



VALUE AGROECOLOGY FOR DRYLANDS

AVACLIM Project -Component 2

Summary

Evaluations of agroecological initiatives

Ethiopia

January 2021

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Summary



Introduction

Presentation of the AVACLIM project

The AVACLIM project (2020-2022) was built on the conviction that agroecology is one of the most promising approaches to enhance the mitigation and adaptation potential of food and agricultural systems to climate change and to strengthen their resilience. Implemented in seven countries (Brazil, Burkina Faso, Ethiopia, India, Morocco, Senegal and South Africa), the project is coordinated by CARI, a French NGO, and implemented by partner NGOs. In Ethiopia, the NGO partner is the Institute for Sustainable Development (ISD), a civil society organisation working with smallholder farming communities in Ethiopia to improve their livelihoods through ecological land use management. In conducting this research, ISD worked in partnership with PELUM and the National Scientific Team.

Despite the growing recognition of agroecology, it often remains a theoretical option for policy makers. In this context, the AVACLIM project aims to strengthen the sharing of knowledge gained by practitioners in the field, to evaluate agroecological initiatives and to implement advocacy, based on this scientifically validated evaluation, towards national and international political institutions.

Thus, the seven NGO partners, in partnership with national research teams, conducted a scientific evaluation of two agro-ecological initiatives in each country according to a methodology specific to the AVACLIM project. The project's national scientific partner is the Institute for Sustainable Development (ISD), whose research combines traditional knowledge and innovation for the sustainable development of local communities in Ethiopia.

This document is a synthesis of the evaluation reports produced for the two initiatives in Ethiopia.

Presentation of the methodology for evaluating the selected agroecological initiatives

What is an agroecological initiative?

Agroecology is an approach to rethinking food systems with the aim of achieving ecological, economic and social sustainability.

The AVACLIM project characterises agroecology in its multi-dimensionality at the scale of a territory and is interested in agroecological initiatives. These can take the form of social, economic and agro-environmental innovations and provide a specific response to a local need. The agroecological initiatives selected for evaluation were chosen according to different criteria: they must be at least 5 years old in order to have

sufficient historical data, be anchored in a territory and in a collective network, have general and historical data and approach agroecology in a holistic way.

AVACLIM multi-criteria assessment methodology

The assessment is carried out using a prototype proposed by the AVACLIM scientific consortium, based on an aggregate of methodologies. **Twenty-six existing assessment methodologies** were studied, in order to propose a single methodology that attempts to overcome certain limitations: multiplicity, lack of inclusion of the different dimensions, adaptation to agriculture and not to agroecology, etc. Among the methodologies used to build the AVACLIM prototype are **LUME** (Petersen *et al.*, 2020), the **Framework for the Analysis of Interactions between Sectors and Territories** (Madelrieux *et al.*, 2017) - 2017, **TAPE** (FAO, 2019), **Memento du GTAE** (Levrard & al., 2019) and **TATA Box** (Audouin *et al.*, 2018).

The Avaclim evaluation methodology is built around four stages: three framing stages to understand and characterise the initiatives studied, and a fourth central stage of multi-criteria and multi-actor evaluation of the initiatives' effects. The following infographic (fig. 1) presents the different stages and their objectives.

Through a multi-criteria analysis, step 4 seeks to quantify the effects of the initiative in four main dimensions: **quality of life and well-being, technical-economic performance, ecosystem health and resilience.**

To feed these four dimensions, **87 indicators** were proposed by the French research team, which the national scientific partners and NGOs in each country selected and adapted in order to carry out the evaluation of the selected initiatives. The data collected was then compared to reference values to judge the performance of the initiative. **The results are expressed as a percentage of a maximum score, which is considered an agro-ecological optimum.**

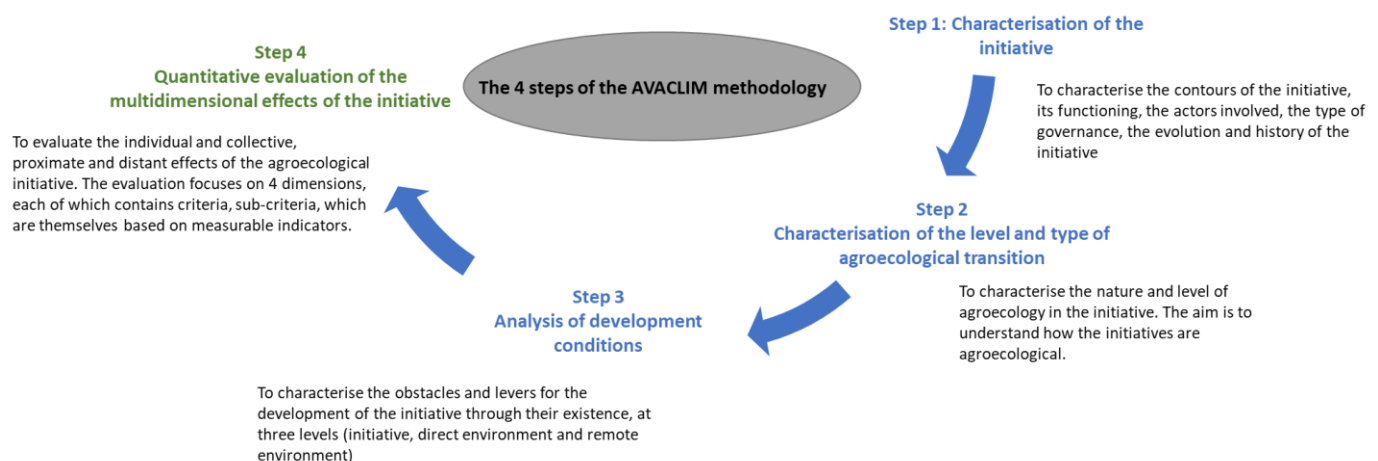


Figure 1. Step of the AVACLIM assessment process
Scoping (blue) and evaluation (green) stages

Maruf's vermicomposting

Description of the initiative

The initiative takes place in Maruf village, located about 15 km east of Guder town (Toke Kutaye district, West Shewa zone, Oromia region). The small farms in the villages in this area, including Maruf, suffer from acidic soils (pH 4.5-5). Acidic soils contain toxic levels of aluminium and manganese and are deficient in essential plant nutrients, resulting in lower crop yields. Farmers may even abandon some land that has become infertile.

