Analysis of an agrarian system in the mid-mountain regions of Wolayita in southwestern Ethiopia

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Introduction

This study was carried out in 2020 in the mid-altitude rural areas of Wolayita, in the Ofa (woreda) district, where Inter Aide is supporting for rural households in partnership with the Ethiopian organisation RCBDIA (Rural Community Based Development Initiative Association). Through an agrarian diagnostic approach, it aimed to draw up a socio-economic typology of farming families and to understand the strategies implemented to meet their needs. In addition, a particular attention was paid to the situation of very vulnerable households in order to be able to set up specific support adapted to their situation at a later date.

Agrarian diagnosis is a multidisciplinary method of analysis of agriculture that mobilises several scales of analysis (agronomy, history, geography, economics) in order to understand the diversity of environments, agricultural practices and farms in a rural region.

After a presentation of the characteristics of the study area, the first part is dedicated to the agrarian history of this region. It aims to understand the transformations of agriculture and the dynamics of the evolution of the socio-economic categories of farmlands over the last decades. In the second part, a technical-economic study of crop and livestock systems make it possible assessing their respective performances, and thus to understand the farmers' strategies.

Finally, the study of production systems (combination of crop and livestock systems within the farm) and their trajectories makes it possible to draw up a typology of farms in this region and to assess their economic performance (farm income).

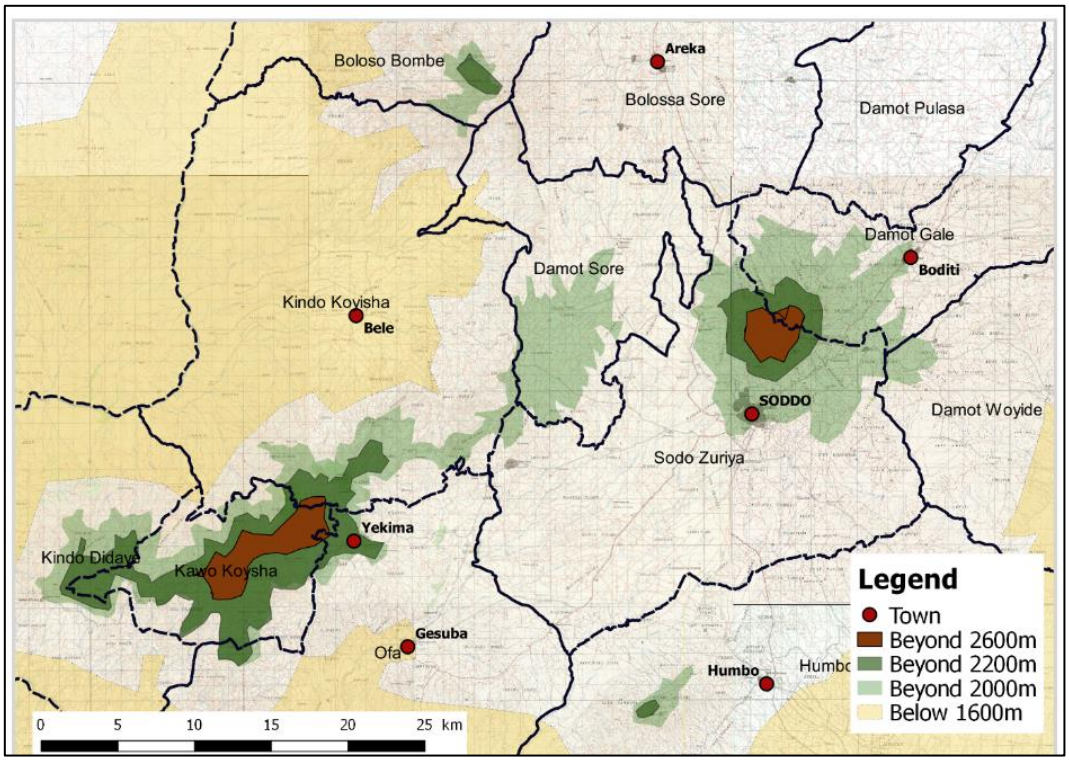
Based on the main criteria of differentiating farms, the objective was also to design a tool that would make it easier to identify families in a very precarious situation and to initiate discussions, with local actors, in order to specifically support these families.

To carry out this study, a survey has been realised in the field over a period of 4 months in 2 villages, followed by a phase of analysis and determination of farm types. The study is therefore based on an in-depth survey of 127 households: 47 qualitative interviews were first conducted at different scales of analysis in these two villages. Then, on the basis of the farm differentiation factors identified in the first stage, 80 quantitative interviews were conducted to expand the sample and to determine the proportion of each type of household in the total population of the two villages.

I. The Wolayita : a green and densely mountainous region

Wolayita is an administrative zone in the Southern Nations, Nationalities and Peoples Region (SNNPR) of Ethiopia. It is characterised by a tropical mountain climate with an average rainfall of 1200mm/year. The dry season extends from October to March, with scattered rainfall (20-30mm per month). The short rainy season, from April to June (Belg), and the "long" rainy season, from July to September (Meher), correspond to the two periods of agricultural activity conducted during the year.

The relief is characterised by the alternation of mountainous areas (peaking at 3,000 metres above sea level) and lowland areas (1,500 - 1,800 metres above sea level). This uneven relief leads to diverse agro-ecological situations, depending on rainfall, temperature and exposure levels.



Map 1: Topographic map of a portion of the Wolayita region

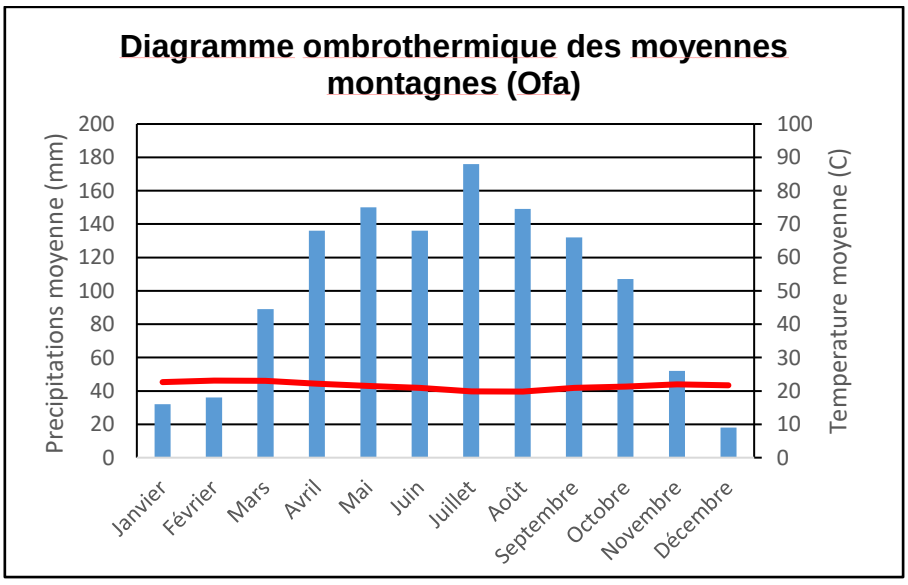


Figure 1 : Umbrothermal diagram midland - Woreda of Ofa

Most of Wolayita's territory is located in the agro-ecological midlands, which range from 1600 to 2200 metres above sea level. The landscape is composed of a continuous mosaic of small farms, with an average size of 0.4 hectares, which cover almost the entire area. There are occasional areas of natural grassland, generally located on the upper parts of the mountains or on steep slopes.

The landscape unit is therefore strongly characterised by agricultural activity. Population densities are particularly high in rural areas, generally ranging from 400 inhabitants per km² in mountainous areas to 500 inhabitants per km² in the plains, with peaks sometimes exceeding 600 inhabitants per km².

Photo 1: Mid- Mountain agrarian landscape in Wolayita, illustrating the mosaic of farms - Ofa Woreda

This seemingly green landscape has led to the region being referred to as "Green Ethiopia"[1].

The study that was carried out therefore specifically concerns the "midlands" and more precisely the altitude range between 1900 and 2000 m.

[1] Gascon, Alain. « Oublier Malthus : Éthiopie, la crise alimentaire surmontée ? », *Hérodote*, vol. 131, no. 4, 2008, pp. 73-91.

II. An agrarian history marked by major socio-historical ruptures

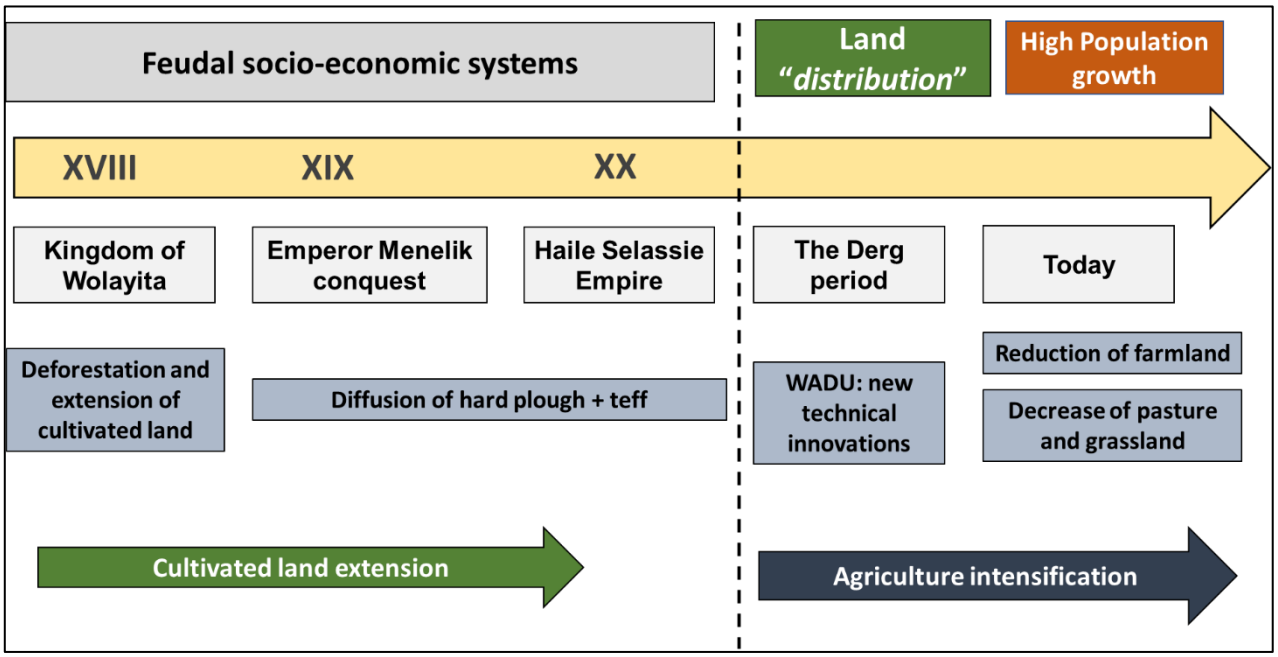


Figure 2: Timeline of agricultural developments in Wolayita

1. The imperial period, characteristic of a feudal society (18th to 1974)

In the 18th century, the King (*Kawo*) Tona a 'reconquered' the territory of Wolayita, previously occupied by a people of herders-pastoralists 'The Morocco'. This period is characterised by strong population migrations towards the Wolayita, leading to a dynamic of extension of cultivated land at the expense of forest areas. During this period, the social structure was divided into 3 different groups:

- The **major landowners**, appointed by King Tona, shared most of the territory (cultivated land, forests, pastures). They owned large herds of cattle (more than 50 heads), and benefited from the labour of the serfs living on their land.
- The **tenants**, 'established' on the land of the major landowners, had the right to cultivate a small piece of land (enset plantation and some food crops). They were forced to work the owner's lands and received one third of the harvest.
- **Independent farmers** owned a small plot of land (around between 0.5 and 5ha) on which they combined home gardens, field food crops and cattle and goat breeding.

