APPROACHES TO CLIMATE-SMART AGRICULTURE

A Review of Good Practices from Czech Development Cooperation Projects in Ethiopia

2009–2023

People in Need

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LIST OF ABBREVIATIONS

ADLI	Agriculture and Development Led Industrialisation
AFS	All for Soil
AITC	Agricultural Innovation and Technology Centers
ATA	Agriculture Transformation Agency
A-TVET	Agriculture Technical and Vocational Trainings
BoAD	Bureau of Agricultural Development
CA	Conservation Agriculture
CIP	Centro Internacional de la Papa – International Potato Center
CRGE	Climate Resilient and Green Economy Strategy
CzDA	Czech Development Agency
CGS	Czech Geological Survey
DAs	Development Agents/Development Armies
FAO	Food and Agriculture Organisation UN
FTCs	Farmer Training Centres
GAP	Good Agricultural Practises
GHG	Greenhouse Gas
GSE	Geological Survey of Ethiopia
GTP I, II	Growth and Transformation Plan
HDA	Health Development Army
HH	Household
HLC	Healthy Living Clubs
IAIP	Integrated Agro-Industrial Parks
I/NGOs	International / Non-governmental Organisations
IPCC	The Intergovernmental Panel on Climate Change
IWM	Integrated Watershed Management
MoARD	Ministry of Agriculture and Rural Development
MFA	Ministry of Foreign Affairs
MENDELU	Mendel University in Brno
MERET	Managing Resources to Enable Transition to Sustainable Livelihoods
MSME	Micro, Small and Medium Enterprises
NRM	Natural Resource Management
NBS	Nature-based Solution
ODA	Official Development Assistance
OFSP	Orange-Fleshed Sweet Potato
PSNP	Productive Safety Net Programmes
PIN	People in Need
SMS	Sector Matter Specialist
SNNPR	Southern Nations, Nationalities and Peoples' Region
TYDP	Ten Year Development Plan (2021–2030)
WASH	Water, Sanitation and Hygiene
WAO	Woreda Agriculture Office
WMCs	Watershed Management Committee

Published by: People in Need (PIN), August 2024

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Acknowledgements: Authors of the publication are grateful for the contributions from People in Need's teams in Ethiopia, Mendel University in Brno, the Czech University of Livelihoods in Prague, All for Soil, Holistic Solutions and others, who shared their experiences of agriculture development in Ethiopia. The authors would also like to thank the Czech Development Agency for their financial contribution to this publication through the "Participatory Development of Productive Landscapes in Sidama II" project.

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1. CONTEXT OF PUBLICATION

1.1 Czech Development Cooperation in Ethiopia: An Overview

Ethiopia and the Czech Republic share a long history of mutual cooperation which includes development cooperation, humanitarian aid, scholarships and business relations. The objectives of this publication are to present experiences from successfully implemented development projects, which have focused on climate-smart agriculture and demonstrate cooperation between these two countries.

With a total population of 117.88 million (as of 2021), Ethiopia is the second most populated country in Africa. 77.83 per cent of the country's population live in rural areas and engage in agricultural activities as their main source of livelihood. As elaborated on in further detail in this publication, Ethiopia, as a vast country whose economy generates income primarily from agriculture, has a high degree of vulnerability to rising temperatures and changing weather patterns, due to its reliance on rainfed agriculture and natural resources. Such factors, compounded by rapid population growth and the degradation of natural resources, mean that Ethiopia is not able to meet production standards, adequately feed its population and overcome poverty.

As such, the importance of climate-smart agriculture is strongly linked with the need for sufficient food production, better nutrition, climate resilience and adaptability, as well as the wellbeing of the population and sustainable development.

To respond to this, climate-smart programming and natural resource management (NRM) programmes

Watershed rehabilitation, Halaba, 2020

implemented to date have been part of the Ethiopian governmental strategies for many years. Recently though, the topics of climate smart agriculture and climate resilience have become more clearly pronounced, not only within the country's Growth and Development Plan, but also across other strategy papers which aim to improve the stability of agricultural production and the adaptability of agriculture systems to climate change.

The first agricultural climate resilience projects focused on reforestation and were carried out in 2008 with financing from the Czech Official Development Assistance (ODA) budget. This publication maps the long-term cooperation which has been ongoing since the formulation of the first Memorandum of Understanding between the Czech Ministry of Foreign Affairs and the Ethiopian Ministry of Finance and Economic Development (MoFED)1. This led to the classification of Ethiopia as a priority country for Czech development cooperation in 2010 and, subsequently, the formulation of bilateral Development Cooperation Programmes between 2012–2017 and more recently between 2018–2023, under the supervision of the Czech Development Agency (CzDA).

The initial programme period (2012–2017) prioritised agriculture (forestry and fishing), environment (water and disaster risk reduction) and social development (education and health). The subsequent strategy (2018–2023) further emphasised the

Water harvesting system at FTC premises, Sidama, 2019

importance of climate change adaptation and resilience in Ethiopia, and the following three key objectives linked to Sustainable Development Goal (SDG) 13 on Climate Action and SDG 15 on Life on Land were introduced:

I. **Agriculture and rural development** – ensuring universal access to safe, nutritious, and sufficient food at all times of the year; introducing sustainable soil and landscape management strategies
II. **Sustainable management of natural resources** – ensuring universal and equal access to safe and affordable drinking water and to adequate sanitary and hygiene facilities (with specific regard to the needs of women, girls, and young children); building sustainable drinking water supply systems
III. **Humanitarian assistance** – ensuring a reduction of vulnerability overall and building resilience to climate impacts and security risks.

The development of agricultural programmes has been closely interlinked with other sector programming, for example in the fields of natural resource management, livelihoods, food security, economic development and humanitarian response to recurrent natural hazards. Following multiple project cycles, many improvements have been made in terms of programme design, alignment of strategies and the harmonisation of approaches among the Czech and Ethiopian partners. Major improvements in coordination has been seen in terms of:

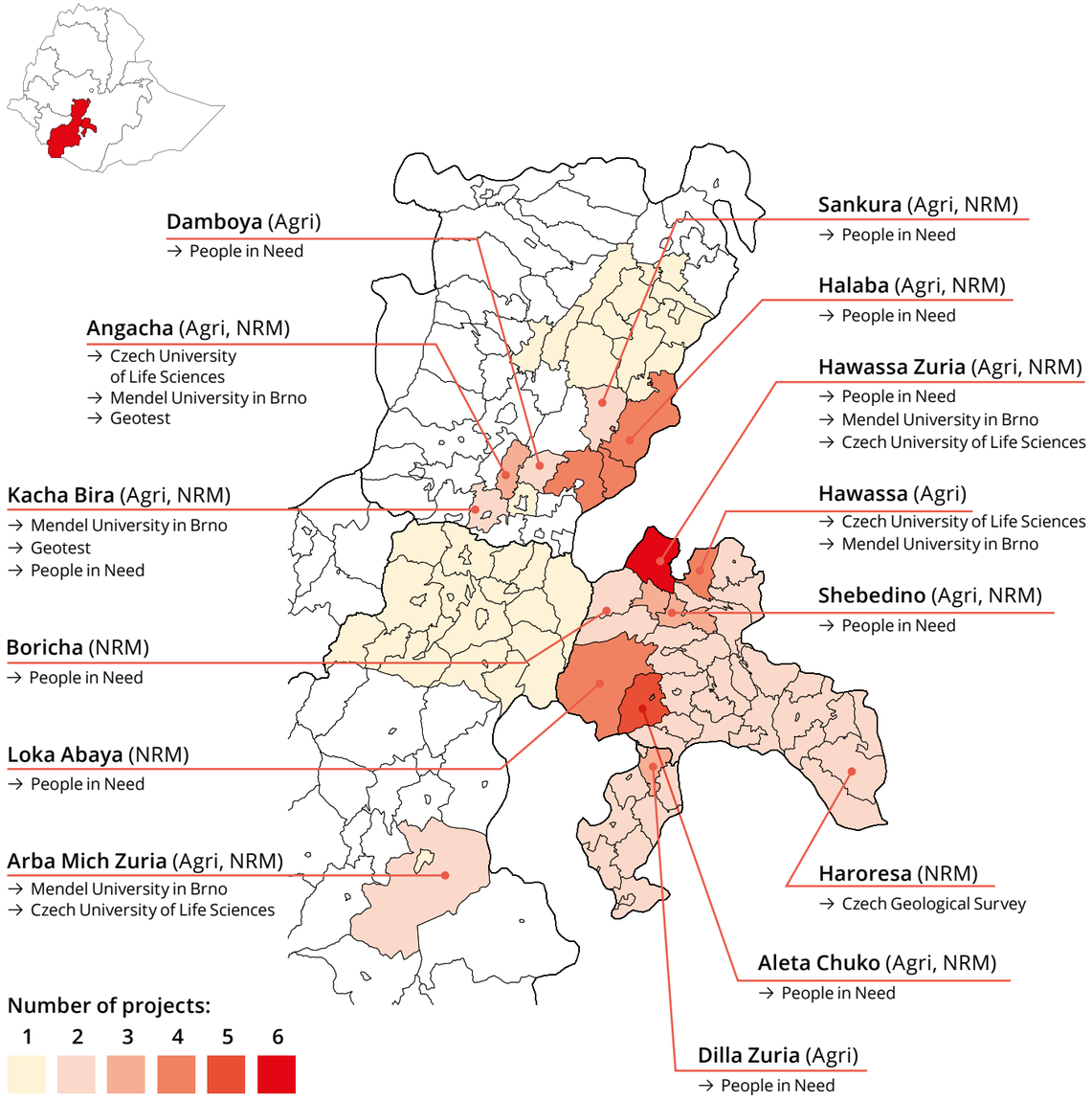
a. geographical coordination – projects being gathered in the same or neighbouring areas
a. the integration of sectors – projects with different scope being integrated together in one area

Examples of good practice from CzDA initiatives can be found in projects implemented in Sidama, Gedeo and the Alaba zones. These projects combine a focus on appropriate and good agricultural practices (GAP), sustainable livelihoods, NRM techniques, local capacity strengthening, and climate-smart agriculture with the majority also being linked to CzDA projects in the Water, Sanitation and Hygiene (WASH) sector, which deal with water supply, the rehabilitation of water sources, and sanitation in communities. Through such integration of programming, projects have a very positive impact on entire villages and communities, as they are able to address multiple challenges simultaneously. Besides the direct benefits to the local population, water sources, whether they target nurseries or fields, have been established and maintained, which means that agricultural production and forests can prosper, which in turn positively contributes to the socio-economic situation of the targeted areas as well.

Agricultural projects require long-term commitment because positive change in relation to natural ecosystem dynamics cannot be achieved within a short period of time. Both nature and people need time to adapt and adopt. Thanks to the CzDA's strategic support to agricultural programming over 15 years, improvements can be observed and CzDA alongside its implementing partners have become well recognised actors in Ethiopia. Indeed, local administrative bodies value long term partnerships and cooperation, which today is based on personal relationships.

The next steps for future cooperation between CzDA and Ethiopia would include: building on the previous good practices; integrating projects which focus on the comprehensive development of a particular area; the sharing of best practices by neighbouring woredas or zones (learning by doing); and the integration of commonly used indicators for monitoring and evaluation purposes.

1.2 Projects implemented in the timeframe 2010–2020 Key



1.3 Implementing Agencies

Ethiopia and the Czech Republic enjoy a long history of cooperation and a variety of stable partnerships on an institutional level as well as in technology transfers. Soon after the establishment of the CzDA in 2008, new programmes of bilateral cooperation were initiated in 2010, smoothening the cooperation, and allowing multiple partners from both sides to provide direct assistance to vulnerable communities including those imminently affected by environmental degradation and related challenges.

People in Need Ethiopia

People in Need

PIN has been working in Ethiopia since 2003. PIN's offices in Ethiopia are led by a country director and comprise of several departments which ensure the effective management of entrusted projects and operations. In addition to CzDA, PIN enjoys the support of many donors, including the European Commission (EC), the UK's Foreign, Commonwealth and Development Office (FCDO), European Civil Protection and Humanitarian Aid Operations (ECHO), UN Office for the Coordination of Humanitarian Affairs (OCHA) and a variety of other national and private donors.

Since 2003 the character of PIN's programming has changed, as have the sectors covered. Initially PIN supported the education sector, before programming expanded into WASH and agriculture sectors, social programmes, and humanitarian aid. In 2024, PIN works in the following four main programming areas in Ethiopia and implement various long-term projects:

→ Environmental, livelihoods and agriculture
→ Water, sanitation and hygiene
→ Education and social inclusion and employment
→ Emergency assistance

PIN has carried out its agricultural projects in Ethiopia in line with its own long-term strategies, including the Sustainable Livelihoods and Environment strategy for 2016-2022, and the Climate Resilience Pillar of its Global Strategy for 2023-2028. As an ongoing programme, PIN has been following its Environment, Livelihoods and Agriculture Programme Strategy (ELAP) since 2009.

Mendel University in Brno

Mendel University in Brno

Mendel University in Brno (MENDELU) has been working in Ethiopia since 2010. With over 10 years' experience in country, it has a sound record of successful development projects and interventions in Ethiopia which respond to global as well as local environmental challenges (see the table in Annex 1 for all projects implemented under the CzDA during the Growth and Transformation Plan (GTP) I and II phases. The focus has been on agriculture in the Southern Nations, Nationalities and Peoples' Region (SNNPR), specifically in the areas of::

→ Reforestation and forestry restoration, agroforestry, and non-timber production
→ Management of protected areas, the rehabilitation of soil and its management
→ Water management and irrigation
→ Climate-smart agriculture practices

Czech University of Life Science (CULS)

The Czech University of Life Science in Prague, and specifically its Faculty of Tropical Agri-Science has been active in Ethiopia since 2011, when it began supporting Farmer Training Centres and extension activities in Kembata Tembaro. This direct implementation was then followed by further projects focused on academic cooperation that included capacity development in research and higher education, as well as exchanges of teachers, students and researchers. Lately, teams from CULS were also involved in projects focused on agriculture value chains and food processing, with particular emphasis on commodities related to fruit production and agroforestry.

Partners from Ethiopia

Awassa University

Awassa University is the biggest university in the SNNPR state. Between 2017 and December 2020, Awassa University has implemented one NRM project collaboratively with PIN – "The Participatory Development of a Productive Landscape in Sidama". Together they cooperated, built a strong partnership and implemented some major project activities such as the capacity development of technical farmers to ensure that project participants are actively involved in the rehabilitation of degraded lands and regularly promote the Ethiopian Government's campaigns for the rehabilitation of degraded catchment areas, afforestation, and more.

Wondo Genet College of Forestry

The Wondo Genet College of Forestry and Natural Resources is a college situated in Shashemene, Oromia region, Ethiopia. Mendel University cooperates with Wondo Genet College in the fields of holistic management, climate-smart agriculture, pastoral farming, agroforestry, afforestation, and more.

Arba Minch University

Arba Minch University is a national university in Arba Minch, SNNPR, Ethiopia. Mendel University cooperates with Arba Minch University in the fields of holistic management, climate-smart agriculture, consultation in agriculture, pastoral farming and agroforestry, cattle care, afforestation, and seedlings.