Despite these difficulties related to the acidity of the soil, smallholders in the area practice mixed farming combining crops – (cereals, vegetables, fruits, pulses, root crops and spices)-with livestock–(cattle, chickens, goats, donkeys, and horses). Agrobiodiversity is high in the plots, with different species and varieties grown. In addition, hedgerows with wild species, fruit trees and large trees, delimit the landholdings. Farmers intercrop and rotate crops to improve productivity and soil fertility and to reduce diseases and pests. Chemical inputs (inorganic fertilisers and pesticides) are mainly used for maize and sometimes for vegetables. Livestock management varies according to the season (stalling and grazing). The livestock are fed exclusively with feed from the farm (crop residues, field weeds, hedge foliage). Cereal seeds are produced on the farm or supplied by the District Agricultural Office, while vegetable seeds are purchased from local traders. Producers sell their produce at the local market and buy household products and other supplies. Only family labour is used for farm work.

With the support of the government agricultural bureau and national agricultural research institutions, vermicomposting was introduced in Toke Kutaye district as early as 2013 with the aim of improving soil health and fertility. At the start of the initiative (2017), however, significant support from the agricultural bureau and various NGOs was needed for farmers to adopt the practice. As a first step, soil acidity was assessed by the Holeta Agricultural Research Centre, located in close proximity to Maruf, in order to determine the optimal amount of lime to add to the soil to reduce its acidity and *ultimately* improve agricultural productivity. The lime and earthworms were then supplied by a government company. It should be noted that the effect of lime is improved if it is applied simultaneously with the implementation of agroecological practices such as crop rotations or symbiotic associations. Also, training was provided to farmers on organic vegetable production using vermicomposting. Since then, the local agricultural Bureau has been training and supporting farmers to set up and use their own vermicomposting system, thus reducing the farmers' heavy dependence on chemical inputs. In addition, practical exercises and demonstrations by experienced "lead" farmers also helped other farmers to take up these practices.

Vermicomposting has since been disseminated to different villages in the district. The initiative has grown to the point where a Regional Vermicomposting Centre has been established in Guder town in 2019 to provide farmers with inputs and technical support. The town of Guder and its surroundings are now known for their excellence in producing and promoting vermicomposting and vermiculture and for transferring this

practice to other regions. Today, more than 200 farmers from 12 villages in Toke Kutaye district have adopted the practice of vermicomposting.

Public policy involvement has also evolved favourably. Indeed, vermicomposting is now being promoted nationally as a soil health management approach through farmer training centres and the Guder Vermicomposting Centre, which hosts and shares its knowledge and experience with farmers from different regions.

The main actors

- **National partners:** Institute for Sustainable Development (ISD), Participatory Ecological Land Use Management Association, and the National Scientific Team (Dr. Bayush Tsegaye, Dr. Hailu Araya and Atalo Belay); and researcher Bikila Keno.
- **Beneficiaries:** 12 villages in Toke Kutaye district (208 farmers, including 24 women)
- **Other stakeholders:** Regional Vermicomposting Centre, Regional Agricultural Office, Holeta Agricultural Research Centre; Enhanced Rural Self Help Association (ERSHA)

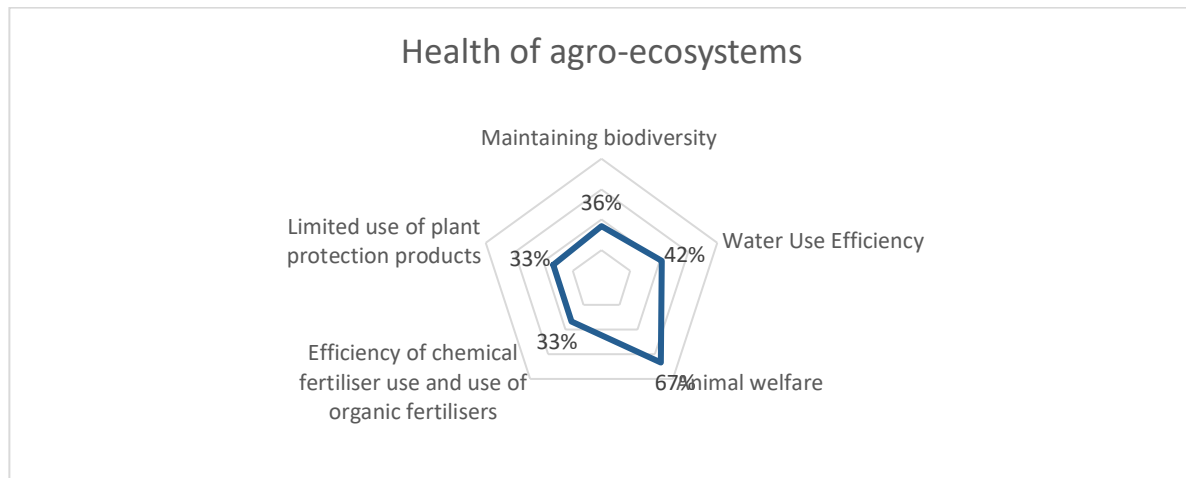
Quantitative results

- More than 200 farmers in 12 villages are practising vermicomposting
- Establishment of the Regional Vermicomposting Centre in Guder in 2019
- Training courses held on vermicomposting

