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**Agricultural and economic
analysis-diagnosis of Obe Jage
(Damot Gale, Wolayta)**



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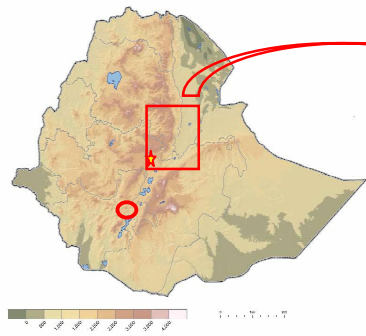
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The study region : localisation



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Introduction.....	1
1 General framework of the study	4
1.1 Institutional context	4
1.1.1 Presentation of Inter Aide's activities.....	4
1.1.2 The demand : origin, transformation	4
1.2 Methodology.....	5
1.2.1 The agrarian diagnosis	5
1.2.2 Complementary study	6
1.2.3 The main difficulties we met	6
1.3 General presentation of the study region	7
1.3.1 Location of the study region	7
1.3.2 Bio-physical characteristics of the study region	9
1.3.3 Socio-économique characteristics of the study region	11
1.3.4 Farming activities and trade.....	12
2 Recent evolutions of agriculture in the study region	17
2.1 Introduction.....	17
2.2 The second reign of the negus Hailé Selassie : an agrarian system built on a feudal society (1941-1974)	18
2.2.1 The agrarian landscape	18
2.2.2 Social relationships	20
2.2.3 Livestock farming and cropping systems	21
2.2.4 Farm typology at the end of the 60's	24
2.3 The socialist regime (1974-1991).....	24
2.3.1 The agrarian reform and its consequences.....	24
2.3.2 The intensification of the regime (1980-1991).....	29
2.4 The liberal era (1991- today)	31
2.4.1 The market liberalization	31
2.4.2 Extention programs : Sasakawa/Global 2000	32
2.4.3 A new work intensification.....	33
2.4.4 Development of off-farm work and temporary migrations.....	34
3 The present agrarian system.....	37
3.1 Access to means of production	37
3.1.1 The land	37
3.1.2 The workforce.....	38
3.1.3 The capital.....	38
3.2 Cropping system, livestock farming system and management of the fertility	38
3.2.1 The cropping systems	39
3.2.2 The livestock farming systems	60
3.2.3 A close association between agriculture and breeding	66
3.3 Farm typology.....	70
3.4 Economic results and analysis	88
3.4.1 Study of the Net Added Value (NAV) and of the farm family income per agricultural labourer.....	88
3.4.2 The contribution of off-farm incomes	90
3.4.3 The impact of the SAFETYNET program.....	90
4 Conclusions discussions	93
Appendix.....	96
Bibliography.....	109

INTRODUCTION

The Wolayta is a little montaneous area from the south west of ethiopia, located on the occidental edge of the great rift valley. It was dubbed “ethiopian balkans”, owing to its strong cultural and ethnic identity.

This area is overcrowded (450 inhabitants/km²) and agricultural (92% of the working population works in agriculture and the total utilised farm area represent 90% of the territory). The enset cropping gives it a stiking geographic originality (Wolayta belongs indeed to the “enset area” (Steven, 1997, quoted by N. Barthès and V. Boquien, 2005)).

Enset (*Ensete Ventricosum*), considered as a “miracle plant” (Gascon, 1991) is a false banana tree. The pulp extracted from the “pseudo tronc” gives a fermented paste with a high rate of carbohydrates. However, if this plant makes it possible to explain that the wolayta peasants succeeded to resist many severe drought and famines (significant high-calorie production per unit of area, plant resistance to the climatic hazards), nowadays, it is not enough anymore to ensure the feed security for most of them. The wolayta is thus from now on dubbed “the green famine’s land”.

In this context of chronical food shortage intervenes the NGO (Non Governemental Organization) Inter Aide. The aim of our study is to provide keys to better understand the situation and to contribute to the impact assessment of Inter Aide’s actions, on running since three years in our study area. Working on the recent evolutions and transformations of the agrarian system, we will attempt to explain the remaining of the “peasantry” in a context of agricultural crisis, begun a few decades ago. With this study, we will analyze the Inter Aide projects results, and then we will suggest evolution prospects in terms of agricultural development for this little area.

1 GENERAL FRAMEWORK OF THE STUDY

1.1 INSTITUTIONAL CONTEXT

1.1.1 Presentation of Inter Aide's activities

Our study occurs within the framework of a project entitled “Preservation of farm resources and improvement of food security for the vulnerable rural families of Damot Gale and Kacha Bira – SNNPR, Ethiopia” started in 2005. In the *woreda* of Damot Gale, this project prolongs two year of agricultural support started by Inter Aide in 2003 and primarily centered on the erosion control.

Inter Aide is the only one NGO in our area of study, the *kébélé* (common) of Obe Jage and its action are divided into tree sections :

Access to drinking water : construction of waterpoints with the participation of the beneficiaries of the project.

Erosion control and fodder stock management : extention of vegetalized structures to control erosion (ditches earth bank, earth bank ditches, terraces). Three of the five village units of our area of study are involved in these activities. The management of the first village unit (Koysha) integrated into the project three years ago, is today gradually relayed by the agents of development of MoARD (Ministry for Agriculture and the Rural Development). Concerning the two other “villages” whose activities started more recently (one and two years ago), peasants carry out the implementation of their own structures accompanied by the field animators from Inter Aide and by the loan of tools (three fingers claw, shovel, spade). These physical installations are then reinforced by the plantation of shrubs or perennial gramineaeous (vetiver, elephant grass, cesbania, pigeon pea), which makes small fodder hedges. Thus, in addition to the erosion control (by slowing down the run off, increasing the infiltration of water and improving the drainage of surplus water), the popularized structures give additional fodder resources to the peasants.

Seeds saving : Inter Aide support the grouping of peasants for the preserving of seeds of wheat through Idirs (Community organization whose first function is to support families for funerals). The peasants provide a quantity of grains at the time of the harvest to make a stock, which is given to Idir and supplied by the NGO with “improved” seeds. The seeds are redistributed at the sowing time. In the long term, the objective is to decrease the credits taken by the peasants for the purchase of inputs, but also to support a seed selection in order to improve the outputs.

1.1.2 The demand : origin, transformation

Inter Aide ordered this study to take part to the impact assessment of the actions of the project carried out for three years. The objective is to help to better characterize the families beneficiaries, to assess the impact of the project on these last, but also to propose changes which could be brought for the next years. More accurately, after “*recalling the broad outline of the recent evolution of the farmers strategies*”, the wish of the NGO was to have “*a typology of the peasant farming system focused on food security and the capacity to take opportunities or risks and to organize themselves in order to innovate*”. From this typology, we should extract indicators and key criteria simple enough to be used for the implementation of tools for diagnosis usable by the

field actors. Lastly, *“the comparative study between the farms which implemented soil conservation structures and management of their resources thanks to the support of the project and families who did not”* should enable to assess *“some margins of possible progress brought by the different actions of the project”*.

This demand was partly modified thereafter, when the training supervisors came on the field. Indeed, following the first work completed in our area of study, we noted that it would be very difficult to carry out a study based on the comparison of the productions and yields between the beneficiaries farms and the non beneficiaries farms, because of the great variability even between the beneficiaries. In addition, the data collected since three years, over which we were supposed to base our study were not exploitable. Moreover, we observed that it was often too early to detect changes of practices linked with the implementation of soil conservation structures.

The study was thus turned towards a more qualitative assessment, with a particular stress put on the fodder and the seeds preserving. However, the study will also have to provide elements to analyse the impact of erosion control.

1.2 METHODOLOGY

1.2.1 The agrarian diagnosis

To answer this request, we did a work according to the education we received during our scholarship (agricultural development followed in the National Agronomic Institute of Paris-Grignon and the National Centre of Agronomic Studies of the Hot Areas). It is an analysis diagnosis, i.e. the study of agrarian realities and their dynamic of evolution. This study enabled us to better understand the agrarian systems of the area and thus to consider prospects for evolution from the point of view of the agricultural development.

The agrarian system is defined as *“a way to farm the territory, historically made up and sustainable, a system of force of production (a technical system), adapted to the bioclimatic conditions of a given space and which meets the current social needs”* (M. Mazoyer, 1987).

We made this study in four stages, according to the method of the agrarian diagnosis that we received in our respective establishments :

First of all, we studied the agrarian landscape, in order to understand and then to explain why and how the peasant do what they do. This first stage enabled us to highlight the agro-ecological (geomorphology, pedology, climate) and socio-economic elements which enable to explain the current mode of farming.

In a second time, we carried out a historical analysis by carrying out interviews with the oldest farmers of our area of study. This enabled us to identify the main stages of the evolution of the mode of farming and the farms themselves, i.e. to understand more accurately the diversity of the agricultural situations which can be observed today.

Then, we made a sharpest economic survey (technical and economical) of the livestock farming and cropping systems present in the area in order to improve our understanding of the farmers' practices. For that, we carried out interviews directly in the plots of the peasants.

Lastly, we carried out an analysis of the farming system implemented in our area of study.

A farming system is “*the combination of the productions and the means of production (land capital, working capital and labour force) in the farm*” (J Chombart de Lauwe, J Poitevin and J-C. Tirel, 1969).

For that stage, we carried out sharpest inquiries with farmers chosen in a reasoned sample. To carry out this sample, we built a pre typology based on the information collected during the previous stages. As we took care to identify the diversity of the situations, this pre-typology, and thus the sample we used, is representative of all the existing situations in the area of study. This last stage led us to analyze, then to construct a model of the economic performances of the different types of farms identified in our area of study.

1.2.2 Complementary study

The main informations essentials to answer the request of Inter Aide were collected during interviews carried out within the framework of the agrarian diagnosis explained previously. However, we carried out additional inquiries with families who benefit from the projects of the NGO. We asked more precisely the peasants on all the aspects of their membership (origin, motivation, changes, knowledge and implementation and use of the popularized elements) and on their results (determination of the quantities of fodder obtained, comparison with fodder accessible in the area...).

The collected data were several times crossed, by reformulating the questions or by carrying out discussions with groups of peasants.

1.2.3 The main difficulties we met

The first difficulty is related to the period of our arrival on the field. April, which just follows sowings, is in the middle of a food shortage period. This one was particularly hard this year because of the prices explosion. The first contact with families was thus rather difficult, because they were waiting for food aid.

We also found it difficult to assess the farm areas. Indeed, local measurement is the *timad*, which corresponds theoretically to the area that can be ploughed in six hours with two oxen, that is to say approximately 0,25 hectares. However, this area varies strongly according to the state of the soil, the oxen and the slope. We measured that to plough 0,25 ha, it takes between six and ten hours. That's why we measured by ourselves all the farms area (starting from the number of steps).