Other partners

All for Soil (AFS)
AFS is a Czech non-governmental organisation (NGO) specialised in the field of soil and water conservation management in SNNPR region. In Ethiopia, AFS works on landscape management and has focused, in particular, on preparing and communicating advanced GIS and remote sensing analysis to local authorities and partners through the preparation of thematic map materials, various workshops and training sessions. The main activities and focus of AFS are soil quality analysis, mapping and monitoring of natural resources, soil and water conservation management, landscape modelling and advanced GIS and remote sensing analysis.

Caritas Czech Republic (CCR)
CCR is the Czech branch of the international Caritas network, which provides both emergency relief as well as development assistance. It is active in most of the priority countries of the CzDA and supports bilateral programming in Ethiopia through its local network. Its support to small-scale farming in the Kembata Tembaro zone highlights the importance of integrated watershed management in relation to food security.

Holistic Solutions
Holistic Solutions is a Czech company which focuses on providing technical consultations and comprehensive services in the field of environmental protection, agriculture, and technology innovations. In Ethiopia, the company supports the sustainable agricultural activities of local farmers, access to drinking water for people and livestock, simple irrigation systems for small-scale farmers, the development of solar dryers for fruit, the protection of Lake Hawassa, as well as the rehabilitation of Hawassa's city parks.

Geotest
Geotest in cooperation with Development Alliance focuses on development and humanitarian aid in the Czech Republic and abroad. It responds to the need to create interdisciplinary and intersectoral partnerships. As part of its activities, it focuses on complex projects related to environment, agriculture, forestry, water and waste management, social development and the overall life of individuals and entire communities.

1.4 Key Roles of Agriculture

The broad concept of agriculture includes and extends to many other sectors. Agricultural production plays various roles in human life, it is essential to our survival, affects our social connections, economy and is determined by our understanding and perception of our relation to land and environment.

Food Security

Ensuring sufficient food is a basic requirement for the survival of the growing population in Ethiopia. This requirement is directly dependent on the volume and quality of agricultural production. Therefore, the term "food security" refers to the development of the entire agricultural sector to meet this demand. In recent years, the impacts of climate change on agricultural production have become the greatest threats to food security as its effects cause a decline in food production and consequently a rise in food prices. Insufficient production makes the country highly dependent on imports to meet its food needs. The term "food security" is used also in the contexts of conflict and displacement, where the effort to provide people with food is one of the basic forms of emergency assistance. Though this support provides immediate relief, this approach is insufficient and fails to address underlying causes of long-term food insecurity.

Nutrition

The ultimate goal of food systems, after food security, is appropriate and stabilised nutrition. However, it is not correlated with sufficient agriculture production anywhere this might take place. Prevention of undernutrition and malnutrition, especially stunting and wasting among children and vulnerable members of the community does not only depend on accessibility to food, but it is a complex problem related to the overall socioeconomic situation of communities, as well as the consumption behaviours of individual households. Promoting sustainable and diversified diets needs to be approached through integrated programming, including healthcare, and behavioural change approaches. From the production perspective, however, nutrition-sensitive agriculture should be promoted. This prioritises the production of diverse and nutrient-rich crops for local markets and encourages localised household production that diversifies the diets individual families.

Livelihoods and Income

Agriculture and livelihoods in rural areas are closely intertwined. Land cultivation and subsistence crop production are sources of livelihood for 72% of the rural population in Ethiopia. The livelihood of smallholder farmers is dependent on agricultural production, and therefore development and improvements in agriculture directly impact their lives. Additionally, insufficient agricultural production and unfavourable conditions can even force them to leave their homes. Moreover, rural communities are being adversely affected as climate and associated land-use changes lead to losses in agriculture, biological diversity and resources.

Environmental Stability

Ethiopia has a very diverse set of ecosystems ranging from humid forests and extensive wetlands to deserts. Despite this richness, threats to biodiversity and endemism are among the critical environmental issues in the country. The main threats include the unsustainable utilisation of natural resources, invasive species, the replacement of local varieties and breeds, climate change and pollution, all of which have a major impact on agricultural production.

Issues such as poverty reduction and development across the country are major priorities for Ethiopia and can be linked to decisions which might provide short term gains but can negatively impact biodiversity in the longer term.

Climate Resilience

The apparent dependence and vulnerability of the agricultural sector on the impacts of climate change (e.g. floods and droughts) have resulted in efforts to design strategies for climate change mitigation and adaptation that can have a positive impact on maintaining production. Agricultural activities contribute significantly to climate change and at the same time are critically affected by climate change impacts. Therefore, climate-smart agriculture involves developing recommendations, introducing new technologies and crops and providing options for reorienting existing sustainable agricultural strategies to respond to changing conditions.

Shallow well hand-pump installation at farm, Wondo Genet, 2023

1.5 Relevant Strategies in Ethiopia

Growth and Transformation Plans (GTP) & the Ten-Year Development Plan (TYDP)

The Ethiopian Government periodically prepares long term plans for economic growth and poverty reduction focusing on the realisation of the national vision to become a low-middle-income country by 2025. In previous Growth and Transformation Plans (GTP I and II) from 2010–2020, the agriculture sector continued to be identified as the main source of economic growth for the country due to its significant contribution to the country's GDP and its employment of a large swathes of the population. During these periods, efforts have been made to implement strategies aimed at improving productivity of smallholder farmers by disseminating effective technologies through the scaling up strategy, conserving natural resources and improving irrigation systems, and bringing about a shift from subsistence agriculture to production of high value agricultural products.


Initiation of reforestation campaign, Sidma, 2022

During these plan periods, the five main strategic directions for Agriculture and Rural Transformation were:

I. To further enhance the development of smallholder crop and pastoral agriculture so that it remains the main source of growth and rural transformation during the GTP II period;
II. To provide all around support to educated youth to enable them to organise and engage in agriculture investment;
III. To enhance necessary support for domestic and selected foreign investors to enable them to participate in transformative agriculture sub-sectors such as crop, flower, fruit and vegetable, and livestock development;
IV. To further pursue the implementation of the scaling up strategy, as relevant for the various agro-ecological development zones; and
V. To pursue holistic measures aimed at addressing constraints and challenges related to the supply of agricultural inputs and the utilisation of agricultural technologies.

Overall, Ethiopia's GTPs focused on modernising and commercialising the agricultural sector in order to improve productivity, increase incomes, and reduce poverty. By investing in technology, infrastructure, and human resources, the plans sought to transform Ethiopian agriculture into a vibrant and sustainable sector.

The new Ten-Year Development Plan (2021–2030), builds on GTP I and II. In the TYDP, the country plans to take a multisectoral growth approach by diversifying sources of economic growth. The plan recognises the high interdependence and interconnectedness of the various productive sectors, particularly, modern agriculture and manufacturing.

In terms of sectoral composition, while agricultural development remains a very important source of economic growth, the primary focus of the TYDP is on the development of industry and services.

Accordingly, agriculture, industry and service sectors are projected to grow by annual average rates of 5.9%, 13% and 10.6%, respectively. Agriculture remains one of the five priority sectors, but in order to bring about structural transformation of the economy, the share of the agricultural sector in GDP is projected to decrease from 32.6% in 2019/20 to 22% in 2029/30.

ⓘ The main obcjectives of the agricultural development plan are:

- → to raise the incomes and livelihoods of farmers and pastoralists and end poverty by making agriculture more productive and competitive;
- → to play a major role in the structural transformation of the economy, especially to satisfy the food and nutritional needs of the nation by modernising agriculture;
- → to supply raw material inputs for the industrial sector;
- → to provide adequate quantities of exportable agricultural products that have added value;
- → to create sufficient job opportunities in rural areas; and
- → to reduce the impact of climate change on the sector.

The following targets have been set in order to achieve these agricultural development objectives:

- → Increase the total annual quantity of **crop production** in all production systems by developing irrigation capacity;
- → Increase **horticulture** production (mainly for export);
- → Increase the quantity, variety, and productivity of **livestock and fisheries** (increase of dairy, meat, egg, fish and honey);
- → Reduce annual **soil pollution** and raise the rate of annual increases in soil carbon content;
- → Establish associations vested with legal personality for ten thousand catchment areas in order to enhance **sustainable natural resource development**, management and conservation;
- → urther reduce **greenhouse gas emissions.**


Initiation of reforestation campaign, Sidama, 2022

The following targets have been set in order to achieve the objectives of the plan in the areas of **environment and climate change** for the coming ten years (2020/21–2029/30):

- → Increase greenhouse gas emissions reduction capacity from the present 92.7 million metric tons of carbon dioxide equivalent (CO2) to 162.3 million metric tons of carbon dioxide equivalent by 2030;
- → Increase national forest coverage from current 15.5% to 30% by 2030;
- → Increase the coverage of protection against illicit activities in wildlife habitats from 62% to 92%;
- → Increase the number of enriched wildlife and biodiversity species from 311,470 to 743,447.

The TYDP seeks to transform Ethiopia's agriculture from a subsistence-based sector to a modern and competitive industry. By investing in infrastructure, technology, and value chain development, the plan aims to achieve sustained agricultural growth, poverty reduction, and food security in the country.

In addition, Ethiopia launched its **National Adaptation Plan** (NAP-ETH) supported by the UN Environmental Programme (UNEP) which builds on ongoing efforts to address climate change in the country's development policy framework. The goal of NAP-ETH is to reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience. This plan is in line with the new **FAO Strategic Framework 2022–2031**, in which green and climate-resilient agriculture are part of FAO's aspirations for better production, nutrition, environment and better life for all.

Climate-Resilient Green Economy Strategy (CRGE)

Climate change is already negatively impacting livelihoods in Ethiopia, and in particular those of rural smallholder farmers. In addition to the need to deal with the direct impacts of extreme weather events such as floods or droughts, adaptation also represents an opportunity to move to a new, climate-resilient development model. The Ethiopian Government has therefore published the Climate-Resilient Green Economy (CRGE) Strategy in 2011 to protect the country from the adverse effects of climate change and to build a green economy that will help the country realise its ambition of reaching low-middle income status before 2025.

The objective of this initiative is to identify green economy opportunities while keeping greenhouse gas emissions low, improving forestry development, conservation and utilisation. It is necessary to engage smallholder farmers and connect educated youth farmers with private investors in order to promote the adoption of new technologies and produce significant marketable surpluses.

Farmer Training Centres

Since 2010, Ethiopia's public extension service has been promoted and supported as key instrument of agriculture sector development.[1] Its main objective has been the transfer of technology to rural populations in order to raise the quality of agricultural production and bring smallholder production systems onto more market-oriented and ecologically sustainable paths.

To this end, the government established Agricultural Technical and Vocational Education and Training (A-TVET) Colleges and Farmer Training Centres (FTC) as critical knowledge institutions to support the transformation of the agriculture sector. Prior to 2017, close to 12,500 FTCs had been established and are functioning at different levels, in addition to 25 A-TVETs. The agricultural extension system was planned to be scaled up primarily via the 'agricultural development army' who are trained in A-TVET and they in turn use FTCs to train farmers. At least three development (extension) agents should be deployed to each kebele/FTC.

Although making the FTCs functional, responsive and effective remains a challenge, the FTCs constitute a robust system which contributes to improving agricultural processes and to strengthening research-extension-farmer linkages in pursuit of the transformation from subsistence farming to high value crop production.

Agriculture and Development Led Industrialisation (ADLI)

Since 1991, the Ethiopian Government has been implementing its strategy of Agricultural Development-Led Industrialisation (ADLI) that sees agriculture as the engine of growth. Its main thrust has been to: (i) improve agricultural extension services; (ii) promote better use of land and water resources; (iii) enhance access to financial services; (iv) improve access to domestic and export markets; and (v) provide rural infrastructure.

Part of this strategy also includes the development of agro-industrial parks which should accelerate agribusiness development and agricultural modernisation. The aim is to attract private sector investments, create jobs, boost exports, reduce urban and rural poverty and further the overall agricultural transformation of the country.

1 *The Agricultural Extension System*, Ministry of Agriculture and Natural Resources, 2017 / https://faolex.fao.org/docs/pdf/eth149550.pdf

Reforestation Campaigns – Green Legacy Initiative

Protecting forests is crucial for climate change mitigation. Forests absorb vast amounts of carbon dioxide and can be a source of greenhouse gas emissions when destroyed or damaged. The rapid growth of populations in forested areas coupled with continued spontaneous in-migration into those areas and the expansion of small-scale agriculture has resulted in increased rates of deforestation. Growing populations also have a higher demand for fuel wood and cropland leading to further deforestation and land degradation.

Over the years, Ethiopia has been implementing various programmes within its policy frameworks addressing direct drivers of deforestation and forest degradation. One such programme, which has been by far the most consequential, has been the Green Legacy Initiative (GLI) launched in 2019. The GLI aimed (among other things) to plant 20 billion seedlings throughout the country, which will positively contribute to increasing forest coverage. By the fourth year, Ethiopia had succeeded in planting 25 billion seedlings by mobilising more than 20 million citizens throughout the nation. In the second four-year phase, the intention is to plant 25 billion seedlings in different agro-ecologies. The GLI demonstrates Ethiopia's long-term commitment to a multifaceted response to tackling the impacts of climate change and environmental degradation that encompasses agroforestry, forest sector development, greening and renewal of urban areas, and integrated water and soil resources management.

Initiation of Green Legacy reforestation campaign, Sidama, 2022

2. GLOSSARY

This chapter introduces terms which are frequently used across various types of projects related to agriculture and are important for understanding the context of sustainable agriculture in Ethiopia.

Focus group discussion with farmers at FTC premises, Angacha, 2011

2.1 Climate-Smart Agriculture

Climate-smart agriculture (CSA) is a relatively new concept which advocates for the better integration of adaptation and mitigation actions in agriculture to capture synergies between them and to support sustainable agricultural development for food security amidst climate change. CSA does not aim to provide a new set of sustainability principles, but rather be a means of integrating the specificities of adaptation and mitigation into sustainable agricultural development policies, programmes and investments. However, although CSA builds on existing knowledge, technologies, and principles of sustainable agriculture, it is distinct in two ways. Firstly, it has an explicit focus on addressing climate change and secondly, CSA systematically considers the synergies and tradeoffs that exist between productivity, adaptation and mitigation.

Additionally, it should be emphasised that the implementation of sustainable agriculture projects involving climate change adaptation and mitigation approaches has long been part of agriculture development projects and food security initiatives before the term CSA came into use.

Climate-smart agriculture (CSA), as it is defined by the UN Food and Agriculture Office (FAO), is an approach that helps guide actions to transform agri-food systems towards green and climate resilient practices. The aim is to simultaneously achieve three outcomes:

I. **Increased productivity:** Produce more and better food to improve nutrition security and boost incomes, especially 75 percent of the world's poor who live in rural areas and mainly rely on agriculture for their livelihoods.
II. **Enhanced resilience:** Reduce vulnerability to drought, pests, diseases and other climate-related risks and shocks; and improve capacity to adapt and grow in the face of longer-term stresses like shortened seasons and erratic weather patterns.
III. **Reduced emissions:** Pursue lower emissions for each calorie or kilo of food produced, avoid deforestation from agriculture and identify ways to absorb carbon out of the atmosphere.

