enset. Poor processing with safety concern Inefficient processing leading to huge PHL (34%) Lack of proper packaging & branding causing limited export 	<ul style="list-style-type: none"> Lack of quality standards for food & non-food products Lack of price incentive for quality products Limited enriched food products Limited industrial utilization of products Vs its potential
Enablers	<ul style="list-style-type: none"> Non-existence of seed system to support efficient distribution of certified enset planting materials. Limited institutional capacity for managing, coordinating, overseeing, and monitoring enset-related initiatives. Limited policy focus on incentivizing entrepreneurs to get engaged in modern processing technology production & multiplication. Under rating of enset industry in providing employment opportunity for entrepreneurs in processing of food & non-food products Limited advocacy for and awareness on the potential export revenue and imports substitution from food and non-food enset products Poor linkages among value chain actors Wrong notion that enset is a crop to few Ethnic groups and important only as a tree against hunger. 			

Figure 2. Key challenges along the Enset value chain and systems

Furthering production and productivity of enset as well as improving the processing and utilization of enset products remain fundamental tasks that deserve immediate attention. However, confounding challenges along the whole value chain require strategic thinking to prioritize intervention options arrive at set of outputs and final outcomes. This underpins the need for



preparing the National Enset Development Flagship program (NEtDFP) discussed in the ensuing section.

3. THE STRATEGY

3.1. Strategic Issues

Following the discussion on major challenges and threats of enset cultivation, effort was made to streamline the strategic issues to be treated. The following are the major thematic areas of enset:

- Lack of supply system for certified disease and pest free enset planting material
- Few varieties released which could not satisfy the need of different purposes and agro-ecologies.
- Little or no use of agricultural inputs resulting in below potential productivity.
- Production limited to few zones and subsistent homestead level.
- Low and unregulated plant population causing low productivity.
- Unhygienic, inefficient and tiresome processing with high drudgery of women and instilling low interest of the youth in production & processing.
- Unacceptably huge postharvest loss
- Very few processed and value-added products
- Poor & substandard packaging and non-existence of branded products
- Poor marketing infrastructure and logistics
- Limited awareness & practice of utilizing products for various purposes.
- Limited attention rendered to awareness creation and advocacy on economic, environmental & social importance of the crop.

3.2. Goals & Objectives

Goal: The overall goal of the program is to improve food availability, food access, food safety and nutrition, and incomes of value chain actors through increased production & reduced PHL along the enset VC in Ethiopia. This surely can contribute to the national agenda of ensuring food and nutrition security, enhancing employment opportunity, provision of raw material for agro-industries, and increasing foreign exchange earnings of the country (Fig. 3).



Figure. 3: The four National Agenda to which the goal of NEtDFP contribute

Objectives: The main objective of NEtDFP is to transform Ethiopian enset production, processing and marketing into a robust, competitive, commercially oriented, and sustainably productive cluster-based enset industry/subsector which, with proper management and support, can sustainably supply quality food and non-food products for both domestic and export markets in fresh and processed forms.

Specific objectives:

- To boost enset production through intensification and expansion to new production areas (*Kocho, Bulla & Amicho*) from 12.3 million ton to 99 million ton by 2031.

- To increase the productivity of enset (*Kocho, Bulla & Amicho*) from **60kg** per plant to **120kg** by 2031.
- To establish commercial enset production with estimated land area of **250,000 ha** by 2031.
- To ensure food security of **40 million people** through consumption of enset-based food products
- To reduce enset postharvest loss from existing **34% down to 10% by 2031**
- To engage **5.11 million women and youth** in business along enset VC
- To increase export earnings from enset from **3.6 million USD to 4.9 billion USD** by 2031.
- To strengthen enabling environment (policies, regulations, marketing infrastructures, etc.) for effective production, processing and Marketing (local & export).
- To build the capacity of research and extension for enhancing enset production, productivity and utilization
- To strengthen the capacity of enset value chain actors based on innovative enset platform.
- To conserve **62.1 and 576.15 million tons** of soil by 2031 as compared with land cultivated with cereals and simple build up soil. The total opportunity cost of seven years would be close to **123 million USD and 1.14 billion USD**, respectively.

3.3. Strategic Interventions

The theory of change depicting the vision, goal, objectives, interventions activities and action interaction dashboard is given in *figure 4*.



The NEtDFP has the vision to see a holistic national development of Ethiopia through enhanced employment opportunities, sustainable supply of agricultural raw materials to agro-industries, increased export earnings, and food and nutrition security as a function of improved Enset production and marketing system. In alignment with this, the goal of the program is to improve food availability, food access, food safety and nutrition, and incomes of VC actors through increased production & reduced PHL along the VC. The program has four different yet interwoven strategic components: enhancing the production & productivity of Enset; improving the processing & value addition of Enset; and improving marketing & utilization food and non-food products; and implementing efficient and transparent program management, which altogether will result in an immediate outcome of increased production & improved quality of enset. Given that Enset is a resilient crop; Ethiopia has a vast suitable area for production; economic, social, and environmental sustainability the intended program; and the enormous national, regional, and international interest in Enset, the interventions under each strategic component, with appropriate implementation, can deliver the intended specific outputs and thus lead to complete realization of the NEtDFP's overall goal. This ambitious program can not only benefit 40 million Ethiopians but also have spillover effect to many more people (estimated 100 million) in other African countries like Kenya, Uganda, Tanzania, etc. where enset is underutilized and contribute to the realization of several SDGs.

The NEtDFP will firmly adhere to the important principles of community engagement & accountability; protection, gender & inclusion; action-oriented research & learning; and innovation & technology.

Options and justification: - the interventions planned in the NEtDFP will



demand multi-stakeholder engagement to benefit the wider communities residing in federal and all regions of Ethiopia. By the same virtue, it requires setting up of effective enabling environment, coordination arrangement for the diversified benefits of the resource and roles of institutions and requires strong extension services to deliver the outputs underpinned in the program. There has been no such effort made so far to transform enset production in the country. Therefore, systematic capacity building, infrastructure development, arrangement of logistics facilities, knowledge and skill improvement, awareness creation to enset value chain actors are needed to transform enset production system. Currently, most of the NGOs and private sectors are not actively engaged in enset research and development. Therefore, PPP approach is very vital to transform enset production and productivity in sustainable way.

The sustainability of the expected outcomes strongly rests on profitability of intervention activities which happened to be quite remarkable. Hence, the engagement of smallholder farmers, private investors and small and medium enterprises (SMEs) will sustain the program outcomes. Six fundamental choices are sought in the production, processing & value addition, and marketing & utilization phases. These are:

- **Option-1:** Continuing in the conventional or existing subsistent homestead enset production in south, southwest and central parts of the country.
- **Option-2:** Intensification, expansion and commercialization of enset production across the country by providing improved production packages via active participation of PPP.

- **Option-3:** Continuing the existing postharvest management which is characterized by women drudgery, time consuming, high postharvest losses and non-hygienic processing and fermentation practices.
- **Option-4:** Introducing appropriate processing and fermentation technologies that can reduce women drudgery, time, high postharvest losses and food safety risks.
- **Option 5:** Utilizing the limited enset products (*Kocho, Amicho, Bulla* and fiber) for domestic consumption without improving their nutritional values and continue importing starch, fiber and other products (with hard currencies) which otherwise could have been replaced by enset products.
- **Option 6:** Diversifying types and nutritional value, packaging, branding of enset based products for domestic consumption and export market.

After a critical evaluation of the six options identified, options 1, 3, and 5 were rejected. The detailed rationale for the decision arrived at is given below.

- **Option 1** was excluded for the mere reason that it does not improve production and productivity of the crop and would result in loss of genetic resources which ultimately affect lives of millions in Ethiopia and beyond.
- **Option 3** was vetoed due to the fact that processing and fermentation are laborious, taking much of the time of women and pose health risk due to poor hygiene and uncomfortable working condition for women.
- **Option 5** was not preferred because the limited products are not nutritionally enriched, poorly packed, not branded, and exclusively been used for local consumption. Therefore, the country is losing potential export earnings from the commodity and spending hard currency to import starch, fiber and related products which would otherwise been replaced by enset products.



By default, the remaining three options were endorsed as viable options. Option 2, 4, and 6 were preferred on the grounds explained below.

- **Option 2** was preferred because production can be improved from 12.3 million ton to 99 million ton. Accordingly, 20 million additional people can be fed with enset alone and use the surplus for industrial and export purpose. In addition, the intensified and commercial enset production system can ensure job opportunity for 9.6 million people engaged in input supply and production.
- **Option 4** was selected to increase the efficiency of processing, reduce women trudge, minimize postharvest loss from 34% to 10% and minimize health risks by improving hygiene and working conditions. Moreover, improved processing technologies will create job opportunities for 1.2 million women and youth organized as entrepreneurs.
- **Option 6** permits increasing income of value chain actors and a country at large by introducing proper packaging, branding and marketing. With this option, Ethiopia can increase its export revenue from enset from the current 3.6 million USD per annum to 4.9 billion USD per annum by 2031. Women and youth can be organized and engaged in enset product marketing.