In the 19th century, Emperor Menelik conquered the territory of Wolayita, which was then integrated into the vast empire of Ethiopia. This period saw the gradual spread of two major technical innovations that contributed to the economic and commercial integration of Wolayita: the plough, which made it possible to cultivate the soil with the help of harnessed cattle and thus extend the area cultivated per worker; and the spread of teff, an endemic cereal of Ethiopia, cultivated essentially for commercial purposes. From the 1930s, following the death of Zewditu, Emperor Haile Selassie took control of the empire.

During this imperial period, the feudal social structure (landowners - serfs and independent farmers) was not disrupted, and was even reinforced by both the change of the major landowners (who became mainly Amhara) and the increase in the amount of taxes imposed on the poor, landless farmers. Thus, during this imperial period, socio-economic inequalities increased.

2. The Derg regime and lands redistribution (1974 to 1991)

The establishment of the Derg regime led to a major socio-historical break: the redistribution of lands to rural households and thus the abolition of the feudal system. In practice, this land reform resulted in:

- ✓ The access to land for the majority of rural families: a piece of land is granted (right of usus fructus but not abusus) and its surface is supposed to be proportional to the size of the household (surfaces usually between 0.5 and 1 hectare).
- ✓ The partial abolition of the privileges of the major landowners, with a drastic reduction of their area, but without any redistribution of the herds.

On the agricultural front, the Derg has invested heavily in development programmes focusing on:

- ✓ The spread of 'improved' cattle breeds (crosses between improved and local breeds can now be found).
- ✓ The dissemination of so-called "improved" varieties (maize, sweet potato) combined with the introduction of new cultivation methods (sowing in rows, second crop cycle in the year).
- ✓ The access to chemical fertilisers through decentralised agencies of the Ministry of Agriculture.

Thus, the Derg period makes unprecedented changes for farmers in Wolayita, resulting in a reduction in land inequalities between rural households, the abolition of serfdom and some 'modernisation' of agriculture.

However, significant differences between farms persist, mainly due to the non-redistribution of livestock. This gradually results in a multiplicity of animal-sharing contracts: former landowners, who have maintained their herds but are facing a drastic reduction in their agricultural area, are no longer able to feed their livestock. These farmers therefore choose to entrust their animals to small farmers who look after them on their own farm. In return, these small farmers undertake to give part of the products of the livestock to the owner (50% of the butter). When the animal is sold, once the initial cost of the animal has been deducted, the income is shared between the two families.

3. The EPRDF period: population growth and farm miniaturisation (1991 - 2020)

The redistribution of land implemented by the Derg regime, combined with strong demographic growth over the last 30 years, has led to an unprecedented expansion of cultivated agricultural space and the almost complete disappearance of forest and pasture areas.

Gradually, the agrarian space becomes saturated, and no longer enables the farmers to increase the area cultivated per worker. The demographic pressure leads to a miniaturisation of farms, which are divided between family members from one generation to the next, resulting today in an average area of less than half a hectare per family (i.e., 0.25 ha per agricultural worker).

In such circumstances, the farmers have no other option for increasing agricultural production than to intensify agriculture through labour, by increasing the number of crop cycles on the plot in the same year and by gradually abandoning the short-lived herbaceous fallows. These changes were achieved through the generalisation of chemical fertilisers, which ensured the fertilisation of annual crops, previously made possible by animal manuring.

At the same time, fodder resources per livestock unit have drastically decreased at the village level (scarcity of common pasture areas), generating unprecedented pressure on fodder. Farmers are thus faced with periods of intense, regular and longer-lasting fodder shortages, leading to a gradual decline in livestock performance (increased mortality rates during periods of shortage, particularly among calves; lower milk production per suckler cow, etc.).

III. Today's agricultural system.

1. A diversified agriculture which combines perennial and annual crops and livestock.

This agrarian history is reflected today in a remarkably diverse agriculture, combining perennial and annual crops, and integrated with small herds of cattle and goats. Each farm has a relatively similar agrarian structure, with varying proportions and areas of each agro-ecological unit between households.

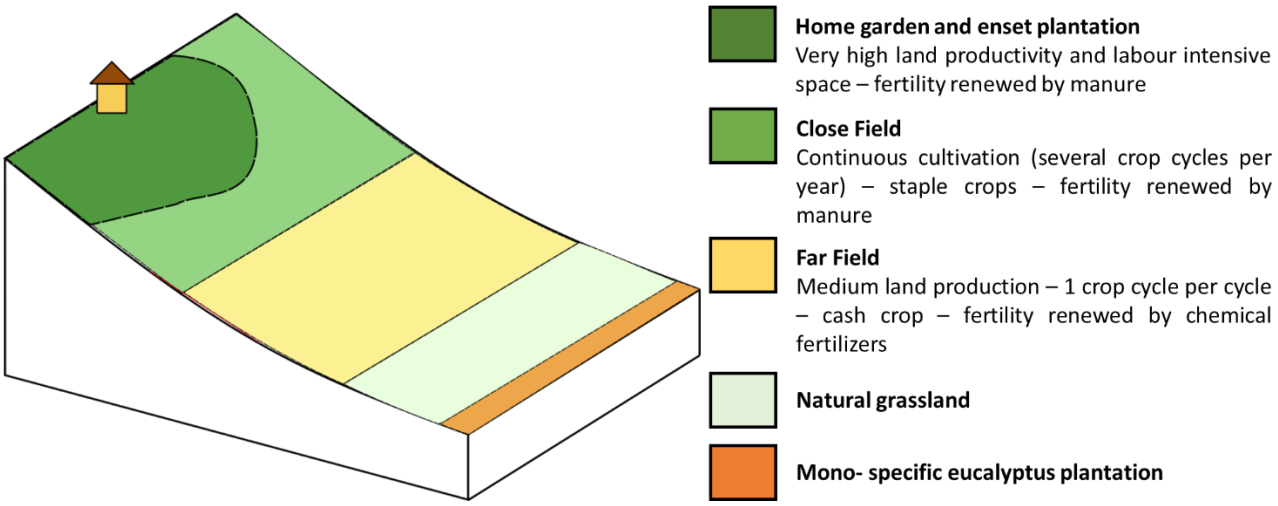


Figure 3: Agrarian structure of farms

a. The enset plantation: a 'populating'[2] crop ensuring household resilience

The area near the house is devoted to the production of enset (ensete ventricosum or 'false banana') and an agroforestry orchard (coffee, fruit and banana trees). The enset plantation ensures substantial food production and contributes greatly to the resilience of farming households, especially due to the plant's very high resistance to drought: a mature enset plant (6-8 years old) in the middle of the mountain can produce up to 60 kg of kotcho (pulp produced after fermentation of the trunk) and can be processed throughout the year. Although the calorific value of enset is slightly lower than that of tubers and cereals[3], its protein content is lower.

The reproduction of the fertility of the enset plantation and the hut garden is ensured by a massive contribution of animal manure (*more than 50% of manure production is spread over less than 10% of the farm's surface*). Furthermore, enset is an important source of livestock feed in times of fodder shortage. With its high-water content, enset is particularly interesting for the dry season because the difficulties in accessing water for watering cattle make the ingestion of straw and crop residues more difficult. Thus, the interaction between livestock and enset is fundamental in the functioning of Wolayita farms.

For the same altitude range of farms, there is a very high variability in the productivity of the enset plantation according to the socio-economic situation of the households. Vulnerable households do not have the capacity to wait for the enset to mature (6 years) before consuming it, and do not have sufficient manure resources, which are essential for the reproduction of enset and getting high yields.

[2] GASCON Alain - 1994 - " Le Miracle de l'Enset, géographie d'une plante peuplante " in Bahru Zewde et el. (eds), Proceeding of the 11th International Conference of Ethiopian Studies 1-6 April 1991 - Institute of Ethiopian Studies, Addis Ababa. The enset has played a crucial role in the food security of a rural population that has doubled in the last 30 years in these southern Ethiopian territories, enabling many families and their animals to survive drought periods.

[3] 3800 kcal/kg for enset against 4000 kcal/kg for sweet potatoes, but a much lower protein content https://www.africamuseum.be/publication_docs/Jacobsen%20etal%202018Fruits.pdf

Thus, these households obtain less than 12kg of kotcho per enset (harvested at 3-4 years of age), and an average annual yield of 3,500kg/ha of kotcho. In comparison, the better-off farms have average yields of 45kg per enset harvested (8,000kg/ha per year)[4].

Photo 1: The enset plantation is usually located on the edge of the houses

Photo 2: Transformation of enset into kotcho

b. Annual crop fields

Below the home gardens are fields of annual crops. In the mid-mountain agro-ecological zone, the main crops are maize, beans, sweet potatoes, taro, teff and cassava.

The soil is worked with a plough, which consists of a light tillage of the soil (10 - 15cm), without turning over. Several moves are made before sowing (2 to 6 depending on the farm and the type of crop), with an interval of 3 weeks between each pass, allowing weed seeds to germinate and then to be destroyed before the crop is planted. This reduces the weed seed stock, and thus reduces weed pressure in subsequent crop cycles.

Farms in a precarious situation, lacking a hitch or the social network to access it, will carry out the tillage manually, using a hoe. This requires a significant investment in labour, with less satisfactory results in general.

[4] The proportion of enset harvested out of the total enset population varies according to the age of harvesting; the same is true for the area harvested/total plantation area. In the case of immature enset (3-4 years), the number of enset harvested is 300/ha/year. For the enset harvested at 8 years, the number of enset harvested is 180/ha/year.

Photos 3: Soil preparation in annual crop fields

Two types of fields can be observed, with different technical management. The first type is the **close fields**, located just below the home garden and the enset plantation, in which food crops are grown (taro, sweet potato, maize, beans). This field illustrates the dynamics of agricultural intensification underway in the region: several crop cycles follow one another continuously, without a return to fallow, with periods between cycles not exceeding 3 months. These fields are heavily manured in order to reproduce the fertility.

Then, the second type is the **far fields**, mainly used for cash crops (teff, cassava, sometimes maize). These fields are less labour intensive, with usually only one crop cycle per year and a variable duration between crop cycles. The reproduction of fertility is ensured by chemical fertilisers (around 200 kg/ha*year of NPK 18-46-0; 100 kg/ha per year of urea 46-0-0). The use of chemical fertilisers developed during the Derg period, which rapidly became widespread, played a central role in the intensification of agriculture in the light of population growth, in particular in the fertilisation of crops in these remote fields. This raises the question of the dependence of current agricultural systems on chemical fertilisers and their sustainability. An increase in the price of fertilisers would certainly result in a sharp drop in the yields of these crops, as well as crop residues, leading to a decrease in the productivity of breeding systems and therefore in the production of manure, which would have consequences on the entire production system.