For more information: <https://avaclim.org/fiches-initiatives-ethiopie/>

Presentation of the lessons learned on the four dimensions

Agroecosystem health dimension

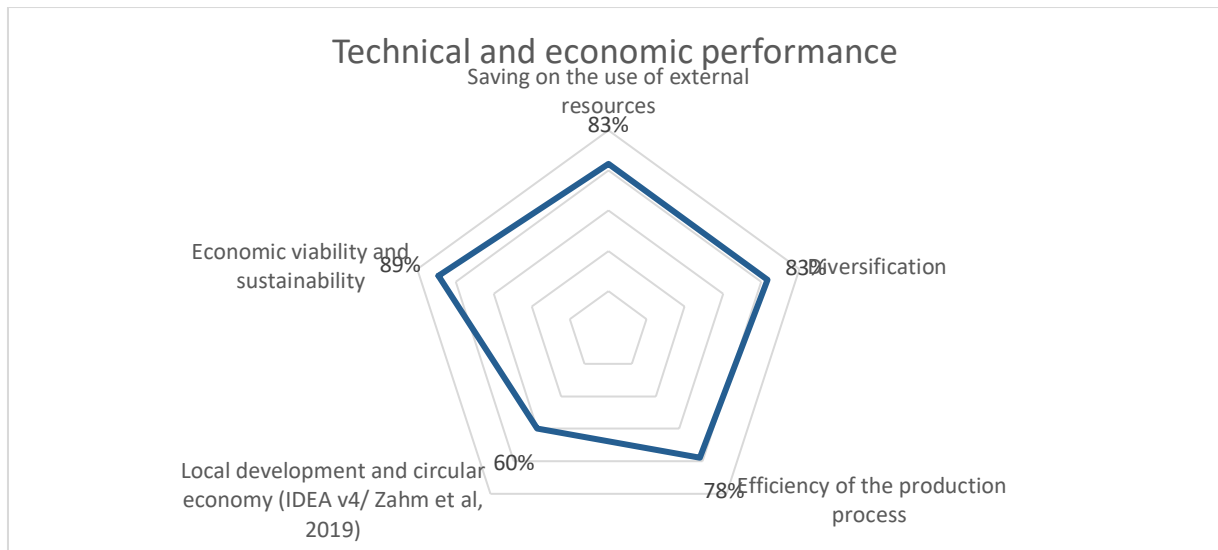


The initiative performs poorly on agro-ecosystem health, with an overall score of 35% due to its poor performance on several criteria. **Water use** (42%) is poor, even though irrigation is used reasonably and there are no water use conflicts in the study area. No water harvesting and saving practices and, more generally, no sustainable water management practices are implemented. Furthermore, the criteria "**efficiency of chemical fertiliser use and use of organic fertilisers**" and "**limited use of plant protection products**" both score low (33%). Legumes represent less than 5% of the cultivated area and chemical fertilisers are still mainly used due to a lack of extension on organic fertilisers. Phytosanitary products (herbicides and pesticides) are also used, especially for maize cultivation. It should be noted that data are scarce due to the lack of access to the study area.

Despite the diversity of species cultivated, the performance of the initiative in terms of **maintaining biodiversity** is also low (36%). Only one animal species is raised on the one farm surveyed and no rare or endangered species are grown or raised. Genetic diversity is also low, as none of the species cultivated includes more than three varieties. In addition, there are no sustainable biodiversity management practices or practices to protect/favour the presence of melliferous species. Despite the crop rotation implemented in the area, the intercropping period is short (less than one year) and the integration of intermediate cover crops (for agronomic purposes for livestock feed or energy production) is punctual.

Finally, **animal welfare** scored well (67%). The animals are free to graze and are treated properly; they are provided with appropriate feed, veterinary services and shelter.

Dimension "Technical and economic performance"

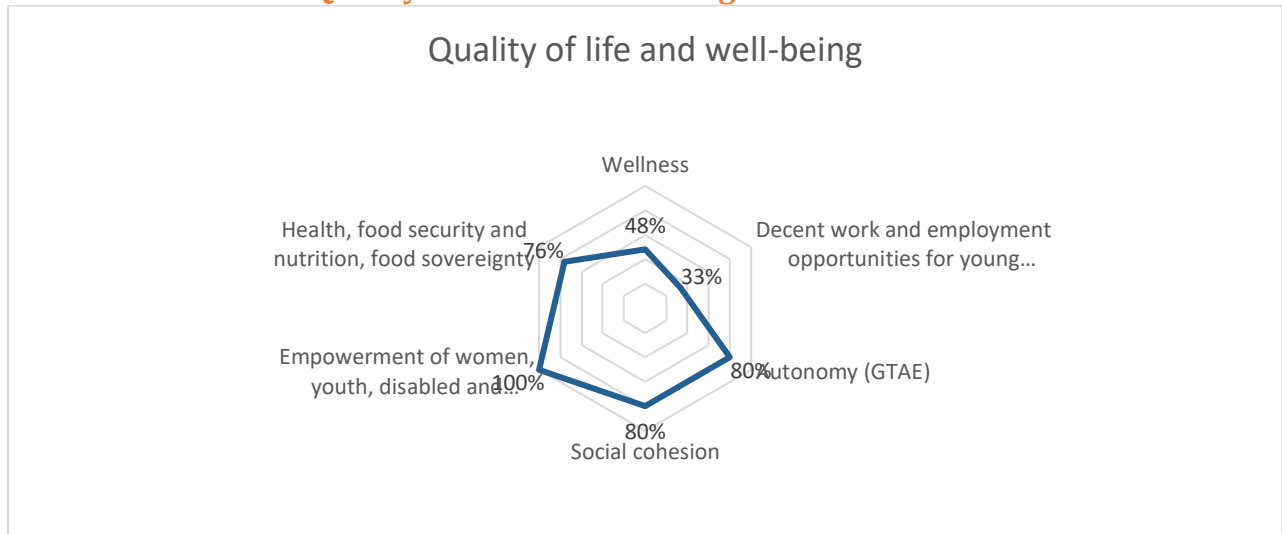


The initiative performs well technically and economically (overall score of 79%), with high scores in the criteria:

- **Economic viability and sustainability (89%)**: the assessed farm does not depend on subsidies to operate and provides paid employment to its members. Debts have no impact on the economic results. The farmer also sells part of the production locally;
- **savings in the use of external resources (83%)** due to a certain level of independence of farmers from inputs (by producing vermicompost) and food products because of the self-consumption of part of their own production;
- **production efficiency (78%)**, although little information was collected on this aspect;
- **diversification (83%)**, with a fairly diversified production system including one main production and three other productions which represent respectively 50-75% and more than 20% of the turnover.