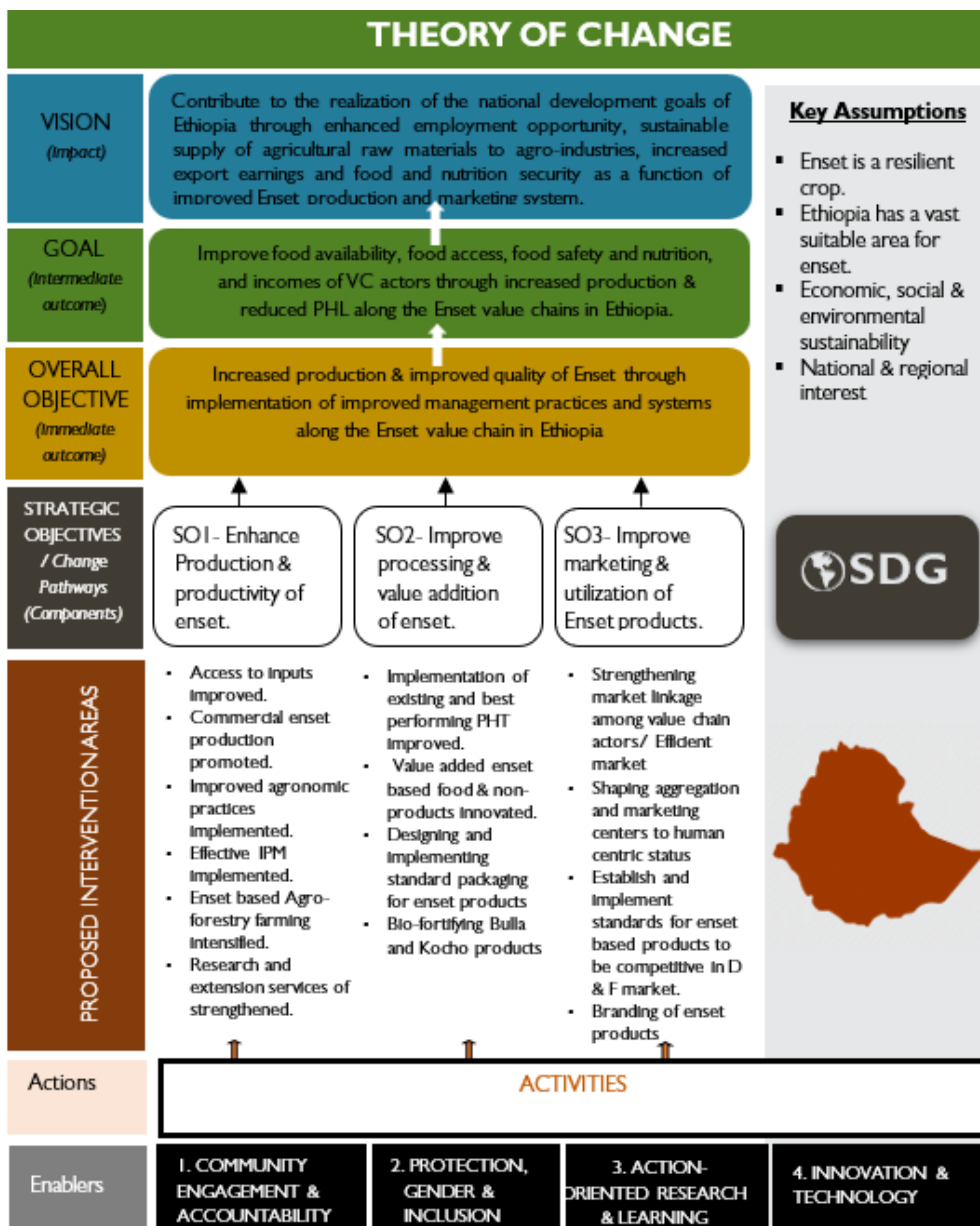


Figure4- Enset transformation vision, goals, objective, interventions activities and action interaction dashboard

The detail description of the three strategic components, expected outcomes, outputs (deliverables) and planned activities are given in the subsequent section. Moreover, program management has been included as the fourth component of the program with its own outcome, deliverables and activities.



COMPONENT-I: ENHANCE PRODUCTION AND PRODUCTIVITY OF ENSET

OUTCOME-I: ENHANCED PRODUCTION AND PRODUCTIVITY OF ENSET

Output-I.1: Access to inputs improved.

To date there is no seed system that addresses the demand for clean planting material for enset. The conventional multiplication through natural sucker initiation from the corm has served as the main source of planting materials in all regions of enset growing. Therefore, this program will establish standard nurseries for planting material production. Women and youth will be organized to manage and benefit from enset nursery sites. Moreover, tissue culture technique will be envisaged to mass propagate selected released varieties to support the intensification and expansion of enset within the stipulated time of the program. Private value chain actors with good track record of multiplication and distribution of enset or similar commodities like banana will receive capacity building on areas to be identified through gap assessment. To curb the spread of bacterial wilt and other diseases and insect pests, guidelines will be prepared and implemented to govern the movement of planting materials from place to place.

Deliverables:

- 140 classical enset seedling propagation nurseries established.
- 4.23 million planting materials multiplied and supplied.
- 256 ,000 ton of organic fertilizers distributed
- 300 women and youth organized in input supply.
- 310 private and public institutions that received capacity building.



- 600 cooperatives of youth and women engaged in seedling production.

To attain these deliverables, the following activities have been identified for implementation.

Activities

- Multiply and supply breeder and pre-basic seeds (suckers).
- Classical enset seedling propagation nurseries established.
- Develop standards for enset planting materials; Establish and strengthen enset seed producer and supplier cooperatives.
- Link enset producer cooperatives with saving and credit financial institutions.
- Capacitate public and private seed producers.
- Develop and validate enset planting material business model.

Output-1.2: Commercial enset production promoted.

Augmented private sector engagement in enset commercialization is one means to enhancing the enset industry. To do so, suitable sites will be identified and mapped as new investment sites in eight regions of the country. In consultation with the regional land administration, land transfer working modality for investment will be prepared. Succeeding activities such as facilitating access to road and electric power infrastructure, publicizing availability of suitable land for investment in enset production, facilitating linkage between private investors and out-growers as well as supervision and technical support provision will be mainly conducted. Prior preparations will be made to ensure availability of sufficient clean planting materials and other inputs



as well as timely delivery of already prepared enset production package through tailored ToTs.

Deliverables:

- 10 private enset commercial farms established.
- 250,000 ha transferred to private investors.
- 250,000 ha brought to cultivation and production thereof.
- 642 tons Urea, 300 tons NPS and 49,200-ton compost/vermin-compost delivered.
- 10 linkages created with at least five financial institutions.
- 930 women and men trained in commercial enset production.
- Ten irrigation schemes established.
- One appropriate irrigation package for different AEZs.

Activities:

- Enhance the skill and knowledge of enset farming cooperatives and private commercial farms.
- Organize and capacitate youth and women groups in enset production.
- Develop, multiply and disseminate enset production devices (farm implements)

Output-1.3: Improved agronomic practices implemented.

Total production is a function of area and productivity. This national program plans to double the existing productivity (60kg plant-1) to 120 Kg plant-1 by 2031. To this end, interventions have been identified to improve agronomic practices such as integrated nutrient management and use of supplementary irrigation. Fertilizer application 100 kg N ha-1, 100 kg P ha-1, and inclusion of 200 kg K ha-1 fertilizers resulted in yields in the range of 10–12 tons ha-1, which

is three to four times higher than without fertilizer application. Training will be provided on selected relevant topic and field demonstration and scale up of recommended agronomic practices.

Deliverables:

- One report on gap assessment.
- 12 trainings provided on enset agronomy.
- 10 million trainees received training on agronomic practices and implemented enset production package successfully.
- 300 suitable woredas sites mapped and transformed.
- 5.1 million SHF and 10 investors apply recommended enset production packages.
- Productivity increased from 60kg plant-1 to 120kg plant-1.

Activities

- Assess the gaps on enset production and expansion.
- Develop suitability map for enset production.
- Implement integrated soil fertility management (ISFM) practices.
- Demonstrate and scale-up recommended fertilizer type and rate across different agro-ecologies.
- Demonstrate and promote Packages of enset production technologies.
- Training on irrigation water management and drainage practices conducted.
- Strengthen implementation capacity of extension staff and administrators.

Output-I.4: Effective Integrated Pest Management (IPM) implemented.

Enset has relatively few diseases and pests that impart significant reduction of yield. However, Bacterial wilt and mealy bug are already becoming prevalent



in most enset growing areas of Ethiopia. To restrict the spread of diseases and insect pests, the program has streamlined a series of interventions including preparation of implementable IPM guideline, emplacing functional quarantine system, provision of ToT and establishment of early warning system. The following are major deliverables.

Deliverables

- 10 quarantines strengthened.
- One document referring to prepared guidelines of IPM on enset.
- Six trainings organized and offered.
- One million trainees received training on IPM.
- One report on early warning system prepared.
- 25% decrease in loss of enset attributed to diseases and pests from the current 50-80% loss.

Activities

- Establish enset pest early warning system (EWS)
- Conduct training and experience sharing on IPM.
- Prepare implementable guideline for enset IPM.
- Establish functional internal quarantine system.

Output-1.5: Enset based Agro-forestry farming intensified.

The existing one million ha of land under enset cultivation is typified by multi-canopy agro-forestry with low input use, variable plant density and agronomic management. This will be intensified through improved agronomic practices, adjustment of planting density per unit area. Moreover, the area under smallholder will be doubled making the total 2.09 million ha.



Deliverables

- 2.34 million ha of enset based agro-forestry strengthened.
- One national enset museum will be established.
- One million ha will be improved through improvement of plant density, input use and agronomic practices.
- 22,050,000 USD (7 years x 1500 visitors x 7 days @ 300USD) earned from foreigners visit and used for community development.
- 35 million USD (7 years x 200,000 visitors x 3 days @ 500 Birr) earned from local/internal visitors and used for community development.

Activities

- Diversified enset farming system with various species
- Exploit Carbon trade from enset agro-forestry system.
- Promote Integrated Soil and water conservation practices (ISWCP)
- Establish enset eco-tourism centers in enset growing areas.
- Establish national enset museum.

Output-1.6: Regulatory system strengthened.

Strengthening the regulatory system for enset production, processing, and marketing can help ensure the quality, safety, and sustainability of enset products. Some of the key interventions that can be implemented include establishing regulatory frameworks, capacity building, certification and accreditation, quality control and testing, traceability systems, marketing, enforcement & monitoring, and research and development.

Deliverables

- 30 experts from the regulatory system received capacity building training.

- 10 regional quarantine centers strengthened.
- 5 regulatory guidelines (seed, market, agro-chemicals, etc)

Activities

- Train regional regulatory experts
- Strengthen/establish regional quarantine centers.
- Develop regulatory guidelines.

Output-I.7: Research and extension services of enset strengthened.

Comparatively, enset has not been the interest of the research community outside of Ethiopia for the mere reason that the crop is mainly cultivated as food only in Ethiopia. As for extension, it is usually crop focused and more specifically cereals render little or no room for horticultural crops in general and enset in particular. Therefore, there is need to capacitate the national and regional research and extension system to touch base with the realistic importance of the crop.

Deliverables

- At least 3 fertilizer recommendations released for each enset production cluster.
- At least two additional high yielding enset varieties nationally released.
- At least one EBW tolerant variety nationally released.
- At least 3 IPM technologies introduced and promoted.
- Existing germplasm of enset conserved.
- A complete guide on integrated soil fertility management developed.

- At least two integrated irrigation agronomy technologies developed and demonstrated.

Activities

- Suitability trial of enset varieties for irrigable land tested and selected.
- Fertilizer type and rate recommended for different agro-ecologies.
- Integrated irrigation agronomy technologies developed and demonstrated.
- Enset varieties tested and selected for adaptation trial.
- Qualified enset researchers, extension workers, Lab and workshop technicians trained.
- Pesticide screened and registered for the control of enset pests.
- Tissue culture laboratory with screenhouses established.
- Conduct enset market research (Market size, share, growth, forecast)

Output 1.8. Decision support tool developed.

Enset faces major challenges from pests, diseases, and environmental factors, with bacterial wilt disease being a key issue for decades. Leveraging artificial intelligence (AI) offers a promising solution, enabling precise yield mapping and prediction. AI models can analyze extensive data to identify patterns and risks, providing insights to enhance crop management and mitigate these threats.

Deliverables

- One AI-based model for National Enset yield mapping and prediction developed.
- A mobile app for disease diagnosis and recommendations developed.



- At least one AI-powered image recognition system for disease detection established.
- A centralized database with geo-referenced pest and disease images built.
- Enset based farming system carbon sequestration model developed.

Activities

- Develop AI-based mobile application for enset yield mapping and prediction.
- Design AI-powered image recognition tools for early detection of enset pathogens.
- AI-powered image recognition system for disease detection.
- Build a centralized database with geo-referenced pest and disease images.
- Develop a carbon sequestration model for enset using data from drones and satellites.