2.2 Agro-ecological Zones

Ethiopia's diverse geography and climate conditions have led to the formation of distinct agro-ecological zones, each with its own characteristics and agricultural potential. These agro-ecological zones (AEZs) are traditionally classified into six categories with traditional names assigned to each zone, based on altitude and temperature:

I. Bereha: hot lowlands, <500 metres, in the arid east, crop production is very limited, in the humid west root crops and maize are largely grown
II. Kolla: lowlands, 500 -1,500m, sorghum, finger millet, sesame, cowpeas, groundnuts
III. Woina Dega: midlands, 1,500 -2,300m, wheat, teff, barley, maize, sorghum, chick-peas, haricot beans
IV. Dega: highlands, 2,300 -3,200m, barley, wheat, highland oilseeds, highland pulses
V. Wurch: highlands, 3,200 -3,700m, barley is common
VI. Kur: highlands, >3,700m, primarily for grazing

By recognising and considering the unique characteristics of different agro-ecological zones, Ethiopia can develop more targeted and sustainable agricultural practices. This understanding allows farmers to optimise their agricultural activities, adapt to local conditions, and improve overall productivity and resilience in the face of environmental challenges.

Agroforesty demonstration plot at FTC

2.3 Specifics of Farming Systems in South Ethiopia

The diversity of farming systems in SNNPR is large, due to a considerable variety of ecological, cultural and socioeconomical characteristics. The following few examples illustrate some specific phenomena and conditions of the farming systems in South Ethiopia that need to be considered.

Continuous Homestead Farming – A large proportion of the rural population is engaged in farming to sustain household income as well as food intake, including in areas and zones where resources are becoming scarce. For example, the average land area per household in the Ethiopian highlands is roughly 2.5 ha compared to 7ha in Omo, this is due to the growing population and the number of families that need to share the land. Shifting agriculture is therefore very rare and cropping fields are being used continuously, with no fallow periods.

Highland Farming – The topography of Ethiopia is mountainous and hilly in general, so with a growing population, farmers gradually encroach upon areas with less favourable exposition of their field. A large proportion of agricultural lands are therefore located on sloping lands, or in floodplains which are vulnerable to flash floods. Most of the fields are highly exposed to erosion and loss of soils, especially in areas where deforestation has taken place. Nonetheless, until the 1990s only a few areas, except those that were internationally recognised (e.g. Konso), engaged in large-scale stabilisation of the landscape through terracing or substantial land works.

Traditional Cash Crop Farming – Traditional areas of South Ethiopia, where most of the projects have been implemented, are often associated with and renown for the production of cash crops which impact how much attention and investment farmers give to their farms. Typically, these crops include commodities such as coffee or qat, are produced in particular in Sidama and play a role in local culture. In other more pastoral areas, the production of bulk fodder and forage is often prioritised even on irrigated and intensively managed plots of land for income generation.

Irrigated Farming – A substantial amount of field production is still dependent on rainfall coming from the two seasons of Belg and Meher. Well-developed large-scale irrigation systems along large rivers and streams serve either for flood irrigation, or for further distribution to surrounding areas. Gravity irrigation, with systems of streams and surface distribution, is still a predominant method of irrigation, especially in small-scale production areas in the highlands where sources of water are highly localised, and individual farmers and communities depend on local springs or collect surface water and harvest precipitation runoff.

Livestock and Agro-pastoralism – Cattle keeping is widespread, as well as the practice of fattening sheep and goats, small-scale milk production and poultry-rearing. A large proportion of the small livestock however is still dependent on pasture, and limited fodder stock, combined sometimes with free roaming on community lands. Integrated agriculture and the production of organic fertilisers has only gained popularity recently and integration is still not widely practiced as an established system. There is, however, a distinct difference between communities engaged in pastoralism and agro-pastoralists, who do not migrate and keep their small mixed herds close to their home community and fields.

Pastures and Herders – These range from densely populated areas in the Ethiopian highlands, where more sedentary livelihoods are common, to arid extensive pastures which are populated by nomadic pastoralists. In both contexts, at present these pastures are usually overexploited as extensive farming is still broadly applied in Ethiopia instead of more suitable forms of intensification. In particular, land suffers from overgrazing. Cattle, goats, and sheep are found on all types of land and significantly contribute to land degradation. In densely populated areas, the trends are set for fodder production and the adoption of a cut and carry system.

Small-scale Mechanisation – Both the terrain and individualised structure of homestead farms, especially in highland areas, do not allow for on-field mechanisation, so the majority of field labour is carried out manually and using animal power. Available mechanisations tend to be utilised more in the community processing of products and is concentrated around the communal cooperatives, governmental institutions or some private investors. Substantial field mechanisation is applicable in lowland areas, and is usually available to private investors, cooperatives and government-affiliated bodies that have been able to consolidate the land blocks suitable for the mechanised production.

Forestry and Wood Production – Problems associated with deforestation, erosion and the overall loss of soil quality have long been recognised in Ethiopia and initiatives promoting sustainable NRM, soil and water conservation and reforestation are well embedded in the attitudes and approaches of the majority of farmers. Massive reforestation campaigns focusing on preventing soil degradation and erosion have been organised in different forms and modalities since the late 1990s. Recently, development initiatives focusing on the sustainability of these campaigns and systems have been put in place, as well as nationwide public campaigns and initiatives, such as the GLI. The governmental interventions and campaigns often run in parallel with the private investments in the sector and both fruit production and sustainable forestry management systems are yet to be properly adopted at a national level.

Highly Industrialised Farming – Despite a large proportion of the population and landscape being directly dependent on agriculture in the form of homestead farms with low investments in the production, high-investment projects put forward both by government and the private sector are abundant in Ethiopia, and profit from the comparative advantage of cheap labour available in rural areas. Such examples include the investments in the flower and strawberry industries, or those which target global markets, short shelf-life commodities, or cotton or oil crops. These productions are demanding in terms of effective irrigation and energy sources, as well as accessibility by roads. While the direct economic impact and income of such ventures carries a clear benefit, such economic gain often comes at the expense of added value to local processing businesses as well as negative social and environmental impacts.

2.4 Infrastructure

Farmer Training Centres (FTCs)

FTCs are units established under a woreda agricultural office (WAO). Each kebele should have an FTC within its administration area. An FTC serves as the training centre for farmers and is responsible for their continuous training and ensuring direct support to their fields and cooperation during governmental campaigns. They are also responsible for presenting innovative techniques and direct demonstrations of agricultural practices on demonstration fields. They employ development agents (DAs) responsible for the dissemination of best practices among farmers and closely observe the works taking place in farmers' fields. Nonetheless, due to the vast distances and poor accessibility of rural areas it is difficult to reach all farmers.

Community Farming Assets and Facilities

Since farming assets are in short supply among individual smallholder farmers, FTC and WAO should offer mechanisation and processing facilities which would serve the whole community. Examples of such equipment include grain-mills, threshers, oil presses or drying machines. The farming facilities can be also managed and maintained by community cooperatives.

Seedbanks and Granaries

The Government-owned Ethiopian Seed Enterprise (ESE) is the only public sector organisation that is involved in seed production, processing and distribution. Such certified seed can be purchased from public and private seed companies as well as cooperatives. The seed supply system in Ethiopia can be classified either as formal or informal. The formal sector is made up of institutional operations associated with the development of improved varieties, multiplication, processing, storage and distribution to farmers. Unfortunately, the seed distribution systems could not satisfy the needs of the farmers with the right quality and quantity or timeframe with respect to farming season. But the seed system also operates informally, and farmer-to-farmer exchanges account for substantial proportion of staple crops seeds in circulation.

The community seed banks should collect and preserve the seeds of local crops and maintain quality seed to ensure farmers have a steady supply of seeds to sow each year.

Warehouses and Storage Capacities

Expanding the availability of high-quality agricultural storage is critical for food security, the commercialisation of smallholder agriculture and price stabilisation. Smallholder farmers face a lack of proper storage to ensure the preservation of harvest and seeds. Addressing the obstacles in storage capacity can significantly reduce post-harvest losses and increase the amount of produce marketed through cooperatives. Although cooperatives are the preferred vehicle for smallholder commercialisation, they retain a predominant focus on livelihood support with limited engagement in output marketing and other commercial activities. For instance, only a small percentage of grain produced is currently marketed; just 12.7% of maize grown by smallholders is marketed and only 10% of marketed maize is sold through cooperatives.

Veterinary Infrastructure & Animal Care

Most veterinary staff work in government services. Federal and regional governmental veterinary services are responsible for overseeing the quality and standard of animal health services. Regional services are provided through clinics and animal health posts which are ideally staffed by veterinarians, animal health assistants and technicians. Woreda-level veterinary services should include the provision of vaccination and treatment services to prevent and control diseases; meat inspection and collection; and reporting on animal disease occurrence. However, existing animal health services are mostly scattered, urban-based and have limited reach to livestock farmers and cooperatives. A lack of personnel, a shortage of inputs (drugs, vaccines and equipment) and poor mobility means there is limited access to these vital services.

2.5 Institutions

Woreda Agriculture Office (WAO)

A woreda is a basic administration unit serving multiple communities (kebeles). It fulfils the role of governance, coordination, planning and monitoring to the lowest level of kebeles of a particular woreda and it reflects the governmental structure through its offices. The Woreda Agriculture Office coordinates the agenda of agriculture extension and related development planning. There are, on average, about 30 agricultural officers across nine divisions or units within each WAO, who directly supervise the function of the FTCs and other governmental supported operations, such as tree nurseries and seasonal agriculture campaigns.

Development Agents (DAs) and Subject Matter Specialists (SMSs)

DAs and SMSs work under the WAO. DAs are assigned and often also posted to particular FTCs in individual kebeles and facilitate the implementation of governmental campaigns at a community level with respect to their specialisation. The SMSs provide technical support to DAs, monitor FTCs and their clusters and act as a link between FTC and woreda offices. Most SMSs are assigned across the same technical areas as the DA staff, that is, crops, livestock, and NRM. In the past, most of the staff assigned to these SMS positions had begun their extension careers at least five to ten years earlier in DA positions.

Development Army

This is the name given to a group of people, usually community volunteers, who are willing to advise their community on a certain topic that is currently being promoted under governmental strategies, such as malnutrition, fertiliser usage, building terraces, etc. The volunteers also invest their spare time in visiting people in the kebele in order to check on how their work is progressing and see what difficulties they are experiencing with the promoted practices. For specific purposes, the development army may break down into more specific development groups, either according to topic or for practical reasons to ensureco such as the co such as the coverage of a given community.

Model and Technical Farmers

There is a division in every woreda and kebele for the farmers' classification. Despite some standardisation efforts, the specific selection criteria and definitions differs across kebeles. This complicates the work of development workers and makes evaluation and monitoring more difficult, as the data from different kebeles may vary slightly based on what these farmers are responsible for.

Nevertheless, a model farmer is a farmer who is the role model for other farmers in their neighbourhood. He/she is usually responsible for five other farmers and their responsibilities lie in transferring good practices or know-how in agriculture around topics such as the usage of fertilisers, conservation agriculture and other modern methods which are also promoted at the FTC level. Technical farmers are sometimes mis-categorised as model farmers which complicates the classification even more. The technical farmers are a distinct category who are supposed to give advice on technical issues like building anti-erosion structures, managing the drip irrigation systems etc. Like model farmers, every technical farmer should be responsible for five farmers in each neighbourhood.

Productive Safety Net Programmes (PSNP) – Cash-for-Work

In response to ongoing food insecurity in some areas, PSNP were initiated in 2005 in order to prevent household asset depletion and create community assets among the most vulnerable households. With assistance from DAs, the programme monitors the situation of individual households and triggers public works in cases of urgent need. For participation in the public works, individuals are granted cash, food, or agricultural materials. This programme has a high level of relevance. Typically, annual watershed or irrigation campaigns and works are organised in degraded and rehabilitated community areas.

Watershed Management Committees

These committees exist in each kebele but the level of their activity varies. They are primarily established to monitor the situation in the watershed and are involved in the works during watershed campaigns. They should also be involved in maintenance and rehabilitation works. The level of the technical knowledge among members varies significantly, which is then recognisable when assessing works performed in the their watersheds.

Agricultural Cooperatives in Ethiopia (ACE)

Providing inputs like fertilisers, feed, agrochemicals and seeds has traditionally been one of the main economic functions of agricultural cooperatives. They facilitate input access for farmers through bulk purchase, which lowers prices. In addition to supplying inputs, cooperatives often provide technical assistance about the use of those inputs.

Cooperatives are registered under the woreda office livelihood section. The main types of agricultural cooperatives include multipurpose, coffee, fruit and vegetables, and dairy cooperatives.

The cooperative unions are the key organisational platform for smallholder commercialisation, because the unions make the link to domestic and foreign buyers. Rural Transformation Centres (RTCs) mediate contact between farmers and agro-industrial parks. For most farmers, the RTCs are the main point of contact with commercial agricultural value chains.

Integrated Agro-Industrial Parks (IAIP)

This is a cluster of independent firms grouped together in one location to gain economies of scale and positive externalities by; sharing infrastructure, such as roads, power, communication, storage, packaging, by-product utilisation, effluent treatment, logistics and transport, laboratory facilities, etc. and; taking advantage of opportunities for bulk purchasing and selling, training courses and extension services. Although the number of IAIPs is growing they are facing a shortage of skilled labourers from technical professions.

Agricultural Transformation Agency (ATA)

ATA is a strategy and delivery-oriented government agency created to help accelerate the growth and transformation of Ethiopia's agriculture sector. The agency's mandate focuses solely on improving the livelihoods of smallholder farmers across the country.

Agricultural Innovation and Technology Centres (AITEC)

These are medium-scale, economically self-sustainable farms that act as regional mechanisms for agricultural development, extension, research, capacity building and the overall transformation of the agriculture sector. AITEC farms serve as pathways for the integrated introduction and demonstration of innovations and technologies for horticulture, crop farming and livestock production that improve the productivity of smallholder farmers.

Agriculture Technical and Vocational Education and Training (A-TVETs)

A-TVETs play an important role in further educating youth and farmers in modern agricultural practices, plant and animal production, agri-business and agro-processing. The labour market in Ethiopia has been experiencing strong demographic pressures in recent years and at the same time companies in Ethiopia encounter difficulties finding employees with the right skillset and practical experience. Agri-business demand for skilled labour, market demand for agricultural products, and local community demand for particular agricultural skills should all be factored into agricultural TVET design.

Installation of the submerged borehole pump, Halaba, 2023


Soil and Water conservation measures, Hambaricho, 2024

3. KEY CHALLENGES TO AGRICULTURE IN ETHIOPIA

PSNP daily labourers in Hargeda nursery, 2019

The country's ecological and agricultural systems are fragile and vulnerable to rising temperatures and changing weather patterns which are likely to impact critical seasonal rainfall levels. These vulnerabilities are compounded by population pressures and stretched natural resources. Due to major dependency on rainfed irrigation, Ethiopian agriculture is vulnerable to rainfall anomaly, pest invasion, and extreme climate events. The rural population, which constitutes 77% of the population according the World Bank, is considered one of the most vulnerable communities affected by the changing climate. The Government of Ethiopia recognises the negative consequences of climate change to the country's ongoing and future development and has therefore prioritised climate resilience in its transition towards a green, sustainable growth model.