Moreover, the prices variations of the foodstuffs and inputs are very strong from one year to another and even from one month to another. According to the inquiries we made with local actors, the prices of this year would be particularly high. It was thus difficult for us to assess the prices for a “normal” year. However, the results that we present come from the cross-checking of many informations and can be regarded as reliable.

The evaluation of yields was also problematic because, on the one hand, the harvests are often daily (auto-consumption) and thus not easily quantifiable (harvest of a handle of bean seedlings twice per weeks) what led us to approximations. On the other

hand, the local measuring unit, the *shala*, is a bag whose mass can vary from 50 to 75 kg according to type of seeds (it is thus the same for the variability of the units on the smallest quantities).

In addition, we observed a great variability about amounts of inputs applicated but we didn't succeed to draw a link with the output actually obtained.

1.3 GENERAL PRESENTATION OF THE STUDY REGION

1.3.1 Location of the study region

The study zone is located in the wide region SNNPR (Southern Nation and Nationalities People's Region) in the south west of Ethiopia. This is a *kébélé*, located in the territorial and administrative division (*woreda*) of Damot Gale, itself located in the small agricultural and montagneous Wolayta region. This *kébélé* is divided into five Village Unit which can be regarded as micro watershed : Anshakaro, Akabilo, Koysha, Bola Jage and Garsa Tida.

The nearest town (more than 20 000 inhabitants) are Boditi and Sodo. They are located on the asphalt road which connect Addis Ababa, the capital city, to the south of Ethiopia. This town can be reached in three to four hours'walk away from the study area.

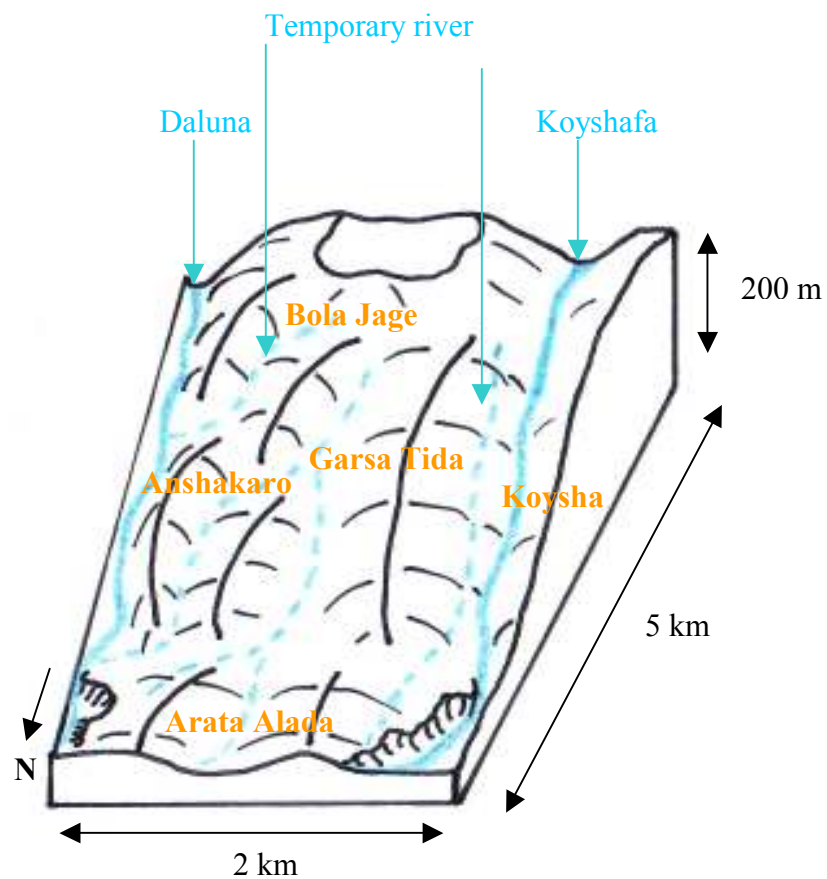


Figure 1 : Block diagramm

Source : E. Le Gal, N. Molinier, from our field inquiries

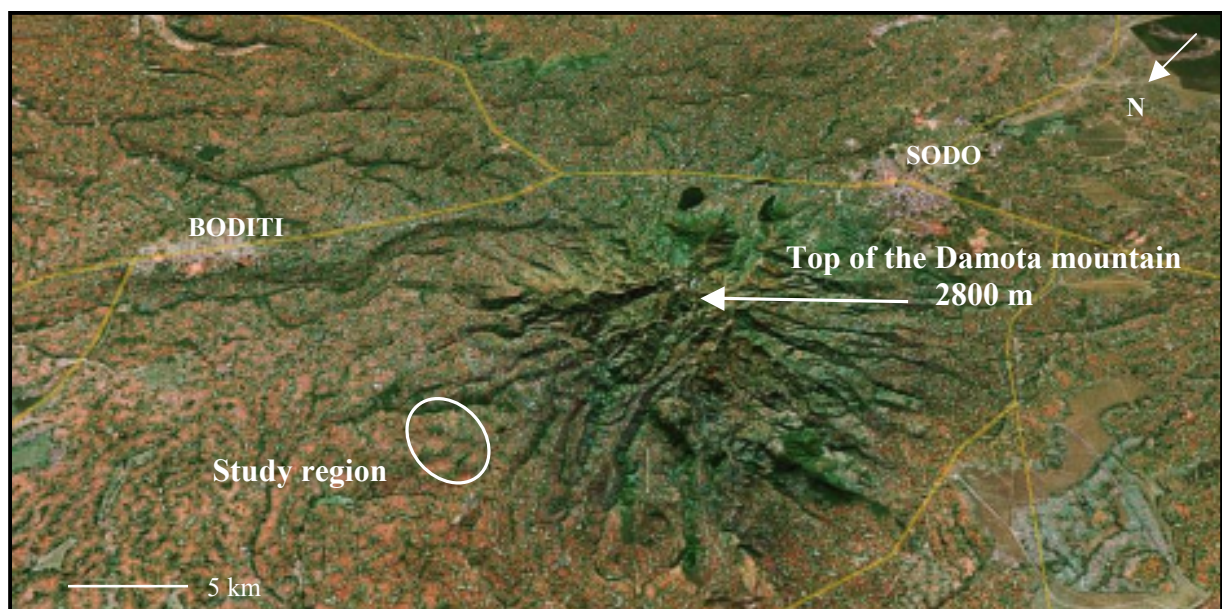


Figure 2 : location of the study region

Source : From Google Earth 2006

More accurately, the study region, approximately 10 km² wide, is located on the northern side of the Damota Mountain which is 2800 meters high. It belongs to an intermediary agro-ecological level which is called *Woïna Dega* and which is located between *highlands* (*Dega* between 2500 et 3500 m above the level of the sea) and *lowlands* (*Kolla* less than 1500 m above the level of the sea).

We chose the region in collaboration with the Inter Aide staff. The idea was to find a zone where this organisation lead actions for a long enough duration in order to give basics for the impact assessment of its project.

The study region is demarcated in the West and the East with two permanent river (*Daluna* and *Koishafa*). After the river *Koishafa*, in the south, it is more slopping and the relief is more steep. In the south west, there is an administrative border (another *woreda* where the NGO didn't begin project). In the North, where the climate is more hot and less humid, and the relief quite undulated, the strain for the resources management and use are not the same anymore (*Cf appendix 1*).

Furthermore, we chose to focus on a *Woina dega* area and not to spread the study zone to the *Dega*, because the management and the use of resources in those two agro-ecological levels are different, so they can be regarded as two distinct agrarian systems. We made this choice after checking that there is no complementary management of the resources between this two zones, no bursted land tenure. We will see later in this study that it is due to the historical evolution in our study region.

1.3.2 Bio-physical characteristics of the study region

1.3.2.1 Geomorphology- hydrology

Approximatly located between 1900m and 2100m, Obe jage can be described as a set of undulating hills which hillocks represent the basic landscape unit.

The network of waterways draws a succession of little hill-chains which are from 500 to 1500 meters wide and lieing in the direction of the slope (from South to North). They are separated by narrow valleys (V valleys), paralell one to another and from 30 to 45 meter deep. In diagonal view, the profile of the hill-chains is convex and wide. The slope is gentle on the top and begin to be more steep on the sides (roughly 20% of slope) (*Cf appendix 1*). The valleys, which are lined with the bottom of the sides are frequently eroded into « badlands ». Numerous small temporary or permanent waterways which appear in the rainfall season enable an efficient drainage.

1.3.2.2 Geology - soils

The formation of the Damota mountain is due to volcanic activity in tertiary which occured on the occidental edge of the Great Rift Valley. This volcano was made up in Pleistocene, from the accumulation of rhiolitics lavas and high pressure gaz. After that, this relief have been submitted to the erosion under a humid and forest climate what created numerous small valleys cut by rivers.

So, the soils of the region are derived from an inimbritic substratum (inimbritics rocks represent a multistorey structure : one layer with rhiolitics rocks, that is to say hard and well crystallised (quartz, feldspath) alternately with one layer more tender, less crystallised (according to Raunet, 1984)).

According to our fieldwork, the soils are red, deep from 2 to 4 meters in the top of the hills and more thin on the slope. The initial rock have totally been transformed and “digested”. Thanks to a good structure (angular polyhedral) the soil has a good general porosity, a high capacity to absorb rainfall water and a high infiltration speed. There is no physical obstacle for the roots to enter the soil (no big elements, no compaction, no temporary stagnation of the water). These ferrallitic soils, well structured, homogeneous and with a high level of clay are favourable to the cultivation. However, the small rate of phosphorus and nitrogen supposes fertilizer (mineral and/or organic) application and their clayey texture make the soil difficult to cultivate.

1.3.2.3 The climate

In Obe Jage, we can consider that the climate is subtropical, humid in a mountainous environment. The annual average of rainfall is 1250 mm and annual average of temperature around 16°C to 20°C all along the year.