COMPONENT 2: IMPROVE PROCESSING AND VALUE ADDITION OF ENSET

OUTCOME-2: PROCESSING AND VALUE ADDITION OF ENSET IMPROVED

Output-2.1: Use of existing and best performing post-harvest technologies improved.

The processing of enset is traditionally a role for women, who act as a reservoir of knowledge about the techniques involved, but the tasks involved are labor-intensive and tedious. With the current laborious and painful method of enset



processing, highlights the danger of indigenous knowledge being lost as younger people turn away from enset-based agriculture, and thus the documentation of the diversity of agronomic practices, and especially processing methods, is a priority.

There is significant potential to improve the efficiency and effectiveness of enset processing, which is currently a labor-intensive process. Therefore, it is key to improve enset processing through introduction of improved technologies for decortication, fermentation, squeezing, and drying, packaging. Characterizing and standardizing the bacteria and yeast species currently used in enset fermentation is important for improving quality and consistency of food products and supporting the development of an effective standard set of starter cult. Organizing youth and women groups under a service provision center can open the opportunity for off-farm employment.

Deliverables

- One need assessment for processing technology conducted.
- 12,000 youth and women groups organized on processing and value addition supporting 480,000 beneficiaries.
- 12 prototypes produced.
- Five standards of enset product developed.
- One guideline for service provision in enset processing developed.
- Nine million fermentation vessels distributed.
- Six starter cultures for fermentation developed and distributed distributes.
- Days for fermentation shortened to seven days from the usual 6 to 8 months.
- 27 model processing service centers established.
- 300 Woredas benefited.
- 60 demonstrations conducted.



Activities

- Undertake need assessment on enset processing, fermentation, storage and value-addition technologies.
- Develop and promote enset processing machine prototypes.
- Select and validate appropriate enset processing technologies.
- Develop guideline for processing machinery service providers.
- Organize youth and women groups in enset production and value addition.
- Demonstrate and deliver improved enset processing machines (scraping, enset paste drying, milling and packaging) in selected regions.
- Distributed vessels/jars for enset product fermentation
- Develop enset starter cultures for multiple agro-ecologies.
- Promote improve enset fermentation vessels/jars and starter cultures.
- Establish and strengthen model processing service center and community-based site.

Output-2.2:Value added enset based products innovated.

Deliverables

- Nine Processed products
- 10 food products innovated.
- Four types (45 million tons) of non-food enset based products (Industrial starch, sheath, sack, rope, etc.) developed.
- 10 types of nutrient rich enset based food products developed.
- 16 types of additives used to develop enriched food.
- 10 ingredients used for enriched food development.
- 8 biodegradable package materials developed.



- 27 functional processing centers established.
- 216,000 beneficiaries benefited.
- 12 types of processing technologies introduced.
- 22 types of fermentation technology introduced.

Activities

- Need assessment conducted to identify the existing gaps on enset processing and value-addition.
- Enset based food products formulated and developed.
- Nutrient rich enset based food products promoted and demonstrated.
- Non-food enset based products (Industrial starch, sheath, sack, rope, etc.) developed.
- Develop biodegradable enset packaging technologies by private firms.

COMPONENT 3: IMPROVE MARKETING AND UTILIZATION OF ENSET PRODUCTS

OUTCOME-3: MARKETING, INFRASTRUCTURE, LOGISTICS AND UTILIZATION OF ENSET PRODUCTS IMPROVED

Output-3.1: Market linkage and market infrastructure strengthened.

The enset marketing system is not well organized and dominated by traders and informal brokers. These value chain actors get higher profit margin than the producer farmers. The traders simply buy the products from the farmer and sell to consumers. But they get high amount of share profit than the farmers who did most of the activities from production to processing. Therefore, encouraging cooperative organizations to collect the enset products from the



producers could be one of the strategies to enhance the market performance. Development of market infrastructure is also very vital to enhance efficiency of the marketing system.

Deliverables

- One report on market linkage developed.
- 10 market linkages established.
- 900 product collection and aggregation centers established.
- 58,500 beneficiaries from each center
- 12,000 received awareness creation.
- Six business to business (B2B) platform established.
- 300 Human centric marketplaces established.
- 200 wholesalers benefited.
- MIS system developed.
- 320 enterprises and cooperatives linked with markets.

Activities

- Conduct need assessment on enset market linkage.
- Establish centralized enset market information system.
- Collect and organize Geo-referenced information.
- Create "Innovative and inclusive business to business (B2B) platform."
- Established enset products collection and aggregation centers.
- Conduct study on existing enset value chain and forward recommendations for possible implementation.
- Piloting safe and human centric marketplaces
- Create enset market linkage.
- Introduce innovative marketing strategy through delivery system and e-marketing.
- Deliver training on enset value chain development to all VC actors.



Output-3.2: Product development and utilization of Enset based products enhanced.

In the southern, southwestern, and central Ethiopian highlands, enset is used for food, animal fodder, industrial fiber, rope, fencing, building, mattresses, seating, packaging, and tableware. It stabilizes soils and microclimates and holds cultural significance. Major enset food products like *Amicho*, *Bulla*, and *Kocho* are rich in carbohydrates, calcium, and potassium, essential for consumers (Borrell *et al.*, 2020). Enhancing the development and utilization of new enset-based food products is crucial to fully benefit from this valuable commodity.

Deliverables

- 20 branded enset food and non-food products created and promoted.
- One document on enset based food safety developed.
- One document on enset utilization prepared.

Activities

- Support implementation of standards of enset products
- Promote branding and utilization of enset products.
- Conduct need assessment on enset utilization.
- Developing enset based food safety document.
- Deliver training on enset product development and utilization.

COMPONENT 4: IMPLEMENT EFFICIENT AND TRANSPARENT PROGRAM MANAGEMENT OUTCOME-4: PROGRAM MANAGEMENT

Output 4.1: Program coordination, implementation, monitoring, evaluation and learning enhanced.



Most projects fail due to poor management, inadequate communication, and misaligned expectations. Effective project coordination involves gathering relevant information, creating action plans, anticipating and mitigating risks, breaking down complex tasks, and using creative problem-solving. Program management systematically applies knowledge, tools, and techniques to initiate, plan, execute, monitor, control, and close projects.

Monitoring, Evaluation, and Learning (MEL) are crucial for supporting program implementation by increasing knowledge, confidence, and success. MEL aims to strengthen program practices, enhance effectiveness, and maximize impact through review and learning with partners and communities.

Deliverables

- **40 million** beneficiaries satisfied with program intervention.
- **3 Policy documents** (Policy brief, Strategy, Road map) developed.
- **One** monitoring and evaluation guideline developed.
- **One** financial and procurement guideline developed.
- **Two** evaluation documents developed (mid-term and end line)

Activities

- Feasibility study and Program Implementation Manual (PIM) Prepared
- Policy documents developed.
- Proper program management modality selected and organized.
- Stakeholders mapped and mutual agreements on roles and responsibilities reached.

- Supportive supervision, monitoring and evaluation system in place
- Finance, procurement, audit, and property administration system of the program aligned to the national standard established and operationalized.
- Financial and other resource mobilization and cost recovery system in place

Output 4.2: Capacity of institutions and other program stakeholders strengthened.

In the flagship program, capacity building enhances the skills, knowledge, and resources of individuals, teams, and organizations to achieve the program goal. Successful implementation of the NEtDFP requires upgrading of both physical and staff capacity through both long-term and short-term training, timely availability of various facilities, and strengthening effective program management.

Deliverables

- 10 project development offices established.
- 164 project staff recruited.
- 11,426 people received short-term training.
- At least 40 and 20 researchers and extension staffs received MSc and PhD/postdoc training, respectively.
- 323 vehicles and motor bicycles procured.
- 414 computers procured.
- Other office furniture and supplies procured.



Activities

- Recruit 164 project staff
- Provide short-term training for agricultural experts.
- Facilitate long term-trainings of qualified researchers and extension workers.
- Procure vehicles, motor bicycles and computers.
- Procure office furniture and supplies.

4. IMPLEMENTATION PLAN AND MODALITY

4.1. Implementation modality

Currently enset is cultivated on a million of hectares of land in 208 woredas mainly in Sidama, Oromia, SNNP and SWEP located in the south and southwestern Ethiopia under smallholder farming (Fig.5). However, the suitability study conducted by EIAR indicates that enset can be profitably grown in more than 300 woredas almost in all regions of Ethiopia (Fig.6). Therefore, this program aspires to scale out enset production to 300 woredas throughout the country. The transformation of enset culture will entertain three modalities namely i) intensification of the existing smallholder enset production, ii) expansion of enset production to newer areas, and iii) commercialization of enset production throughout the country through private investment.

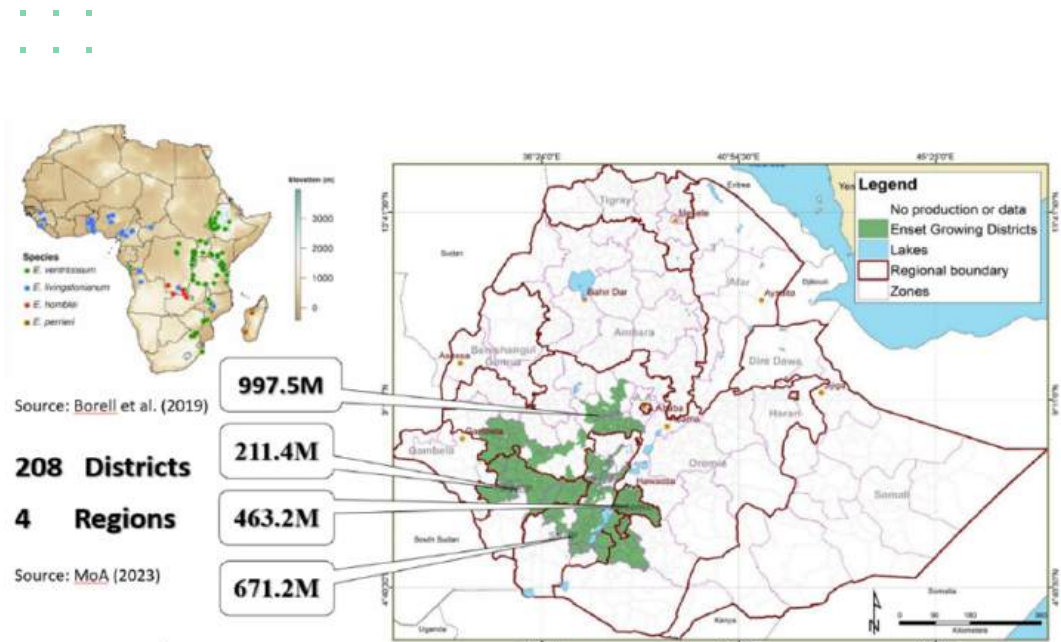


Figure 5. The number of Enset plants in different production areas in Ethiopia (EIAR)

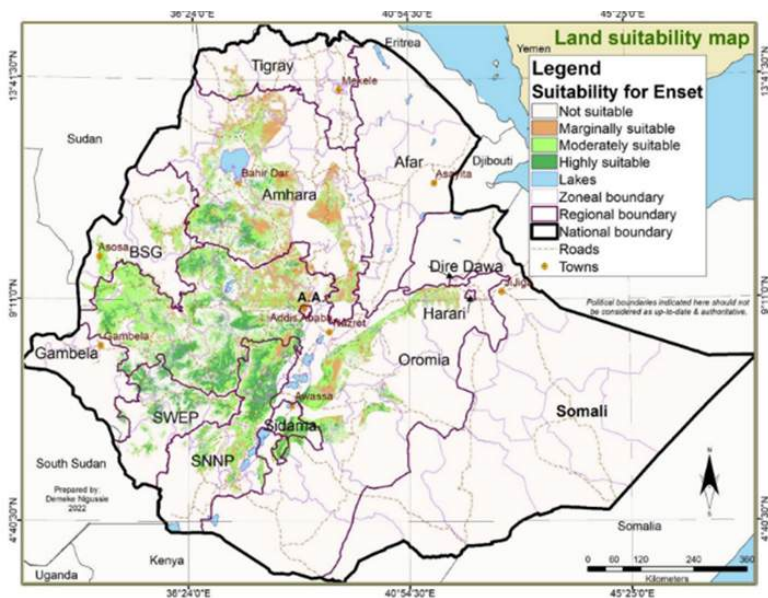


Figure 6. Potentially suitable agro-ecologies for enset production

In order to implementation of NETDFP, data base has been developed as excel spread (Table1) showing starting from base-line year (2024) to program termination year (2031).