Primary production and climate change are two of the most pressing challenges that accompany other socio-economic constraints within the Ethiopian agriculture sector.

3.1 Primary Agriculture Production

Land Degradation

Soil degradation is one of the major causes of low and declining agricultural productivity and continuing food insecurity in rural areas of Ethiopia. It causes the severe loss of fertile soil and disturbs the sustainability of land resources due to the low supply of organic matter. Drivers of degradation are either direct or indirect (underlying). Deforestation, inappropriate land management systems, the use of dung and crop residues for fuel wood, overgrazing of pastureland, and natural conditions are among the direct drivers of land degradation in Ethiopia. Indirect causes are economic, technological and institutional. Land degradation is a great threat to future production in Ethiopia. It is therefore crucial to strengthen sustainable land management and conservation techniques.

The country has been using land in an unplanned and uncontrolled fashion without regard for the land's best potential use. Thus, urban development and industries take place on arable land or grasslands, reducing the farmland and increasing displacement of the farming community. Loss of such fertile productive arable farmland creates food demand gaps in Ethiopia and leads to undesirable environmental consequences.

Rainfed Agriculture

Rainfed agriculture without irrigation systems presents a major challenge for agricultural production. Reliance on rainfed agriculture makes the sector vulnerable to erratic weather patterns, leading to fluctuations in yields and livestock productivity. FAO indicated that Ethiopia has the potential to irrigate about 5.7 million ha, but at present, about 2.7 million ha is currently being used.

Deforestation

Forestation has a major impact on ensuring sufficient agricultural production, food security and sustainable livelihoods for millions of people. Forests carry a whole range of benefits, such as preventing erosion, enriching soil, absorbing and retaining water, providing habitat for wildlife populations etc. Thus, deforestation and forest degradation in Ethiopia have had a direct impact on agriculture and have been underlying drivers of the horrific impact of the changing weather patterns.

Despite some successes and efforts to develop strategies and plans for forest restoration, deforestation and forest degradation is continuing in Ethiopia. The rapid population increase and the associated growing demand for land and energy are indirectly driving deforestation.

Landscape fragmented by erosion, Silte, 2019

Poor Living Conditions for Livestock (Animal Husbandry)

Despite its potential, the livestock sub-sector has remained underdeveloped in Ethiopia. The productivity of livestock is constrained by several factors: mainly shortages of feed and high feed prices; lack of pastures or poor genetics. The sector also faces challenges related to diseases and parasites, with limited prevention methods, access to drugs, vaccines, and veterinary services. Access to water and water scarcity during the dry season also affect livestock productivity and health. Climate, which includes both temperature and precipitation, can affect any animals' ability to survive and to be productive in many ways. Moreover, livestock are the single most important household asset for rural communities and there is a strong correlation between lack of livestock ownership and poverty, particularly among woman-headed households.

Shortage of Technological Advancements

Ethiopia has a strong cultural attachment to traditional farming practices, so while there has been uptake in the adoption of modern agricultural practices and technologies, many smallholder farmers still lack the skills and awareness of climate smart agriculture. They use techniques that are not effective or suitable for their agro-ecological zones and lack access to trainings, improved seeds, fertilisers, and irrigation systems. The productivity of smallholder farmers is also significantly affected by the insufficient development and distribution of mechanised agricultural tools and equipment.

3.2 Impacts of Climate Change

Changing Seasonal Cycles

The country has been exposed to increasing temperatures, changing precipitation patterns, and a greater frequency of certain extreme weather events, which have severe impacts on food security. Changes in the annual seasonal cycles (i.e. lengthened wet *seasons)* and long-term trends impact the traditional practices that smallholder farmers use to grow crops and cultivate the land. It is estimated that rainfall variability and temperature increases will cause an average yield reduction in some traditional crops (teff, wheat, maize, coffee). Additionally, poor water retention capacities of degraded landscapes, depleted soils and a lack of water-storage facilities further increase the vulnerability of natural resource dependent rural communities to climatic risks.

Rapid population growth and the expansion of farming and pastoralism under a drier, warmer climate regime could dramatically increase the number of at-risk people in Ethiopia during the upcoming years.

Floods and Droughts

Floods and droughts, as consequences of climate events described above, pose major threats to Ethiopian agriculture. *2016 was* the worst year for drought in Ethiopia in the last 50 years, eclipsing the infamous drought year of 1984. More recently, the 2020–2022 droughts were horrific both in terms of duration and severity, and such phenomena will most probably continue to intensify in the years ahead. If not addressed, droughts may lead to famine-like conditions.

Main factors in the occurrence of flooding in Ethiopia are land degradation due to deforestation, population growth, rainfall changes and variability, and other human activities. Both, droughts and floods cause rises in food prices, increases in malnutrition rates amongst children, and displacement of people searching for food and pasture.

Pests and Diseases

Smallholder farmers face substantial challenges from the diverse insects and pathogens that attack their crops and the weeds. They have a little flexibility for adjustment to cope up with those risks and to take preventative measures before, and at initial stages of, infestations. Additionally, post-harvest grain losses caused by pests is an urgent concern too. Existing problems are exacerbated by newly emerging insect pests and diseases in the country due to climate change.

Farmers lack relevant information related to agricultural risk management and mechanisms for the timely sharing of knowledge which would enable local communities to make appropriate decisions and take remedial action. Farmers require trainings on crop protection measures to help eradicate and prevent the spread of new pest species, and to reduce pest incidence, restrict their distribution and reduce crop losses.

3.3 Major Economic, Institutional and Social Constraints

Economic and Financial

Expanding market access to farmers is crucial to strengthening agricultural and rural livelihoods. Smallholder farmers struggle to access affordable credit and financial services, which hinders their ability to invest in modern inputs, technologies, and sustainable practices. A lack of market infrastructure, information, and bargaining power often result in low incomes and limited opportunities for their development beyond subsistence farming.

Moreover, poor infrastructure with a relatively low level of road networks, and in particular, limited connections between woredas to main roads has been a critical bottleneck and put communities in these areas at a disadvantage, preventing them from equitable access to the market.

Legal and Regulatory

While there have been efforts by the Ethiopian Government to promote climate-smart agriculture, the policy and institutional frameworks needed to enable its widespread adoption are relatively weak. Limited policy support and coordination among different departments and organisations can hinder the scaling up of sustainable agriculture in the country.

Despite efforts to formulate land use planning, the absence of clearly defined property right and land tenure security is found to be one of the most significant factors that affect farmers' decisions around long term investment on their land. As such, farmers then prioritise immediate food production and income generation over long-term sustainable land management practices.

Social and Political

Exposure to new technology in agriculture remains highly gendered, with most of the development-related initiatives being targeted at men. Women typically have less access to new technology, information, and training related to climate adaptation.

Furthermore, periods of political instability and conflicts disrupt agricultural production and investment. Communities are forced to flee their homes which also impacts the agricultural sector, as crops may not be harvested, livestock may be stolen or killed, agricultural inputs may not be distributed, supply and transportation may be disrupted etc. Rural communities may also face the immediate threat of starvation as a result of the displacement. Yet it is precisely the control of and access to vital natural resources (disputes over land, grazing land, water resources, etc.) and to agricultural production that are some of the main causes of inter-community conflicts in Ethiopia.

4. RESPONSE OF THE CzDA COOPERATION

Development Agent, Angacha, 2013

4.1 Support to Agriculture Extension and Education

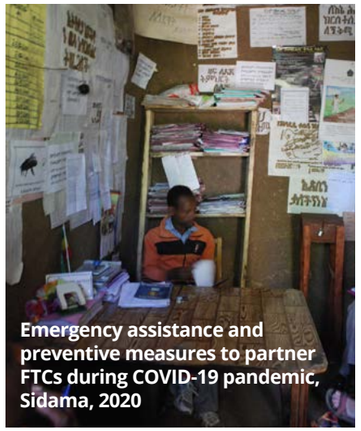
Support to Farmer Training Centres (FTCs)

FTCs serve as major learning and communication centres for farmers and rural populations at the level of individual communities, clusters or kebeles. Due to the fact that they present a unique opportunity for agriculture extension efforts, cooperation with and support to FTCs were key components of most of the agricultural projects. Thanks to long-term cooperation, this support could be tailored depending on the needs of each WAO and woreda, ranging from material support and construction to soft-skills trainings for Development Agents assigned to FTCs.

To tackle the FTCs' lack of basic office and education materials, FTCs were equipped with basic office and classroom equipment, including furniture, stationery, learning materials, technical libraries and electronics. Equipment was also provided to assigned DAs, so they would be well equipped to serve the community. This support included equipment for their living quarters, personal equipment, bicycles or motorbikes. In terms of infrastructure, warehouses, water sources (wells, roof catchments, ponds), fencing, irrigation, stables, and general housing developments were provided along with improved access roads, electricity and other structures, where possible.

For technical operations materials were also provided, such as farm tools, machines and small-scale machinery. This equipment was provided for use not only by the DAs, but also by model farmers, WAO, farmers, and cooperatives in a form of FTC Tool Banks. Through those, FTCs also rent out their own farm tools and machinery to farmers, so they can practice the techniques learned in FTCs on their own fields and the rental costs also generate income.

FTCs were also supported in establishing and developing long-term demonstration plots, which not only address the annual trial, but are also used to showcase the long-term effects of good soil practice, such as agroforestry, conservation agriculture or integrated farming.



Emergency assistance and preventive measures to partner FTCs during COVID-19 pandemic, Sidama, 2020

Capacity Building and Curricula Development

There have been significant differences between woredas and kebeles in terms of their capacity to deliver extension services to the communities. A key part of the activities was therefore not only the provision of a broad range of trainings to improve agricultural practices, but also capacity building and training for DAs, WAO specialists as well as model farmers. Systematic long-term technical training and mentoring was crucial for improving the FTCs' operations, both in terms of enhancing technical expertise as well as improving outreach methods and communication with farmers to ensure the efficient provision of agriculture extension services

To ensure familiarisation with the new approaches, different aspects of good agricultural practice were delivered through trainings, both theoretically and practically, and were followed by refresher trainings. Numerous assessments and studies provided a

15 years in numbers (2008–2023)

Results of PIN's direct engagement with communities and partners:

- → 108 FTCs supported by trainings, material equipment and crops
- → 30 cooperatives received trainings and in-kind items
- → 400 people graduated in agri-processing from Agriculture TVETs
- → 10,000 hectares of degraded landscape rehabilitated
- → 50 landscape management plans formulated
- → In the forestry sector, 10 million trees planted
- → More than 10 thousand farmers have been trained

starting point for the development of training materials, ToT manuals and handbooks for particular technologies (e.g. beekeeping handbook, haricot bean production training manual, intercropping and crop protection etc.). These were also translated into Amharic and other local languages. Experts from local institutions (e.g. WoA, BoAD, Arba Minch University, Awassa University) and international advisors were involved in their preparations. Moreover, hundreds of agricultural publications were handed over to WAO libraries to serve as a basis for training preparation, consultations and self-study.

An extension logic of farmer-to-farmer knowledge transfer was commonly adopted and applied across the implemented projects. The primary participants of trainings were DAs, who cascaded the same methodological training for targeted model farmers and involved them in the creation of demonstration and reference plots on their agriculture lands, where they tested the recommended crops. The model farmers (trained by DA) then further disseminated their knowledge among "ordinary" farmers with a 1:5 teaching ratio, as well as with other members of the community.

Introduction of new farming practices and knowledge transfer:

Sectoral experts → FTC/ Development Agents → Model farmers → Ordinary farmers/ community sector/subject matter specialist

Agriculture TVET Support

In the field of agricultural education, cooperation with agriculture TVETs, especially with the agro-processing departments, has also been established. The aim was to strengthen the technical, pedagogical and operational capacity of TVETs in order to improve the employability of graduates in the agricultural sector. Part of the cooperation with TVETs involved the preparation and revision of training materials (curricula and modules) for the eight short-term agro-processing occupations with the support of specialists from regional TVET bureaus, TVET colleges and other partners (e.g. AICS or PIN). Additional ToT further supported the TVET college teachers with methodologies and techniques recommended in agro-processing sectors. The most useful courses were bakery production, juice extraction, coffee processing and roasting.

Demonstration Plots

Agriculture extension through demonstration plots has been used in various forms across all implemented agriculture projects. They serve as a good tool for presenting new agriculture practices to local farmers, but even more importantly, they help both experts and practitioners verify the feasibility of the recommendations first-hand on the ground with potential users, considering the ecological context as well as local common practice.

Demonstration plots were mostly established on the premises of an FTC, on communal lands, as well on private lands. For basic field production and crop trials, they are usually established as a part of FTCs trial plots, however, in the case of such topics as sustainable landscape management or reforestation, they take the form of closure areas or selected parts of individual private farms.


Crop production Sector Matter Specialists at trial plot, Halaba 2018

Various techniques were introduced, including pest management, fertilisation, soil preparation or intercropping, however those presenting the multi-annual trials for long-term or continuous phenomena had the greatest added value. This is taken into account especially in relation to topics presenting long-term change like NRM techniques, agroforestry, conservation agriculture and indeed climate adaptation.

In general, the demonstration plots serve two main objectives:

a. practical participatory experience-sharing (education part) and as a
b. reference plot for the collection of technical data and the verification of the feasibility of introduced techniques in each context.

For both of these objectives, the techniques which were presented on the demonstration plots needed to be properly planned and designed and the results that are monitored over the demonstration period should be regularly recorded. In this way, the know-how can be transferred, and lessons learned by the farmers can be recorded and justified.

Sharing and Exposure Visits

We believe, and practice also proves, that sharing practical experiences is an invaluable tool for promoting the adoption of new practices in common farming. This is also evidenced by the great interest in events of this kind. Therefore, seasonal experience sharing among FTCs, DAs from different kebeles, WAO experts and model and ordinary farmers is a crucial activity. Evidence-based learning and success-sharing with other FTCs and farmers living in similar conditions opens new perspectives and motivates farmers to make changes such as increasing crop diversity, improving animal husbandry or using new technologies. Experience-sharing sessions are not only organised for primary production farmers but also for representatives from enterprises, agri-colleges, agro-processing industrial parks and government bodies. These visits contribute to people's better understanding of the needs at different levels of the agriculture production and value chain.

Coordinated by the Czech Embassy in Addis Ababa, four agricultural experts (two from PIN and two from regional institutions) attended a training in Israel. The experts had an opportunity to acquire new information by participating in the course "Agricultural Development in Arid Areas" organised by MASHAV training centre and Hebrew University of Jerusalem in 2016 and 2018. The theoretical part of the course included information on modern irrigation and fertilisation methods, rural development, agro-tourism opportunities in arid areas and specific Israeli examples in the production of selected vegetables. The course also included excursions to two agricultural research centres and a dairy farm.

4.2 Building Community Infrastructure

Seedbanks and Granaries

Governmental sources usually ensure good standards of the supplied materials, however, their availability is limited due to both production capacity and the limits set for each woreda and rules applied for the extension system. Private sources (such as cooperatives, unions), on the other hand, can supply seeds that are not available through official government sources (e.g. tree seeds, enset and tuber shoots, local seeds of cereals etc.). However, their quality and sources need to be properly verified and physically tested. In both cases the proper specification, including the type, variety and sub-variety of the seeds or the breed of animal should be specified and the process of selection should be recorded. The information about the seeds that are distributed and their purpose is essential for making evidence-based, technical decisions with long-term consideration. Despite the establishment of seedbanks and capacity development efforts which covered the rigorous evidence-collection and expertise required for seedbank management, the management of the seeds genetic purity and quality proved challenging. Although the constructed premises intended as seedbanks are available to supported communities and cooperatives, they often serve rather as simple community storage and grain-banks.