The initiative performs quite well on **local development and circular economy** (score of 60%). Indeed, more than 50% of the agricultural production is destined for local food systems. The farm also contributes to local development by employing six people on the surveyed farm, with a fairly high UAA/work unit ratio. However, collective work and local input supply need to be improved.

Quality of life and well-being" dimension

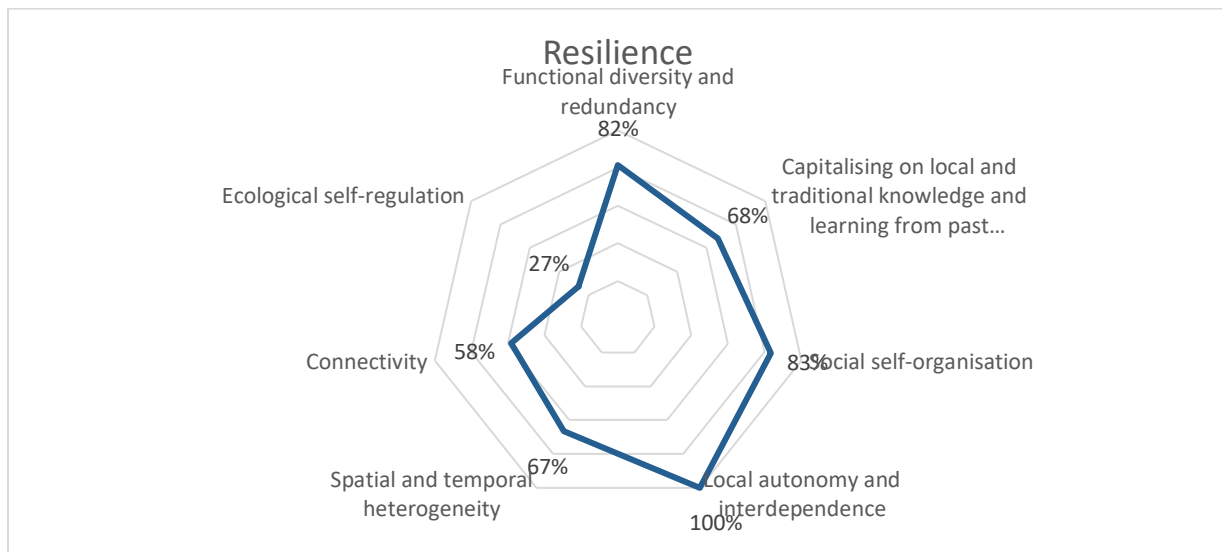


The initiative scores well in the dimension of **quality of life and well-being** (overall score of 70%). Indeed, the following four criteria score very well on:

- **Empowerment of women, youth, disabled and marginalised people (100%):** Members of the surveyed farm collectively manage the outlets. They take part in the responsibilities, in the equitable sharing of profits and in decision-making about the use of production and resources. They receive training from the local NGO ERSHA on the preparation and management of vermi-compost;
- **Autonomy (80%):** Independence from inputs and autonomy in decision-making (including production, processing, marketing and the family's investment capacity) are promoted by the initiative. Both husband and wife can take minor decisions alone, for example, on the marketing of a small amount of grain or the purchase of everyday goods;
- **Social cohesion (80%):** farmers are involved in professional structures (associations); they regularly participate in knowledge and know-how networks through community meetings, social events (Farmers' Field Days) and farm visits. They participate in collective activities on communal land, and support the needy. However, the sharing of equipment remains low and the borrowing of equipment is rare;
- **Health, food security and nutrition, and food sovereignty (76%):** producers are rather low on pesticides; they use local varieties and organic fertilisers (vermicompost). Thus, production depends little on the outside world. The agroecological practices used allow for the production of healthy food, which contributes to food and nutritional security.

Welfare and contribution to employment show average and low performance (48% and 33% respectively). For the first criterion, this average result is explained by the weakness of the non-monetary economic wealth and agricultural indicators (score below 1), which are not well adapted to the Ethiopian context. However, producers are satisfied with their quality of life. The low score for the second criterion is linked to a mostly informal (although permanent) contracting, irregular remuneration and the arduousness of work on the farm.

Resilience dimension



The initiative scored well overall (69%) on the Resilience dimension, in particular due to the very high **local autonomy and interdependence** of farmers (100%). Indeed, more than 50% of the agricultural production is sold locally, which contributes to local development. Producers use few external inputs and produce their own fertiliser through vermicomposting. **Social self-organisation** is high (83%), although there is little collective work done on the particular farm studied. The training provided to farmers has indeed contributed to the empowerment of farmers, strengthening interactions and social cohesion. **Capitalisation of local and traditional knowledge and learning from past experiences** (68%) is done through various training and experience sharing organised by the Agricultural Development Bureau and ERSHA. Practical exercises and demonstrations of vermicomposting are done by experienced farmers with learners. The knowledge sharing also includes local and non-local varieties. This farmer-to-farmer learning takes place at the village, district and even regional level. However, the **connectivity** of farms with the local socio-economic fabric is average (score of 58%) with local supply and collective work to be developed.

Regarding the agroecosystem, different elements contribute to the connectivity (trees, shrubs, hedges, ponds) and are integrated or contiguous to the plots. However, this criterion needs to be improved at the landscape level. Furthermore, the high **functional diversity and redundancy** (score of 82%) are linked to a high diversification of crop species and crop rotation.

The low score for the criterion "**ecological self-regulation**" (27%) reflects the low genetic diversity present on farms with few varieties grown. Only the main crop has a maximum of two varieties. Even if soil fertility amendment is increasingly done with organic fertilisers, chemical inputs (fertilisers and pesticides) are still used for maize and legumes are not very present. In addition, there is little involvement in the maintenance of farmers' genetic resources.