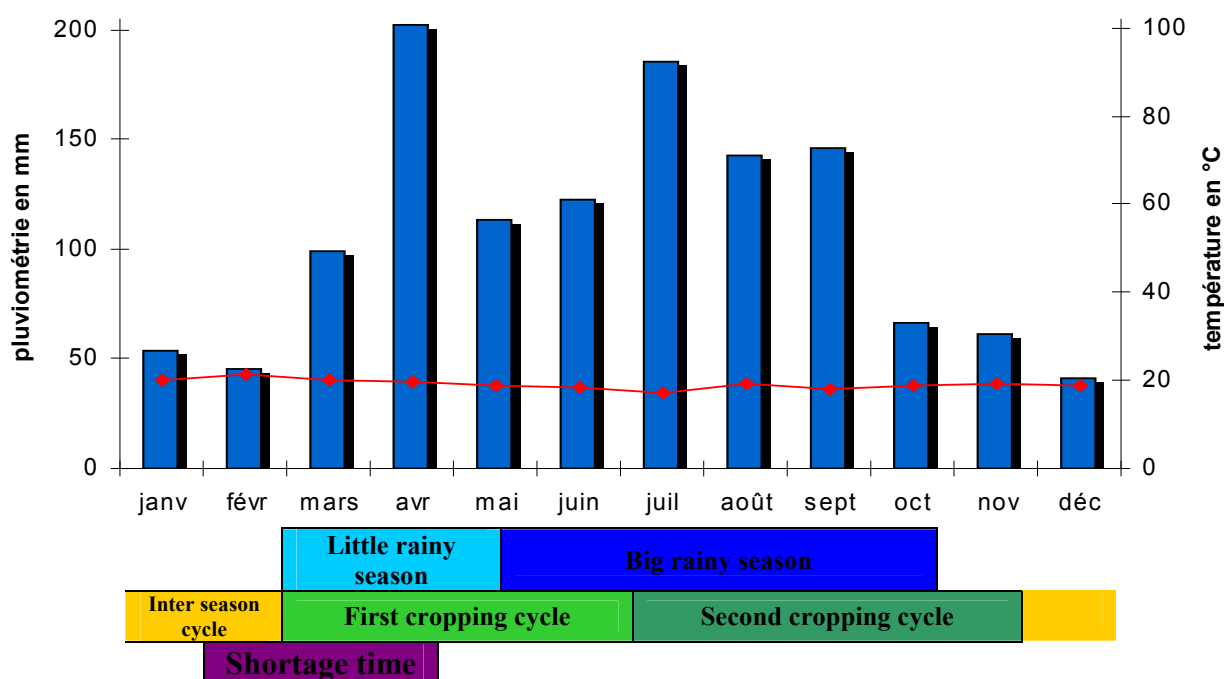


Figure 3 : Ombrothermic diagram, Boditi, medium year
Source : from the Rural Development office of Boditi

The main rainy season is from April to September and presents a bimodal scheme every year. This climate enables a Length of Growing Period (LGP) of almost 300 days. That's why Wolayta peasants carry out two cycles of seasonal cropping (the *gaba* during the short rainy season from February to July and the *sela* during the long rainy season from August to December) and sometimes an inter season cycle from December to March.

However, even if the amount and the duration of rainfall seems to be favourable to agriculture, big inter annual variations can occur, what makes impossible to foresee the conditions and the results of the different cultivation operations. For instance, the insufficiency and/or the delay of the rainfall (1991, 1995, 1997, 1999) or on the contrary, particularly abundant and/or long rainfall (1996, 1998, 2006) caused an

important harvest's loss which led sometimes to food deficiency (according to M. Le Pommelec, 2000, completed with our field inquiries). What's more, the beginning of the rains is quite hazardous and the sowing time is very changeable (between march and february). At last, the rain can be like very violent downpour, what causes devastating run off (inputs carried away, crops destroyed with the hail) and furrow the soils located on the steepest sides. So, the rainfed erosion scours little by little the soils located on the steepest sides.

1.3.3 Socio-économique characteristics of the study region

Obe jage is one of the most populated villages in the department of Damot Gale with a density of settlement exceeding 500 inhabitants per km², which, according to our estimates, would raise the load per hectare of arable land to more than 6 inhabitants. According to official statistics of 2003 (Central Statistical Authority), the growth rate would be higher than 3%, with an estimate of the doubling of the population from here to 24 years, which suggests that Obe Jage is *"a full world which is going on filling"* (Gascon, 1995). In addition, the population of our area of study, whose great majority is native from Wolayta, is very young since, according to the census of 1994, approximately 67% of the population would have less than 24 years.

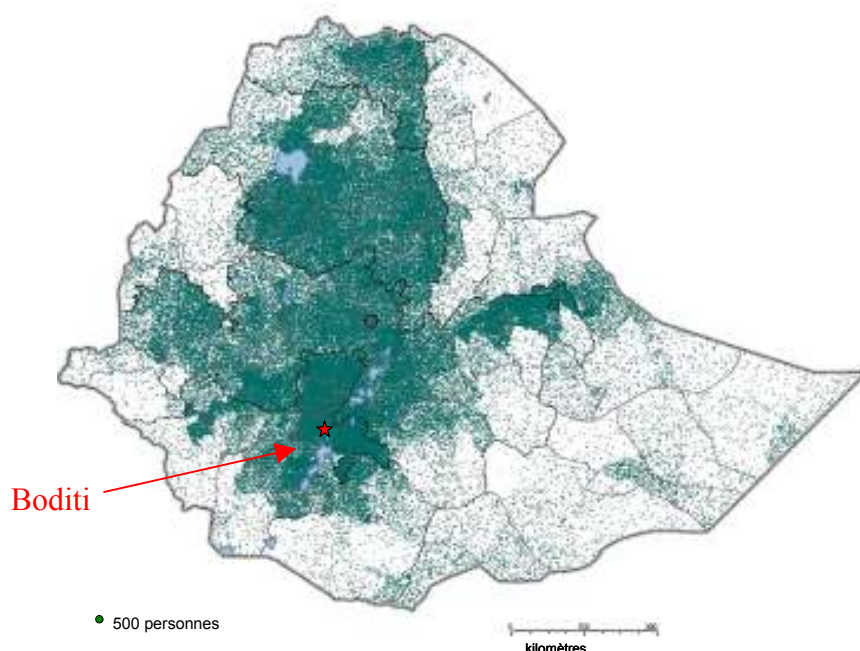


Figure 4 : Pattern of the settlement on the Ethiopian territory

Source : Projections 2004 based on the census of the population 1994, Central Statistic Agency

Moreover, according to the regional statistics, the working farm/non-working farm population ratio is very weak (0,9 agricultural labourer for one non working people). That means that the great part of the income earned by an agricultural worker will be devoted to meet not only its needs (food, clothing...) but also those for non working people (less than 15 years old children, old people) who depend on him. It will be very difficult to save or to reinvest what has been produced. However, it is essential to recall that these people considered as non working take part in the production (to keep an eye on the herd, to distribute the rations, to cut the grass).

Half of the owners in zone is concerned with the SAFETYNET program (cash for work), impelled by the World Bank in 1998 and whose funds are managed in the field by government agents within the framework of the food security program of the

ministry for agriculture. After having noted that the pay in kind (food for work) was a major factor of destabilization of the local markets, this program was modified two years ago and the pay is from now on in money (cash for work).

The selection of the families, carried out by a committee of peasants indicated by the local councillors and represented by the mayor of the *kébélé*, is subjected to the evaluation of the village communities. The beneficiaries of this program work a number of days proportional to the number of people selected in their house (5 working days per month payed 3 euros per selected member). For example, for a five people family whose all members are selected by the committee, the head of household will work 25 days per month for a monthly pay of 15 euros. For a family whose only two people are retained, he will work only 10 days per month for monthly wage of 6 euros. The farmers whose families are selected take part in the realization of works recognized “*of public interest*” (maintenance of common roads, implementation of soil conservation structures) between January and June. This ensures to them an income from 36 to 90 euros per year. This sum, we will see it later, increases significantly the household income of the beneficiaries.

Moreover, the international food aid (EU and the USA) like cereals (maize, wheat) or nutritional concentrates for children (“*fafa*”, NGO MCA) is regular and shows the brittleness of the agrarian system to cover the feed requirements of the population.

The work opportunities are relatively rare in Obe Jage, which is exclusively rural, dominated by peasant farming and already saturated with farm labour force. It is the same in Boditi and Sodo where the industrial sector is only slightly developed. This absence of viable migration opportunities makes even more important the land access and its intensification in a context of demographic growth.

However, Boditi and Sodo, located on the asphalt road of the Great Rift Valley, are start-up cities towards possible seasonal off-farm employment. Thus, the poorest farmers leave the area of study from September to December (between sowing and harvest) even the good years in the search of an employment.

The principal destinations are the State farms of Awash (cotton, fruits and sugar cane), Arba Minch (cotton) and the private farms of Awassa, Shashamane and Alaba (harvest of corn and tef).

1.3.4 Farming activities and trade

1.3.4.1 *The landscape : an area totally man-made*

Thanks to the natural aptitudes of the area for agriculture and because of the very high density of population, the land is totally farmed. The rural settlement is dense and scattered. Nevertheless, the house are seldom insulated. They form groups of 3 to 10 families organized around a small undivided grassland (*karé*). If the farms were historically preferentially located on the tops or projecting ledges of the hills, they are actually distributed on all the territory, even on the slopes and the unfavourable soils.

The frame of farms in the space forms a bocage screen which partitions the hills and decreases the risks of erosion. The extreme fragmentation of the plots gives to the landscape the aspect of an irregular checkerwork. These plots are generally perpendicular to the slope and with a rectangular aspect.

In addition to some spontaneous species of trees preserved for their importance in the renewal of soil fertility (*Acacia abyssinia* or *albida*), the foddering (*Erythrina abyssinia*) and firewood, very few not planted raised or shrubby formations can be seen.

The landscape is punctuated of permanent grassland (familial undivided meadows) made of spontaneous species. The grasslands are generally located in bottom of slope and/or in difficult to reach and/or cultivable areas (strong erosion, steep slope). They can also be located in edge of plots and garden.



Source : E. Le Gal, N. Molinier, 2006

1.3.4.2 The landscape unit : the mixed crop-livestock farming

The landscape is the repetition of numerous small farms. They are generally perpendicular to the direction of the slope. Even if the size of these farms can differ from one to another, they are always following the same scheme of organization. What change is the proportion of the different parts.

The farm is located just near the individuated grassland where peasants manage the cattle with tethered rearing. Each house has a fence with fencing plants (entire plant or cut part of *Erythrina abyssinica*) which includes the garden. It looks like an enclosure made of a small meadow (*shuria*), the house and the garden (*darensa*). The meadow can be protected from grazing with thorny branch of *Acacia Africana*.

The house (*tukul* or *keita*) is made of a wood frame (mainly Eucalyptus). The walls are made in cob (from straw of tef) and the roof is covered with dry grass (*gata*) bought and/or cut annually (in December) on the pasture of the *kébélé*. This dwelling shelters the nuclear family made up from 5 to 8 members. The animals are kept there in stalling (bovines, sheep, poultry). Beyond the garden, are cultivated the tubers (taro, sweet potatoes, potatoes) and the maize mixed with haricot bean or broad bean and/or pea. This is the close field, on which farmers apply only organic manure (*mata gadia*). Lastly, the cereal crops (tef, wheat) and leguminous (pea, bean) are cultivated on the most distant fields which receive chemical fertilizers (*haho gadia*). Shrubby euphorbiums mark the borders between the properties (every 20 to 30 meters) of the families.

A small thicket of Eucalyptus (*zafia*), sometimes preceded by a grass band (mowing), is also maintained and farmed for firewood and timber to build house. These small raised plots are located down below and/or in zones difficult to reach and/or to cultivate (strong erosion, strong slope) as on edges of the road or of the family undivided. Lastly, grass bands, trees and shrubs (fodder and/or timber) generally border the fields.