4.2. Implementation Plan

The detail implementation plan of the program is given in appendix (Appendix 2). The program will be implemented over seven years (from 2024/25 to 2030/31) and the activities under the different strategic objectives are mainstreamed based on logical flow the interventions and their symphony.

5. EXPECTED BENEFITS AND BENEFICIARIES

5.1. Expected Benefits

This national development program aspires to transform the present subsistence approach to a more resilient commercial, highly productive and more inclusive economic activity that can ensure better food security, employment opportunity, income generation, agro-processing and foreign exchange earnings for the country. As the interventions of the program are crafted following the value chain approach, the number of beneficiaries is sizeable. In a nutshell, the following specific benefits can be accrued from the transformation of enset production system.

- **Increased food and nutrition security for 40 million people:** With proper implementation of this proposed program, in addition to the present 20 million people that rely on enset for their livelihood, another 20 million can benefit from the intensification and commercialization of enset production. In a country wherein **22.6 million are food insecure, 37% of children under five are stunted** and food and nutrition insecurity are prevalent, the promotion of production and utilization of enset as source of carbohydrate can be the best natural way of combating malnutrition which is costing the country **55.5 billion ETB per year.**



Enset Development program is designed to **abet postharvest losses from 34% to 10%**, is another prong of increasing food availability (which is one of the four pillars of food security) to stabilize price and increase access to food as well. Enset in Ethiopia comes into maturity at different occasions when other crops could not cope up environmental stresses and shocks. Lessons have taught Ethiopians that the crop has rescued the lives of many Ethiopians during harsh times of hunger.

- **Increased income of enset value chain actors:** Through increased production and productivity of enset, availability and supply of enset and its products will be ensured which in turn can improve the income of value chain actors. Households in enset growing area can earn their income from the sale of *Bulla*, *Kocho*, *Amicho*, leaves and fibers.
- **Better export earnings and import substitution:** Even with the little support rendered to the existing subsistence production system, 3.6 million USD was obtained from the export of *Kocho* and *Bulla*. Moreover, the program is expected to boost production and exportable surplus to raise the amount of obtainable hard currency to 4.9 billion USD in 2031. This will revamp the GDP and minimize the heavy dependency of the country on a few commodities as sources of foreign earnings.
- **Job opportunity for 1.2 million youth and women:** By 2031, close to 1.2 million people will directly benefit from production, postharvest handling, processing and marketing of enset and its products. In addition, about 5.1 million people will be indirectly involved through input provision, marketing and other financial transaction.
- **Environmental Sustainability:** By virtue of its carbon sequestration and drought resistance, enset is articulated as the future crop of the world



that can not only survive shocks and stresses but also provide reasonable yield and ensure the sustainability of life under such conditions. With full implementation of this program, the country can earn nearly 8.8 billion USD from carbon sequestration (243.9-ton CO₂/ha/year) and carbon trade (243.9 CO₂ x 1.5 million ha x 24 USD/ha = 8.8 billion USD) (Wongpiyabovorn & Plastina, 2023; Takele, 2020) (Fig 7). Besides, studies also show that enset is very appreciable in soil and water conservation. Based on a 30-year study in Meki River water shade in western Zewai are, enset was able conserve **4.5- and 41.75-tons ha⁻¹ year⁻¹** as compared to cereal cultivated and build up land (Alemu Beyene *et al.*, 2020). In monetary terms, this is equivalent to **518.14 million and 4.81 billion ETB** as financial gain by 2031 when enset cultivation reaches **2.46 million ha** (Fig.8). Under the agroforestry system, enset compatibly grows with fruits, coffee, vegetables, root and tubers, and spices and herbs. Therefore, enset can be one of the non-timber products that can be extracted from the agroforestry system.

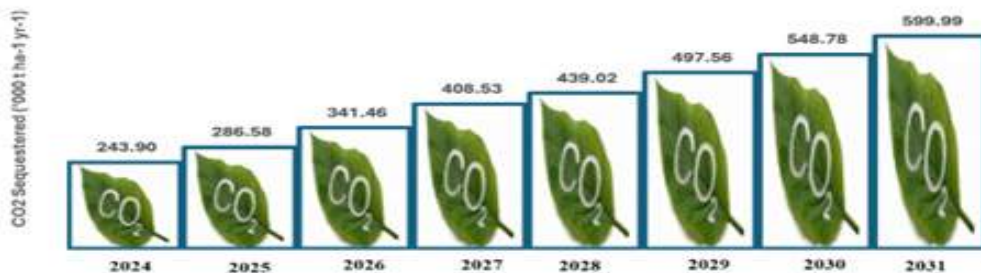


Figure 7: Potential contribution of enset transformation to CO₂ sequestration

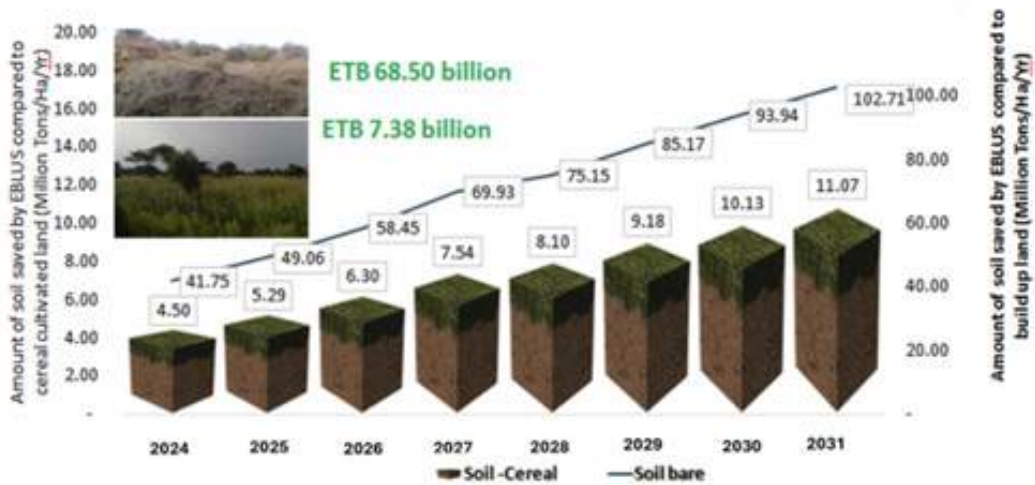


Figure 8: Potential volume and economics of soil conservation by enset compared to cereal cover and bare soils in Ethiopia

- As raw material for agro-industries and import substitution:** Our memories are afresh that Ethiopia has planned to establish 17 Agro-industrial parks throughout the country of which four are already operational. Those that are open and running are however, constrained with shortage of raw materials merely because of poor supply and weak integration between supply and demand. Moreover, the production system is supply driven instead of demand. Every part of the enset plant can be raw material for industrial use (flour, starch, adhesives, fiber, etc.). However, to date most industries working on starch, textile, bakery, pharmaceutical and baby foods are importing semi-finished products from abroad. Therefore, it is conceivable to substitute starch importation in the form of potato and corn extracts and even export enset products such as refined *Bulla Flour*, *Kocho* and fiber (Fig. 9).

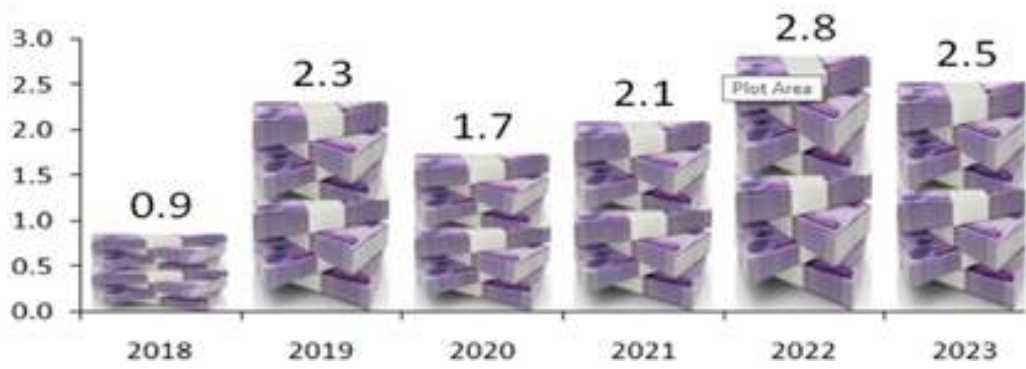


Figure 9: Value of Ethiopian national import of paper and related commodities from 2018 to 2023

- Contribute to farming and culinary Tourism:** Enset cultivation and utilization is unique to Ethiopia. Therefore, like many other countries for other commodities, enset production and processing can be an attraction center for many tourists coming from abroad and local inhabitants who had no exposure to the production, processing and utilization of the crop. This can be an additional source of hard currency and income generation.
- Leverage the Green Legacy:** The unique symphony of nature observed in areas where enset grows under stratified canopy is a true legacy of greenery in the country. Under such production system, it is common to find not only the crop in enset but also the native Arabica coffee, exuberant fruit and shade trees like *Ertrina absysinica* fostering under growing crops like Ethiopian kale, spices, and root crops like sweet potato. This has been the culture in enset growing areas and will continue



as a true heritage if this e National Enset Development Flagship Program is realized.