Improved Storage

Post-harvest losses due to inappropriate storage of the harvest are known to reduce the shelf life of food and result in the insufficient stock of seeds. To tackle this issue, a variety of community warehouses and improved storage houses were introduced and constructed at a community level. Along with designing the new infrastructure, partners provided a series of trainings on healthy, storage management methods, maintaining proper hygiene conditions and keeping the seeds, grains and other products healthy.

Smart solutions were also introduced for storage on the household and farm level. For instance, the Triple S (Store-Sand-Sprouting) method, developed by International Potato Center CIP, was introduced for the preservation of healthy sweet-potato roots during the dry season. Simple but effective storage bags known as PICS bags designed by Purdue University, or their alternatives promoted by CuLS, were successfully introduced and accompanied by instructions on how to safely store grains and harvest These cheap and practical methods ensure a consistent supply of seed and planting materials for farmers particularly in areas with long dry and unpredictable seasons.

Rehabilitated irrigation channel, Kelafo, 2012

Water and Irrigation Systems

Smallholder farmers who depend on rainfed agriculture are facing increasingly unpredictable rainfall and even a complete lack of seasonal rainfall due to climate change. FTCs and ordinary farmers usually lack rainwater harvesting schemes or connections to water pipes (even for small-scale production). As a result, they are witnessing declining harvests and challenges while they try to replicate promoted GAP. To address these obstacles, various solutions were promoted in terms of both physical infrastructure and soft skills including: tank-based rainwater harvesting systems, cemented ponds, water pumps or dripping irrigation systems (in Kembata) for FTCs or cooperatives. To ensure water retention in the fields and landscape, simple small-scale basins and ponds were created. Despite the delivery of some technical structures, the sufficient supply of water remains problematic and without proper operation and regular maintenance those systems can easily cease to be beneficial.

Irish potato model storage, Angacha, 2016

Farming Assets and Facilities

Mechanising farm operations was largely not possible for smallholder farmers. This was due to either a lack of assets, even on a communal level, or outdated and poor-quality technology. The post-harvest processing of key staple crops such as cereals and legume crops is done manually, as well as the processing of cash crops, which reduces the efficiency and quality of the final product.

Asset provision, therefore, focused primarily on increasing access to high-quality mechanisation services for smallholder farmers. Various assets (grain mills, fruit drying, threshers, oil presses) were delivered to FTCs or cooperatives to increase the share of crop processing among farmers. Practical demonstrations on the advantages and operation of different machines were organised to introduce and operationalise appropriate technologies. The investments were largely made in form of the support to local cooperatives or production groups, along with the development of the management and maintenance plans. This increased the quality of services offered to smallholder farmers and allowed the machinery owners to profitably run and expand their businesses. Often facilitation of access to electricity or additional governmental services also proved a significant added value to communities.

Where possible, projects of the Czech intervention aligned with the Zonal and Woreda Economic Development Offices, in order to align with governmental support of such investments and ensure economic sustainability. Such interventions included, for example, the inclusion of the supported businesses within localised revolving funds or further engagement in microfinance schemes.

Establishment of the community water pond at FTC premises, Arba Minch, 2018

4.3 Support to Agriculture Businesses

Support to Cooperatives

Tens of cooperatives were supported through capacity and business development. Besides business training, specific trainings according to their business plans were provided. After having submitted business plans, cooperatives were supported with materials or animals, including equipment for keeping animals (such as heaters, beehives, feed, watering supplies etc.)

Evaluations of implemented projects showed that the successful cooperatives had fewer members, which enabled easier management, coordination and decision making among the members. If the cooperative is engaged in more businesses, then the increased number of members in separate divisions could be considered.

An important factor in the decision-making regarding which activities to pursue was the time at which members will benefit. For example, fruit trees start to bear fruit in several years and thus generate income long after the initial investment. Such a timeframe can significantly discourage farmers from investing into long-term business options.

The production of items for the market was the main task for the cooperatives, however the link between producers and sellers, those actively offering products at the markets, proved a bottleneck, despite the trainings and organisation of seller-producer meetings. The lack of established regular connections to sellers and therefore the market is a big challenge and reflects a generally underdeveloped market economy.

The examples of the cooperative businesses were:

- → Gonzie stoves and charcoal briquette production
- → Moringa production and marketing
- → Fruit processing & solar drying
- → Grain mill cooperatives
- → Poultry farming
- → Goat keeping and fattening
- → Beekeeping producing honey and bees-wax
- → Certified sweet-potato vine multiplication

Micro, Small and Medium Enterprises (MSMEs)

In order to support the food processing industry and increase employment among youth, PIN supported existing and newly established MSMEs in three regions of SNNPR. The entrepreneurs were thus able to improve their managerial, financial, and business skills and were supported with grants based on their business plans. The target MSMEs operated businesses including: poultry, dairy farm/milk processing, bakery, animal husbandry/beef fattening, bee farming/honey production, mini consumable items, spice selling and fruit and vegetable production. Regular meetings with a public-private platform allowed them to better understand the market demands and expand the spectrum of customers.

Value-Chain Development – Fruit Value Chain

Even though fruit crops are staple ingredients of Ethiopian households, the average per capita consumption of fruit in Ethiopia is only 7 kilograms per year (the recommended amount is about 21 times higher). Arba Minch Zuria is an important fruit-growing district, which accounts for 10–15% of total fruit production in Ethiopia. However, the production potential of the area is much higher. A similar situation can be found in Sidama or Hawassa. Besides its impact on the local consumption and nutritional status, fruit present an important cash commodity and opportunity for local and international investors. Czech Universities, CULS and MENDELU, have been engaged in the fruit value chain since 2018 in order to improve nutrition as well as the health of local people, and to increase the market competitiveness of farmers producing fruit. Specifically, the cooperation focuses on the diversification of cultivated fruit crops, efficient storage, post-harvest processing, and subsequent market access with processed products. Building on the expertise of agriculture universities, significant attention is then paid to testing suitable fruit varieties, training workers in tree nurseries and orchards and testing new fruit varieties.

Food Processing

Even though roughly 70% of agricultural production is supplied to local businesses by domestic producers, the food processing industry alone does not constitute even 5% of Ethiopian GDP, which represents a huge area for Ethiopia to grow. A lack of knowledge about technological processes and machineries (which are often not available in local production) result in farmers pursuing primary production without further food processing.

Although the number of agro-industrial parks is growing, companies encounter difficulties in finding employees with the right skillset and practical experience. Agri-TVETs, which should prepare graduates for the agro-processing market, struggle with insufficient machinery for demonstrations and outdated curricula. PIN extended its agricultural activities and cooperated with agri-TVETs and MSMEs, and coordinated market linkages of agro-processing value chain actors. So far, 50% of the short-term programme graduates have found employment in the agriculture sector.

4.4 Crop Diversification

Understanding the existing farming system in SNNPR has been fostered through engagement of the crop specialists, including the local from development agents, WAO specialist, practitioners from seed unions and enterprises, as well as the academicians and researcher from universities from Czech and Ethiopian universities. These built upon current farming practices and introduced new resilient crops suitable for restoring degraded land and for agriculture which is disrupted by climate change. Through trainings and demonstrations in FTCs, farmers are supported to adopt new agricultural practices. However, in some cases access to land or water remains a barrier to using GAPs.

Seed System Support in Staple Crops

The diversity of staple crops in south Ethiopia is large in terms of species, type as well as the variety. The preference for the staple crops derives both from ecology as well as the farmers' culture and traditional cropping practices. There are, however, some staple crops, such as haricot beans, maize, teff, wheat, sweet potatoes, millet or enset, which have long drawn the attention of agronomists, who have developed a multitude of high-yielding and resilient varieties, producing improved hybrid and non-hybrid cultivars of the staple crops providing farmers with different qualities. These improved varieties are provided by different certified private and public enterprises either directly to certified farmers' unions or WAOs as a part of the extension campaigns or eventually through emergency interventions. Development projects assisted in the introduction of these improved varieties through trials of different varieties among model farmers and at FTCs, as well as through subsidised supplies of tested varieties and cultivars among project-participant farmers. Varieties of maize (*BH-660, BH-540, BH-545, Limu)* or haricot beans received most of the attention, seconded by teff, pigeon pea, millet as well as tubers like orange-fleshed sweet potato *(Alamura, Dilla, Vita, Kabode),* Irish potato *(Durame, Belete)*, enset or taro.

Introduction of new Irish potato varieties, Angacha, 2018

Seed distribution, Kajima Ubulo, 2010

Fodder and Fodder Grasses

To decrease the consumption of pastures, the depletion of useful crop residues and overgrazing, especially in densely populated areas, it is important to support the production of fodder crops and grasses. Planting fodder crops and grasses serves two purposes: it contributes to the development of integrated agriculture and stabilises the erosion-control measures. Therefore, all implementers promoted the diversification of fodder resources by combining grasses and legumes (e.g. desho grass with pigeon peas), planting fodder in unproductive places on farms, and promoting the cut and carry system for fodder harvesting. Fodder grasses and crops were further promoted as a component of contour cropping (terraces, grass-strips) or intercropping.

Tree and Nursery Support

Nurseries play an important role in producing different types of seedlings to support farmers plant in enclosed areas and be part of re-forestation programmes. CzDA assistance, led by individual implementers, focused on providing technical improvements and ensuring sustained production in woreda nurseries. This support was highly relevant as the steady supply of seedlings is a major precondition for LMP and for fruit tree production. All the supported nurseries were modernised and provided with essential production materials and infrastructure, as the biggest challenge for the nurseries continues to be financial. A series of projects focusing on natural resource management introduced and helped to boost the dissemination of trees ranging from fruit species, such as mango, avocado, papaya, citrus or banana to multipurpose trees, like moringa.

Appiculture training, Halaba 2010

4.5 Animal Diversification and Care

Animal Care

Despite the existing regulations for animal health points, the public sector is unable to sustain animal health services in rural areas. There is very little, if any, assistance going towards maintaining the health of livestock and caring for animal welfare is not prioritised at the level of smallholder farmers. Although people often fully or partially depend on animals (goats, sheep, donkeys, poultry) for their income, they do not have the means to properly care for them or maintain their health.

Therefore, regular campaigns were carried out within rural communities to raise awareness of animal care, on topics such as how to recognise an animal's illness, basic first aid for animals, the importance of vaccinations etc. FTCs were also equipped with facilities for the provision of animal care (e.g. cattle crushers to enable safe vaccination).

Dairy and Other Cattle

Dairy cattle and livestock provide products and services such as milk, meat, draught power and manure for fertilisers and fuel. Dairy farming is seen as one of the agricultural activities that can provide enough income to maintain the economic viability of smallholder farms. Sidama, the main region of CzDA implementation, is a semi-pastoralist society, with a traditional approach to cow-rearing. Although there were several cow donations to farmers, breeding of dairy breeds and insemination efforts among pastoralists have not been developed or prioritised.

Small Ruminants

Traditionally, caring for small ruminants has been the task of women, for whom it is also a source of livelihood. Goats and sheep were therefore mostly donated to female-headed households or members of women's groups. They are used to provide milk for the women's children, or the lambs and goats raised were sold and the money used to buy household supplies. Animals were purchased by a "purchasing committee" involving women's representatives, technical experts and authorities. All donated animals were vaccinated, and women learned how to take care of them in case of illness. Women were also encouraged to feed animals with fodder crops promoted by local DAs.

Support for Draught Animals

The use of animal power (horses, donkeys, camels) in agricultural work or households is widespread in Ethiopia. PIN collaborate with NGO, The Donkey Sanctuary, where donkeys were donated (as part of the Real Gift public collection) to farmers to support with agriculture. The handover also included training and instructions on how to maintain donkey welfare, quality feed, appropriate harnessing, avoid overloading and ensure rest. Since donkeys primarily serve for transport purposes, light-weight carts were also provided. Moreover, donkeys are used extensively for the daily transport of water cans from distant water sources in rural regions. The provision of donkeys and carts thus became a cross-cutting theme between livestock farming and improving access to water, another sector supported by CzDA.

Poultry

Raising chickens is a common livelihood in rural areas and has a wide range of uses in relation to the diet. As such, one of the common income activities the cooperatives choose was poultry farming in order to provide eggs and meat. Chickens (Red Leghorn breed) were donated to vulnerable groups, in addition to feed, vitamins and vaccines, as well as training. Trainings focused not only on poultry farming but also on related nutrition and hygiene issues. In particular, the increased use of chicken coops contributed to improved hygiene and indirectly also to reduced diarrhoea and other enteric diseases in children.

The big challenge in poultry farming is the high incidence of disease. However, as chickens are small animals with short life spans, it is not common for farmers to vaccinate them. For larger breeding breeds, regular vaccination campaigns of chickens are vital. Therefore, instead of focusing on large-scale breeding of highly productive breeds, the projects aimed at community work which has a higher impact on the inclusion of poultry into self-sustaining farming practices and improved nutrition.

Other Alternatives – Beekeeping

Another livelihood associated with animals that was supported was beekeeping. It was highly appreciated; especially by existing beekeepers who received support in terms of modernisation and were equipped with trainings, protection wear and modern types of beehives. Honey production fluctuated due to the bees' sensitivity and changes in weather patterns. From the perspective of natural resources, honey is only a by-product, bees themselves are important for the development of closure areas and forests. A key element of fruit growing and the rehabilitation of closure areas are pollinators, without which the process is much slower.

Poultry vaccination campaign, Halaba, 2011

4.6 Nutrition-Sensitive Agriculture

Cooperation among representatives of different sectors such as agriculture experts, nutrition experts, development agents, health extension workers, schoolteachers, kebele leaders, and community representatives, proved to be effective for promoting an understanding of nutrition-sensitive agriculture principles, as well as malnutrition, its causes and prevention methods.

Integrating Agriculture and Health

The Health Development Army (HDA) functions as a primary communication channel for the promotion of nutrition-sensitive agriculture and behavioural change through improved nutrition practices using the Positive Deviance/Hearth approach. Health development agents, in collaboration with the project team and Health Extension Workers, actively participated in child growth monitoring and nutrition screening, the identification of undernourished children and a series of behavioural change sessions (including low-cost cooking demonstrations, promotion of hygiene/sanitation practices, and home visits for nutritionally vulnerable families). Health development agents led healthy living clubs (HLC) for groups including households with pregnant women, lactating mothers or households with children under two years of age, who had access to a minimum land size of 100m2. HLC members conducted monthly education nutrition sessions for HHs related to nutrition, infant and young children feeding and food diversity.

Small-Scale Farming and Horticulture

Aligned with activities that focused on the nutrition status of vulnerable households, the projects implemented by PIN also focused on so-called **kitchen gardens**, in which smallholder farmers grow crops in their back garden. Produce from kitchen gardens is readily available and accessible for the daily consumption of households. To align the vegetable production with it's nutrition and health benefits, PIN engaged jointly health workers with FTCs and DAs for training on how nutrition relates to what farmers grow in their garden and how it can be used effectively. Households learn how to repeatedly grow their vegetables, ensure the availability of improved seeds, choose irrigation systems and tools, etc. Multiple implementing agencies were then engaged in the installation of community gardens, which aligned with the infrastructure irrigation projects and community trainings on horticulture production.