1.3.4.3 A subsistence farming which is to be seen in the trade

The main purpose of farming in Obe Jage is the subsistence of the family. This subsistence farming is based on maize and sweet potato consumption. However it is weakened by numerous diseases (caterpillar responsible for the death of leaves of sweet potato) and the brutality of rains which can destroy a great part of the harvest of maize.

The conservation of seeds from one year to another, even from one season to another, is very rare in the area for complex reasons which will be clarified thereafter. The farmers are thus very dependent on the market to provide themselves inputs and to sell a part of their harvest (needs of cash). This strong dependence force them to sell at low prices while seeds price doubles in period of sowing.

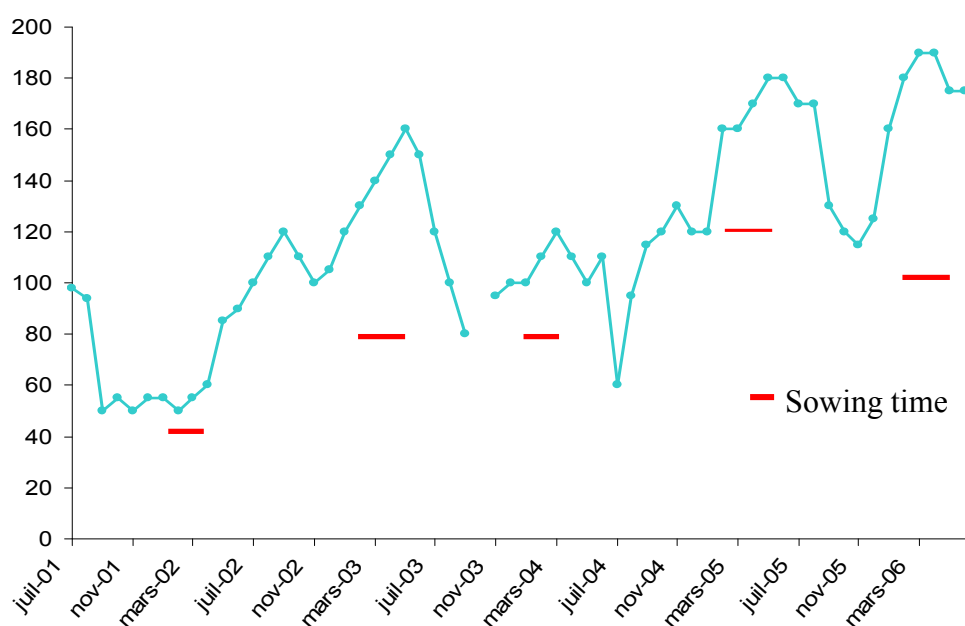


Figure 5 : Evolution of the maize's current price

Source : Datas collected in the Rural Development office from Boditi

The marketing of agricultural commodities takes place on markets which are of two types in the area of study. The main ones, where the transactions between small merchants and wholesale purchasers are carried out, occur twice a week in the towns of Boditi and Sodo. With the latter, are added the daily local markets (*gaab*) which attract a mass of small merchants who buy and sell foodstuffs (cereals, coffee, butter, fruits, vegetables...) or not (fertilizing, kerosene, soap) in small quantity with very low margins. These markets are held in turn between Obe Jage and the six *kébélé* of the vicinity. The flow of goods (by small quantity but in great number), on the back of men, is important between Sodo, Boditi, and the area of study.

The basic food and inputs supply is thus ensured by this intense trade on the daily markets, more especially as the tracks carrying out downtown are bad and as motorized transport doesn't exist.

The market access apart from the zone is inevitably by truck. It depends on the state of the road which connect Addis Ababa to Sodo, administrative and commercial capital of Wolayta.

Little merchant in the sodo market
 Source : E. Le Gal, N. Molinier, 2006



Obe Jage market
 Source : E. Le Gal, N. Molinier, 2006



Departure for daily work from Sodo to Awash
 Source : E. Le Gal, N. Molinier, 2006



2 RECENT EVOLUTIONS OF AGRICULTURE IN THE STUDY REGION

2.1 INTRODUCTION

At the beginning of the XVIII century, a great part of the independent kingdom of Wolayta, including our study region, was occupied by people from a nearby kingdom, Marocco. At that time, the region was only made up of forests, undergrowth and permanent grassland. Marocco were pastors and practised an extensive animal breeding. The great majority of the wolaytas exiled at the time of the invasion, that's why the density of population was very low.

In the middle of the XVIII century, Wolayta people reconquer their territory. It is the apogee of the rich independent kingdom of Wolayta. King Kotona distributes to his close relations and the members of his family (notable) large areas, whose the most are not yet cultivated. Many migrants "landless" are coming from the close regions (Kindo Koysha, Daoro, Kambatta) to put themselves under the protection of these notables, who grant them a piece of land they would have to clear. Several plots are also granted by the king to the soldiers who took part in the reconquest. At that time Wolayta is *"fertile, rich with a great number of forests, large uncultivated land, and an abundant wild fauna"* (Chiatti, 1984). Hunting (cat family) has a significant place in the wolayta culture.

"The diversity of crops is already very widespread: maize, wheat, barley, coffee, sorghum, cotton and many fruit trees are well-known by peasants" (Vanderheim, 1896, Welly, 1901, quoted by Pommelec, 2000).

In 1894, Wolayta is conquered by the armies of the emperor Ménélik II, during a gigantic military campaign. The kingdom, integrated into the central authority of the Ethiopian empire is from now on governed by its laws. The region is doubly overburden with the bloody reprisals and the tax deductions : the King of the Kings levies heavily the population: *"18000 heads of cattle and 1800 people put in slavery (on the scale of Wolayta), to his own profit"* (Data Dea, 1997).

Ménélik II grants plots to amhara notables (members of the orthodox Ethiopian church and the imperial authority) and to soldiers in the region, what gives him a lasting control. These new owners are called *Melka amhara*. These *Melka amharas* are used to do the "test of the flour". They take the peasants who fail as tenants on their lands. Then the latter have no right anymore except to obey their "master". Nevertheless, the *amhara* domination rely on the local social organization, although some local notable, too much friend with the former king, have been "encouraged" to go into exile.

Peasants must pay very heavy contributions (taxes in kind and in cash, hard labour). The farmers who can not pay their taxes are evicted. Then, several of them come under the protection of wolayta or amhara landlord and become their tenants.

The abyssinians impose to cultivate tef, which is necessary to cook *injera*, a kind of fermented pankake which is regarded as the basic food. It is almost sure that they introduced the swing-plough, but the technique of "ploughing" perhaps preceded them: : *"The Wolaita used the plough long before their encounter with the Amharas, although it did not have a metal plough point which was adopted from the latter"* D., 1997 Dated).

In 1939, Italian occupy Ethiopia and our study region. The dignitaries of the amhara regime are driven out. Most of the *Melka amharas* present in the region flee. Italian implement a new land tax, and cancel hard labour and contributions in kind from harvests of the peasants. The exiled wolayta landowners take again possession of their land.

These will be short term changes, because Italian leave Ethiopia in 1941 and the feudalism of Haile Selassie is restored, for its second reign, the reign of the King of the Kings.

2.2 THE SECOND REIGN OF THE NEGUS HAILÉ SELASSIE : AN AGRARIAN SYSTEM BUILT ON A FEUDAL SOCIETY (1941-1974)

2.2.1 The agrarian landscape

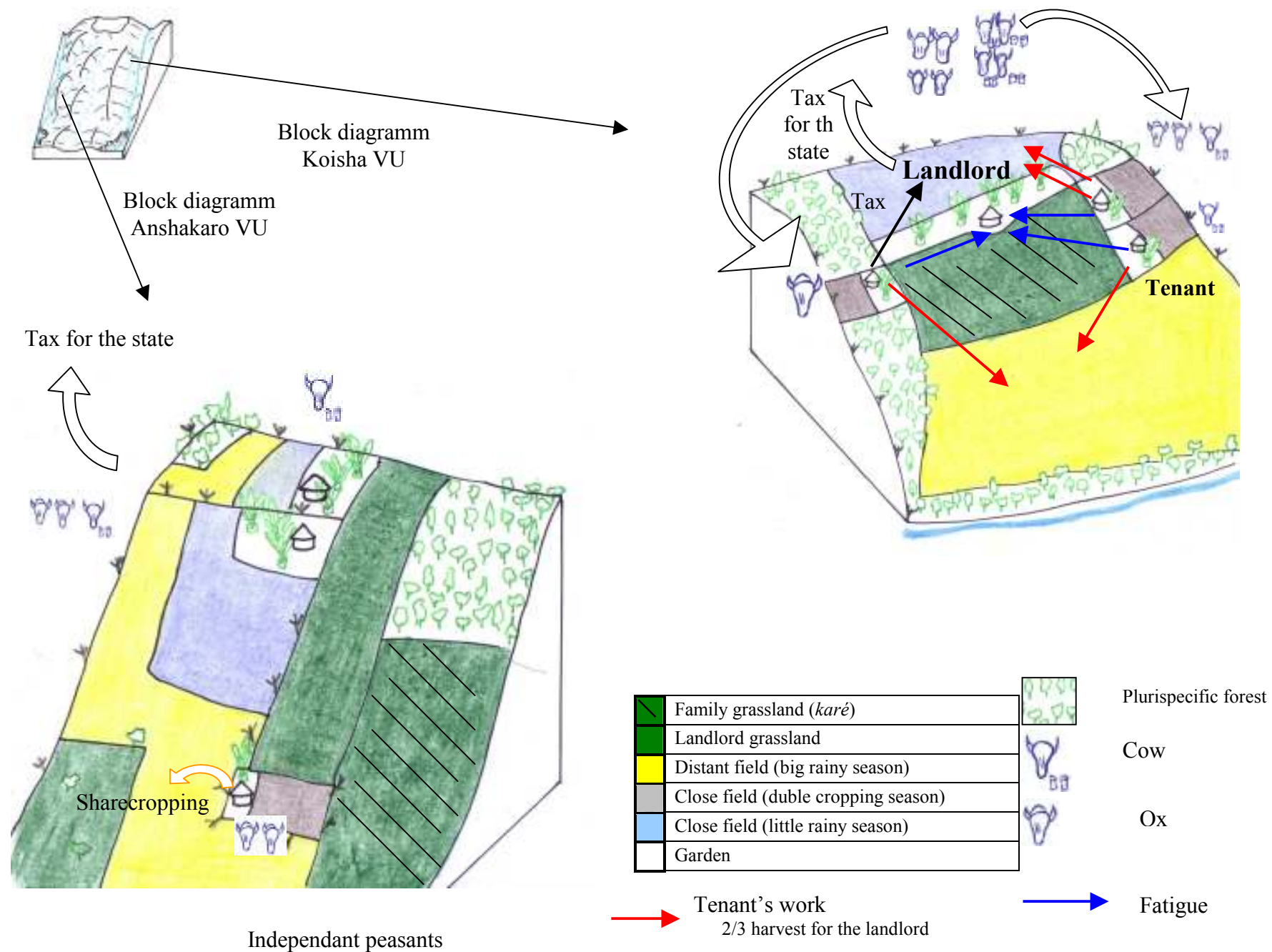
After the wave of clearings during the XIX century (following the land awarding by the king Kotona), the arrival of new migrants was contained by the control of notable (wolayta then amhara) over a large part of the land. The density of population is thus rather low at that time (three times lower than today).