- **Complementing Lemat Turufat:** Enset complements the Lemat Turufat initiative of Ethiopia in several ways- as one of the six diversified food groups expected to present on the Lemat itself. Moreover, it serves as feed for animals, products of which are parts of the Lemat Turufat. Mohammed, Martin, and Laila (2013) identified the leaf as a good source of animal fodder, containing 13% protein, 20% crude fiber and 10% sugar. It is also a good starting material for silage production. The pseudo-stem and the leaf blades, contain potassium, magnesium, zinc and manganese in suitable amounts for ruminants, while the calcium levels are not high enough to support the animal and lactation. Moreover, the leaves are used as wrapping/packing material for animal products such as butter and cheese and serving plate for the traditional foods.
- **Accompanying the Seqota Declaration (2016-2030):** The national Seqota Declaration aims to combat malnutrition in children under two in selected Ethiopian regions, the integration of the enset flagship program will significantly support this initiative. Enset provides nutritious food options that can improve the dietary intake of young children, aiding the Seqota Declaration's mission to reduce malnutrition by 2030.

5.2. Intended Beneficiaries of the NEtDFP

The national enset development flagship program is carefully designed and engaging to many actors along the value chain. It has diverse benefits that can be tapped by the wider enset farming, trading and consuming communities residing in all regions of the country. The following are the major beneficiary's worth mentioning (Fig.10):

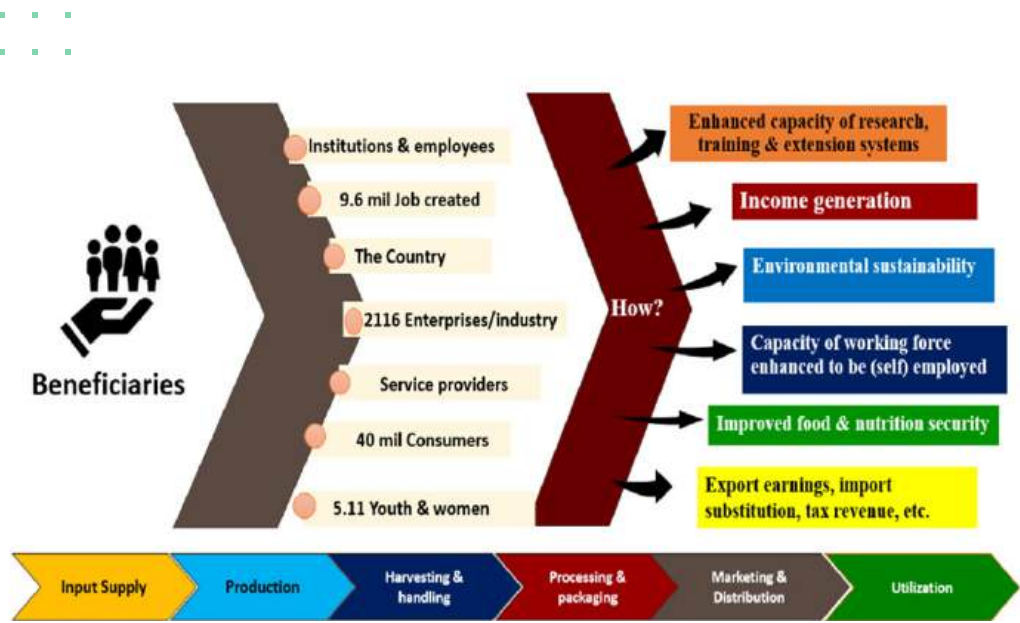


Figure 10. Intended beneficiaries of the NEtDFP

- 5.1 million smallholder farmers, 5 million SHF newly engaged in enset production.
- 1000 small and large textile and bakery establishments use starch and bulla flour.
- All consumers of enset-based food products (40 million people at 1.4 kg/day per capita availability)
- Private investors in enset production, processing and value addition
- Women and youth groups organized into SMEs and work on production, agro-processing and value addition of enset.
- 4.5 million job opportunities created by commercial farms.
- Institutions benefited from the capacity development.
- 5 million people to be employed in the production, handling, transportation, processing and marketing of enset products.
- All enset value chain actors (aggregators, transports, traders, buyers, bakeries, enset cooperatives),



- Ethiopian Government through taxes, foreign exchange earnings and import substitution.
- Federal and regional governmental institutions
- Non-government and civil society organizations
- Several young researchers, extension officers and University staff to gain capacity building project.

6. ALIGNMENT OF NEtDFP WITH NATIONAL, REGIONAL, & GLOBAL POLICIES AND INITIATIVES

Implementation of the NEtDFP aligns very well with various international, regional, and national policies and initiatives related to agriculture, climate change, food security, and sustainable development (*Fig 11*).

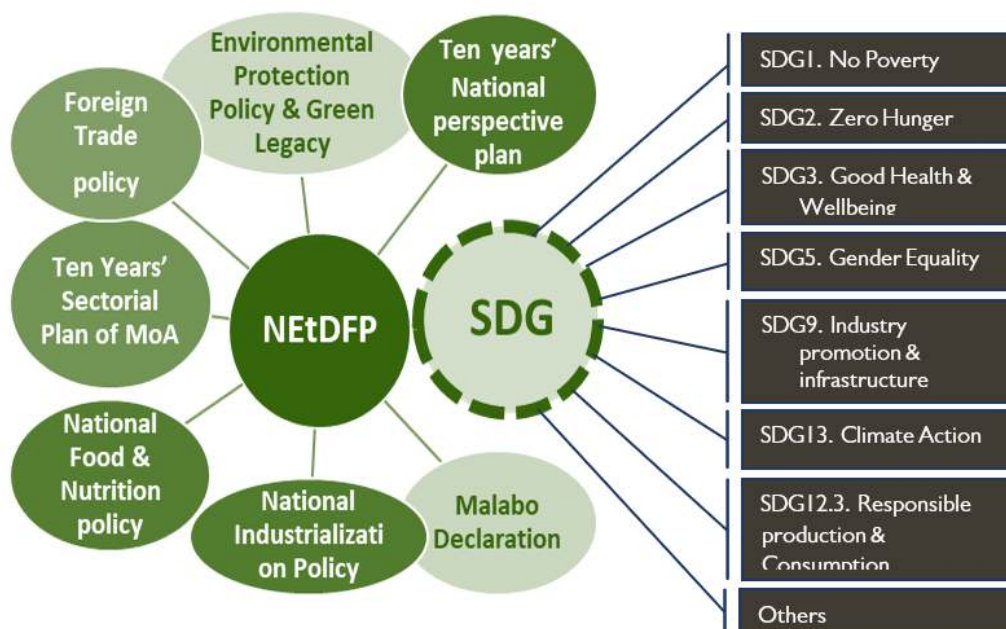


Figure 11. Illustration showing the NEtDFP alignment with different national, regional, and global commitments.



6.1. National Level

National Agricultural Development Plans: Like many countries, Ethiopia, has national agricultural development plans that prioritize agricultural productivity, food security, and rural development. The transformation of enset cultivation can be integrated into these plans by recognizing its potential as a resilient crop, promoting sustainable farming practices, and supporting the livelihoods of smallholder farmers. In the sector plan of Agriculture, Ethiopia has planned to get 950 million USD from the export of horticultural crops namely flowers, fruits, vegetables, root and tuber crops, including enset products. In all respects, the national enset development flagship program will have a significant contribution to the set plans and exceed most of the targets. This National Enset Development Flagship Program (NEtDFP) was irrefutably considered as a part of the midterm plan of the Ministry of Agriculture during the revision of the sector's 10-year plan recently. The project is complementary to the wheat flagship program by partially substituting wheat as a raw material locally, thereby significantly increasing wheat export.

Climate Change Adaptation and Mitigation Strategies: Countries are increasingly developing strategies and policies to address climate change impacts. Enset cultivation, which is characterized by high climate resilience and carbon sequestration, can be an impetus and relevant tool to ensure the successful and timely realization of positive impacts of the national climate change adaptation and mitigation endeavors. Promoting enset cultivation can be part of broader strategies aimed at building climate resilience in agriculture and reducing greenhouse gas emissions.

Ethiopia's emission contribution is negligible and accounts for only 0.53% of global GHG emissions (Ministry of Planning and Development, 2022). On the other hand, the climate vulnerability assessment indicates that agriculture, livestock, forest, water, biodiversity, health, infrastructure, and tourism are the most severely affected sectors and require intensive climate-smart adaptation



interventions. Therefore, the alignment of this flagship program and its pragmatic interventions that promote massive CO2 sequestration is a boon to the intended commitment of Ethiopia to meet Zero Emissions and move towards a low carbon and climate-resilient economy by 2050.

Food and Nutrition Policy and Strategy: By creating an enabling policy environment, the food and nutrition policy objectives will: Ensure the availability and accessibility of adequate food to all Ethiopians at all times. Improve accessibility, and quality of nutrition and nutrition-smart health services at all stages of the life span in an equitable manner. The national Enset development initiative, if successfully implemented, will provide leverage to all pillars of food and nutrition security.

Ethiopian Food Systems Road Map: Through committed implementation 22 key game-changing solutions, Ethiopia seeks to use a sustainable and healthy-diet-centred lens to transform food systems, uniting around a common goal of healthy and sustainable diets for all. The transformation of enset cultivation will immensely contribute to the realization of a sustainable food system and Enset, as part of the agroforestry system, has the transformative potential to reduce rural poverty, increase livestock feed, regenerate food systems, hinder land degradation, foster climate change mitigation, and adaptation, and contribute to biodiversity conservation.

Ethiopian Postharvest Management and Food Safety Strategies: Ethiopia has developed its own strategies on postharvest management and food safety, both of which are ready for implementation. Currently, postharvest management including processing and value addition, packaging, distribution, and storage are laborious and compromises



the safety of consumers. Therefore, in coherence with these strategies, will place due emphasis on the reduction of postharvest losses and food safety risks.

The country has recently developed the “Lemat Turufat” initiative to leverage the production of livestock and fisheries in the country. The NEtDFP acknowledges the importance of, and the positive progress being recorded of the initiative aspires to contribute the full realization of the intended outcomes. Overall, enset will continue to contribute to the livestock industry in Ethiopia by providing animal feed, supporting fodder conservation, enhancing soil fertility, and enabling integration with livestock-rearing systems. This integration helps ensure the availability of nutritious feed for livestock, improving their health and productivity.

Moreover, the interventions proposed in the enset transforming project will contribute to the realization of pertinent strategies and initiatives, such as, in the homegrown economy, the revised Agriculture and Rural Development Policy of Ethiopia, the National Food and Nutrition Policy and roadmap, National Nutrition-Sensitive Agriculture Roadmap, National Postharvest Management Strategy, National Roadmap on Sanitary and Phytosanitary (SPS), National Food Safety Strategy, Seqota declaration, Sodo declaration, horticulture roadmap.



6.2. Regional Level

African Union Agenda 2063: The African Union's development agenda emphasizes sustainable agriculture, food security, and environmental conservation. Enset cultivation aligns with these goals, as it promotes sustainable land use, resilience to climate change, and the preservation of cultural heritage.

The Malabo Declaration; serves as a framework for African countries to prioritize and coordinate their efforts in agricultural development, food security, and poverty reduction. It aims to accelerate progress towards achieving the targets set in the African Union's Agenda 2063 and the United Nations' Sustainable Development Goals (SDGs) which is very well aligned with the NEtDFP.