The proportion devoted to each type of field (and ultimately the ratio between staple and cash crops) is essentially related to the size of the farms, which is an important parameter of socio-economic levels: micro-farms (0.25 ha) will only cultivate nearby fields and will exclude cash crops. Conversely, the best-endowed farms (more than 1 ha) will devote almost 2/3 of the field area to cash crops.

c. Natural grasslands

On the lower part of the farm, there is usually a natural grassland. This is entirely dedicated to feeding the cattle. It is mown three times a year on average, and the cuttings are taken to the barn. For the majority of families, the area of grassland is insufficient to meet the needs of the animals. There is therefore an active market for the sale of fodder in the villages. Surplus owners with larger areas of grassland sell the fodder production by cuttings (on the field).

Photo 4: Women mowing the natural grassland

d. Mono-specific eucalyptus plantations

There are also many eucalyptus plantations. The cultivation of eucalyptus is not very labour-intensive and is limited to the cutting of eucalyptus coppice every 4 to 6 years, after which the trees are re-cut. Small farms have generally around 20 trees, arranged in a hedge, and intended for household needs (various buildings). On the other hand, surplus farms have larger plantations that can extend over several dozen ares, and which are very interesting from a commercial point of view.

e. Comparative analysis of cropping system performance

The following graph shows the technical and economic performance of the cropping systems. There is a clear correlation between the productivity of the land (in monetary value of the crops) and the proximity of the plots to the family home. The gross added value of the different cropping systems is given in ETB per hectare per year.

Home gardens and enset plantations, which are very labour-intensive and intensely manured, provide a high land productivity. **Close fields**, due to the sequence of several crop cycles in the year, generate more wealth per unit area than **far fields**, but at the cost of more labour. **Eucalyptus plantations**, which are not very labour-intensive, show a lower productivity of the land and are rather limited on farms with small agricultural areas.

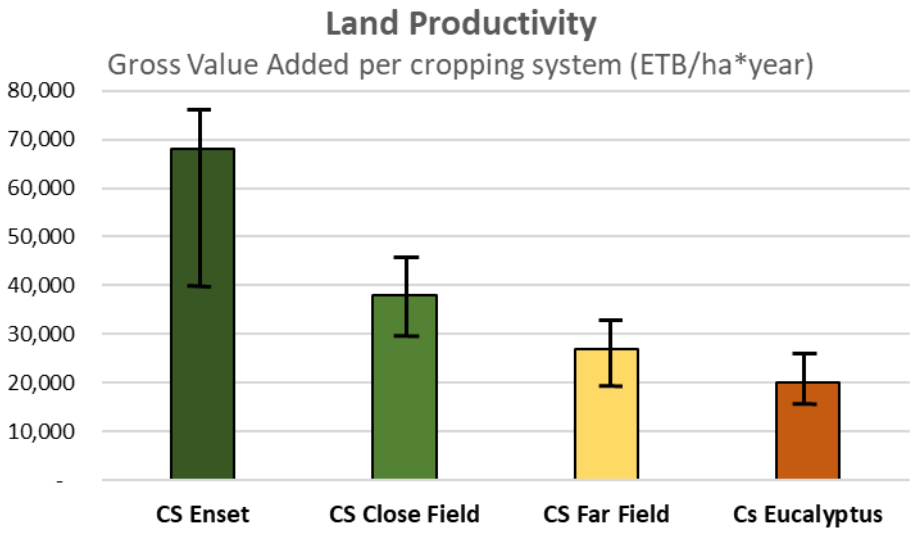


Figure 4: Land productivity of the different cropping systems

However, if we look at labour productivity, which compares the income earned to the labour invested (expressed in ETB per man-day), it shows the opposite performance. The income earned per day of labour invested is significantly higher in the eucalyptus plantations than in the case garden/enset plantation. This illustrates the current agrarian dynamics for the majority of families in this context of farm miniaturisation: the reduction in surface area results in an intensification of work per unit of surface area, making it possible to increase agricultural production on these same surfaces, to the detriment of labour productivity.

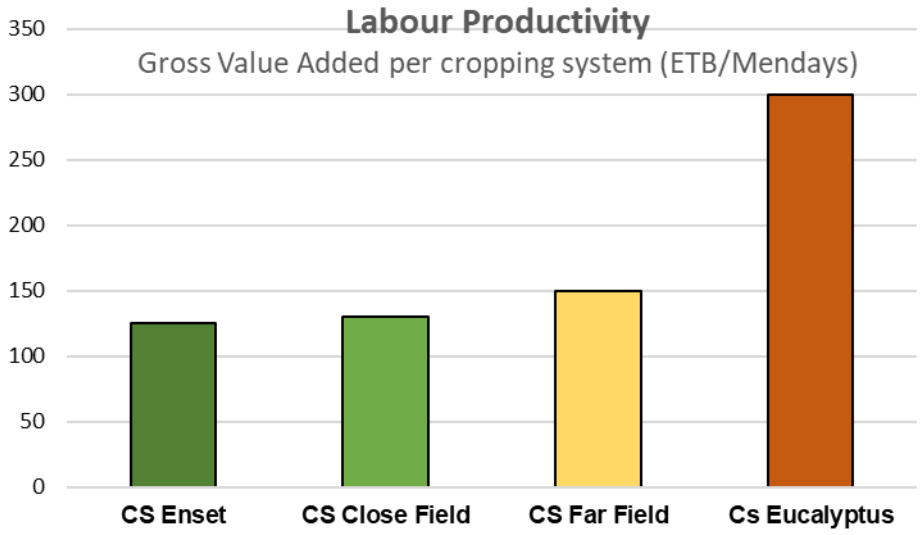


Figure 5: Labour productivity of the different cropping system

2. Livestock: the pillar of the Wolayita agrarian system

Each farm ensures the rearing of one or more heads of livestock. Thus, there is at least 1 suckler cow (owned or shared) and some goats on each farm.

a. The role of livestock in the production system

Cattle rearing is at the heart of the production systems: all crop residues (straw, stalks, maize stalks, etc.) and weed control products are consumed by the cattle. Animal waste is then collected and spread on the home gardens and close fields. In this way, the animals largely ensure the renewal of fertility on the farm, via horizontal transfers of fertility (from the farm and from the purchase of fodder off the farm).

Questions remain regarding the importance of each of the feed sources, which vary according to the production system. A detailed study of feeding systems would make it possible to quantify and evaluate the technical and economic performance of the various farming systems.

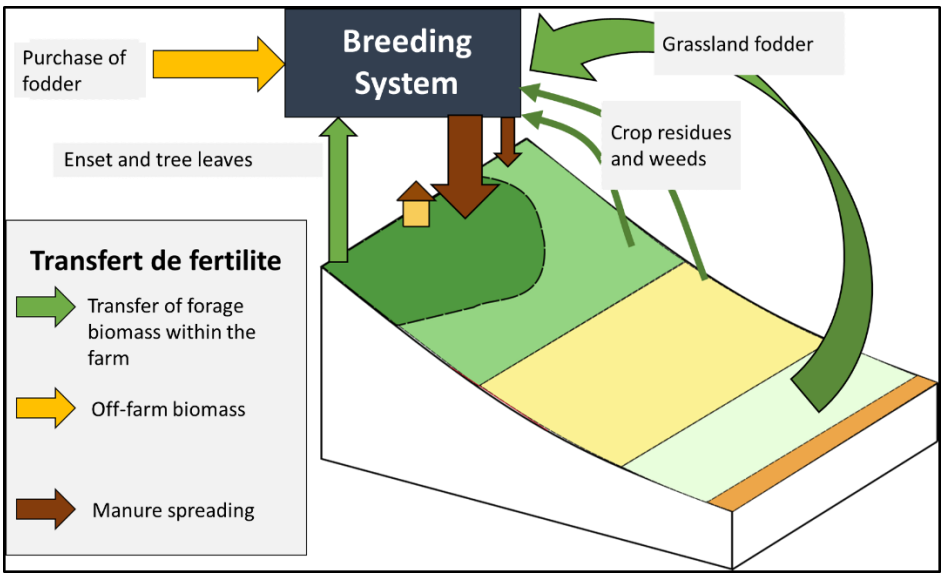


Figure 6: Diagram of fertility transfers within the farm

Animal production (whey, milk, butter) serves both cash-flow functions and as a rich source of protein for the family. The sale of butter provides a regular cash income to meet weekly household needs. While it often further mortgages their future, the sale of animals enables more vulnerable families to obtain a substantial income in the event of a hard blow (death of a family member, poor harvest). For better-off families, it constitutes a source of income that can be invested in agricultural production (purchase of tools and inputs) or the development of small-scale extra-agricultural trade activities ('petty trading').

b. Draft cattle: an important differentiating factor

The possession of a draught cattle is a major differentiating criterion for farms in Wolayita. In the context of a very labour-intensive agriculture that relies heavily on organic fertiliser for all farms, owning an ox enables tillage operations to be carried out on time, which has a positive impact on the harvest.
The agricultural area of households does not usually enable them to make full use of the labour force of a draught cattle. Therefore, these farmers extend their cultivated areas onto 'shared' plots on the farms of farmers who do not own draught cattle. This reverse sharecropping (large farmers extend their cultivated area onto the plots of small farmers with limited means of production) is a feature of southern Ethiopia.

c. Technical management of livestock systems

The animals are herded on family plots (common space between several farms). The practice of grazing has declined in recent decades in Wolayita, gradually giving way to stabling systems (feeding in the barn). In some of the lower density areas where there are still grasslands on the upper slopes, grazing is still practiced.

Animal livestock is an essential part of agricultural work throughout the year.

Photo 5: On the left, the animal is driven by a stake, on the right, it is used to plough the ground

There is a very high variability in livestock performance. If we take the example of suckler cows (local breeds), milk production per day in the lactation period varies from 0.5 litres to more than 2 litres of milk per cow. This difference is explained by the feeding systems of the animals, which depend on the socio-economic situation of the households.