The settlement, scattered and relatively remote, occupies the top of the hills. Land purchase and sale is allowed. Fields are not systematically gathered around the house. Thus, some farmers can cultivate several agro-ecological stages.

The manual cultivation of ensete is preponderant and plots, close to the dwellings, can reach about 25 ares. Fields are “open” and many animals present in the forest (porcupine, anteater, cat family...) regularly damage the harvests.

There are large plurispecific forest (*Cordia abyssinica*, *Juniperus will procera*, *Ficus vasta*, *Podocarpus gracillor*, *Olea africana*...). Forested spaces are grazed and the trees are used as timber or firewood.

There are also large grasslands, which belong to the big landowners.



2.2.2 Social relationships

The society is organized around three quite distinct social categories: *Balabat* or landlords, *Chichenias* or tenants, ex landless, and *Goka*, independant owners.

The notable (*balabat*) are the big landowners of the area. Their property, made of farmed land, grassland and forests stretch over 10 to 50 ha. They seldom cultivate their land and the tenants (*chichenia*) farm it for them. The latter receive a small holding (from 0,25 to 1,5 ha) which they farm for their own consumption. In compensation, they owe two days of work per week (Monday and Thursday), used on the landlord's fields. The latter receive then 2/3 of the production (*sisso*). Moreover, the tenant have to carry out a fatigue each holydays (to cut wood, to grind grain, to clean the landowner house, to serve him or to follow him during his trip). The whole of these obligations mobilizes approximately 15% of their labour time. Lastly, the tenant have to pay every year a tax in cash to the landowner. Then, the landowner pays a tax to the state for all the land that he owns. The notables are free to accept or to "dismiss" the families on their land, what puts the tenants in a state of land insecurity and permanent submission.

The independent owners (*goka*) come generally from families who cleared the land during the apogee of the Wolayta kingdom before the Amhara conquest, and/or who avoided the setting under supervision by the big landowner at his arrival. They pay an annual tax to the State alone or gathered, most of the time between people who have family links.

From 1900, trade is very important (honey, butter, animals, grains) (D. Data, 1997). Many peasants sell a part of their harvest (mainly barley, maize, wheat and coffee) on the small local markets which are already very prosperous. By this way, they can obtain the liquid assets in order to pay the taxes. To coffee plant is forbidden for tenants and they receive only one third of the harvest for the major part of the land that they cultivate. This maintain them in condition of precariousness. Some of them carry on an activity of merchant with an ass between Kambatta where they sell butter and buy honey, and Wolayta where they buy butter to the independent peasants of the region and sell honey. The trade of packs animals (ass, mule) is also very active between these two areas, and until the lowlands (*kolla*).

The rights on the resources, especially the land access, are not the same. The state, and thus the Negus, has an eminent ownership right on the land. But the property is mainly granted to the landlord, who develop it thanks to indirect tenure by sharing the usufruct with tenants. However, the land access is also possible by purchase for the independant peasants having an extra source of capital (merchants).

The land of the landlord are the most favourable for agriculture. Their fields stretch over the least sloping zones of the region of study where the soils are deeper (village units of Garsa Tida and Bola Jage, cf picture 1). The tenants who share the usufruct are often localised on the least fertile soils of those big land, in order to make them develop it by their work. The farms of the small independent holders are on the least fertile soils of our study region. Soils are thinner there and slopes are steep (village units of Anchakaro and Koysha). In the southern part, where physical conditions are a little different (relief slightly undulating, soft slopes, deep soil), live big independent landowners (village unit of Arata arada). They could keep their independence by paying heavy toll to the the wolayta then amhara notables (honey and more than 10 liters of butter).

2.2.3 Livestock farming and cropping systems

2.2.3.1 Cropping systems

Globally, the frame of the farms is the same than today. They have a subsistence garden, a pure plantation of ensete and fields. The size of these components varies according to the social position of the peasants.

The gardens

They are adjoining the house and are very rich in enset. Plots of enset can exceed 25 ares for the big landowners. This plantation is the most important subsistence crop system of the area and is the basis of people feeding.

Marrows, spices and some tubers (yam, Wolayta potato, taro, sweet potatoes) are cultivated in almost all the gardens. Coffee, for autoconsumption or sale, is also cultivated.

The sharecroppers who share the usufruct are not allowed to cultivate perennial crops like coffee, or even ensete in some cases in their garden

The fields (close and distant)

They are cultivated during only one cropping season, which allows common grazing. For the independent peasants, the access is free for all the animals of the neighbourhood. They are kept under surveillance turn by turn by the different families. On the *balabat* fields, tenants are the only ones allowed to make their animals graze.

The **cultivation** is carried out by animal traction (two to three runs with the swing-plough before sowing) when the peasants have access to oxen. The number of oxen determines the surface which it is possible to cultivate.

We met three cases :

The ownership of a full yoke makes it possible to cultivate up to 2,8 hectares

The ownership of a half a yoke supposes to obtain an ox in contract (*gatua*) to cultivate, and makes it possible to cultivate up to 1,15 hectares maximum.

The lack of ploughing oxen on the farm supposes a manual cultivation with a big two fingers claw. Maximum surface that can be cultivated in that case is approximately 0,5 hectares. However, cultivation by hand is often completed by a run of swing-plough. Indeed, to borrow (tax free) ploughing oxen is a current practice between independent peasants. Indeed, several of them have more oxen than what is enough to plough their own lands.

The tenants cultivate by hand their piece of land in usufruct and the land of the landlord with his oxen.

During the **weeding** (approximately two per cropping cycle) carried out with a small two fingers claw (*tekia*), weeds are directly incorporated in the soil.

Harvest is a collective task. It is carried out with a knife in the case of cereals which are cut at the middle, by hand in the case of leguminous which are dig up, with the small two fingers claw in the case of tubers.

After threshing, the crop residues of cereals are gathered near the house of the owner and a part is burned. Ashes are not recovered.

The **fields far away** from the house (distant fields) (landlord and independent peasants) are systematically cultivated for the big rainy season, from July to December, generally with cereals in order to sale them. The main crops are red tef, wheat, barley as well as pea and broad bean. We didn't succeed to define precisely the rotations. The peasants introduce a leguminous approximately every three years and avoid the successions cereal/cereal, except for the tef which can come anywhere. Rotations could thus be of the type:

//-/wheat//-/red tef //-/pea//-/ ou //-/barley//-/red tef //-/fava bean// over three years.

For the landlord, these land are farmed thanks to the hard labour carried out by tenants. The latter, as well as the small land holders (Anchakaro and Koysha) do not have enough surface to produce this crop.

The **fields close** to the dwellings (landlord, tenants and independent peasants) are farmed for the small rainy season, from February to August. Maize, potato and bean are cultivated most of the time there, in monoculture. Crops with longer cycles like taro or sorghum are also cultivated. All this crops are cultivated to reach self sufficiency and are autoconsumed.

Main rotations are:

maize-//taro//maize-//potato/-/ or maize-//haricot/-//sorghum//.

In these fields, harvests are carried out daily for the small-scale farms (tenants, micro farms).

Farmers who have smallest areas (<0,5 ha) and can not produce food enough to feed the family are cultivated during the both rainy seasons, but only in cultivation by hand. They are tenants or small independant peasant without any ploughing oxen. They are the only ones to include sweet potatoes in their rotation :

maize/sweet potatoes//haricot/wheat// over two years.

2.2.3.2 Animal farming systems

The *Balabat* have large herds (until 20 heads of cattle). They give a part to the tenants to share the profit. This tenants benefit from half of the dairy production but have to give all the calfs to the owner.

Independant peasants can own few cattle. The practice of sharing the usufruct is different in that case because calfs are shared equally.

Animal feeding is based on grazing during the day. Animals are kept under surveillance by the children. Tenants have a free access to the large grassland of the landlord. Independent peasants have a small grassland on their farm and use the forested spaces where they have a free access. If they have not enough fodder, they can rent a small piece of land on the grassland of the landlords for one year. Their animals can graze there and moreover they carry out until two mowing between june and september. Cutted grass is directly distributed. Lastly, the common grazing is often used and is an significant resource for the smallest farmers (double return : fodder and manure on the fields). During the dry season, enset leaves help to fill in the fodder shortage.

	Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Grassland												
Common grazing												
Enset leaves												
Solage maize												
Stored straws												
Oxen (ploughing) and cows (lactaction)	grains (cereals), enset leaves and tubers											

Figure 6 : Forage calendar (bovines, ovines)

Source : E. Le Gal, N. Molinier, *from our fields inquiries*

The animals feeding is thus not a limiting factor at that time and according to our investigations, all the peasants could manage to feed at least one bovine (in ownership or contract). Thus, the majority of the owners had enough manure to fertilize correctly a piece of at least 10 ares of enset.

The animals are staying in small boxes in stalling in the house at night, what makes it easier to collect the dejections and decreases the risks of theft. The peasants who share an animal can benefit from almost all of the manure produced at night.

2.2.4 Farm typology at the end of the 60's

Large farm with tillage by animal traction

They are notables who own from 10 to 50 ha and more than 20 heads of cattle (given to the tenant in sharing). Their land is cultivated by tenants and/or sharecroppers in tillage by animal traction, even in cultivation by hand.

Middle farms with tillage by animal traction

They are independent farmers who have from 1 to 5 ha, and at least one ploughing ox and a pair of cows. Peasants who have large surfaces cultivate up to 2,5 ha with two oxen, 1,1 ha with only one ox. What can not be ploughed with the animal traction force (surplus) is given in share-cropping. They provide half of the inputs, sometimes the oxen and the harvest is shared with the sharecropper (50-50). In only some rare cases, the peasant who takes the land has to provide the totality of the inputs. Indeed, the land access is not being a limiting factor, that's why the owner must offer attractive conditions to the sharecropper.

Micro-farm with cultivation by hand :

It concerns the smallest independent peasants and the tenants. They have only a garden and a small field and the whole surface never exceeds ½ ha. They have only animals in sharing. The small independent farmers sometimes practise the share-cropping in cultivation by hand on the land of the notable, but the main way to increase their incomes is trading. The tenants are under the authority of the landlord and have to give to him heavy contributions (taxes, fatigue...).