Comprehensive Africa Agriculture Development Program (CAADP): Enset cultivation can contribute to the CAADP's objectives of increasing agricultural productivity and food security in Africa. By diversifying agricultural practices and enhancing the resilience of smallholder farmers, enset cultivation aligns with the CAADP's focus on sustainable and inclusive agricultural development.

6.3. International Level

United Nations Sustainable Development Goals (SDGs): Enset cultivation contributes to several SDGs, including Zero Hunger (SDG 2), Climate Action (SDG 13), Life on Land (SDG 15), and Partnerships for the Goals (SDG 17). Enset's role in improving food security, climate resilience, biodiversity conservation, and sustainable agricultural practices aligns with the overarching objectives of the SDGs. Successful implementation of the NEtDFP can contribute to 12 (71%) of the 17 SDGs.



Paris Agreement on Climate Change: Enset cultivation supports climate change adaptation and mitigation efforts by promoting resilient agricultural systems, carbon sequestration, and sustainable land management. Enset's ability to thrive in diverse climatic conditions makes it relevant to the goals of the Paris Agreement.

By aligning with international, regional, and national policies and initiatives, enset cultivation promotion can benefit from policy support, funding opportunities, and institutional collaborations. It can also contribute to the achievement of sustainable development goals, enhance food security, and promote the resilience of agricultural systems in line with global and regional objectives.

7. RISKS ASSUMPTIONS AND MITIGATION STRATEGIES

7.1. Positive effects of the program

The major benefits of the National Enset Development Flagship Program (NEtDFP) are given under section 5.1. Specifically, this program will contribute to self-sufficiency in enset through increased production and productivity, enhance access to improved technologies, enhance the use of inputs and mechanizations, create an enabling environment for efficient enset marketing, and capacitate institutions for effective implementation/coordination and effective management of cross-cutting issues.

In addition, women's and youth empowerment increases through improving youth and women's owned enterprise value chains (producers, agro-dealers,



mechanization service providers, processors, aggregators, collectors, traders, etc.).

The program also contributes to mitigating climate change through sequestering CO₂, soil, and water conservation of the area through interception of heavy rain and litterfall. Its ability to sequester ample amounts of CO₂ makes the enset resource ideal for alleviating the Carbon Mitigation and Adaptation (MAD) challenge.

The program is designed to benefit both female and male youth regardless of race and religion. There is sufficient room to accommodate people with disabilities in the program implementing team as well as in any of the intervention activities. E.g., input provision, seedling raising, marketing, value addition of starch and fiber products, etc. Based on experience developed, the program is one of the most inclusive in nature as disabled people are equally benefited through engagement in value addition of food and non-food making business, e.g., in preparation of cakes, biscuits, waffles, etc., as food and non-food products like carpet, mat, baskets, bags, rags, etc. out of fiber.

7.2. Anticipated risk of the program and mitigation solutions

Enset transformation from the existing system to commercial cultivation may cause farmers displacement and habitat destruction. Expansion of enset cultivation to new regions might face challenge from cultural differences. Mass production and introduction of planting materials of enset to the new production regions may spread diseases and pests. Improved production management may create greater demand for improved processing technologies

which may not be readily accessible. Over production of enset products beyond the existing demand could lead to oversupply thereby negatively affecting future expansion. Commercialization of enset production may require better access to inputs which again may compete with other staple crops.

In the unlikely occurrence of the above-mentioned risks, due attention has been given to appropriate and affordable mitigation solutions. Table 1 provides mitigation strategies to pursue for the respective anticipated risks.

Table 1. Anticipated risks of NEtDFP and mitigation solutions

Anticipated Risk	Mitigation Solution
Transformation of the existing enset farming system to commercial cultivation may cause farmers displacement and habitat destruction	<ul style="list-style-type: none"> - Provide compensation for displaced people, - Engage and benefit farmers from the new farm, - Practices minimal disturbance of the environment - Design & practice habitat rehabilitation
Expansion of enset cultivation to new regions might face challenges from cultural differences	<ul style="list-style-type: none"> - Behavior Change Communication (BCC) to bring positive change in the diet of the people. - An extension approach with strong practical on cooking and utilization of Enset products
Mass production and introduction of planting materials varieties of enset to the new production regions may spread diseases and pests	<ul style="list-style-type: none"> - The newly developed nursery standard should be implemented. - Strengthen the plant quarantine system. - Advance promotion of integrated pest management (IMP)



<p>Improved production management may result in greater demand for improved processing technologies which may not be readily accessible</p>	<ul style="list-style-type: none"> - In place innovative financing for the private sector to engage in the multiplication of desired technologies - Support the development of affordable processing technologies
<p>Overproduction above the existing demand could lead to oversupply thereby negatively affecting future expansion.</p>	<ul style="list-style-type: none"> - Create sustainable marketing linkages for enset products both in domestic and export markets. - Diversify enset products through value addition. - Promote more branding and packaging
<p>Commercialization of enset production may increase the need for better access to inputs which again may compete with other staple crops.</p>	<ul style="list-style-type: none"> - Promote the use of on-farm inputs such as compost, vermicompost, farmyard manure, etc.

8. FINANCIAL INFORMATION

The NEtDFP is a large-scale national program that follows a value chain approach encompassing many sectors and all regional states for seven years. Although it is challenging to precisely estimate all required costs for this type of program at PCN level, we use analogues and parametric cost estimating tools and techniques so that the total program cost estimate is closer to reality.

8.1. Estimated Total Capital Cost

The total required cost of the program is 13,462,698,546.75 Birr including 10 % Contingency amounting to Birr 1,223,881,686.07 which is required to offset



cost variations as a result of different unforeseen events that may occur during program implementation.

8.2. Annual Operating Costs

The real benefits of the program will be realized after program completion. In this regard, the program needs to be sustainable to realize the outcomes and impacts of the program without creating a heavy burden on the current Government budget as a result of the incremental recurrent budget requirement of the NEtDFP.

Taking the minimum rate 0.02 of the above empirical evidence, the annual operating cost requirement of the NEtDFP is estimated to be Birr 244,776,337.21 after the implementation period. Although there are different Development Partners that are financing the operation and maintenance costs of similar programs, it is assumed that the Federal and the 12 Regional States targeted by this program will finance the annual operating cost indicated below from their government budget.

8.3. Revenues of the Program

The program at its full capacity will significantly contribute to generating tax and foreign exchange revenue for the Government. However, the major revenue that will be generated by the smallholder producers and the medium and large-scale private investors will be the direct contribution of the NEtDFP program from increased production and productivity of Enset during and after the program investment period. Because of improved management interventions of the existing Enset production area and the new expansion of Enset farms which will be directly supported by the Program, revenue from the



sales of *Kocho*, *Amicho*, *Bulla*, Enset leaf and Fiber products to the local and export market will be collected by targeted beneficiaries.

Sales from processed products are the other sources of revenue that will be received by beneficiaries along the value chain. The revenue that will be generated through the significant contributions of the Program to the benefits of its targeted beneficiaries during and after the program period is summarized in *Fig.12* given below.

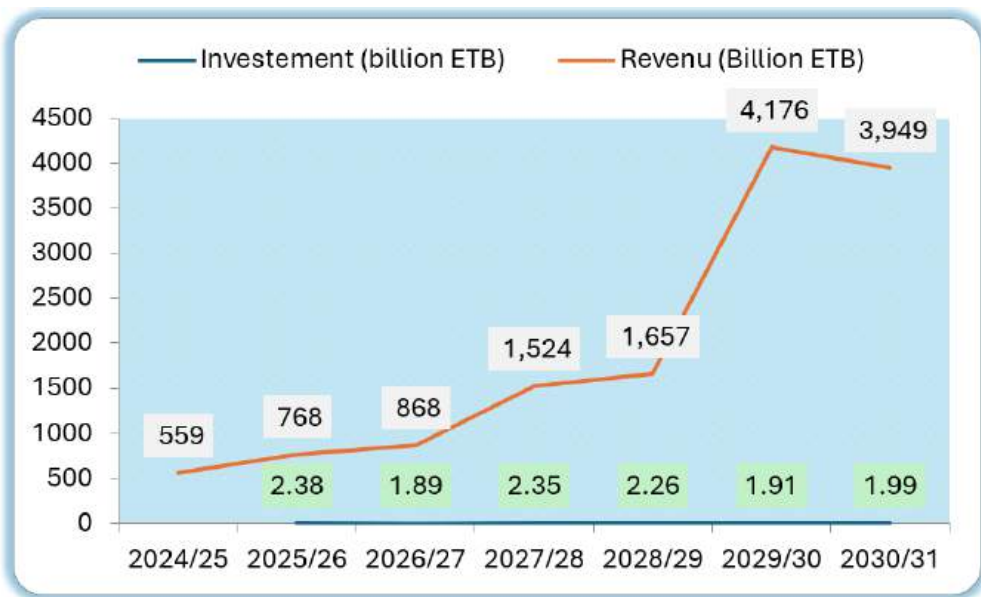


Figure 12: Cost-benefit analysis of the NEtDFP

Anticipated IRR: The Net Present Value at 12% discount rate is calculated to be Birr 3,917,727,416,442.17 and the result of the Financial Internal Return (IRR) of the Program that makes the NPV zero is 902.41%.

The details of the financial breakdown of the program cost and revenues are given in Appendix 1.



The program target dates of 4.1 are justified as follows:

- Enset is currently produced mainly under a rain-fed production system. However, soon, irrigated enset farming system will be in place through intensification, expansion to new areas, and commercialization of the commodity. The rain-fed cropping season ranges from June/July to Oct./Nov. and during the rainy season while the irrigated one can be implemented anytime except the rainy season.
- Therefore, in accordance with the above production systems, NEtDFP document preparation and its appraisal shall be completed in Sept/Oct 2024 (expectation or can be denoted as X 1st year, the year of commencement of the project)).
- For the main season enset production, procurement notices, award contracts, and beginning and finalization of works should be completed, at least two months before the onset of rainfall.
- For the irrigated enset production system, procurement notice, award contracts, and beginning and finalization of works should be completed before operationalization of the activities.
- NEtDFP, therefore, is proposed to be managed/ coordinated by Program Coordination Units/Offices with its institutional arrangement based on existing government structures. At the national level, activities that are planned to be performed by the component will be coordinated by the Program Coordination Unit. Similar structures will be established at all Regional States. However, at the woreda level, focal persons will be assigned to all targeted woredas.
- At all levels, the PMUs will perform program oversight, backstopping, and implementation support. The total number of personnel that will be permanently recruited over the program period will be 164 in number.



9. PREVIOUS EXPERIENCE IN IMPLEMENTING SIMILAR PROGRAMS

The Ministry of Agriculture (MoA) is a mature institution (established in 1907) staffed with well-seasoned experts working under the federal agriculture, regional agricultural bureaus, and its affiliate strong institutions such as EIAR, ATI, BDI, Agricultural Authority, Coffee and Tea Authority and Ethiopian Cooperative Commission with reach experience in crafting and successfully implementing programs of various sizes.