Students field visit to tree seedling nursery, Arba Minch, 2022

Nutrition Dense Crops – Orange-Fleshed Sweet Potatoes (OFSP)

With the objective of increasing the intake of vitamin A and improving food security especially among children and women, new fortified orange-fleshed sweet potatoes (OFSP) were introduced to farmers in SNNPR. Previously, there was only one used OFSP variety grown (Kulfa) which was not very popular among the consumers. Thanks to cooperation with the International Potato Center (CIP), three new varieties were cultivated and registered. These new cultivars are more drought tolerant, resistant to viruses and have a higher dry matter content. The varieties (Alamura, Dilla, and Kabode) were introduced to households during campaigns, through promotion at markets and cooking demonstrations.

Breeding a new enriched crop variety, obtaining its registration and promoting its cultivation is a lengthy and technically demanding process that is usually beyond the priorities of rural experts. Ensuring that new varieties are widely grown and used among farmers and consumers is also an integral part of such innovation.

4.7 Academic Cooperation and Exchange

Boosting Underlying Academic Expertise

Supporting higher education institutions and scientific and research activities have great potential to contribute to sustainable development. As such, the Czech University of Life Sciences (CULS) has been collaborating with Hawassa University (HU) since 2018. The cooperation project has emphasised the critical role of knowledge and technology transfer in the agricultural sector. By promoting the exchange of expertise, this partnership aimed to empower local researchers and contribute to the long-term resilience of Ethiopia's agricultural systems.

The engagement strengthened research and publication capacities at two colleges of Hawassa University in fields linking ecosystem diversity with sustainable agricultural intensification and biotechnologies. Throughout the joint engagement, visiting experts have provided extensive training through workshops and seminars, targeting both HU students and academic staff, providing specialised courses and workshops on scientific writing or statistical data analysis. These equipped participants with essential skills for quality scientific publications to ensure a long-term transfer of knowledge and skills. These activities have been crucial in building technical skills and fostering a strong research culture.

Increasing Expertise in Genetic Resources Analysis

To deepen understanding of the complex relationships between trees, agricultural crops and soil biology, one of the focus areas of academic cooperation was agroforestry and soil science, where the research aimed specifically at climate change adaptation potential of coffee agroforestry and other valuable value-chains.

As Ethiopia is home to a vast pool of genetic resources of agricultural crops and trees, innovative biotechnological solutions are needed for their conservation and utilisation in breeding, as well as the country's extensive reforestation programmes. Therefore, courses of plant molecular genetics and in-vitro plant technologies were also offered.

The course on molecular ecology of animals showcased the use of molecular techniques in the management and conservation of wildlife species, as well as in the sustainable use of animals for production. These topics are important in a country that harbours such a high number of endemic species and has such a frequent occurrence of human-wildlife conflict.

Explantate laboratory practice, Hawassa, 2021

Student Engagement and Support

In addition to specialised courses, ongoing support was provided to supervise student research activities, and help them finalise theses, and prepare manuscripts for submission to peer-reviewed journals.

Along with hundreds of students that participated in the courses and workshops, CULS has accepted several PhD students from HU, facilitating their advanced studies and integrating them into international research networks. Together, researchers from CULS and HU have successfully published multiple scientific articles.

Overall, this partnership not only strengthens the academic and research capabilities of HU but also fosters sustainable development through the effective transfer of knowledge and technology. By empowering local researchers and promoting sustainable agricultural practices, the project contributes to Ethiopia's efforts to achieve food security, environmental sustainability, and socio-economic development.

5. INNOVATIVE CONCEPTS

Instalation of the solar pump at FTC

5.1 Climate Adaptation

The long-term goals of the development cooperation have been formulated around finding sustainable solutions. The sustainability and achievements of the development efforts are, however, being increasingly undermined and challenged by the shocks and events induced by climate change. Therefore, the solutions need to address not only sustainability, but also the climate resilience of the results of any development efforts. In the agriculture sector, this means taking into account potential scenarios which might take place in the future and that will redefine agro-ecological conditions, as well as the occurrence of newly identified risks that the traditional or industrialised production systems have not faced so far.

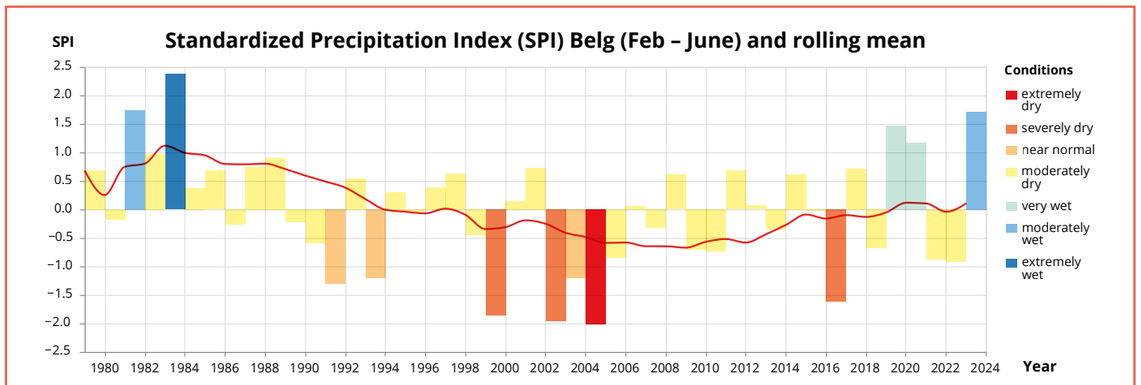
Rather than primarily addressing production efficiency, development interventions need to build the resilience of the production and capacity of all actors in the agriculture sector so they can adapt to the changing conditions. Immediate solutions include promoting good and innovative agriculture practices, such as the efficient management of water sources, irrigation systems, soil management or overall natural resource management with related infrastructure. Secondly, adaptation will need to take into account the biodiversity and genetic pool of crops available to farmers, so that agro-ecological stability can be ensured, and farmers can maintain production through new plants, crops, varieties or animal breeds which will be better suited to new conditions. These types of technical solutions, however, assume conducive socioeconomic conditions which will allow for the uptake of resilient farming systems at scale.

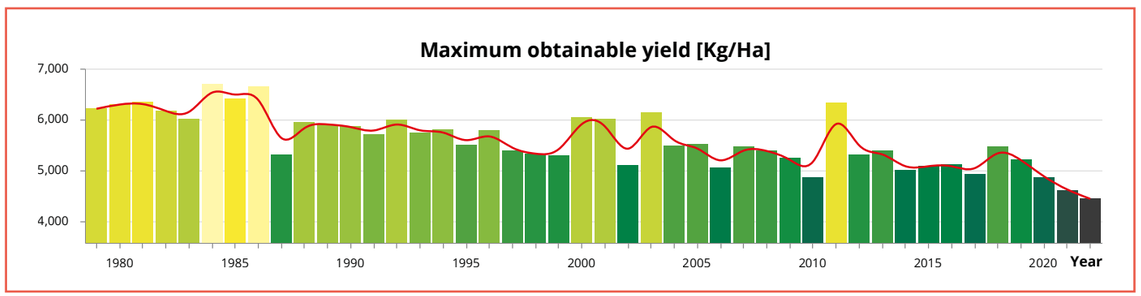
5.2 Climate Risk Assessments and Early Warning Systems

As many models suggest, the impacts of climate change will continue to manifest globally as more frequent and abrupt weather extremes and less reliable seasonal patterns. These trends are being confirmed and observed in Ethiopia, where agriculture seasons have been affected by the El Niño phenomena, as across the whole of Eastern Africa.

The global and regional trends will manifest differently across individual regions, woredas and communities, depending on their exposure, microclimate, landcover, land use, types of livelihoods and farming systems. An assessment of environmental risks and impacts is becoming a standardised component in the design of development or humanitarian projects, and further risk assessments are conducted for programmes oriented at Disaster Risk Reduction (DRR) or Emergency Preparedness.

The changes in climate, however, will very likely lead to new types of risks, which will not only manifest as meteorological phenomena, but also as changes in other agro-ecological dynamics, such as the incidence of disease and pest outbreaks, changing migration patterns and population structures of wildlife, birds and insects, as well as socioeconomic phenomena. The early identification of these trends and risks will be crucial not only for climate adaptation, but also for developing surveillance and early warning systems for both short-onset (floods, storms etc.) as well as slow onset (droughts, diseases, pest outbreaks) crises.





5.3 Conservation Agriculture

Intensive crop production in recent years has depleted soils to the extent that future production in Ethiopia is jeopardised. For many years, the trend was to improve agricultural production through the promotion of agriculture inputs, such as improved seeds, chemical fertilisers (NPK, urea), herbicides, pesticides, and regular and even multiple tillage. These measures, however, lead to further deterioration of soil conditions, and the degradation of farmers' fields from physical, chemical, and biological perspectives. In addition to organic matter, the soil is losing its living microbiological structure, cohesion, nutrients and eventually it is washed or blown away by erosion.

Healthy soil is key to developing sustainable agriculture systems that are resilient to the effects of climate change. Farming systems that reduce soil degradation and prevent losses of cropland, and regenerate degraded lands are pillars of conservation agriculture. Conservation agriculture brings a sustainable management to agriculture while still meeting the requirements for needed intensification of production.

Conservation agriculture promotes three principles:

→ Minimum disturbance of the soil – minimum or zero tillage practices
→ Permanent soil cover by organic matter – through living cultures or mulching
→ Species diversification – using space and time to address the nutrient content of the soil or pest and disease dynamics

Leaving aside large-scale planning and design of the landscape, the key to soil fertility and the foundation of good agriculture management remains in the hands of individual farmers and the soil management practices they are using. It is usually suggested to start with a small plot about 10x10 metres in size for testing and then to proceed with farmer-to-farmer extension and the promotion of the achieved results. The entry point for this can usually be found in the promotion of intercropping, promoting either the use of new combinations (usually leguminous crops) or enhancing the traditional methods. These techniques can be then combined with the use of crop residues for mulching and the use of organic fertilisers and non-chemical fertilisers.

As the shift to conservation agriculture involves changes to some essential practices, there are many misconceptions among farmers as well as agriculture extension workers. For example, it is often perceived that the application of conservation agriculture limits the land area for production or that it is not suitable for dry areas. Therefore, it is paramount to combine the technical evidence-based recommendations and trials with raising awareness, and the promotion and application of KAP (knowledge-attitudes and practices) surveys or techniques for social behavioural change. Also, as with the effects of most agricultural activities, the impact of conservation agriculture is not visible instantly. The measurable soil quality improvement on crop yields will only become apparent over a long-term period, namely with stabilised production and lower expenditures on input costs.

New conservation agriculture (CA) and climate-smart agriculture (CSA) field practices successfully introduced include for example:

→ minimum tillage
→ mulching and use of cover crops
→ sowing and planting in rows,
→ intercropping,
→ agroforestry and use of perennial fodder plants
→ local composting and vermicompost production

5.4 Agroforestry

Agroforestry is a system of land use management in which trees or shrubs are grown over crops or pastureland. It is a sustainable concept which provides benefits both in terms of production and income, and carries advantages over conventional agricultural and forest production methods in terms of increased productivity from the available plots of land. It also has a largely positive impact on the microclimate of the plots. Over a short period of time, agroforestry contributes to the reduction of soil erosion and water runoff, thus increasing the density of nutrients in the soil and water retention in the fields and landscape.

The efficient design of agroforestry systems and the combination of a variety of crops, shrubs and trees can actively improve the soil's nitrogen dynamics, increase biological diversity, prevent the spread of pests and diseases, and improve the overall use of available energy in farming systems. The whole system leads to environmentally stabilised and climate resilient production.

There are several types of agroforestry system:

- → Agri-silvicultural systems, which manage land for the production of crops and forest products
- → Silvopastoral systems, which produce both wood products, fodder for animals and livestock
- → Agri-silvopastoral systems, a mixture of the two systems above, which produces tree products, crops, and livestock

An initial step in the introduction of agroforestry is the production of necessary plants, shrubs, bushes, and grasses that are suitable to the current farming system. The production of fodder grasses and other fodder for animals kept on the farm has proven to be very successful. Grasses or shrubs are then promoted to protect the land from landslides and leftovers like branches or leaves are ploughed into the soil to increase the organic content matter.

A variety of agroforestry systems, combining various staple and cash crops as well as fodder plants, fruits and forest trees have already been presented on the premises of FTCs in all targeted woredas. The techniques were promoted in a variety of seminars, trainings, conferences, and support programmes to extension systems serving ordinary farmers.

The concept of permaculture, as the ultimate variation of agroforestry, has been presented in the permaculture training centre in Arba Minch. The training centre is growing and promoting moringa, a tree with anti-erosion qualities and an agroforestry function, which enriches the soil by binding atmospheric nitrogen, and serves as a source of food (leaves, seeds) and income. Additionally, the centre also promotes planted crops such as root tubers (cassava, sweet potato, taro, yam) and leafy vegetables (chaya, cassava or moringa). The centre also promotes the principles of climate-smart agriculture and holistic management of gardens of one hectare.

5.5 Integrated Agriculture

Integrated farming is a form of agriculture which produces both crops and animals on one farm. It aims at minimising the use of inputs from outside the farm by implementing a variety of practices, such as long and diversified crop rotations, and crop residue or animal excreta restitution to the soil. This farming system implies long and diversified crop rotations, reduced-tillage and permanent soil cover and reduces dependence on chemicals, allowing diversification for better sustainability.

5.6 Nature-based Solutions (NBS)

Nature-based solutions are actions which protect, sustainably manage, or restore natural ecosystems, and address societal challenges such as climate change, human health, food and water security, and simultaneously provide human well-being and biodiversity benefits. NBS may include: avoiding emissions by protecting landscapes and limiting deforestation; restoring ecosystems such as drained peatlands so they sequester carbon; and improving degraded habitats by bringing ecological diversity into landscapes dominated by singular species.

NBS emphasise the benefits of activities implemented in synergy with local ecosystems and the environment without the necessary involvement of technological solutions. Smallholder farmers and food producers are on the frontlines of climate change and play an important role in developing and implementing environmental and agricultural solutions. Farmers can combine their traditional knowledge with new skills and training to deliver contextualised solutions to local problems. For example, a common problem is flooding. This risk can also be addressed by actions that take advantage of ecosystem services such as tree planting.

Some land-related activities that contribute to climate change adaptation, mitigation and sustainable development have already been adopted. Such responses include, but are not limited to, sustainable food production, improved and sustainable forest management, soil organic carbon management, ecosystem conservation and land restoration.

5.7 Agro-ecology and Holistic Management

Agro-ecology shares much in common with other approaches to sustainable farming. The term can refer to a scientific debate, a grassroots social movement, or an agricultural practice. The foundation of agro-ecology is the application of ecological concepts and principles in farming, while recognising the interdependence of human systems and ecosystems. It emphasises focusing on the social and economic dimensions of food and agricultural systems. In other words, agro-ecological practices are viewed holistically and tailored to fit the environmental, social, economic, cultural and political context.