Arbe integrated and sustainable farm

The initiative, located in the village of Udo Wotate (Hawassa Zuria District), some 300 km south of Addis Ababa, is managed and implemented by a woman farmer, Arbe, and her family. Mixed crop-livestock systems dominate in this part of the Rift Valley, with maize as the main crop (for self-consumption) and beans as an intercrop. Year after year, maize is grown, depleting the soil and making small-scale farmers dependent on chemical fertilisers recommended for growing improved maize varieties. Like all small-scale farmers in Udo Wotate, Arbe also grew improved maize and used chemical fertilisers until 2010, when she began her conversion to integrated farming by preparing compost which is followed by diversifying her food sources and gaining additional income. Arbe's conversion was inspired by her visit to a poultry farm and an animal fattening farm in distant localities.

Arbe now practices a mixed crop-livestock system and, unlike her neighbours, various crop rotations and combinations. In addition to beans, intercrops include cabbage, potato, pepper, taro and sweet potato. Her farm has a wide variety of food crops (12 varieties of enset, 5 beans, 3 bananas, 2 kale, etc.) and non-food crops, including trees. Arbe also has fruit trees on her farm, from seedlings provided by the local Agricultural Bureau and other producers. Legumes, such as Desmodium, are included in her plot, as well as elephant grass, which helps control the fall armyworm (a maize pest). Arbe has a more diverse enset plantation than her neighbours. In addition to its food value for humans and livestock, enset also serves as ground cover, a windbreak and provides fibre. Arbe also grows roots and tubers, thus diversifying her food products. Arbe, and all farmers in the village, plant hedges consisting of shrubs, fodder species, and/or multipurpose trees to demarcate and fence their properties. These trees are harvested and used for building houses and for cooking (firewood).

Initially, Arbe received desmodium and elephant grass seeds from the International Centre of Insect Physiology and Ecology (ICIPE), and training in seed production. She now produces her own seed for these two species as well as for other crops. Thanks to training on compost preparation, Arbe stopped using chemical fertilisers. Only organic fertilisers are now used on her farm. In addition, training by experts from the District Agricultural Bureau and ICIPE encouraged Arbe to adopt the integrated pest management (IPM) method of "push-pull technology" to protect maize from insect pests.

Currently, Arbe practices beekeeping, poultry farming, animal fattening and sugarcane production on her farm in order to diversify her income: with the support of agricultural extension agents, she raises poultry on a small scale and fattens oxen for sale. Arbe feeds her animals mainly with feed from her farm (crop residues and weeds: maize stalks, enset leaves, etc.) and buys others. She practices beekeeping and has two traditional and two improved hives. Some of the honey is consumed on the farm and most of it is marketed. She sells her products directly at the farm or at various local markets.

The farm labour force is entirely family-based. Both husband and wife participate equally in family decision-making, including the use and management of income. Men and women jointly decide on agricultural production practices and access to land. Sometimes Arbe uses hired labour. Community organisations exist through which Udo Wotate farmers, including Arbe, can support each other. For example, soil and water

conservation activities are carried out collectively on communal land. In addition, Arbe is connected to many other actors: collectors, traders, consumers, local NGOs (ICIPE and SoS), technical officers (agricultural experts), government offices, etc. Through this network, Arbe receives training, participates in farm visits and has access to seeds and seedlings. She also shares her experience and practices with other farmers locally and beyond. Arbe is now a model farmer promoting the agro-ecological transition. She communicates regularly with local technical officers and other farmers to share her experiences, knowledge and exchange information on best practices.

Now 122 farmers in the village of Udo Wotate (8 ha) use these agroecological practices, including the integrated crop protection method of "push-pull technology".

The main actors

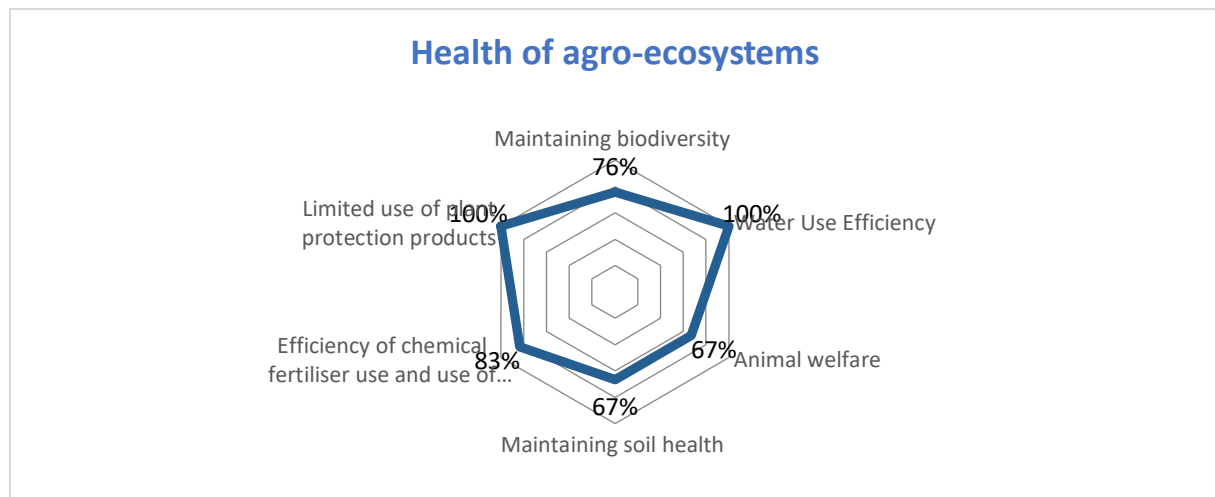
- **National partners:** Institute for Sustainable Development (ISD), Participatory Ecological Land Use Management Association, the National Scientific Team led by Dr Bayush Tsegaye and Researcher Abraham Yimen
- **Beneficiaries:** Arbe and her family as well as the producers of the village of Udo Wotate
- **Other actors:** ICIPE, SoS