An EU-funded program called “Living Larder to Wealth Creation for Resilient Highland Communities in Southern Ethiopia, Wolayita Zone” with a major focus on Rural Job Creation and Transforming Agricultural Technologies has a number of successful achievements that can inspire the proper implementation of NEtDFP.

The development and commercialization of starter media named Lucy to enhance the fermentation of *Kocho* is the credible output of programs of Arba Minch University (AMU). The work of AMU and WKU on packaging and branding of the starter media is a good lesson to follow in branding other Enset products.

Moreover, the mechanization of processing of Enset into *Kocho*, *Bulla*, and *Amicho* has been achieved through the unreserved effort of AMU, WKU, Bako Agricultural Research Center, and others. Organizing youth and women into business groups as service providers of Enset processing has been tested through the program at AMU and WKU. In-situ and ex-situ collection and preservation of Enset germplasm at Arba Minch University, Areka Research Center, and BDI are huge achievements.



MoA has good experience in implementing programs on agro-forestry systems like coffee plantation improvement through a series of Coffee improvement programs (CIP I to IV programs).

The experience of establishing nurseries under different agro-ecologies as potential suppliers of quality planting materials for expansion of Avocado production can be the exemplary approach of the Mashav Avocado Program which our Enset Development program can follow.

The most recent success story of the SNNP in promoting fruit production through 30:40:40 initiatives envisaged to establish 100 fruit trees in three years (Papaya, Avocado, Banana and Apple) per in every household of the region can be adopted to mobilize the community to achieve a common goal. Based on the lesson learnt, the BoA in the region has launched another initiative called 15:20:15 to plant 50 enset plants in three years. This can be a foundation for the intended intensification intervention designed in this program.

Worth mentioning is also the successful management experience of the MoA on the Green Legacy. Therefore, the MoA and its affiliated/associated federal and regional institutions have recognized and verified experience to run such a flagship program throughout the country at a higher scale sustainably.

10. INSTITUTIONAL ARRANGEMENT

This enset program is multisectoral and requires the engagement of several key stakeholders. Table 2 depicts the list of stakeholders consulted during the preparation of the program document. They are key institutions that need to be involved in the implementation of the proposed program in accordance with



the MoU to be assigned after the approval of the program. The Ministry of Agriculture will oversee the national Steering committee and Regional Agricultural Bureaus will follow the established channel. The EIAR will have a parallel coordination of with the national PMU to oversee the financial and technical aspects of research activities under the NEtDFP (Fig. 13).

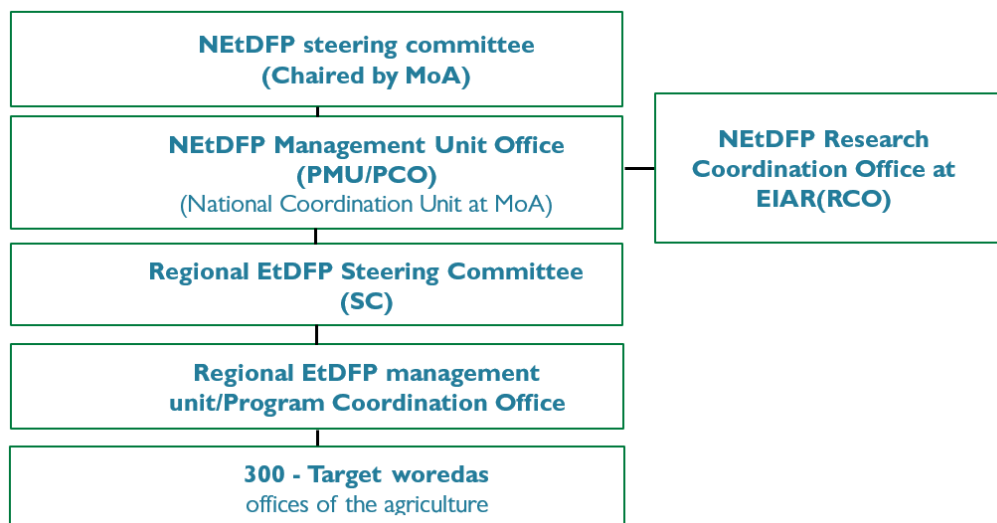


Figure 13. Institutional arrangement of NEtDFP



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APPENDICES

Appendix Table 1. Implementation plan for the National Enset development Flagship Program

No	Program milestones	2024	2025	2026	2027	2028	2029	2030
	Goal: Ensure food security for 40 million Ethiopians and provide surplus for local industry and the export market by 2031							
	Program development objectives (PDO): Transforming Enset production, productivity, processing and marketing							
I	Outcome 1: Enhanced production and productivity of enset through intensification and expansion							
I.1.	Multiply and supply breeder and pre-basic seeds							
I.2.	Training for breeder and pre-basic seed multipliers							
I.3.	Enset planting materials standard developed							
I.4.	Develop standards for enset seeds (planting materials)							
I.5.	Deliver technical backstopping to basic and certified seed producers							
I.6.	Create women and youth producer associations							
I.7.	Distribute planting materials to established Coops							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
I.8.	Link enset farmers cooperatives and or unions with saving and credit financial institutions							
I.9.	Organize Platform and workshop							
I.10.	Increase public and private modern seed multiplication centers							
I.11.	Increase seed multiplication using TC							
I.12.	Deliver technical backstopping and trainings to FCUs							
I.13.	Deliver technical backstopping and trainings to commercial growers							
I.14.	Awareness creation for actors to be engaged in commercial enset production							
I.15.	Organize youth and women groups to be engaged in enset production							
I.16.	Deliver technologies, information and finance for active involvement of Farmers Cooperative Unions (FCUs) and private sector in enset production							
I.17.	Develop enset production farm implements							
I.18.	Multiply and disseminate enset production farm implements							
I.19.	Develop National Enset development policy							
I.20.	Develop National Enset roadmap							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
I.21.	Develop Enset development and marketing strategy							
I.22.	Conduct an assessment to identify the existing gaps on enset production and expansion							
I.23.	Conduct suitability map for enset production							
I.24.	Develop integrated soil fertility management practices							
I.25.	Prepare compost for ISFM implementation							
I.26.	Demonstrate and scale-up recommended type and rate of fertilizers							
I.27.	Conduct training on irrigation water management and drainage practices							
I.28.	Conduct training on irrigation water management and drainage practices							
I.29.	Establish annual enset disease survey and surveillance, and early warning system							
I.30.	Conduct training on integrated pest management (IPM) and scouting							
I.31.	Train plant health clinic experts							
I.32.	Prepare IPM Guidelines							
I.33.	Organize Workshop to promote the guidelines							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
I.34.	Enset farming system intensification with compatible crops, forage and trees							
I.35.	Map the potential of carbon trade							
I.36.	Introduce enset as integrated Soil and water conservation practices							
I.37.	Establish enset eco-tourism centres							
I.38.	Organize national enset day (E-DAY)							
I.39.	Establish national Enset Museum Centre							
I.40.	Train plant regulatory experts							
I.41.	Strengthen internal quarantine system							
I.42.	Test the suitability of improved enset varieties for irrigated agro ecologies at 20 trial sites							
I.43.	Developing and recommending type and rate of fertilizers							
I.44.	Develop integrated irrigation agronomy technology							
I.45.	Demonstrate integrated irrigation agronomy technology							
I.46.	Test the adaptability of improved enset varieties across different agro ecologies at 70 trial sites							
I.47.	Scale-out the selected varieties across different agro-ecologies							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
1.48.	Train researchers and lab technicians on TC lab management and disease indexing							
1.49.	Conduct pesticide testing (efficacy, toxicology) and registration							
1.50.	Conduct training of woreda's extension staff and administrators							
1.51.	Establish and strengthen tissue culture laboratory with screenhouses							
1.52.	Establish classical enset seedling propagation nurseries							
1.53.	Strengthen existing classical enset seedling propagation nurseries							
2	Outcome 2: Improved processing and value addition							
2.1.	Conduct needs assessments to identify the existing gaps on enset processing, value-addition and market linkage							
2.2.	Organize youth and women groups to be engaged in enset processing and value addition							
2.3.	Conduct needs assessments in seven regions to identify needs and existing gaps of enset processing technologies							
2.4.	Selection and validation of appropriate enset processing technologies							
2.5.	Develop and standardize improved enset processing machines							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
2.6.	Organize national enset processing technologies exhibition							
2.7.	Mass multiplication of proven enset processing machines							
2.8.	Demonstration of enset processing devices for enset growing community							
2.9.	Develop machinery service providers guideline							
2.10.	Prepare guideline for dissemination							
2.11.	Support distribution of proven enset product fermentation vessel/ jars							
2.12.	Develop a well-defined enset starter culture for multiple agro ecologies							
2.13.	Validate standardized enset starter culture for multiple agro ecologies							
2.14.	Promote the use of improved enset fermentation vessel/jars for different agro ecologies							
2.15.	Promote standardized enset starter culture for multiple agro ecologies							
2.16.	Production of different types enset flour for domestic and export market							
2.17.	Promote the use of enset flour for export and domestic market							
2.18	Demonstrate enset paste (Kocho & bulla) drying, milling and packaging technologies for enset selected beneficiaries							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
2.19.	Distribute enset paste drying, milling & packaging technologies for selected beneficiaries							
2.20.	Establish model enset processing sites							
2.21.	Strengthen model enset processing service centres							
2.22.	Identify the existing gaps on enset processing and value-addition							
2.23.	Develop nutrient rich enset based food products							
2.24.	Promote nutrient rich enset-based food products							
2.25.	Develop non-food enset based products (starch, feed, sack, rope etc)							
2.26.	Develop standards for non-food enset based products							
2.27.	Develop biodegradable enset packaging technologies							
2.28.	Train private firms, women and youth cooperatives to develop and market biodegradable packaging materials for enset based food products							
3	Outcome 3: Improved marketing, infrastructure, logistics and utilization of enset products							
3.1.	Conduct need assessment to identify the existing gaps on enset market linkage							
3.2.	Improve market information system							

No	Program milestones	2024	2025	2026	2027	2028	2029	2030
3.3.	Collect information on major Enset producers, processors, aggregators, buyers/traders to create company profile and geo-reference locations							
3.4.	Create strong linkages in the value chain inclusive B2B platforms between farmers, processors, input dealers, and financial service providers							
3.5.	Develop enset market infrastructure (e.g., collection and aggregation centres etc.)							
3.6.	Branding by product certification							
3.7.	Branding by agro ecology/speciality							
3.8.	Branding by value addition							
3.9.	Provide skills building trainings for different actors (experts, service providers, technicians & maintainers) on mechanical enset processing							
4	Outcome 4: Program management							
4.1.	Prepare feasibility study							
4.2.	Prepare PIM							
4.3.	Prepare Structure, staffing plan and ToR at all levels							
4.4.	Conduct Steering Committee Meeting							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
4.5.	Recruit Staff							
4.6.	Procure materials, equipment and vehicles							
4.7.	Identify and map stakeholders							
4.8.	Prepare participatory roles and responsibilities							
4.9.	Sign MoU between the program management and each stakeholder							
4.10.	Organize consultative workshops							
4.11.	Commission and conduct independent baseline study							
4.12.	prepare and operationalize monitoring, evaluation and supervision manual							
4.13.	Conduct supportive supervision							
4.14.	Monitor program progress and results							
4.15.	Evaluate program achievements periodically (mid-term, and end line)							
4.16.	Prepare and implement program information management system							
4.17.	Put in place learning and Knowledge Management system and operationalize							
4.18.	Prepare and implement financial manual							
4.19.	Prepare and implement procurement manual							