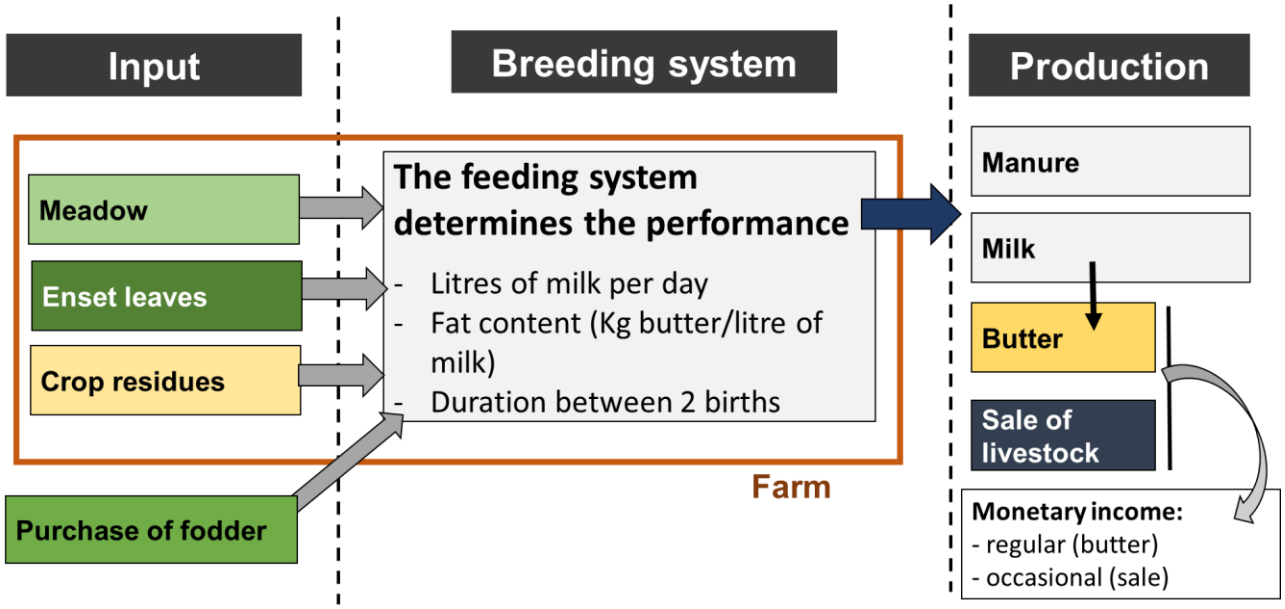


Figure 7: feeding scheme for cattle farms and productions

Thus, we find farms with larger forage production areas (>0.25 ha), in a situation of virtual forage autonomy, which achieve higher livestock performance. However, most farmers face great difficulties in feeding their animals properly throughout the year. The dry season is synonymous with a shortage of fodder on the farm. Thus, depending on household cash flow, farmers may or may not be able to buy fodder off the farm to meet their animals' needs.

Some of the more vulnerable families are unable to feed their animals properly and face under-nutrition of their livestock. This results in loss of animal weight, increased susceptibility to disease and high mortality rates. In order to ensure the survival of animals in the dry season, these households resort to loan at interest rates of over 100%. In some cases, fodder purchases are more important than household food expenditure.

IV. The diversity of today's farms

Today, there are major differences between the farms in Wolayita, inherited from the history of the region, from the 'unequal' access to the factors of agricultural production (land, labour, capital) and from the social status of households. These differences can be identified through several differentiating factors:

- ✓ The surface area of the farm (agricultural area/worker), from which the proportion of different cropping systems used on the farm is derived.
- ✓ The possession of a draught ox, or not, which defines the ability to work the fields in time and to extend the cultivated area in the farm of other farmers.
- ✓ The feeding system used which determines the performance of the farm.
- ✓ The exchange of plots between farmers (sharecropping).
- ✓ The status of the animals on the farm (owned or shared).

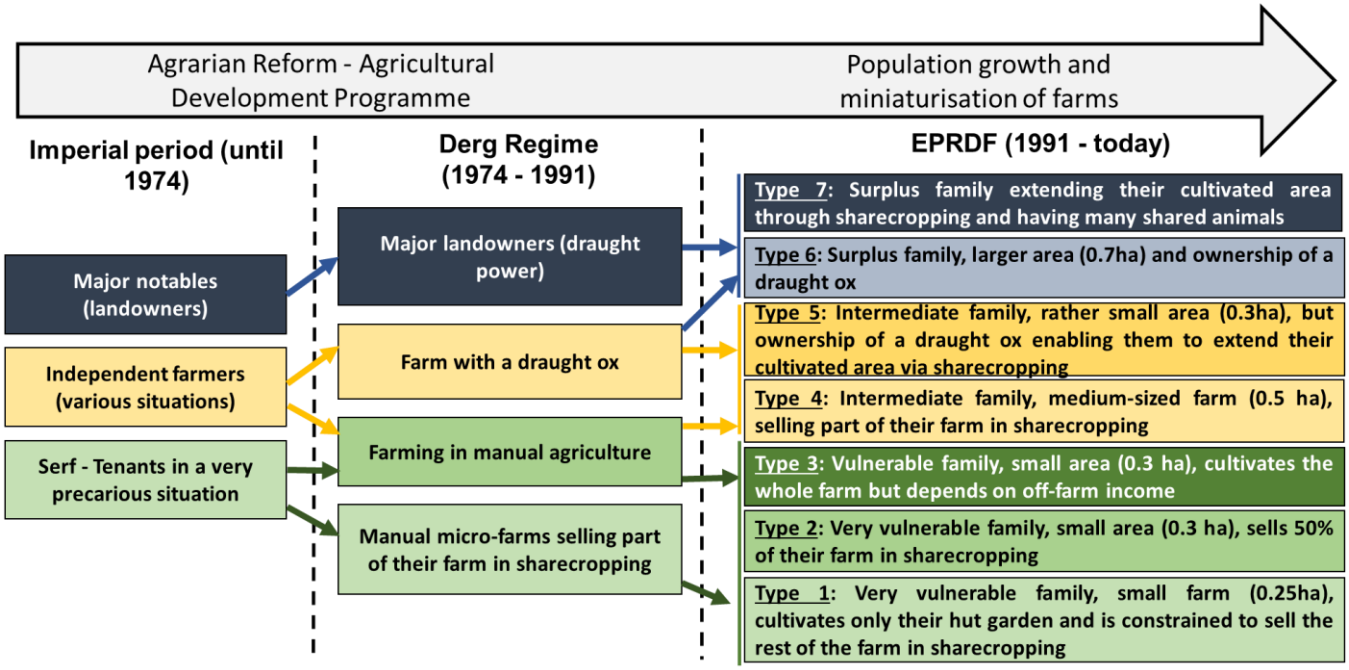


Figure 8: Evolution in farm diversity over the past 50 years

1. Families in a precarious situation on small farms (types 1, 2 & 3)

Type 1, 2 and 3 farms have a very small agricultural area (0.15 to 0.4 ha), with an average of 0.2 ha for a household of 2 workers. They are generally the result of former tenants who gained access to land following the agrarian reform. This very limited area does not enable them to grow cash crops. Thus, these farmers have a small home garden (200 to 500 m2). The fields, cultivated manually by the family labour force only, are used for staple crops (taro, sweet potato, maize), and a small meadow (200 - 300m2).

The productivity of the enset plantation is generally very low, which is explained by:

- ✓ Consumption of enset at a young stage (consumed at the age of 3-4 years) and therefore not sufficient to reach reproductive maturity.
- ✓ The amount of manure available on the farm is limited, thus reducing organic fertilisation of the plantation and production (yield).
- ✓ In times of fodder shortage, farmers are constrained to use enset leaves massively for animal feed, thus decreasing the production potential of the plant.

Some families, in a very vulnerable situation, consume their ensets even before the trunk begins to mature. This results in harvests of around 5kg per enset (instead of 15kg at the 3-4 year stage).

These families raise one dairy cow, usually in a shared unit, and because of the small size of their farms, they have very limited fodder resources. Each year, during the dry season, these farmers face intense fodder shortages, which force them to reduce their feed rations, which are already insufficient to get a decent milk production (less than 0.7 litres of milk per lactation day in the rainy season). This situation severely affects the survival rates of young animals.

The differentiation between these three production systems is based on the capacity to invest in labour and inputs within the farm, and on the use of their land. Types 1 and 2, which are in an extremely precarious situation, do not have sufficient cash to buy inputs at the beginning of the rainy season, nor the necessary labour to work the soil manually. Thus, these families are forced to share part of the farm with a wealthier farmer, who will come ploughing their field with their draught oxen.

☞ **Type 1** families only cultivate their home garden. The rest of the farm is given out in sharecropping, and they therefore only benefit from half of the agricultural production produced on these plots. In this type of extreme situation, there are mostly elderly people, widows and widowers, and people with disabilities.

☞ **Type 2** families share half of their farm. Thus, they cultivate a small home garden and the close field. On the sharecropping land, a few cash crops are grown, ensuring a low monetary income.

☞ **Type 3** households devote their entire farm (total area 0.25ha) to staple crops. These farmers, who have no animal traction (draught oxen), work the soil by hand (hoe), which has an impact on their labour productivity (which is lower than on farms with draught oxen). These families therefore spend a lot of time preparing the fields manually before sowing, within a fairly short calendar window. Moreover, their agricultural production is far from sufficient to meet their needs, which forces them to find work outside the farm. These households therefore depend on off-farm income or on the government's safety-net programme. But these supplements seem insufficient to ensure their food security throughout the year.

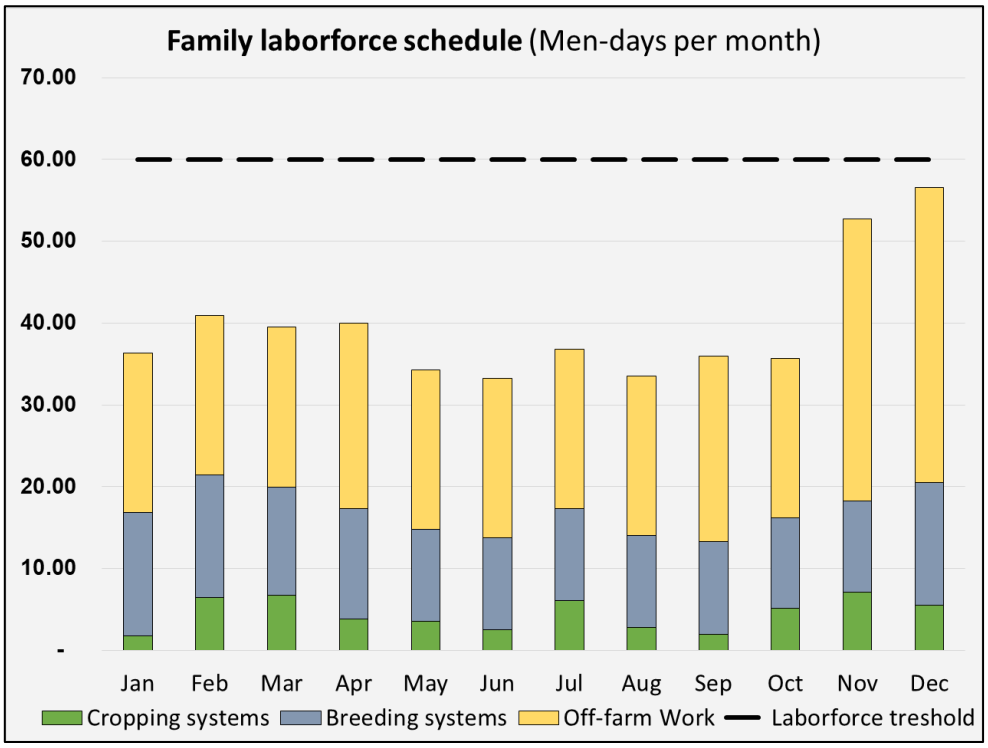


Figure 9: Work schedule of a type 3 household, the top line indicates the theoretical maximum level of labour that the family could devote to the farm