Quantitative results

- 122 farmers in the village of Udo Wotate (8 ha) are implementing agroecological practices

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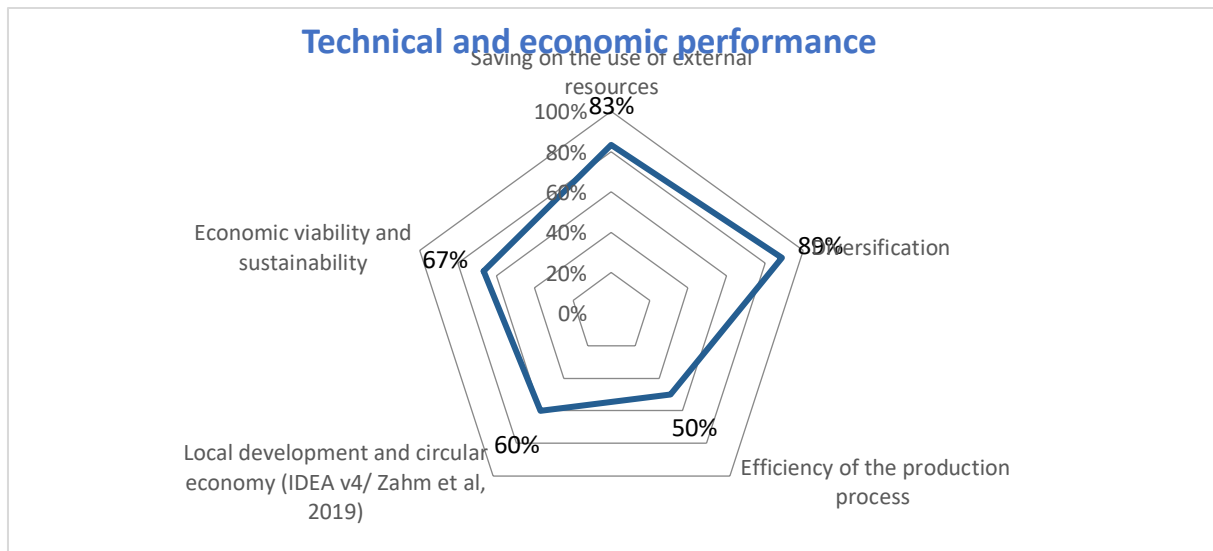
Presentation of the lessons learned on the four dimensions



The initiative performs well in terms of agroecosystem health (overall score of 82%). Indeed, in the integrated and sustainable farm, Arbe implements agroecological practices, respectful of the environment, notably through **efficient water use**, with production spread over the year, and **limited use of phytosanitary products** (score of 100%) thanks to the adoption, among others, composting and the integrated protection method "push-pull technology". The initiative also performs well in terms of **maintaining soil health** (67%) and the **use of organic fertilisers** (83%). Indeed, Arbe uses only organic fertilisers (compost), which improves the soil's organic matter content, texture and soil microfauna activity. These practices, coupled with crop associations and rotations, help to improve soil health. In addition, the farm's soils are covered year-round (corn residue, mulching, permanent vegetation like enset and trees), limiting runoff, moisture loss through evapotranspiration and erosion. Arbe has also stopped using chemical fertilizers since 2018.

The **welfare of the animals, which are** free to graze, also scores well (67%) thanks to proper feeding, adequate housing, and traditional care coupled with veterinary care (in case of serious incidents). Arbe buys part of the feed (for chickens and fattening animals) in addition to what is produced on the farm (crop by-products, enset and sugarcane leaves, desmodium, elephant grass).

Biodiversity is high on Arbe's farm (76%). In fact, she raises three animal species (cattle, chickens, bees) and cultivates species from more than 22 botanical families (cereals, legumes, vegetables, fruits, roots, tubers, coffee), including three vegetable species whose leaves, fruits and roots are edible. Plant genetic diversity is high, with 12 varieties of enset, five of bean, four of maize and three of banana. This high agrobiodiversity allows her to diversify the family's diet and income, and *ultimately* to be more resilient. In addition, these crops flower at different times of the year, contributing to the diet of the bees.



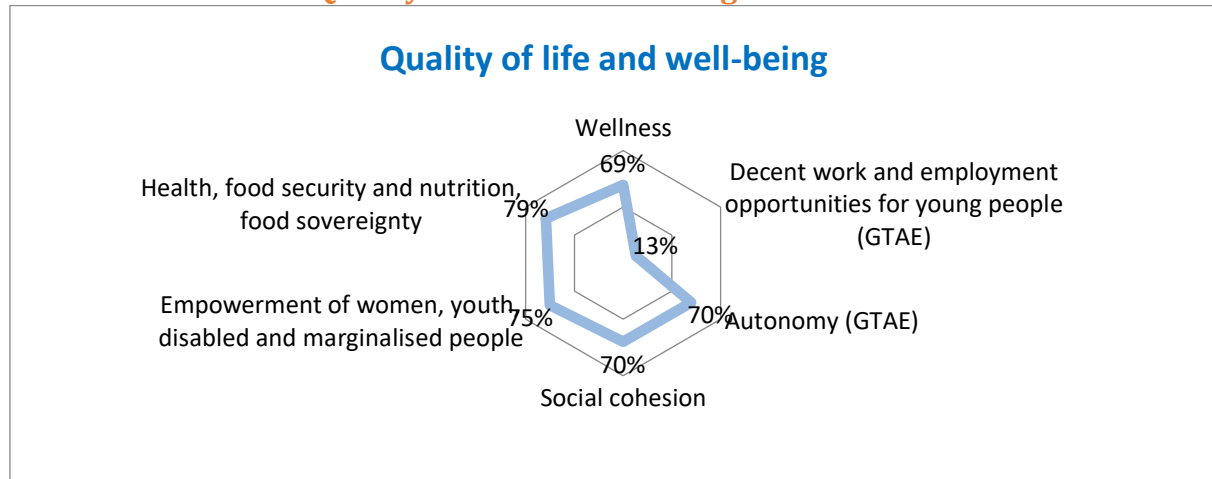
The initiative performs well technically and economically (overall score of 70%), thanks to good results in the following criteria:-