2.3 THE SOCIALIST REGIME (1974-1991)

2.3.1 The agrarian reform and its consequences

2.3.1.1 The land reallocation "*Land to those who farm it* »

In 1975, the communist DERG regime, comes in power in Ethiopia and nationalizes all the land which become "*collective ownership of the Ethiopian people*" (according to article 3 of the land reform). Land purchase and sale are henceforth strictly prohibited. "*Land to the farmers*" and "*land to those who farm it*" is the leitmotiv of the land reform which was felt as a genuine liberation by the farmers. Indeed, the previous system is disrupted, the indirect tenure is forbidden and all contributions are eliminated. The text of the land reform stipulates that the former tenants do not have any more any obligation towards the former landowner.

Peasants associations (*kébélé*) are created approximately every 800 ha. They hold an important administrative and legal power and their principal function is to implement the land reform. The distribution of the land is carried out by a committee made up of the president of the association and members of his office elected by the peasants as well as farmers "selected" by the president. This committee is thus in charge of the redistribution of the land between all the families of its jurisdiction.

2.3.1.2 A vague implementation

The distribution is based on the size of the land which is necessary to produce enough regarding to the size of the family. It seems to have occurred in a rather vague way. Allotted surface is done only according to the visual estimation of the members of the committee. An historical study of the surveyed farms highlights a scale of distributed land variable for the same family size.

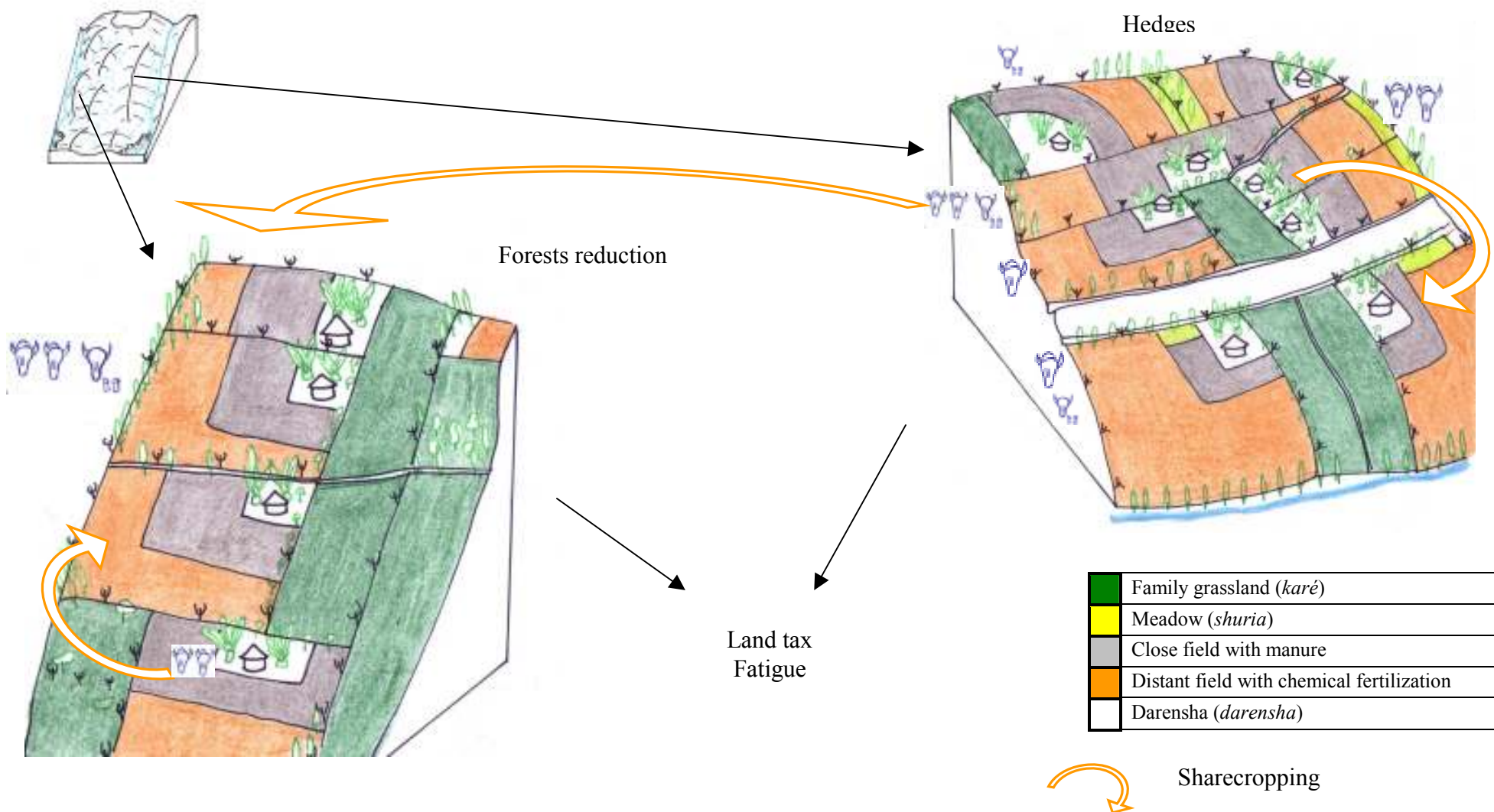
Nevertheless, some main tendencies of this reform in the *kébélé* of Obe Jage are to be explained.

The former tenants and a small number of migrants “landless” (we did not succeed in determining the origin of them) have priority in the redistribution. Surfaces can be widened on the site of the dwelling or the families settled on uncleared land (forests, grassland...). Some of them succeed in keeping a part of the cattle that they had in sharing. Although the increase of the landsize is obvious, the surface they could reach is among the weakest after reform (about 0,5 ha). Moreover, the new farms are often found on the less fertile land.

The major part of the large farms of landlords is confiscated and redistributed. Forests and grassland are allotted and then cleared when the families settle. Their position of force in the social ladder (“negotiations” with the peasants association) enables them however to keep around 1 to 2 ha as well as a part of their livestock of which they quickly sell a great part by fear of confiscation.

The distant fields of the independent peasants are systematically confiscated and allotted, but a compensation is possible like an addition of land on the site of the farm (land consolidation). In the same way, the fields that they gave in share-cropping are redistributed. Their land are thus from now on necessarily around the dwelling. The fragmented land tenure doesn’t exist anymore. That rules out the possibility to farm on different agro-ecological stages. The independent owners seem to have been the major beneficiaries of this reform, because they succeed in keeping a great part of their land, but also in being granted with new piece of land.

Farming, forested and grassland are requisitioned on the fields of landlord by and for the peasants association, in order to pay its functioning.



Moreover, the redistribution does not take into account the means of production of the families (tools, livestock, capital). If some ex-tenants took the cattle that they had in sharefarming, the main part of them is "oxenless". And yet, allotted surfaces do not always correspond to the surface that a peasant could cultivate considering his means of production. Thus, even if the land reform abolishes the privileges concerning the land access, the share-cropping persists and new inequalities appear, based on the possession of ploughing oxen.

There is then a kind of "inversion" of the relationships between the sharecropper and the landowner. During the empire, a peasant was farming by his own all the area it was physically possible to cultivate and that he could access. Then he gave in share-cropping what he was not able to cultivate, because of a lack of time. From now on, the peasants give their land because of a lack of ploughing oxen and/or of capital. The sharecropper comes with all the means of production, and thus has the authority to take the decisions which will be made on the plots. Thus, a redistribution of the cattle could have accompanied the land redistribution.

2.3.1.3 Artificialisation of the landscape

The redistribution and the clearing of grassland and forest (of which the access was controlled before by the big landowners) result in reducing the possibilities of being provided out of wood (timber and firewood) and on grass (fodder). In parallel, the land consolidation around the dwelling and the feeling of "property" felt by the peasants, encourage them to mark the boundaries of their farms. Small bands of eucalyptus are planted at the end of the plots, on the edge of road and river, as well as hedges of shrubs and trees (*Erythrina abyssinica*, *Juniperus will procera*, *Euphorbia candelabrum*) around the plots.

2.3.1.4 Release of the peasantry and intensification in work of the livestock production and cropping

The abolition of the contributions (part of the harvests) and the obligations (work, drudgery) accompanying the land redistribution releases temporarily the peasantry. A single tax depending on the size of the family is implemented. This results in a modification of the distribution of the added value which benefits to the peasants. This period is characterized then by an intensification of agriculture in work and capital.

On the fields, the **double cropping season** and intercropping are puting into general use. The "small fallow" from 5 to 6 months is thus abandoned. This is possible for two main reasons. On the one hand, the access to chemical fertilizer (DAP and Urea) is from now on possible thanks to the governmental subsidies in the form of campaign credit. On the other hand, the adoption of "improved" varieties with short cycle and higher potential of yield (white tef, white pea, maize "Kenya"), allows the succession of two cropping cycles over the same year.

These varieties are popularized by the WADU (Wolayta Agricultural Development Unit), a rural development project funded by the World Bank, which was operational in Wolayta from 1970 to 1982. The main goal of this vast project is to extend improved varieties, chemical inputs and new cultivating techniques (sowing in line, pure culture...). The real objective of this project is to improve food security for the families through the extention of cereals, to the detriment of ensete and tubers whose

feeding value is considered as too weak (Data D., 1997). One of the main impacts of this program in our area of study is the adoption of **new varieties** of “improved” seeds, what changes deeply the cropping systems.

The maize "Kenya", whose uncontrolled crossings in the fields with the local variety initially used made it used currently and known as "local" or "wolayta", is widely adopted. This adoption happens to the detriment of sorghum, less productive than new cultivars of maize. Moreover, their timetable are in competition and the sorghum has the disadvantage to occupy a plot during one year. The sowing in line and sole cropping, combined with the popularization of this maize are knowingly ignored by the peasants. Indeed, they are incompatible with the process of intensification in which they get involved. They implement new intercropping (maize+haricot, maize+sweet potatoes). The efforts devoted to the popularization of the sweet potato make it possible (Mr. Pommelec, 2000, confirmed by our investigations) to increase its production.

The white tef, whose cycle is longer (5 months) than the red tef (3 months) already sowed, appears and is sowed for the second cropping season. The level of yield is higher for the white tef, in spite of a weakest feeding value, which does not penalize the farmers who intend it only for sale.

White pea is more “appetizing” and tasty than the initial variety ("black" pea). It is also adopted, generally in sole cropping.

Thus, the cropping systems become more and more complex and the crop successions are faster since the "small fallow" is removed. The number of cultivation operations increases (an average of 4 ploughing with an interval of 15 days, between each cropping season). According to our investigations, this work is intended to destroy the weeds whose proliferation is due to this new use of fertilizers. Indeed, the cultivation, except for pea and broad bean, is accompanied from now on by a significant apply of chemical fertilizers.

On the fields close to the house, the peasants henceforth practise rather rotations like maize+haricot//maize+sweet potato over two years

On the distant fields, they look like what we can observe currently

//haricot/wheat//haricot/ white tef over two years, or

//barley/red tef //haricot/white tef //barley/pea// over three years

Moreover, thanks to the easiness to obtain inputs, badland with weak potential of production are from now on farmed. Thus, at that time, many grassland are turned over then to be sowed.