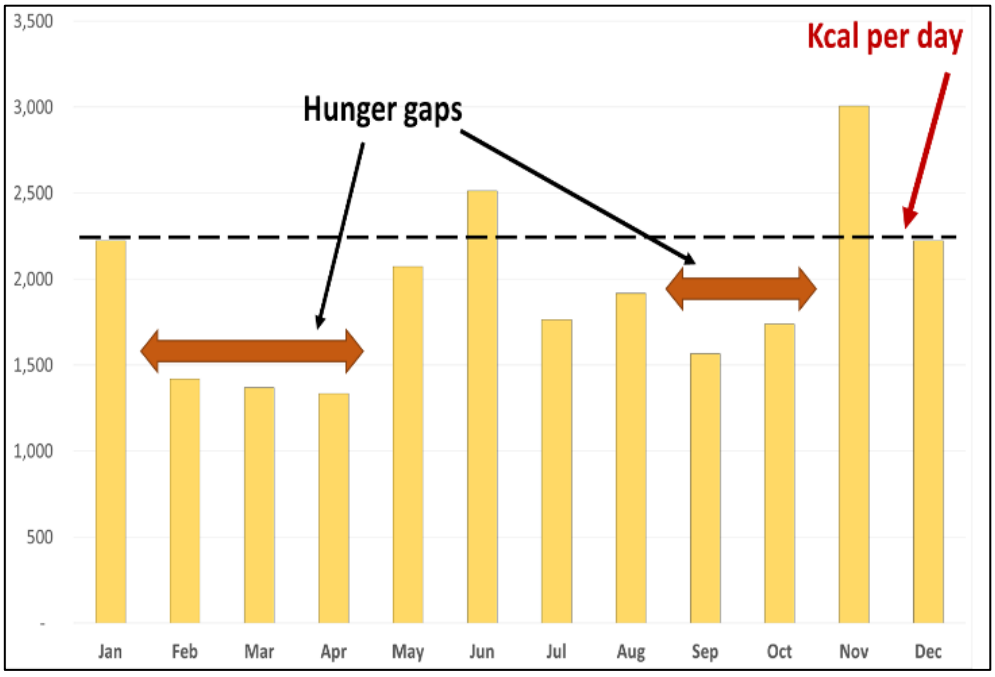


Figure 10: Dietary schedule (average of kcal per day by month) of a type 3 household

An illustrated representation of the different types of farms is available in the annexes.

2. Farms in an intermediate situation (types 4 & 5)

Farm types 4 and 5 are in an intermediate socio-economic situation. They are generally the descendants of former tenants or small independent farmers.

☞ **Type 4** farms have an average area of 0.65 ha for two workers. However, 50% of this area is in sharecropping. These farmers share their land because their labour capacity is limited due to the age of the members or because they have two jobs, or because their cash flow is too limited to enable them to buy the necessary inputs. These households do not own draught oxen and keep 1 or 2 dairy cows, usually in a shared arrangement, which also allows them to benefit from animal manure. Compared to other farms, a large proportion of the farm's area is devoted to fodder production and enset. This helps them to feed their animals with limited recourse to external purchases, for average milk performance. The sharecropping land is used for cash crops, providing a supplementary monetary income for the household.

☞ **Type 5** households are in the opposite situation. They have a limited agricultural area, typically 0.3 ha on average for two workers. However, they own a draught ox, which enables them to increase the area cultivated on other farmers' land, mainly for cash crops. In addition, these households generally try to diversify their sources of income, through petty trading or buying and selling livestock. These families also keep 1 or 2 cows, on their own. The small surface area of the farm results in a very limited forage production on the farm. However, a larger cash flow enables them to buy fodder throughout the year, ensuring high and regular breeding performances. The owned land is entirely dedicated to food production (enset and close field). Cash crops are grown on plots within neighbouring farms on a sharecropping basis. The area cultivated outside the farm exceeds sometimes the area owned.

3. Larger farms managing to generate farm income (types 6 & 7)

There are larger farms run by families who are generally descendants of former landlords or independent farmers. These have a larger agricultural area (1 hectare per household), allowing them to combine different cropping systems, to keep one or two draught cattle and 2 or 3 dairy cows, and to own shared animals kept on other farmers' farms.

The size of their farm and the presence of several cattle enable them to maintain a large enset plantation, thanks to the large amount of manure available, which is in turn helped by the good feeding capacity of the cattle (grassland area, crop residues, enset leaves).

The enset plantation sometimes exceeds the household's food needs, leading some households not to consume all the mature enset. This powerful image of 'unconsumed' mature ensets (in fact used for animal feed) is synonymous with wealth, and reinforces the social position of these households in the villages.

These farms have nearby, largely manured fields that provide the household's food production (in addition to the enset). Down below, there are far fields devoted to cash crops. The area devoted to cash crops is much larger than the area devoted to food crops. In these far fields, the fertility renewal is mainly ensured by mineral fertilisers. These farmers grow crops that are rarely found in other farmers' fields, such as potatoes, which require a large amount of monetary capital for the purchase of planting material, mineral fertilisers and pesticides.

In addition, these farmers dedicate part of their land to mono-specific eucalyptus plantations. This cultivation makes it possible to make the most of "surplus" areas that are degraded or too far from the farm, at the cost of a relatively low investment in labour.

These farms are generally self-sufficient in animal feed. Some farmers, with grassland, have surplus fodder which they sell to farmers who face shortages. Strategies of buying feed supplements to increase animal production (dairy products, fattening) are sometimes observed. The possession of one or two draught oxen allows these farms to complete soil preparation operations in time, which has a positive impact on crop yields.

This production system allows(enables) them to mobilise the entire family labour force on the farm. The marketed agricultural surpluses are generally sufficient to cover the needs of the family, which is therefore not constrained to sell the family labour to complete the income.

There are two types of farms:

☞ **Type 6** farms that cultivate only on their own farm.

☞ **Type 7** farms that extend the areas cultivated by other farmers, mainly for cash crops (cassava, teff). This strategy gives them the opportunity to make full use of their entire team (2 draught cattle). In addition, they sometimes use outside daily labour during work peaks, for example for harvesting cassava.

4. Summary of results and representation in the studied population

The following table provides a summary of the 7 socio-economic categories identified and their representation within the population of the 2 villages surveyed exhaustively (127 households in total).

Socio-economic level	Type	Definition	Surface	Labour force	Number of animals	% Shared area within the farm	% Shared outside on the total area of the farm	% Off-farm activities on total income	representation in the sample (%)
Vulnerable	**1**	Family in a very precarious situation, with little labour force and small farms. Cultivation only of the hut garden with the constraint of selling the rest of the farm in sharecropping	0.30 ha	1,5	1 shared cow	70%	0%	51%	8%
	2	Very vulnerable family, small area, gives up 50% of their farm in sharecropping	0.25 ha	2	1 shared cow	50%	0%	48%	3%
	3	Vulnerable family, small area, cultivates the whole farm but depends on off-farm income	0.25 ha	2	1-2 shared and owned cow(s)	0%	0%	43%	39%
Intermediate	**4**	Family in intermediate situation, medium-sized farm, assigning part of the farm in sharecropping	0.65 ha	2	1-2 shared and owned cow(s)	50%	0%	17%	10%
	5	Family in an intermediate situation on a small farm but owning a draught ox, which **enables** them to extend the area cultivated through sharecropping	0.30 ha	2	2 cows and 1 ox owned	0%	0%	24%	20%
Better-of	**6**	Surplus family, larger area and ownership of a draught ox	0.75 ha	2,5	2-3 cows et 1 ox owned	0%	50%	5%	15%
	7	Surplus family able to expand their cultivated area through sharecropping + ownership of many shared animals	1.25 ha	3	3 cows et 2 oxen owned + many shared cattle outside	0%	25%	0%	6%

V. A peasant society with strong socio-economic differences

1. Economic performance of farms and dynamics of change

a. Results for all crop and livestock systems

For each type of farm, an analysis of economic performance was carried out, taking into account the income generated for all crop and livestock systems. The following graph shows how these performances evolve according to the size of the farm. It can be observed, for example, that for type 1 families, which are limited in terms of labour force, the increase in agricultural area has little effect on the level of income generated annually per worker. The graph also shows the "survival threshold", which indicates the minimum annual income that an active person must generate to cover his or her minimum needs (food, clothing and health) and those of dependent non-active household members. In the case of the region, this is equivalent to 6,000 ETB/year per working adult with 2 children (i.e., around 150 euros at the time of the study).

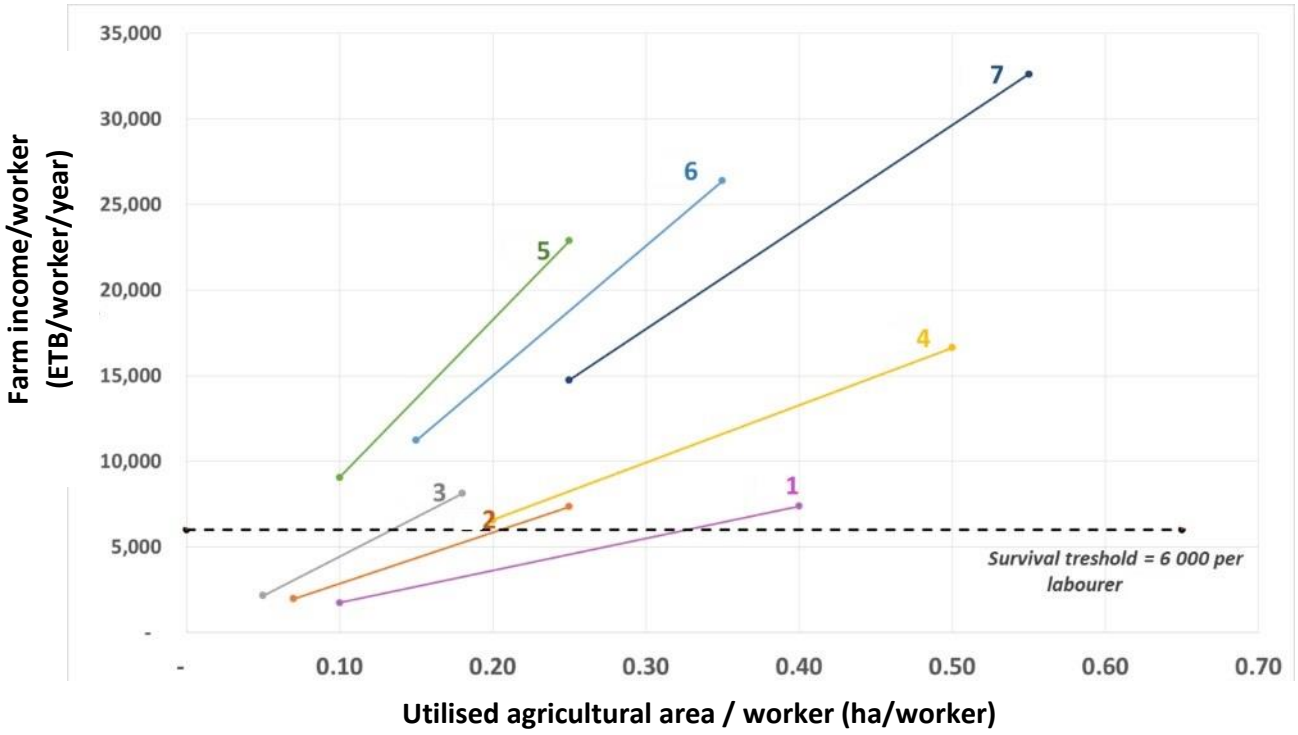


Figure 11: Economic performance of farms (income per cultivated area for 1 worker)

☞ The **'micro-farms'** (**types 1, 2 & 3**) are in a very precarious situation. They represent around 50% of the population studied (i.e., 50% of 127 households, 39% of which are type 3). As illustrated in the graph, the survival capacity of the household is strongly correlated with the agricultural area. Households with less than 0.15 ha per worker are not able to meet their family's minimum needs (food, care, basic necessities). They are therefore obliged to supplement the farm's production through the daily sale of family labour, or thanks to the "Safety Net" programme set up by the government.