- The **saving in the use of external resources** is important (score of 83%) due to the independence of the farm from external inputs and the good coverage of food needs by the products of the farm. Only some products are purchased, such as cooking oil, salt, soap, and sugar.
- The strong **diversification** (89%) of the farm is linked to the diversity of productions, the number of products marketed, and the outlets. Indeed, Arbe sells her products using different outlets: the farmgate, the local market, the market of Hawassa (nearby town), and a hotel-restaurant.
- The **economic viability and sustainability** of the farm is good (67%). Eventhough Arbe has no income other than from the farm, she finances her production with her own funds. She has not received any subsidies and, although she has benefited from loan, her level of debt remains low (less than 2% of the operating income). She does not buy any external inputs and uses only organic fertilisers produced on the farm.

Local development and circular economy are relatively impacted by the initiative (60%). Although Arbe's family farm is self-sufficient in food, it does not employ any external people and only family members - including young people - act as labourers. Although no collective work or sharing of materials has taken place on her farm, Arbe participates in many training courses, farm visits and other public events outside the initiative.

Finally, the **efficiency of the production process** is the least performing criterion of this dimension due to a lower value added per farm worker than the national average (595 *versus* 804 USD/worker, World Bank, 2020). Indeed, agroecological practices require more labour than those needed for intensive agriculture.

Quality of life and well-being" dimension

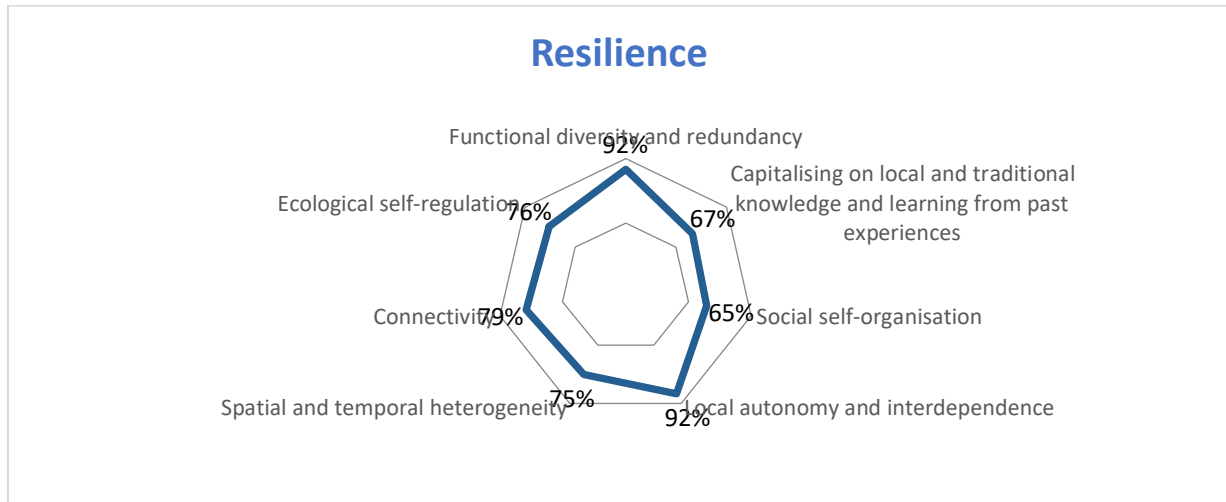


The performance of the initiative on quality of life and well-being is quite high (overall score of 66%), and in particular in terms of **autonomy** (70%). Indeed, the farm is autonomous with regard to external inputs, with inputs produced on site (fertiliser, seeds). In addition, most decisions concerning this family business are taken on the basis of discussions between husband and wife. However, milk processing as well as the marketing of eggs, dairy products and leafy vegetables are reserved for women. This last point is one of the factors that also justifies the good score for the criterion "**empowerment of women, youth, disabled and marginalised people**" (75%). In addition, the initiative is led by a woman trained in new skills and knowledge. Through the initiative, Arbe has become economically independent and has acquired knowledge in business management and accounting. **Social cohesion** within the initiative is high (70% score) with Arbe participating in various community meetings, collective activities on communal land and actions to help the needy. She is a member of the local farmers' association and actively participates in agricultural days and farm visits organised by the District Agricultural Office. She has multiple social networks and shares her experiences with other farmers.

The initiative performs well in the **health, food security and nutrition, and food sovereignty** criteria (79%). Indeed, Arbe produces diversified food on her farm. She meets the food needs of her family and has a surplus which she sells on the local market. She uses mainly local varieties and does not apply any chemicals on her farm. These agroecological practices help her to produce healthy food, free of pesticides. **Well-being** also scores well (69%) with a high level of satisfaction among farmers, although this is offset by an average level of economic wealth. Access to clean water and electricity would significantly improve welfare and reduce the workload associated with fetching water and firewood.

Finally, the initiative has little effect on **decent employment and job opportunities for young people** (13%). Indeed, the level of remuneration for work is low, and only family labour is used. School children provide support during weekends and school holidays. No formal jobs have been created by the initiative.

Resilience dimension



The initiative performs well in terms of resilience (overall score of 77%), through good results in the criteria:

- **Functional diversity** (92%): Arbe farm produces a variety of foodstuffs and develops different income-generating activities (market gardening, animal fattening, poultry, beekeeping, etc.), thus providing a diversified means of subsistence, which minimises the risks linked to economic and/or environmental hazards. In addition, the products are marketed and sold on different markets;
- **Spatial and temporal heterogeneity** (75%) with a high diversity of cultivated varieties and breeds and a diversity of crops over time (crop rotations) which ensure that Arbe has a varied food production throughout the year;
- **ecological self-regulation**, which scores highly (76%) due to the farm's sobriety in the use of pesticides, the exclusive use of organic fertilisers, the integration of leguminous plants, the genetic diversity of crop production and the temporal diversity of crops. In addition, Arbe is a beekeeper.