It results in a rise of the global production thanks to a significant increase of the land productivity, which accompanies the increasing feeding needs for a population in demographic transition. Indeed the population of wolayta would have almost doubled between 1960 and 1984, passing from a density of 108,4 hab/km² to 212,2 hab/km² (Gascon, 1991). The released surpluses thus do not allow a process of accumulation, but just to better feed the families.

This intensification affects also the livestock farming. The regression of the grassland and the removal of the "small fallow" (ploughing just after the harvest), result in a radical change of the livestock management practices. The distribution of food takes place in stalling. The diet is made of crop residues, grass or weeds. The work load

dedicated to the animals increases thus significantly. Moreover, the fodder shortage requires from now on to purchase fodder (*dupa*, grass cut in the highlands sold at high price) in dry season. It results in a progressive reduction of the livestock because many peasants cannot assume these costs. This reduction is reflecting on a fall of the organic manure available. In addition, the reduction in the dairy products available weakens the food balance of the population, based on the complementarity between the *enset* and animal proteins.

2.3.2 The intensification of the regime (1980-1991)

2.3.2.1 The resumption of the contributions

The DERG government quickly implements constraining taxes for the farmers:

- the tax proportional to the family size is multiplied by five
- Tax on the agricultural income, whose rate is fixed every year by the government
- Contribution to the war (to support the soldiers and the campaigns of the Ethiopian army in Erythrea and Ogaden) in kind, from 50 to 250 kg of maize, and/or in cash, from 20 to 100 birrs
- Two days per week of hard labour on the communal land, with their tools, i.e. 30% of their working time

The agricultural price control at the national level, to maintain the price of the agricultural food products 50% below the market price, represents an additional tax for the peasants.

Wood and coffee trade are prohibited. The peasants associations implement obligatory deliveries of cereal, even coffee, to the state cooperatives but the farmers of Obe Jage do not seem to be touched too much by these laws (only the owners with more than 1ha seem to have been worried).

2.3.2.2 A minifundisation of the farms

The farmers who were born at the time of the demographic transition during the Sixties begin to settle. The land purchase is impossible, so the father must divide his own land between his sons. The land pressure thus increases brutally (farm size is divided into two) in spite of the significant departure of young people to Eritrean and Ogaden war.

Funerals, wedding, (very expensive events in Wolayta) and contributions thus are reflecting in a stronger way on the farms. Many farmers must decapitalize, the livestock decrease, what weakens them if things get rough and once again the gap between farms is widening.

It is in this context that the very bad harvests related to the dryness of 1984 put the peasants in a serious situation of food shortage. The same year, whereas crops have already been destroyed, the bacterial disease of the *ensete* causes the loss of this basis element of food security for Wolayta people, and thus for Obe Jage, which leads to the terrible famine of 1985.

After this disease the peasants do not manage any more to built up again so large ensete plots than the previous ones.

On the one hand, cleaning up a plantation requires a change of crop for a minimum duration of three years (according to N Boquien and V Barthès, 2005). In accordance to this method, many farmers thus (partially) changed of crop but without returning thereafter to the initial one. If they did not, there are all the same difficulties to build up again an ensete plot. Indeed, this crop requires four years to be productive. It is impossible for a peasant “to sacrifice” a unproductive plot for this duration. Moreover, it requires a big amount of organic manure. In a context of reduction of the size of the land and of the livestock, it becomes very difficult to manure enough a plot of ensete.

Thus, ensete areas strongly reduce in aid of maize and sweet potato because these crops allow a spread out production of food (free harvest) after a few months only. However, the system maize/sweet potato produces a third energy missing per cultivated hectare ($26400 \cdot 10^3$ kcal/ha for the ensete against $16850 \cdot 10^3$ for the system mais/sweet potato), and the state of food insecurity of the majority of the farms is becoming more marked.

The responsibility of the WADU is not insignificant in this regression since the reduction of ensete areas was taking part to its project. Moreover, it is undeniable that the absence of agronomic research by the government and the development organizations during the Eighties to fight against the disease contributed to this regresion.

The famine of 1984 thus marks a turning in the diet of the population of the area. From now on farm have a garden where some ensete can be cultivated, an increased field manured, close to the dwelling and a more distant field whose renewal of the fertility is based on the contribution of chemical inputs.

2.3.2.3 Farm typology at the end of the eighties

Differentiation between the farms is based on the cultivated area, which is directly correlated with the number of ploughing oxen. Farmers who own a yoke are often the landlords or the independent peasants who succeeded in saving it.

Farm in tillage by animal traction with one full yoke (two oxen)

They were previously landlords. They own between 0,5 and 2 ha. The ownership of a full yoke enables them to cultivate their land (up to 2,5 ha) and also to take more land in share-cropping (about 1 ha) if their own landsize is not sufficient to use all the potential of their force of traction. They have their own animals (some cows and ewes) and can even give some in contract to share the usufruct.

Farms in tillage by animal traction with half a yoke (1 ox)

They are former independent peasants or notable who have between 0,5 and 1 ha. The possession of a half a yoke enables them to work occasionally in share-cropping (about 0,5 ha). They are owners of their animals (1 to 3 cows).

Farms in cultivation by hand (oxenless)

They are former tenant or former small independent farmers (micro farms) who have from 0,25 to 1 ha. Some are obliged to give a part of their land in share-cropping because of a lack of means of production (oxen and/or working capital). They do not own their animals.

2.4 THE LIBERAL ERA (1991- TODAY)

2.4.1 The market liberalization

When the DERG failed, the government of Meles Zenawi (the government still in power today) implements a radical reform on the markets. The price control by the State comes to an end. The DERG, through the cooperatives and the official agency AMC (Agricultural Marketing Corporation), maintained the prices under the level of those of the free market. The official prices and the quotas are abandoned as well as the subsidies for consumption on the price of wheat.

Following this reform, inter and intra annual prices variability becomes very important and the farmers lose the insurance of a "regular income".

Moreover, liberalization marks the end of the subsidies for the fertilizers whose price increases more than that of the grain (50 kg of DAP which were equivalent to 50 kg of haricot bean, are henceforth equivalent to 100 kg of it). This explosion of relative prices of fertilizers damages the peasants whom a part of the farming system is based on the chemical inputs access (cereal cropping on the fields whose renewal of the fertility is based on the chemical contributions).

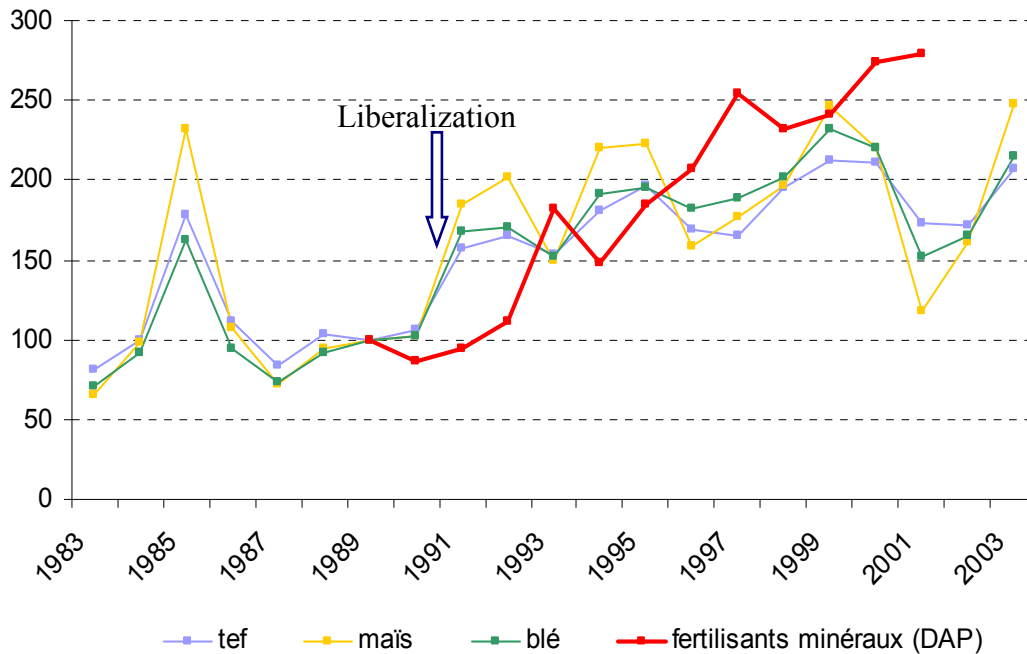


Figure 7 : Evolution of relative prices of cereals and fertilizers (Indice 100 in 1983), Addis Abeba
Source : from datas of IFPRI (International Food Policy Research Institute) and FAO

Lastly, the variations of the price of maize are much more important than those of wheat or tef. It put the farmers of our study region in a difficult situation since the maize is the angular stone of their farming systems.

2.4.2 Extention programs : Sasakawa/Global 2000

The program Sasakawa/Global 2000 is launched in Ethiopia in 1996 by the ministry of agriculture. The stress is put on the popularization of "technological packages" allocated with credit and composed of improved seeds of maize (variety BH), tef, wheat and fertilizers (DAP, urea). This program was a real "poisoned gift" for the peasants of the region.

Purchasing these packages was initially "strongly advised" for all the farmers whose landsize was larger than 0,25 hectares. This condition, excluding the small farmers, was largely got round by using other farmer's name. Following the catastrophic yields of the year 2000 (particularly dry), the majority of peasants were unable to refund the credit they contracted, so that today, half of them is excluded from any official access to fertilizers.

Indeed, even if a part of the farmers of the study region succeeded in, under duress, refunding its debt to the State by selling their cattle, a part of them spends every year, in November (time of harvest), one week in the communal jail, while waiting to be able to refund. The most serious is that the list of people in debt, therefore excluded from inputs, continues to lengthen.

Indeed, even if the authorities established a kind of flexibility by authorizing the purchase of seeds separately from fertilizers, it is still impossible to obtain less than 50 kg of fertilizer (what means the quantity necessary to fertilize 0,5 hectare). Farmers are allowed for a few time to gather themselves to share the purchase of a bag of DAP. In fact it consists only to entitle a practice already used by the farmers since they were used to lend their name to their friends in order “*to get round the normative and restrictive aspects of this program*” (Mr. Pommelec, 2000). However its acquisition supposes to be selected (according to rather vague criteria) as “solvent” by the mayor of the *kébélé*.

Variety	Seeds /0,5 ha	DAP/0,5 ha	Urea/0,5 ha
Maize BH	12,5 kg	50 kg	50 kg
Tef (G277xDzo1354)	30 kg	50 kg	50 kg
Wheat (HAR 604)	75 kg	50 kg	/

Figure 8 : Composition of technological package foreseen for 0,5 ha which are proposed to peasants

Source : from interview with a development agent from the program for rural development of the MoA wolayta

Group of purchase and lending ones name are the main ways to access inputs. But the “solvent” are rare and a bad harvest can happen to anybody what would put them in the incapacity to refund. It is besides what happens each year since “the list of excluded” lengthens with a few names after each cropping season.