These households are extremely exposed to hazards (drought, crop failure, illness of an asset), which can lead to a real period of decapitalisation, reflecting the great vulnerability of these farms. For example, a type 3 family facing a poor harvest may find itself forced to take out loans to feed the household, causing an inability to obtain inputs and thus leading to the sharing of part of the farm and the obligation to share half of the production (moving from type 3 to type 2).

☞ The '**better-of**' **farms** (**types 6 and 7**) generate a sufficiently large agricultural income to cover the immediate needs of the household and to reinvest a surplus in production factors within the farm (tools, animals), or in extra-agricultural activities (purchase of a motorbike taxi, trade) or in longer-term investment strategies such as financing their children's education. These farms are the only ones to implement extensive labour-based cropping systems (eucalyptus, cassava), a priori at odds with the agrarian dynamics of the region.

These households are generally resilient to hazards. The diversity of their crop and livestock systems ensures that their agricultural production and income are more evenly distributed throughout the year, making it possible to cope with temporary difficulties, such as a poor harvest. However, in a few rare cases, a series of severe hazards (long illness, death of a family member, loss of livestock) may force some families to share part of the farm's plots and decapitalise (families in type 4 situation).

When the active members of a household age, limiting their capacity to work, and no children are ready to take over the farm, these farmers tend to share part of their land. However, this sharing situation is not comparable to the case of micro-farms, where the cause is economic insecurity and the absence of draught cattle. In this case, the sharing is only due to a limited work capacity, which does not translate into economic difficulty.

b. Very strong disparities concerning the breeding system

If we now focus only on the performance of suckler cows, the analysis of the results also reinforces these strong disparities between the different farms. For example, the gross added value per breeding mother varies from 1 to 4, which is essentially explained, as we saw earlier, by the diversity of feeding systems: the breeding system of vulnerable families (types 1, 2 and 3) is characterised by under-feeding of the animals, resulting in very low milk production. Conversely, the better-off farmers (types 5, 6 and 7) use more protein- or calorie-rich feed, and manage to maintain high performance throughout the year, sometimes by buying large quantities of fodder off the farm.

Note: The shaded part of the graph below shows the expenses incurred for the purchase of fodder. Type 5 is characteristic of farms with limited forage area but higher cash income, allowing them to achieve fairly high performance per breeding dam.

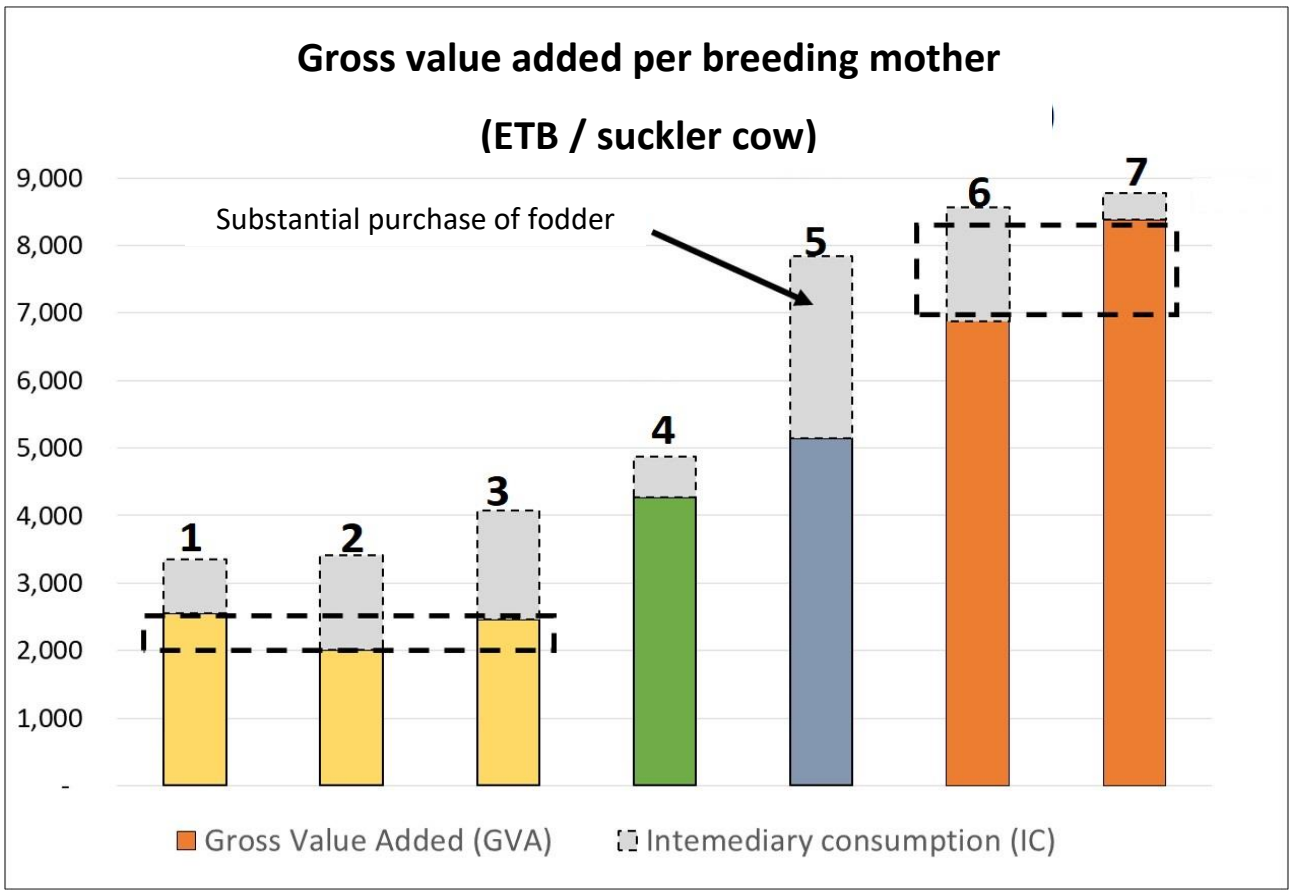


Figure 12: Comparison of the performance of different dairy farming systems

2. A region marked by strong socio-economic inequalities

The economic results of the production systems illustrate strong socio-economic differences in the Wolayita countryside. For example, there is a ratio of around 1 to 7 between the average income of a type 1 and type 7 farm (farm income per worker).

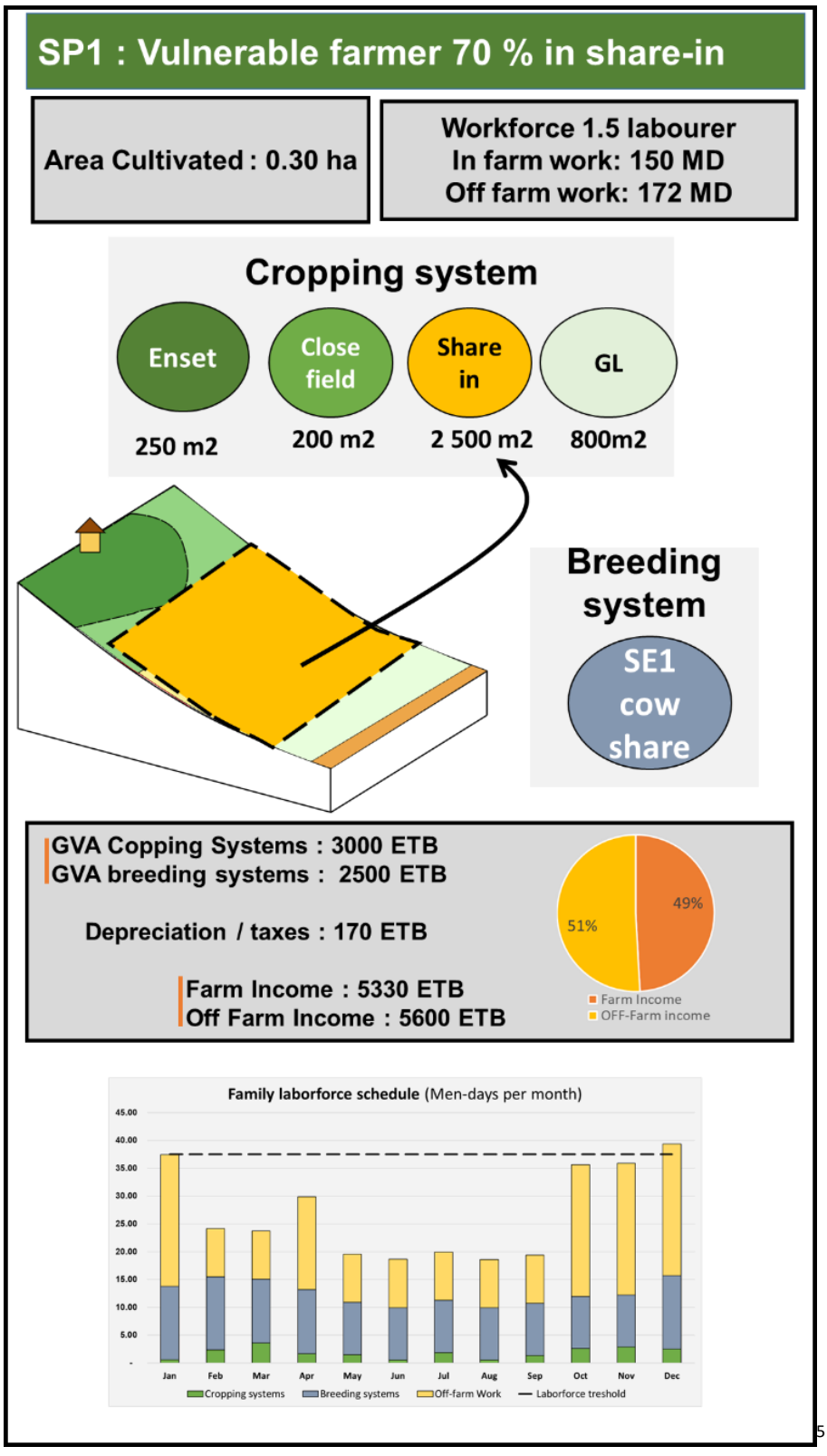
This large gap is illustrated by the strong interdependent relationships between these socio-economic categories. Indeed, 'micro-farms' are dependent on larger ones, both for access to shared livestock (the purchase of a dairy cow and the associated risks are beyond their reach), the purchase of surplus fodder, the shared cultivation of agricultural plots (initial investment for inputs and tillage), and monetary loans in times of difficulty (lean season, cash flow problems).

Conversely, farms that achieve to generate higher incomes are dependent on micro-farms to increase the area cultivated, to raise shared animals or to use day labour during peaks in farm work.

We can see that these differences, inherited from history, are reflected today in the very unequal production factors between families. These differences, which are characteristic of the contemporary agrarian system, are now rooted in strong interdependencies between micro and large farms.