The initiative performs well in **capitalising on traditional local knowledge and learning from past experience** (67%). Indeed, Arbe grows farmers' varieties, with the exception of maize. She uses knowledge learned from her parents about production practices. In addition, traditional knowledge (and curiosity!) led her to experiment with the adaptation of enset to the hot and dry climate of Udo Wotate; she now has 12 adapted enset varieties on her farm. In addition, Arbe participates in training and experience sharing events organised by the agricultural development office and NGOs. In return, experts from the agricultural office learn from the farmers.

The initiative has a fairly strong effect on **social self-organisation** (65%), due in particular to the existence of community organisations and collective actions through which farmers help each other in times of need. There is a traditional system of helping the needy. This is also one of the reasons why **local self-reliance and interdependence** scores 92%. Also noteworthy is the farm's self-sufficiency in external inputs and the value of products in the local food system. Finally, **connectivity**, with a score of 79%, also contributes to the resilience of the farm, through the solidarity between producers and the strong connectivity of the elements of the agro-ecosystem and the landscape (presence of hedges, trees, etc.).

Cross-sectional analysis

The various agroecological practices implemented by the two Ethiopian initiatives improve soil health, such as vermicomposting in Maruf, the exclusive use of organic fertiliser on Arbe's farm, and its integrated pest management practices ("push-pull technology"). Indeed, the **use of organic fertilisers**, mostly produced on the farm, improves the organic matter content of the soil, its texture and favours life in the soil. The coupling of this practice with those **of crop associations and rotations**, as well as **the introduction of trees** (hedges, fences), contribute strongly to the maintenance or improvement of the productive capacity of the soil. Another lever used by the producers is the implementation of a **mixed farming-livestock system** allowing both the recycling of the farm's animal manure and crop residues (production of compost), and a **high level of specific agricultural diversity**. For example, the Arbe farm alone has 22 botanical families (cereals, legumes, vegetables, fruits, roots, tubers, coffee), and 12 types of enset! This high level of agrobiodiversity encourages the diversity of agricultural production throughout the year, thus minimising the risks incurred by farmers in the face of climatic hazards. On the other hand, it allows for a **varied diet** (larger share of the production is self-consumed) and the improvement of **the livelihoods** of producers and their families (another part of the raw or processed products are sold at the farmgate or at the market), which *ultimately* improves not only the food security, autonomy and resilience of the households, but also encourages other farmers to convert to agro-ecology within the initiatives, and even beyond.

A major production constraint mentioned by farmers in both initiatives is **the low availability of water resources**, coupled with the lack of water harvesting and saving practices. Irregular rainfall and recurrent droughts are major problems for producers. Rotations with crops adapted to this environment allow production to be spread out over the year. Soil mulching also avoids water loss, especially with enset, a multi-purpose plant introduced to Arbe's farm and for which she has even conducted experiments to adapt it to the hot, dry climate! **Access to inputs (and their high costs)**, especially quality seeds, is another important concern of the producers. To address this, they produce most of the seeds on the farm and receive training on this subject. Some seeds are bought from traders or obtained from other farmers or are provided by the local agriculture office (the case of improved maize seeds for the Arbe farm). In Maruf, farmers report the low availability of biomass (in large quantities) for vermicomposting, which is a barrier to wider adoption of the practice.

The **marketing of agroecological products** (raw and processed) is an important lever for the deployment of agroecology. Even if farmers have access to local markets - and even to those further away - in both initiatives, the instability and increase in agricultural input costs (especially since the Covid-19 crisis) are cited as major constraints faced by producers.

Secure access to agricultural land is fundamental. This land issue is exacerbated by the scarcity of available fertile land in the areas studied. Without land security, producers are reluctant to commit financially and to take the risk of changing their practices. Indeed, the implementation of agroecological practices may require substantial financial investments, such as the purchase of inputs or equipment. However, farmers own their own (small) farms that they can pass on to their children,

which can motivate them to engage in such a transition, especially in view of the long-term benefits linked to the change of practices (improvement of soil fertility in particular). In addition, there is little or no external financial support. Thus, farmer Arbe has never received any **external financial support from** the government, village savings and credit schemes, trade unions or NGOs. She started agroecological transition using her own resources. It is also difficult to get credit from banks because of the guarantees they require.

Some practices can generate **extra work, such as** vermicomposting in Maruf, which requires special monitoring and management in addition to the regular agricultural work. Also, the lack of **manpower** can be an obstacle to certain agroecological practices. However, farmers help each other for different activities and in case of need. There is indeed a **traditional system of mutual aid and social cohesion**, and even help for the needy (in both study villages)^o

Capacity building and knowledge sharing among farmers are key levers for the development of agroecology, with the two Ethiopian initiatives providing technical training, farm visits and demonstrations by experienced farmers. In addition, **raising awareness of the long-term benefits** of integrated farming and vermicomposting encourages the adoption of these practices by other farmers. Thus, Arbe is sharing her experience with other farmers in her locally and beyond. She is now a model farmer promoting -agroecological transition. The vermicomposting initiative has grown to the point where a regional vermicomposting centre has been established in Guder to provide farmers with the necessary inputs and technical support.

Gender equality is promoted. Indeed, there are district 'women's and children's affairs' offices, self-help groups and women's associations to help women organise and engage collectively in income-generating activities. In this respect, the integrated farm in Udo Wotate is exemplary with a woman farmer - Arbe - as the head of the business who has been trained in the skills and knowledge necessary for this **empowerment**.

Finally, **public policy** involvement has also evolved favourably in Ethiopia. For example, vermicomposting is now being promoted nationally with, for example, the establishment of training centres for farmers in sustainable soil management and the creation of the Guder Vermicomposting Centre. However, government agricultural offices continue to promote and distribute agrochemicals. The transition needs time and as more farmers transit into agroecological farming, the demand for external agrochemical inputs will continue to decline. Strong political commitment at local, regional and national levels could better support grassroots agroecological initiatives (human, financial and material resources).

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