5.8 Integration of Soil and Water Conservation Measures

Soil and water conservation measures are predominantly applied for the following purposes: to control runoff and thus prevent loss of soil by the soil erosion; to maintain or to improve soil fertility; to conserve or drain soil water; or to harvest (excess) water.

Measures to reduce soil erosion can be soil or water management specific but they mostly contain an element of both. For example, the reduction of surface runoff by changes made to land management will also help to reduce erosion. Both efforts are closely interlinked, as quality soil is essential for water retention.

5.9 Behavioural Change

The consequences of deforestation, land degradation and the impacts of climate change require innovative approaches as described above. However, those approaches rely on the adaptation of famers' practices, as traditional practices applied for centuries might not be appropriate within the new circumstances. Education, training, and awareness-raising has long been the cornerstone of the extension system's work, as the lack of know-how and poor attitudes towards the promoted topics were often seen as the main barriers to achieving desired behavioural changes amongst farmers. The Ethiopian Government invested in a robust system of FTCs and extension services and PIN facilitated annual awareness campaigns supported by the CzDA programme. However, these efforts continued to be considered secondary to material support and technical assistance.

Nonetheless, the impact of the awareness campaigns and adult education did have often only a temporary or limited impact. Only some of the promoted practices, techniques, and behaviours were afterwards adopted by the majority of farmers.

For a significant period, sectors like healthcare, nutrition or WASH have focused heavily on analysing barriers to the acceptance of promoted behaviours (e.g. handwashing, breastfeeding, HIV prevention), often analysing knowledge, attitudes, and practices of programme participants. Over time this has shown the need for an even deeper analysis of the variety of barriers that prevent programme participants from successfully changing behaviours and of the drivers which contribute to the adoption of promoted practices.

Designing activities around the concept of Social Behavioural Change is an approach that helps to formulate projects and activities in more efficient ways, addressing the relevant barriers and drivers. This makes projects more efficient both in terms of time and budget. As long as the desired practices and behaviours are well identified and defined, the behavioural change design starts with the **barrier analysis** in which the barriers that prevent people from adopting a particular behaviour or practice are defined. The research is composed of qualitative and quantitative questions, which help to guide and define the most appropriate actions.

Farmers Focus Group Discussions, Lebu Koromo, 2022

Behavioural determinants:

knowledge and skills • perceived social norms • perceived positive & negative consequences • access to materials and services • cues and reminders for action • perceived risk susceptibility • perceived risk severity • perceived action efficacy • perceived divine will and superstitions • legal framework & policy • cultural background

6. STORIES

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6.1 Almaze Argeta – Vermicompost Producer

Almaze Argeta is a female model farmer and mother of six from Sidama region, in Aleta Chiko Woreda, Dibicha Village/kebele. As has been the case for many farmers living in the area, the loss of fertile soil and the ensuing loss of income has become a big problem. Almaze was selected as a model farmer by PIN and participated in different promoted practices including producing and using vermicompost. Vermicomposting is regarded as an approach which can help Ethiopian farmers become more resilient to the changing environment. Vermicompost is a purely organic fertiliser made from the biological excretion of worms. The process of producing vermicompost begins with the multiplication of worms and the preparation of any plant leftovers into small sizes to feed the worms. PIN provided Almaze with training and experience-sharing in how to produce vermicompost using household waste, enset/false banana leaves and crop residues from her garden.

Since 2020, Almaze has not used any chemical/inorganic fertilisers, which has saved her money. Instead, she has adopted the use of climate-friendly organic fertiliser to produce organically farmed products, mainly pineapple, vegetables, maize, ensete, and coffee, all of which have long-term benefits when grown with respect to the cycle of nature. On top of this, she sells worms and vermicompost to generate additional income for her family.

She shares her skills with others and provides practical training and experience-sharing too, especially as more model farmers would adopt this type of business to cope with rising prices of inorganic fertiliser and the need to reduce the impacts of climate change by introducing long-lasting practices.

> *“At first, I thought it was a joke and unbelievable because, rather than using it as something valuable and important, I couldn’t even see or touch the worms. I despised worms so much. I only attended the training and sought simple benefits, not expecting to go any further in producing more worms and vermicompost.”*
>
> **Almaze**

6.2 Aschelew Tesafye – Beeswax Candle Producer

Aschalew Tesfaye was an unemployed college student living in Aleta Wondo area before he attended a training course, in which he saw potential for his future. Aschalew took a short agricultural product processing course from Aleta Wondo Vocational Training College supported by CzDA and PIN. The training covered avocado oil production, coffee roasting, juice extraction, and beeswax candle production. The training taught young people new skills and supercharged their creativity. Further, his team, consisting of four others, successfully completed a business challenge competition to be awarded a business grant. After eight months of hard work, their association secured a monthly income of 3000 Birr (€50) for each team member and managed to save 5000 Birr (€84) monthly at the association level.

Aschalew is now the coordinator of the Ghion Candles Association, established in 2023. He spends time leading and coordinating the association's daily business. In their workshop, they produce 2–3 thousand candles daily. They purchase beeswax from the local community and supply various candles and "tuaf", usually used for church rituals. Their customers are small merchants and churches in Aleta Wondo. Originally, a moulding machine and office equipment were provided to the association, however, they then created their own moulding machine to better suit their needs.

Ghion Candles aspire to expand their small business industry, while the local government have acknowledged their efforts and invited them to share their experience. Aschalew is very pleased to have set up his business and now be able to financially support his mother.

6.3 Tewabech Talo – Model Farmer

Mrs Tewabech is one of the model farmers, who participated in trainings on the good agriculture practices, provided jointly by the team of People in Need and Development Agents. Trainings addressed the practices of conservation agriculture and good soil management, such as crop rotation, intercropping, use of organic manure and mulching. These trainings were first presented on the demonstration plots of local Farmers Training Centers and then adopted for further trials on plots of Model Farmers, just like those of Mrs Tewabech.

She describes her experience: "PIN introduced us to the agriculture practice such as conservation mulching. My land is now protected from the excess sun and this keeps the soil moisturized. You can see the productivity between the fields with and without the mulching. I didn't use any chemical fertilizers for the mulched field, but you can see the difference. Now I am a model farmer in the village and I share my experience with others and the land remains fertile."

She teaches her neighbors sustainable farming practices and innovations that she has learned from the trainings and trials. Her own farm is visited by their neighbors and Development agents help her to organize also the experience sharing sessions among the local farmers. In first year, she has already passed on her knowledge to more than 400 people. Together, they contribute to protecting

6.4 Yekatit – moringa and fruit grower

Yekatit is a young farmer from the small village of Chano Mile. At her 35 years, she manages not only a small farm but also a two-room household where the children sleep on the floor while she and her husband share a bedroom. Her sister lives in the house next door, they cook together outside on the fire and share their joys and worries. They have a cow and chickens together and grow their own mangoes and avocados. But her household is special in many ways. In her garden she grows not only herbs and vegetables, but also medicinal plants. "For example, buna katal, this concoction is for malaria," she points to the dark greenish-brown liquid. "Bitter as life, but a lifesaver."

> *"Every morning before the sun came up, I prayed for my children and because of what I learned, I can now give more to my family."*

But her farm is slowly changing. The change came with a fruit value chain project in Arba Minch, funded by the Czech Development Agency. "Before, we just ate the fruit or sold it at low prices. Thanks to the training, I now produce jams and dried fruits that I sell for much more," she explains. She smiles as she recalls cooking together with the project team. "From moringa leaves and maize, for example, we learned how to cook kurkufa and fossesi so that the children could have more nutritious meals, and we were also given an advice on how to farm better." The project also taught her new methods of working with soil and fruit. "We learned how to have a bigger crop and process it more efficiently."

7. WAYS FORWARD AND RECOMMENDATIONS

Daily labourer in the community nursery, Sidama, 2019

7.1 Technical Innovations

Technical Components of Early Warning Systems (EWS) and Big Data Management

When developing institutional and community capacities in the agriculture sector, there are overlaps with a large variety of the systems crucial to EWS. Monitoring and prediction of threats such as flash-floods, droughts, disease or pest outbreaks, landslides, or crop failures, benefit from to the efficient management of data combining meteorology, pedology, hydrology as well as geology dynamics.

Collection of the initial data relies either on the installation of automatized sensors with remote control capabilities or those requiring assistance of human data collectors, who ensure their reliable function and maintenance, as well as the timely interpretation of the recorded data. As such, the design, installation and training of responsible staff are crucial components and incur recurrent costs while deploying any technical sensors and systems. Additionally, the technical equipment needs be compatible with the software system capable of handling the large amount of data coming from the field, bearing the necessary variety of technical characteristics. This type of data then needs to be compiled into mathematical probability models capable of providing multifactorial estimations of the situational development.

Needless to say, the collection of the technical data is only a precondition to the successful deployment of any EWS, and such systems can only be effective when the dissemination of the interpreted information and the reaction component of the EWS is properly developed.

The Development of Analytical Capacities on Woreda and Community Level

Analytical capacities are indeed key to diagnostics, monitoring, planning and designing activities in most sectors. Analytical capacities in agriculture, usually come second to those in other sectors such as healthcare or WASH, nonetheless, the variety of analysis needed for this sector is extensive. The analytical equipment varies from microbiological, veterinary, genetic equipment to those that are essential for field production, which include soil analysis and testing.

For an informed decision to be made in relation to conservation agriculture, erosion control or improved agriculture practices, all farmers and experts need to have information on phenomena like soil structure, nutrient content, organic content, and pH levels. While many orientational estimations can be done using approximation methods with farmers, and through the use of field kits, there remains a large opportunity for improving their capacities in soil analytical services, especially given the role that agriculture plays in the economy of the SNNPR region. For now, these laboratory capacities and services are limited to only a few academic offices and governmental bureaus with limited amounts of equipment and outreach capacity among the farmers.

Digitalisation of Farming and Precision Agriculture

The vast majority of the agriculture projects supported by the Czech Development Cooperation target small-scale farmers, addressing the livelihoods of poor farming families and prioritising their food security, nutrition status and resilience of their communities. Such priorities are reflected in the size of land accessible to these families as well as the manual labour they invest in the production. In the medium-term, the mechanisation and industrialisation of farming will take place, favouring more investments in technology and digitalisation of the farming production. This transition will affect the structure of the farming systems, yet the characteristics crucial for shaping them will include the ability of farmers, communities or extension structures to efficiently collect available data, then process, interpret and apply them either in the decision making or final field application. While the general trends of remote sensing data can be provided by private, governmental or extension actors, individual farms will have to be equipped with field sensors, machinery and mechanisation that will allow the application of the precision agriculture. Testing and investments in mechanisation and methods of precision agriculture are therefore highly relevant for future projects to proactively address the technologically smart solutions.

The Development of a Land Tenure Cadastre System

The participatory and community approach to landscape management shows the high importance of factors such as land access, land rights, and land ownership. Countries like the Czech Republic have a solid cadastre system, which includes combined data on the ownership along with pre-defined land use types, legal definitions related to this and access regulations.

These systems are being intensively developed also in Ethiopia, supported by World Bank programming and

funding. Over the last decade, numerous efforts have been made in terms of building the databases that assign land ownership / land access rights and the development of such a cadastre system is still in progress. Nonetheless, the land use application, inclusion of landscape management plans and alignment with the community decision-making process will continue to be a development challenge for years to come. The structure, track record and expertise of the Czech development assistance shows the high potential for programme components that focus on capacity development in this area.

Targeting Gaps in Prioritised Commodity Value Chains

Multiple strategies, both governmental and international, stress the importance of the development of industrialisation and the efficient marketing of agricultural commodities with high added value and quality. These strategies intend to capitalise traditional, as well as, innovative market opportunities, reach international markets and develop international partnerships in agriculture value chains. Typical examples in South Ethiopia are coffee, fruits (mango, avocado), qat, or flowers. As part of the Czech-Ethiopian bilateral cooperation, there is a positive trend towards supporting pro-market solutions and addressing specific commodities such as fruit, moringa, leather processing etc. through technical vocational trainings complementary to the needs of agro-industrial processing centres, hubs and local cooperatives.

However, given the financial and technical capacity of the Czech ODA, this assistance should be well targeted into weak points and gaps within prioritised value chains. More attention, coordination and analytical capacities will have to be invested in order to identify the value chains and agricultural commodities suitable for bilateral cooperation that would enable the engagement of investors and business partners from the Czech Republic, Europe or globally, while maintaining the ODA's role of ensuring an equitable approach and the protection of vulnerable members of communities in target regions.

Development of the Commodity Control Capacities and Hubs

Despite the efforts of governmental extension structures, agricultural production still remains highly decentralised and individualised, which limits significantly the efficiency and quality of agriculture production available to local consumers or raw materials needed in agro-processing centres and wholesalers. On the other hand, a good level of community self-subsistence as well as a diverse production are good preconditions to environmental resilience and food and nutrition security. Therefore, it is necessary to maintain the balance between fully industrialised systems and those which are well developed in terms of agro-ecology and community functions.

Quality control in produced raw materials as well as the in monitoring the food safety standards should be therefore organised and accessible to community actors, preferably on the woreda or zonal level. The organisational capacity of the WAOs and FTCs is substantial, however the technical capacity, equipment and awareness remains lacking in terms of laboratory equipment, or the setup of the monitoring, awareness and communication between customers, clients and key actors.

7.2 Programming

Promoting Cooperation and Complementarity Among Implementing Partners

Through Czech bilateral programming in the agriculture sector in Ethiopia, considerable technical experience, in addition to a variety of methods, data and good practices have been delivered by multiple partner organisations both from Czech Republic and Ethiopia. Such organisations range from academic institutions, research institutions, NGOs, technological centres, private companies as well as governmental actors. While these interventions bring considerable impact on the local level to their project participants and local actors, the methods, approaches and technical experience generated within the projects over the years remains largely retained by individual project teams. The presentation and sharing of the project outputs remains a responsibility of individual implementing teams and consortia. The variety and levels of expertise put forward in projects has been high and demonstrable among individual experts and partners, yet this know-how does not translate efficiently into well-established and long-term strategies in the agriculture sector. Investment in knowledge-management and the sharing of existing best practices hold significant potential for improving the impact of the Czech ODA in the agriculture sector.

Climate Adaptation and Resilience Mainstreaming

Ethiopia, like many of the Least Developed Countries (LDCs), is facing the impacts of climate change more pressingly than higher income countries. The majority of the population is not able to adapt to the rapidly changing conditions due to underdeveloped or unavailable technologies and the vulnerable nature of their livelihood systems. Governments across LDCs are well aware of the need for climate resilience programming and have incorporated this topic into their strategic documents, on which future steps and projects are to be realised.

Climate adaptation programming and climate resilience are then significantly more relevant in the context of the humanitarian-development nexus and the prevention of environmental migration. The promotion of climate-smart agriculture is an integrated approach for developing strategies to secure sustainable food security in response to climate change in specific locations. While the overall production rate is not the ultimate goal, it still sustainably increases productivity, enhances resilience and adaptation, reduces, or removes greenhouse gases, and enhances the attainment of national food security and multiple SDGs.