Annexes

i. Diagrams of the different production systems



[5]

[5] MD : *men/days*. 1 M/D = 7 hours of work.
GVA: *gross value added*.
GL: grassland (meadow)

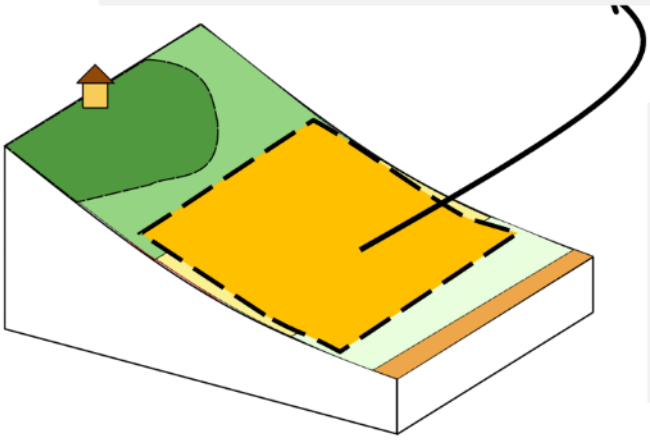
SP2 : Small vulnerable farmer 50% in share-in

Area Cultivated : 0.25 ha

Workforce 2 labourer
In farm work: 182 MD
Off farm work: 204 MD

Cropping system

Enset	Close Field	Share in	GL
400 m2	600 m2	1600 m2	400m2



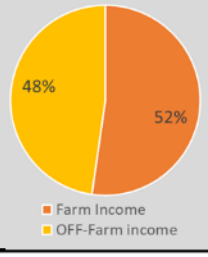
Breeding system

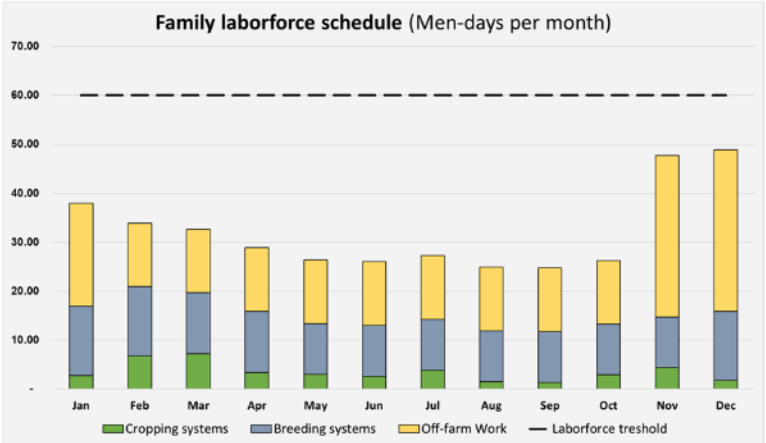
SE1 cow share

GVA Copping Systems : 5300 ETB
GVA breeding systems : 2800 ETB

Depreciation / taxes : 170 ETB

Farm Income : 7900 ETB
Off Farm Income : 7200 ETB



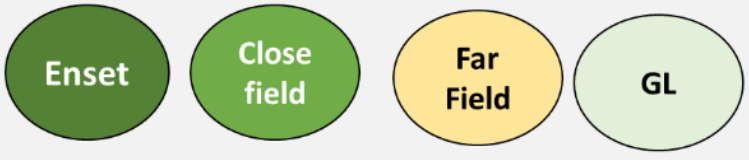


SP3 : Small farmer in own

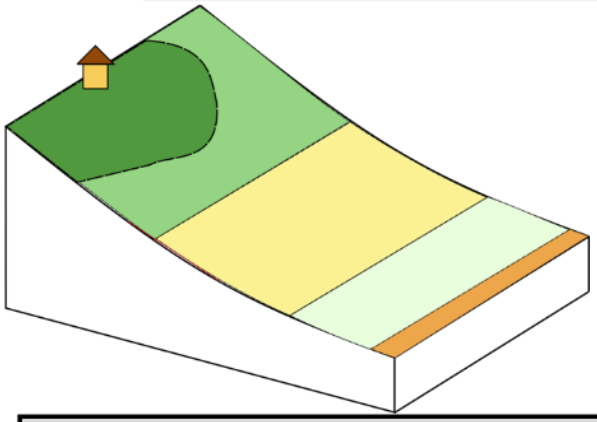
Area Cultivated : 0.25 ha

Workforce 2 labourer
In farm work: 203 MD
Off farm work: 272 MD

Cropping system



500 m2 | 900 m2 | 600 m2 | 400m2



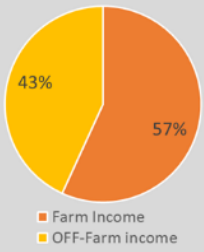
Breeding system

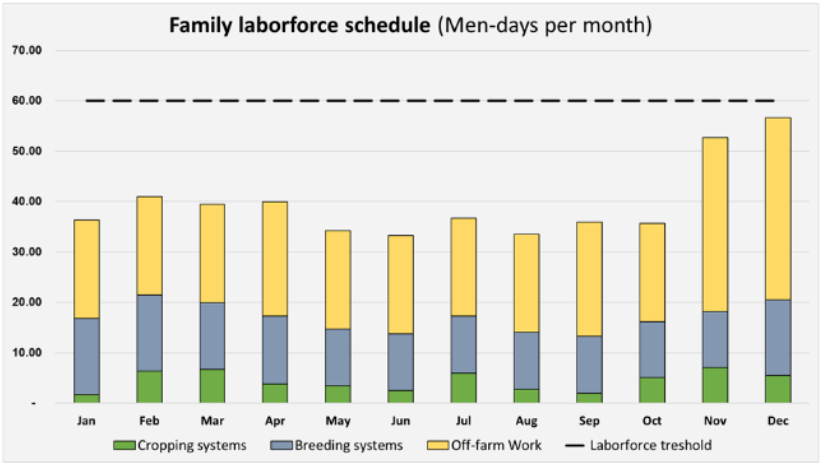
SE1 cow own

GVA Copping Systems : 7300 ETB
GVA breeding systems : 4100 ETB

Depreciation / taxes : 170 ETB

Farm Income : 11200ETB
Off Farm Income : 8500 ETB





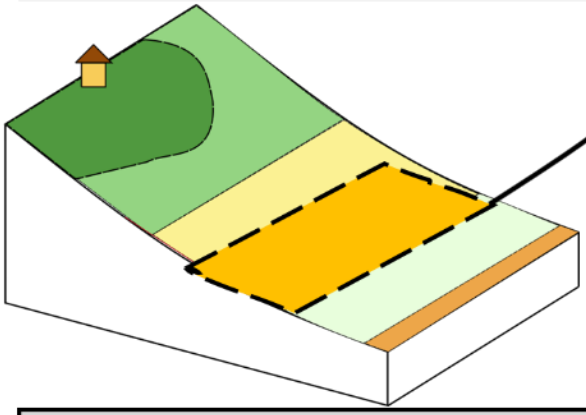
SP4 : Medium farmer 50% in share in

Area Cultivated : 0.65 ha

Workforce 2 labourer
In farm work: 316 MD
Off farm work: 168 MD

Cropping system

Enset	Close field	Far Field	Share in	GL
650 m2	1250 m2	950 m2	2000 m2	1500m2



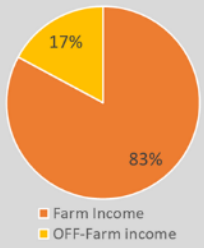
Breeding system

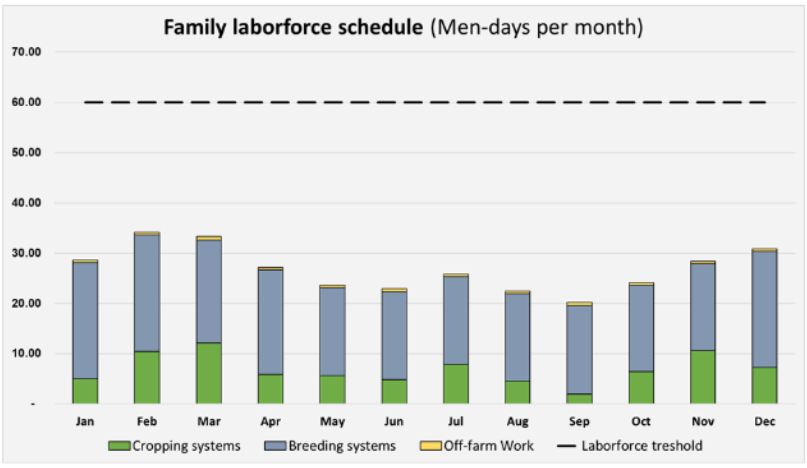
SE2
1-2
cow

GVA Copping Systems : 11700 ETB
GVA breeding systems : 9900 ETB

Depreciation / taxes : 170 ETB

Farm Income : 21430 ETB
Off Farm Income : 4460 ETB





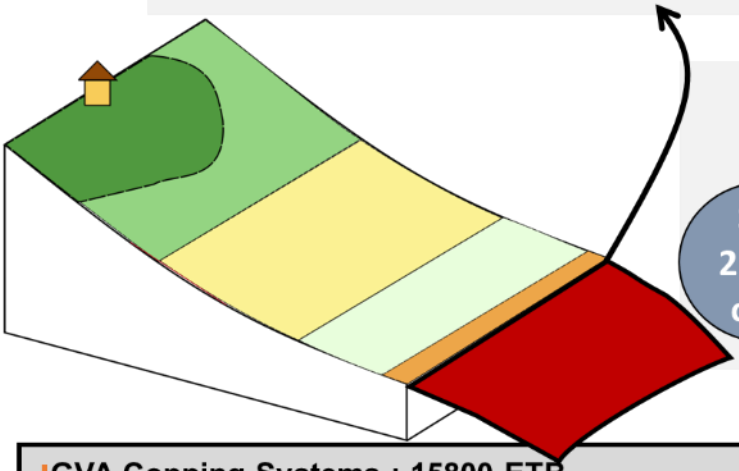
SP5 : Small farmer in share-out

Area Cultivated : 0.30 ha

Workforce 2 labourer
In farm work: 408 MD
Off farm work: 182 MD

Cropping system

Enset	Close field	Share out	GL
600 m2	2000 m2	1500 m2	400 m2



Breeding system

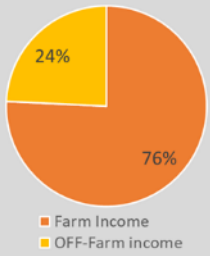
SE3
2 cow
own

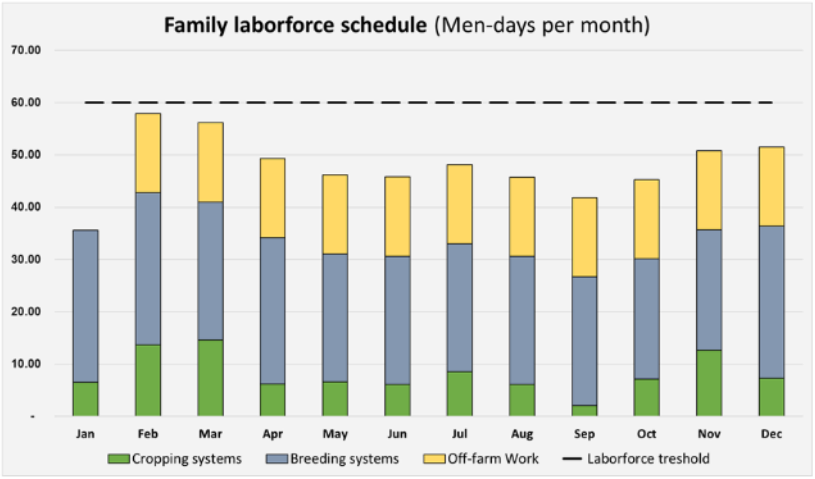
1
Ox

GVA Copping Systems : 15800 ETB
GVA breeding systems : 12800 ETB

Depreciation / taxes : 200 ETB

Farm Income : 28400 ETB
Off Farm Income : 9100 ETB



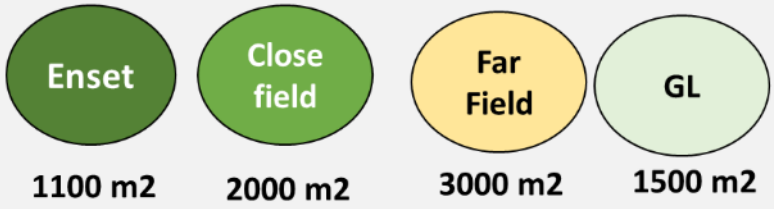


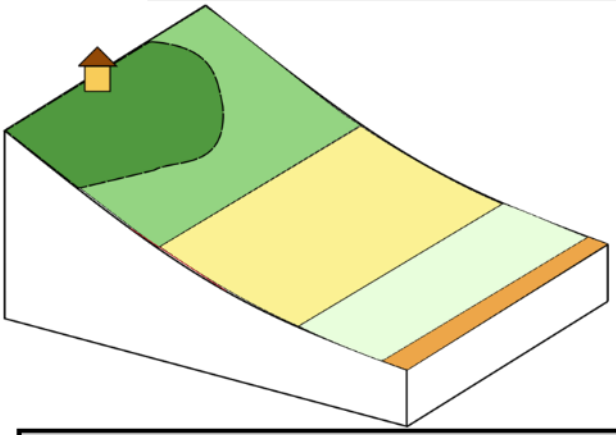
SP6 : Large farmer in own

Area Cultivated : 0.75 ha

Workforce 2.5 labourer
In farm work: 528 MD
Off farm work: 78 MD

Cropping system



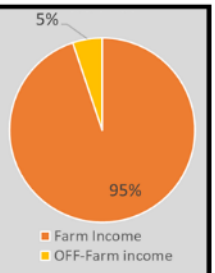


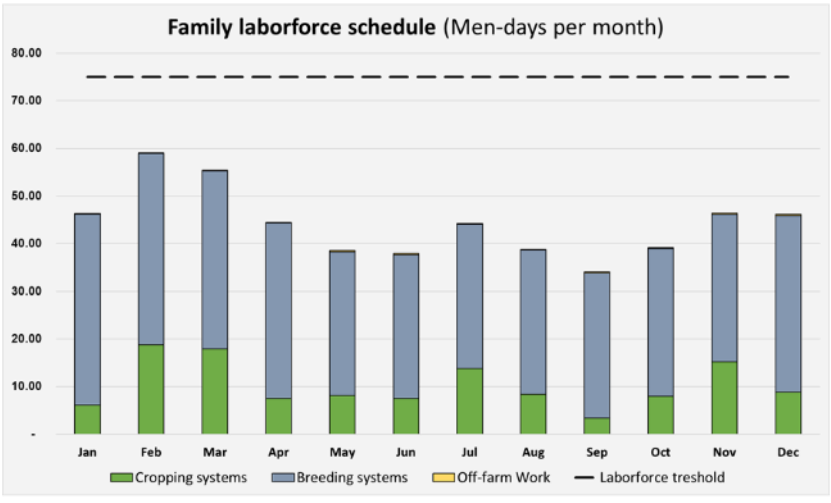
Breeding system

GVA Copping Systems : 19900 ETB
GVA breeding systems : 28000 ETB

Depreciation / taxes : 200 ETB

Farm Income : 47795 ETB
Off Farm Income : 2600 ETB





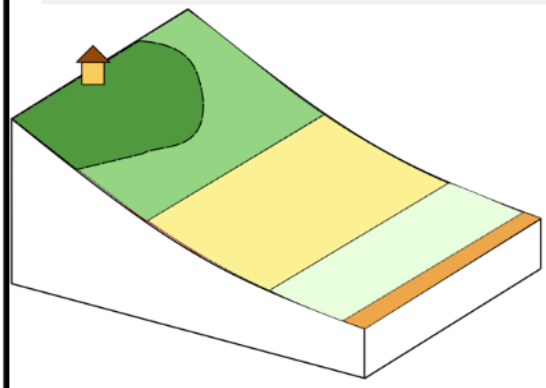
SP7 : Large Farmer catching other farmers land

Area Cultivated : 1 ha

Workforce 3 labourer
In farm work: 652 MD
Off farm work: 0 MD

Cropping system

Enset	Close field	Far Field	Share out	GL
1500 m2	2000 m2	3800 m2	2500 m2	3000 m2



Breeding system

SE4 3 cow own

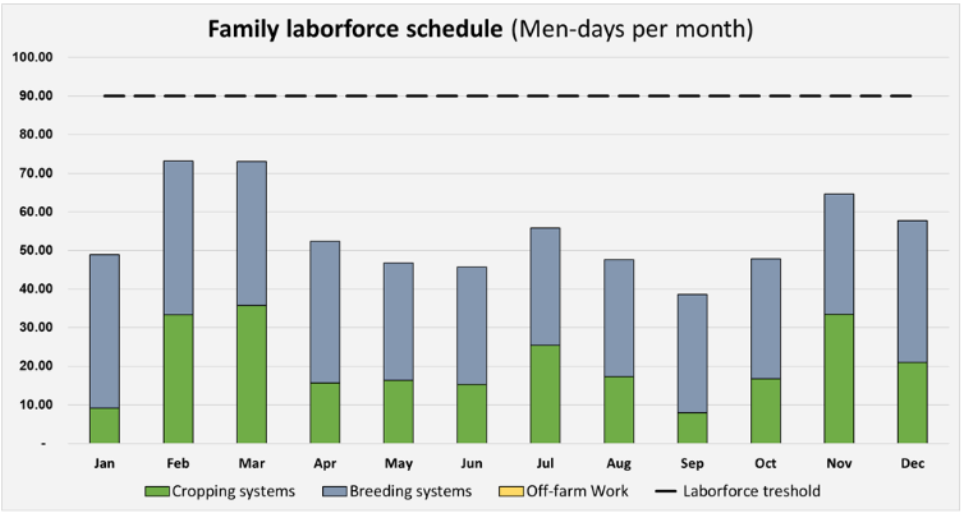
3 Ox

Cattle out

GVA Copping Systems : 40500 ETB
GVA breeding systems : 40800 ETB

Depreciation / taxes : 200 ETB

Farm Income : 81100 ETB