No	Program milestones	2024	2025	2026	2027	2028	2029	2030
4.20.	Prepare and implement audit manual							
4.21.	Prepare and implement property administration manual							
4.22.	Provide trainings on different program manuals (management system)							
4.23.	conduct experience sharing							
4.24.	Avail vehicles, motorbikes, office furniture and equipment							
4.25.	Prepare and disseminate quality and timely Physical and financial plan							
4.26.	Prepare and report physical and financial report on time as per standard							

Appendix Table 2. The details of the financial breakdown of NETDFP's costs and revenues

Year	2023	2024	2025	2026	2027	2028	2029	2030 Total (cumulative)
I. Area, production & productivity								
Area under SHF ('000 ha)	1000	1100	1250	1500	1600	1770	1930	2090
Number of plants ('000)	2000000	2200000	2500000	3000000	3200000	3540000	3860000	4180000
Productivity (Kg plant ⁻¹)	60	70	90	105	110	115	120	120
Production from SHF (million tons)	12,000,000.00	14,000,000	18,000,000	21,000,000	30,800,000	708,4000	42,000,000	54,000,000.00
Area under commercial farm ('000 ha) harvested area	0	75	150	175	200	250	250	250
Number of plants ('000)	0	0	0	0	35	110	163	188
Productivity (Kg plant ⁻¹)	0	150000	300000	350000	400000	500000	500000	500000
Production from commercial (million tons)	0	0	0	0	110	120	120	120
Production total	200000	14,000,000	18,000,000	21,000,000	30,800,000	24,000,000	39,000,000	45,000,000.00
Number of plants harvested ('000)	12000000	14,000,000	18,000,000	21,000,000	38,500,000	33,484,000	81,000,000	99,000,000.00
Planting material multiplication								
N ₀ nurseries established	26	52	78	104	130	156	182	208
N ₁ seedlings raised through nursery ('000)	260	390	650	260	442	416	416	-5434
N ₂ seedlings propagated through TC ('000)	225	225	75	75	150	0	0	-750
Total planting material multiplied ('000)	485	615	725	335	592	416	416	-6184
Fertilizer required (tons)								
Fertilizer-Urea (tons)	261	307	365	437	470	527	569	611
Value in USD	261000	306675	365400	437175	469800	527220	568980	610740
Fertilizer-NPS (tons)	122	143	171	204	220	246	266	285
Value in USD	1000000	1175000	1400000	1675000	1800000	2020000	2180000	2340000
Fertilizer Total (tons)	383	450	536	642	689	774	835	896
Total Value in USD	1261000	1481675	1765400	2112175	2269800	2547220	2748980	2950740
Compost/Vermi-compost in tons	20000	23500	28000	33500	36000	40400	43600	46800
Value in USD	666667	783333	933333	1116667	1200000	1346667	1453333	1560000
Mechanization								
N ₀ technologies for production & PHH	900,256.00	901,210.00	901,804.00	1,203,405.00	1,501,206.00	1,700,705.00	1,900,702.00	600,500.00
Value in USD	15,636,220.33	21,241,806.85	25,986,730.37	43,154,398.74	42,896,212.27	49,446,141.07	60,055,864.75	22,322,229.59
II. Amount of Kocho WET BASIS								
Amount for home consumption (tons)	6216000	7252000	9324000	10878000	19943000	17344712	41958000	51282000
Value in USD ('000's)	4972800	5439000	6526800	7070700	2018232	9572640	10878000	12,587,400.00
Amount for Fresh Amanket (tons)	2486400	2719500	3203400	3533500	4786320	1009116	5439000	6,293,700.00
Value in USD ('000's)	621600	942760	1491840	2066820	5544154	7308027	13348860	14219100
Value in USD ('000's)	4492772	54092772	27046386	4492772	54092772	27046386	4492772	54092772

Year	2023	2024	2025	2026	2027	2028	2029	2030 Total (cumulative)
Value in USD (1,000's)	41,440.0	62,850.7	99,456.0	137,788.0	36,891.03	48,720.18	88,992.40	9,479,400.00
Amount for industry (tons)	12,432.0	362,600	745,920	1,196,580	354,985.4	643,076.3	1,460,760.0	20,233,080.00
Value in USD (1,000's)	12,432.0	362,600	745,920	1,196,580	354,985.4	643,076.3	1,460,760.0	20,233,080.00
Amount for Export	12,432.0	145,940	186,480	217,560	598,290	830,540	1,522,920.00	4,009,320.00
Value in USD (1,000's)	14,540.0	169,113	217,560	253,820	698,005	968,964	1,776,740.00	4,677,540.00
III. Amount of Bulla WET BASIS	18,000.0	21,000.0	27,000.0	31,500.0	57,750.0	502,160	121,500.0	1,485,000.00
Amount for home consumption (million tons)	14,400.0	15,750.0	18,900.0	20,475.0	37,725.0	584,430	31,500.00	364,500.00
Value in USD (1,000's)	19,200.0	21,000.0	25,200.0	27,300.0	36,960.0	779,240	42,000.00	486,000.00
Amount for Fresh market (million tons)	18,000.0	27,300.0	43,200.0	59,850.0	160,545.0	211,622.0	386,550.00	411,750.00
Value in USD (1,000's)	30,000.0	45,500.0	72,000.0	99,750.0	267,575.0	352,704.0	644,250.00	686,250.00
Amount for industry (million tons)	3,600.0	10,500.0	21,600.0	34,650.0	102,795.0	186,219.0	423,000.00	221,400.00
Value in USD (1,000's)	6,600.0	192,500	396,000	635,250	1,884,580	341,402.0	775,500.00	405,900.00
Amount for Export (tons)	6,600.0	42,500	54,000	63,000	173,250	240,500	441,000.00	116,100.00
Value in USD (1,000's)	7,200.0	84,000	108,000	126,000	346,500	481,010	882,000.00	232,200.00
IV. Amount of Amicho WET BASIS	56,940.0	65,380.0	84,060.0	98,070.0	179,750.0	156,370.8	378,700.0	462,330.00
Amount for home consumption (tons)	50,436.0	58,842.0	75,654.0	89,263.0	129,452.40	297,740.5	1,765,260.00	22,692.00
Value in USD (1,000's)	126,090.0	147,105.0	189,135.0	220,657.5	323,631.0	744,351.0	441,315.00	567,405.00
Amount for Fresh market (tons)	56,040.0	65,980.0	84,060.0	98,070.0	431,508.0	1,019,863.0	1,651,800.00	1,933,380.00
Value in USD (1,000's)	186,800.0	217,933.0	280,200.0	326,990.0	1,438,360.0	3,397,954.0	5,510,600.00	6,444,600.00
Amount for industry (tons)	0.0	0.0	0.0	0.0	719.80	246,576.0	364,600.00	420,300.00
Value in USD (1,000's)	0.0	0.0	0.0	0.0	299,658.0	1,027,400.0	1,517,750.00	1,751,250.00
V. Amount of leaves (1000's)	26,000.0	53,820.0	78,000.0	96,200.0	106,080.0	129,428.0	135,520.0	1,465,100.00
Amount for home use (leaves 1000's)	14,000.0	28,980.0	42,000.0	51,800.0	571,200.0	696,920.0	728,800.00	788,900.00
Value in USD (1,000's)	11,666.7	241,500.0	350,000.0	431,667.0	476,000.0	580,767.0	606,900.00	657,417.00
Amount for livestock feed (leaves 1000's)	78,000.0	161,460.0	234,000.0	288,600.0	318,240.0	388,284.0	405,756.00	439,530.00
Value in USD (1,000's)	65,000.0	134,550.0	195,000.0	246,500.0	265,200.0	323,570.0	338,130.00	366,275.00
Amount for Fresh market (leaves 1000's)	78,000.0	161,460.0	234,000.0	288,600.0	318,240.0	388,284.0	405,756.00	439,530.00
Value in USD (1,000's)	91,000.0	188,370.0	273,000.0	336,700.0	371,180.0	452,980.0	473,882.00	512,785.00
VI. Amount of Fiber	100	207	300	370	408	498	520	564
Amount for home use (tons)	1	2	3	4	4	5	5	6
Value in USD	0	1	1	2	2	2	2	2
Amount for Fresh market (tons)	99	205	297	366	404	493	515	558
Value in USD (1,000's)	50	102	149	183	202	246	257	279



Year	2023	2024	2025	2026	2027	2028	2029	2030 Total (cumulative)
Benefits								
N _a people to feed								
Soil Conserved (tons)								
CO ₂ Sequestered (CO ₂)								
N _a Jobs Created	5111673							
N _a Entrepreneurs established	2116							
N _a processing centers established	100							
Grand Total Value In USD	6,530,376.58	9,322,756.66	12,797,539.75	14,472,909.36	25,405,896.16	27,617,391.43	69,598,769.67	65,812,267.95
Grand Total Value In ETB	391,822,595,000.00	559,365,399,650.00	767,852,385,000.00	868,374,561,500.00	1,524,355,769,600.00	1,657,043,485,910.00	4,175,926,179,990.00	3,948,736,076,825.00
Export value (000USD) in project life	152,240.000	177,613,333	228,360.000	266,420.000	732,655.000	1,017,064.693	18,649,400.000	4,909,740.000
in million birr	391,822.60	559,365.40	767,852.39	868,374.56	1,524,355.77	1,657,043.49	4,175,926.18	3,948,736.08
	2,647,448.58	4,643,681.33	6,590,023.75	8,084,240.36	14,206,148.63	27,706,626.29	37,892,165.67	45,374,983.95
	3889298.00	4679075.33	6207516.00	6388669.00	11199747.53	-89234.86	31706604.00	20437284.00
CO ₂ Sequestered (CO ₂)								
N _a Jobs Created	5111673							
N _a Entrepreneurs established	2116							
N _a processing centers established	100							



The document is prepared by:

Mr. Abdella Negash, MoA	Chairperson
Dr. Mekuria Tadesse, EIAR	Secretary
Prof. Ali Mohammed, Jimma University (affiliated MoA)	Member
Dr. Fekadu Gurmu, EIAR	Member
Dr. Zerihun Yemataw, DG SARI	Member
Mr. Gutu Mijena, MoA	Member
Dr. Addisu Fekadu, Arba Minch University	Member
Mr. Tamiru Dibaba, EIAR	Member
Mr. Minilik Tsega, EIAR	Member
Mr. Ermias Mengistu, MoA	Member
Mr. Belayneh Nigussie, MoA	Member
Dr. Mulugeta Teamer, MoA	Member



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