Aligning Geological Surveys, Landscape Planning and Community Works

As mentioned in the introduction, hydrogeological surveys have a 40-year-old history within the bilateral cooperation between the Czech Republic and Ethiopia. After the last decade's experience implementing a robust programme in landscape management and community extension, it is highly advisable to align the objectives of the projects that are being identified and designed. As an example, there have been projects implemented by PIN and CGS in similar geographic areas. Data sharing between the implementer and projects shall be beneficial, as the mapping of CGS are instrumental to PIN's projects addressing agriculture and water. Such integrated interventions based on shared data have been found very useful and the impacts of those joint efforts has significantly increased the not only the impact of the intervention, but also the visibility of the CzDA programming and the likelihood of the formation of international consortia of NGOs, implementers as well as donors.

Planning Long-term, Well-Sequenced Interventions in Selected Areas

In comparison with other sectors, most of the NRM projects require some degree of time flexibility and a long-term timeframe for their implementation. This is due to the sensitivity of NRM in terms of climate and weather, both of which have become highly unpredictable. Also, the majority of the NRM activities are only possible to implement during a specific time of the year and the impacts of such activities are also only possible to observe the following year, at the earliest. Here, we are still only talking about the immediate impact, relatively speaking, not about the long-term impact, which is essential for successful NRM projects. These projects should also involve areas which are not selected administratively but rather geographically, which would make the areas covered by these programmes much larger than they currently are.

Lastly, projects should be implemented in phases. Rather than thinking in terms of projects, we should talk about programmes which would include not only NRM, but also involve water and agricultural components.

7.3 Suggested Modes of Cooperation

Data Sharing and Database Maintenance

During the implementation of CzDA programming there have been plenty of projects realised. Over the course of time, these projects have gathered a huge amount of data which are used usually only for the purpose of project evaluation and in the exchange between donor and implementer. After the project phase-out, the data are handed over to partners in Ethiopia and often lost or unreachable by other implementing partners or in future CzDA project cycles. Datasets or ready-made databases of collected information are neither kept in one place by donors nor by implementers or their partners. If we can manage to keep databases in centralised or shared, and accessible by all the stakeholders

(donors, implementers, partner organisations, partner/recipient countries) this would mean considerable savings in terms of time, money, and human resources that are needed for repeated data collections. Also, relevant implementing agencies and partner could easily secure the necessary data from the databases without the need for additional needs or risk assessments or even baseline studies.

Unified Monitoring and the Use of Programme Indicators

As above, the efforts of CzDA to connect projects into programmes based on a topic or a geographic location should go hand-in-hand with the unification of indicators. Even if the indicators are developed by the implementers, when it comes to the evaluation of a programme, it is difficult for the donor to evaluate all of the projects from different implementers if they use different indicators. The common practice so far has been to divide the indicators into basic groups – general, specific outcome, output and activity indicators.

The introduction of IndiKit, a tool developed by PIN in 2018, was done so with such an intention. This tool was offered to CzDA so that it could be widely used among implementers and is available also on the webpage indikit.net. IndiKit aims to make the monitoring and evaluation of relief and development interventions easier and better. It was developed thanks to a financial contribution from CzDA and was offered to CzDA so that it could be shared with other implementers and could be used during project formulation. The unification of indicators would enable the evaluation of the projects implemented by different implementers to be much easier.

Promotion of Consortia and Participatory Design

As has been shown in many prior examples, the cooperation of many entities would be advisable. By many entities we mean INGOs, government officers or offices, universities, specialists (like pedologists, hydrogeologists, agriculturalists, climatologists, etc.). The cooperation should start during the formulation phase. The idea should always come from the responsible governmental office or from affected people and communities themselves. However, to be able to propose a well thought-out project, the idea should at least be commented on by other actors as they will be able to bring new perspectives to the challenges and can propose different methods and approaches. This mutual cooperation should ideally continue during the project cycle and even after the project has been phased out, so that the impact and results can be shared and monitored.

Traditional plowing with Maresha

8. ANNEXES

8.1 Review of the Projects Implemented

#	Time frame	Name of the project	Project type	Targeted area	Woreda	Implemented by
1	2008–2010	Anti-erosion measures in the vicinity of Lake Awassa	NRM	Sidama	Hawassa Zuria	People in Need
2	2010–2012	Sustainable management of soil, forest, and water resources as a pilot project of community development of South Ethiopia	NRM	Sidama	Hawassa Zuria	Mendel University in Brno
3	2011–2013	Support of household food security through integrated watershed management	NRM	Kembata Tembaro	Angacha Woreda	Caritas Czech Republic People in Need
4	2011–2013	Enhancement of quality and extent of extension services in woreda Angacha, Kembata Tembaro zone	AGRI	Kembata Tembaro	Angacha Woreda	Czech University of Life Science
5	2011–2013	Support to agriculture livelihoods and sustainable management of natural resources	AGRI/ NRM	Sidama	Hawassa Zuria, Boricha	People in Need
6	2011–2013	Support of farmers and agriculture education in Damboya and Halaba Special Woreda	AGRI	Kembata Tembaro & Halaba	Damboya, Halaba	People in Need
7	2013–2019	Support of an agriculture consultancy in Ethiopia, Aleta Chuko, Dilla	AGRI	Sidama	Aleta Chuko, Dilla Woreda	People in Need
8	2014–2015	Enhancement of quality and extent of extension services in woreda Angacha, Kembata Tembaro zone II	AGRI	Kembata Tembaro	Angacha	Czech University of Life Science
9	2014–2015	Support to agriculture livelihoods and sustainable management of natural resources in Sidama II	NRM/ AGRI	Sidama	Shebedino	People in Need
10	2014–2016	Support of farmers and agriculture education in Damboya and Alaba Special Woredas SNNPR, Ethiopia	AGRI	Halaba	Alaba Special Woreda Damboya	People in Need
11	2014–2016	Long-term access to water in Alaba Special Woreda	NRM	Halaba	Alaba Special Woreda	People in Need
12	2014–2017	Effective irrigation for sustainable agriculture production in the Kembata Tembaro Zone	AGRI	Kembata Tembaro	Kacha Bira, Angacha	Mendel University in Brno
13	2014–2016	Degraded lands sanitation and reclamation as a base of sustainable management of natural resources in Awassa Zuria Woreda	NRM	Sidama	Awassa Zuria	Mendel University in Brno
14	2015–2018	Study of natural hazards harmful to agriculture production in selected areas of SNNPR	AGRI/ NRM	SNNPR	Whole region	Czech Geological Survey
15	2016–2020	Increased ecological stability of Dijo and Bilate Watersheds	NRM	Alaba & Sankura	Alaba Special Woreda, Sankura	People in Need
16	2016–2017	Implementation of holistic management and Climate Smart Agriculture in the Baso River catchment area, Arba Minch Zuria Woreda	NRM/ AGRI	Arba Minch	Arba Minch Zuria	Mendel University in Brno
17	2017–2020	Participatory development of productive landscapes I	NRM	Sidama	Loka Abaya, Aleta Chuko	People in Need
18	2017–2020	Sustained Diet Quality Improvement by Fortification with Climate-smart, Nutrition-Smart Orange-fleshed Sweet Potato (CzDA trilateral cooperation)	AGRI	Aleta Chuko, Dilla Zuria, Kochere, Wonago	Aleta Chuko, Dilla Zuria, Kochere, Wonago	People in Need
19	2017–2020	Strengthening livelihoods and nutrition through improved community services	AGRI	Sidama, Gedeo	Whole Zones	People in Need
20	2019–2020	Extended Implementation of holistic management and Climate Smart Agriculture in Arba Minch Zuria Woreda	AGRI	Arba Minch	Arba Minch Zuria	Mendel University in Brno
21	2019–2021	Support for community management of natural resources for the development of sustainable livelihoods in Sankura and Alaba	NRM/ AGRI	Halaba, Sankura	Sankura, Halaba	People in Need
22	2019–2021	Support for farmers in ensuring the access to food and increased community resilience in selected kebeles of Kembata Tembaro Zone	AGRI	Kembata Tembaro	Angacha, Kacha Bira	Geotest
23	2019–2022	Introduction of the principles of sustainable management of the landscape in the vicinity of Lake Awassa	AGRI	Awassa	Hawassa, Hawassa Zuria	Mendel University in Brno
24	2019–2023	Ensuring sustainable landscape management in selected areas of Ethiopia based on geoscientific mapping	NRM	SNNPR	Whole region	Czech geological service

#	Time frame	Name of the project	Project type	Targeted area	Woreda	Implemented by
25	2020–2022	Publication and Research Development for Education in Life Sciences at Hawassa University	AGRI	Awassa	Hawassa city	Czech University of Life Science
26	2020–2023	Arba Minch Fruit Value Chain	AGRI	Arba Minch	Arba Minch Arba Minch Zuria	Mendel University in Brno
27	2020–2023	Support of employment opportunities and employability of youth in the agriculture sector in SNNPR	AGRI	Sidama, Gedeo, Wolayta	Whole three zones	People in Need
28	2021–2024	Participatory development of productive landscapes in Sidama region, Ethiopia II	NRM	Sidama	Loka Abaya, Aleta Chuko	People in Need
29	2021–2024	Improving nutrition, hygiene and sanitation in Hawassa Zuriya woreda, Sidama, Ethiopia	AGRI	Sidama, Awassa	Hawassa Zuria	People in Need
30	2023–2025	Adaptation of agricultural systems to climate change in the Kembata Tembaro watershed of Mount Hambaricho	NRM/ AGRI	Kembata Tembaro	Kachabira, Kadida Gamela	People in Need
31	2023–2025	Agriculture Systems Adaptation Program in Reqame Watershed, Halaba and Silte-ASAP in Reqame	NRM/ AGRI	Halaba, Silte	SNNPR, Zone Halaba and Silte	People in Need

1	2008–2010	Anti-erosion measures in the vicinity of Lake Awassa	NRM	Sidama	Hawassa Zuria	People in Need
2	2010–2012	Sustainable management of soil, forest, and water resources as a pilot project of community development of South Ethiopia	NRM	Sidama	Hawassa Zuria	Mendel University in Brno
3	2011–2013	Support of household food security through integrated watershed management	NRM	Kembata Tembaro	Angacha Woreda	Caritas Czech Republic People in Need
4	2011–2013	Enhancement of quality and extent of extension services in woreda Angacha, Kembata Tembaro zone	AGRI	Kembata Tembaro	Angacha Woreda	Czech University of Life Science
5	2011–2013	Support to agriculture livelihoods and sustainable management of natural resources	AGRI/ NRM	Sidama	Hawassa Zuria, Boricha	People in Need
6	2011–2013	Support of farmers and agriculture education in Damboya and Halaba Special Woreda	AGRI	Kembata Tembaro & Halaba	Damboya, Halaba	People in Need

#	Time frame	Name of the project	Project type	Targeted area	Woreda	Implemented by
7	2013–2019	Support of an agriculture consultancy in Ethiopia, Aleta Chuko, Dilla	AGRI	Sidama	Aleta Chuko, Dilla Woreda	People in Need
8	2014–2015	Enhancement of quality and extent of extension services in woreda Angacha, Kembata Tembaro zone II	AGRI	Kembata Tembaro	Angacha	Czech University of Life Science
9	2014–2015	Support to agriculture livelihoods and sustainable management of natural resources in Sidama II	NRM/ AGRI	Sidama	Shebedino	People in Need
10	2014–2016	Support of farmers and agriculture education in Damboya and Alaba Special Woredas SNNPR, Ethiopia	AGRI	Halaba	Alaba Special Woreda Damboya	People in Need
11	2014–2016	Long-term access to water in Alaba Special Woreda	NRM	Halaba	Alaba Special Woreda	People in Need
12	2014–2017	Effective irrigation for sustainable agriculture production in the Kembata Tembaro Zone	AGRI	Kembata Tembaro	Kacha Bira, Angacha	Mendel University in Brno
13	2014–2016	Degraded lands sanitation and reclamation as a base of sustainable management of natural resources in Awassa Zuria Woreda	NRM	Sidama	Awassa Zuria	Mendel University in Brno
14	2015–2018	Study of natural hazards harmful to agriculture production in selected areas of SNNPR	AGRI/ NRM	SNNPR	Whole region	Czech Geological Survey
15	2016–2020	Increased ecological stability of Dijo and Bilate Watersheds	NRM	Alaba & Sankura	Alaba Special Woreda, Sankura	People in Need
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20	2019–2020	Extended Implementation of holistic management and Climate Smart Agriculture in Arba Minch Zuria Woreda	AGRI	Arba Minch	Arba Minch Zuria	Mendel University in Brno

#	Time frame	Name of the project	Project type	Targeted area	Woreda	Implemented by
21	2019–2021	Support for community management of natural resources for the development of sustainable livelihoods in Sankura and Alaba	NRM/ AGRI	Halaba, Sankura	Sankura, Halaba	People in Need
22	2019–2021	Support for farmers in ensuring the access to food and increased community resilience in selected kebeles of Kembata Tembaro Zone	AGRI	Kembata Tembaro	Angacha, Kacha Bira	Geotest
23	2019–2022	Introduction of the principles of sustainable management of the landscape in the vicinity of Lake Awassa	AGRI	Awassa	Hawassa, Hawassa Zuria	Mendel University in Brno
24	2019–2023	Ensuring sustainable landscape management in selected areas of Ethiopia based on geoscientific mapping	NRM	SNNPR	Whole region	Czech geological service
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26	2020–2023	Arba Minch Fruit Value Chain	AGRI	Arba Minch	Arba Minch Arba Minch Zuria	Mendel University in Brno
27	2020–2023	Support of employment opportunities and employability of youth in the agriculture sector in SNNPR	AGRI	Sidama, Gedeo, Wolayta	Whole three zones	People in Need
28	2021–2024	Participatory development of productive landscapes in Sidama region, Ethiopia II	NRM	Sidama	Loka Abaya, Aleta Chuko	People in Need
29	2021–2024	Improving nutrition, hygiene and sanitation in Hawassa Zuriya woreda, Sidama, Ethiopia	AGRI	Sidama, Awassa	Hawassa Zuria	People in Need
30	2023–2025	Adaptation of agricultural systems to climate change in the Kembata Tembaro watershed of Mount Hambaricho	NRM/ AGRI	Kembata Tembaro	Kachabira, Kadida Gamela	People in Need
31	2023–2025	Agriculture Systems Adaptation Program in Reqame Watershed, Halaba and Silte-ASAP in Reqame	NRM/ AGRI	Halaba, Silte	SNNPR, Zone Halaba and Silte	People in Need

People in Need

People in Need
www.peopleinneed.cz

People in Need is a Czech, non-governmental organisation (NGO) that has been providing aid in troubled regions and supporting respect for human rights since 1992. People in Need has since grown to become one of the largest NGOs in Central Europe. Today, its work focuses on relief and development aid, advocacy for human rights and democratic freedom, field social work, and education, awareness and information.

CZECH AID

Czech Development Agency
www.czechaid.cz/en

The Czech Development Agency is a state organisation under the authority of the Ministry of Foreign Affairs of the Czech Republic and an implementing body of the development cooperation of the Czech Republic. The main aims of the Czech Development Agency include reducing poverty, improving quality of life and supporting sustainable development. The Czech Development Agency connects three groups of actors: state sector and local authorities, non-profit sector with universities and private sector.