Off Farm Income : 0 ETB



ii. Concepts and indicators used

a. Crop and livestock systems

The cropping system corresponds to a set of plots cultivated in a similar way. It therefore includes the crops grown, the rotations and all associated practices (the technical itinerary). The livestock system is a set of interacting elements organised by the farmer in order to make the most of resources through domestic animals to obtain production (Landais E. 1992).

This technical-economic study aims to evaluate the wealth production of these systems, per unit of area (ha) and work (workday of an active person). The first evaluates the land productivity (ETB per hectare); the second evaluates the labour productivity (ETB per person-day). The objective is to conduct a comparative analysis of the technical and economic performance of cropping systems and livestock systems.

b. The production system

The agricultural production system corresponds to a specific combination of cropping systems and livestock systems. It is characterised by the nature of the production, labour and capital mobilised on the farm (Reboul, 1976). They are considered at the level of the household that contributes to the production and the sharing of the farm's products.

On this scale, the net value added (NVA) of the production system is evaluated, which corresponds to the wealth created by the farm. To do this, we deduct from the wealth created by the farm the economic depreciation (Capital depreciation) of the equipment used in the production process. In the case of manual farming, this depreciation is minimal.

The farm income (FI) measures the income from the agricultural holding. It includes the value of sold and self-consumed production. This is done by assessing the part of the NVA that is redistributed among the different actors: wages for extra-domestic labour, interest on loans, land taxes, and other expenses related to the agricultural production process.

c. The activity system

The activity system is defined as "a set of activities carried out by a social entity (domestic group) by mobilising the resources available in a given ecological and social environment". (Gasselin et Al, 2014). In this study, the activity system was studied for the farm household (nuclear family). At this scale of analysis, several indicators were used:

- Off-farm income and opportunity cost of labour (daily cash income when selling family labour).
- The household food calendar. This provides information on the level of food security of the household and the strategies used to meet the household's food needs.
- The survival threshold of agricultural households, i.e., the minimum annual income that an active person must generate to cover their minimum needs (food, clothing and health) and those of their dependent non-active members (in the case of the region, this is equivalent to 6,000 ETB/year per active(asset) adult with 2 children).
- The household cash flow calendar: this allows the circulation of money capital over the year to be studied.

6

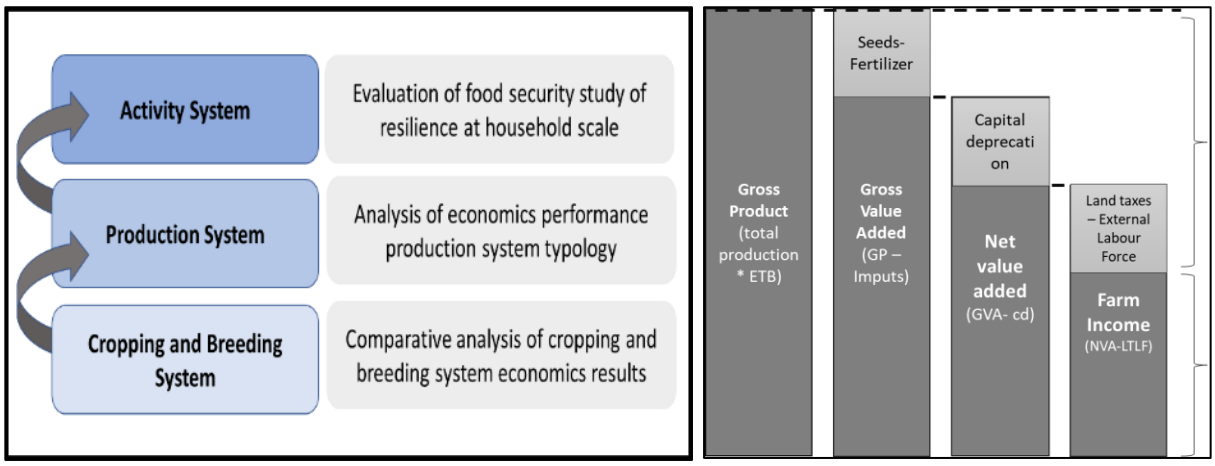


Figure 13: Scales of analysis and quantities used

[6] CD: capital depreciation
LT: land taxes
LF: labour force