Some peasants, the richest of the region, buy with credit more fertilizer than they need for their farm and resell the surplus on the local market with a significant margin (up to 20€/quintal). We’ve also observed merchants who buy “*behind the building*” (expression collected with one of them) seeds and fertilizers to representatives members of the government of Boditi, right before the official distribution. It is a “wellknown” practice, and as they come in favorable calendar period, they resell them at high price on the local market to the peasants who do not benefit from the technological packages. It is thus possible for almost all the peasants to be provided in improved seeds and fertilizer at the sowing time on the markets, but at prohibitive prices.

The conditions of access to these inputs are extremely unfair and are still a major stake for the peasants. The market, even at high price, is the main way to get this supply of inputs because the payment is direct and the purchase of small quantities is possible. Nevertheless, this way is risky, what testifies the arrival of falsified seeds on the stalls (local variety of maize is tinted to imitate maize BH of the technological packages).

2.4.3 A new work intensification

The reduction of the size of the farms accompanying the demographic growth obliges the peasants to produce more on a very restricted area. The peasants change their farming systems, while shortening and/or overlapping the cycles. The modifications relate mainly to the close fields, which receiving organic manure.

A new cycle (from October to March) of sweet potatoes with fast maturation (extended by the MOA) is inserted between the big and the small cropping season, which makes it possible to carry out three cycles on the close field. Moreover, for approximately five years, the farmers carry out successions like sweet potato /sweet

potato on the same plot in the same year, what involves a significant investment in work. Lastly, we observed associations maize/wheat, which might be a questionable practice from an agronomic point of view. However, in a context where the ground and thus food are lacking, *“little wheat with poor yield is better than no wheat at all!”* (Berano Arba, young peasant from Obe Jage).

The number of run with the swing-plough, which is considered as improving the soil fertility by the peasants, increases (up to 6 or 7 runs in the case of white tef). The calendar window is tightened and the possession of oxen seems to become determining for obtaining better yields.

The weedings are also more and more frequent to face the shortage of fodder.

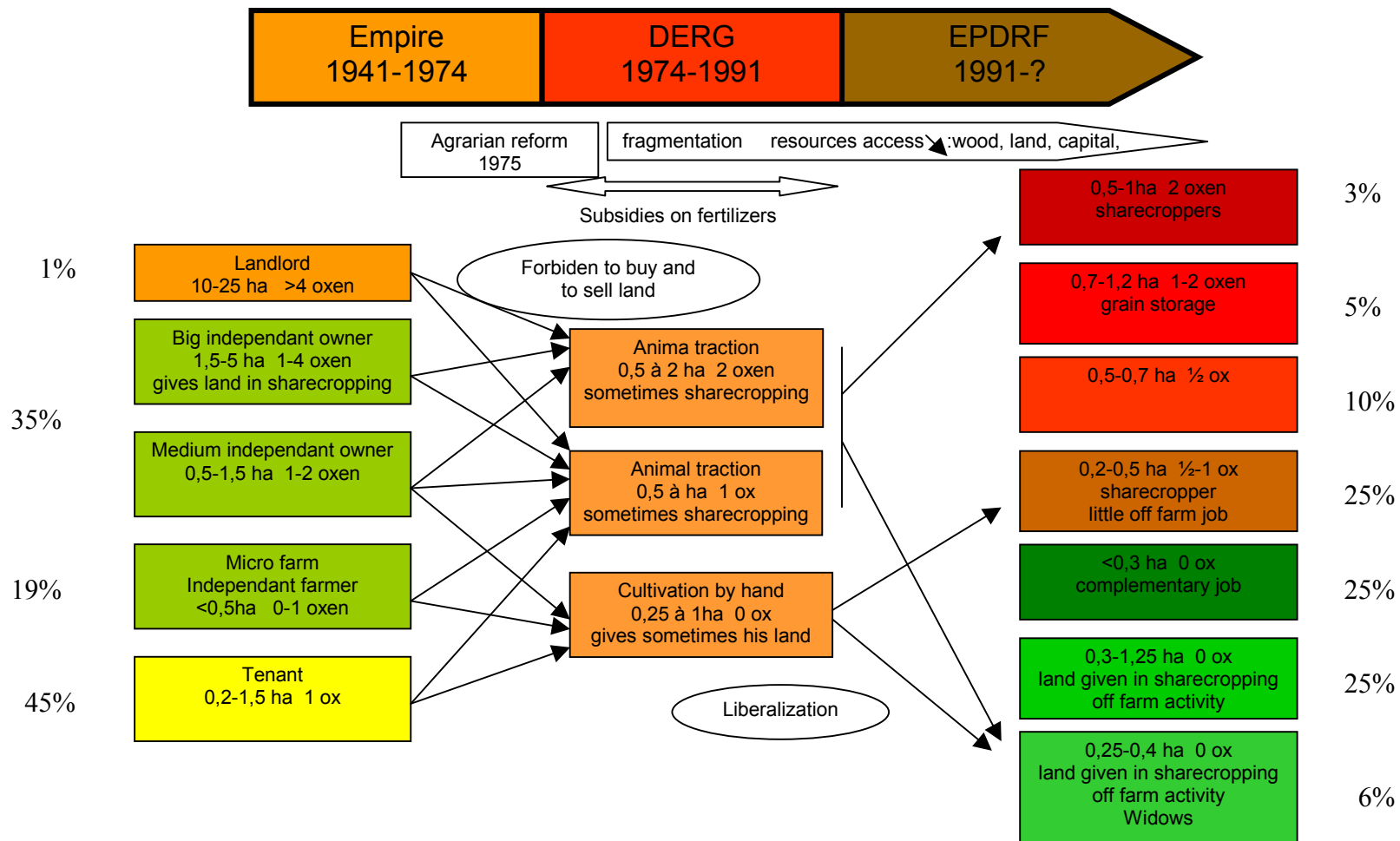
2.4.4 Development of off-farm work and temporary migrations

In this context of strong land pressure and of locking of land transactions, the young people who settle do not have enough to provide for their family needs by their simple agriculture. They then have recourse to different extra-agricultural sources of income. The local possibilities are summarized to the small trade, the purchase of small quantity (sweet potato, coffee, pea...) whose resale generally makes it possible to release a weak margin like a meal for the family. It is not rare to observe until four intermediaries from the arrival of the product on the market to its exit.

The majority of young peasants migrate to find a temporary job in the farms of the rift valley from September to December. The departure occurs after sowings of the big cropping season, and harvests are carried out by the family if the peasant comes back too late.



Evolution of social categories



3 THE PRESENT AGRARIAN SYSTEM

3.1 ACCESS TO MEANS OF PRODUCTION

3.1.1 The land

The land market is locked since 1975, and the last cultivable land were allotted to the soldiers of the DERG when the socialist regime fell. In this context of exhaustion of the land reserve, the access to the land is a major stake for the evolution of the farms. Three methods make it possible to have access to additional area.

Heritage : the young people receive from their father a small holding when they get married. The remainder of the family land is divided, in a fair and official way between sons, only when the parents die. Since the redistribution of the land by the DERG, it is today the third generation which settles, and areas inherited, in most of cases, are not sufficient to live (1000 m²).

Share-cropping : a farmer who is not capable to cultivate his land for a lack of oxes, labour force (old, widow or people having an off farm principal activity like the teachers) or cash to buy inputs can give his land in share-cropping. There are two types of contracts of share-cropping in our study area, according to the implication of each part.

The first, not far from the *share-farming* consists in sharing all the means of production. The owner provides the land, the sharecropper the oxes while each one provides half of the inputs. Harvest is shared in equally between the two parts, as well as the remuneration of the labour.

For the second, not far from the *share-cropping*, the owner provides only the land while the sharecropper provides the oxes, the labour and all the inputs. Harvest is then shared in two equal parts, after that the sharecropper took again the equivalent amount to the cost of the inputs. In this case, it is thus the sharecropper who takes all the risks since in the case of bad harvest, he is not sure to cover the expenditure that he carried out for the purchase of the inputs.

In the first case, the landowner generally imposes the crops which will be sowed, while in the second, it is more often the sharecropper who has the power to take these decisions ("*reverse tenancy*").

Setting in pledge (*oytous*): This practice appeared with the prohibition of the land transactions, assimilable to a tenant farming. It concerns farmers who, having to face a "hard blow" (death of a member of the family, disease), immediately need a big amount of money. These owners can rent their land for leases going from three to ten years. In fact, most of the time, it is acted on a disguised "sale" because the owner practically never recovers his land. Indeed, this last must refund the perceived sum completely, in once, to put an end to the contract, what is impossible for the large majority of the owners concerned. In a context of strong reduction of farms size, to set in pledge is used only as a last resort.

Share-cropping and setting in pledge are the reflection of the great precariousness in which many farmers are.

Taking into account the exhaustion of the land reserve, the land offered is not sufficient, what does not enable the majority of the owners to use all their potential of production (force of traction, work). Thus, really cultivated areas are very often lower than those that a farmer would be able to cultivate, taking into account his means of production.

3.1.2 The workforce

Labour is done by all the members of families. The recourse to the mutual aid for the operations which must be carried out quickly (sowing, harvest) or for the operations which require much work (plantation of sweet potatoes) is frequent. A multitude of small "contracts" exists between the peasants. The "day" of work last six hours and stops after the lunch, leaving spare time to the farmers to occupy themselves of their own land. This day is remunerated by two meals, by one brewed of grass or straw, or the loan of a ox.

3.1.3 The capital

The credits for consumption in period of bridging time, for the inputs of small rainy season as for the constitution of small savings to carry on an activity of merchant are frequent. They are contracted in March with members of the family, the groupings of Community saving (*kamadja*, refunding in September at rates from 20 to 50 %) or usurers (refunding in November at rates of 50 %) residing in the neighborhood of the higher agro-ecological level (*dega*) and who are very few in the area of study.

The fertilizers (DAP and urea) and the improved seeds are accessible only via the government, but the majority of the farmers of our area of study are excluded from this system. It is nevertheless possible to get some on the local market but the seeds are sometimes falsified (grains of corn of local variety dyed with the egg yolk) and the fertilizers very expensive (45 €/quintal).

3.2 CROPPING SYSTEM, LIVESTOCK FARMING SYSTEM AND MANAGEMENT OF THE FERTILITY

As we explained previously, the historical evolution of the farms led to the emergence of little differentiated farming systems, based on a subsistence farming. However, in spite of this apparent homogeneity, farms differ from one to another, particularly according to the resources to which peasants have access. Thus, we initially propose to treat the breeding and cropping systems while insisting on the criteria which make it possible to differentiate the exploitations. We will present then how they combine it in the various farming systems in order to highlight the diversity of the existing situations in our study area.

3.2.1 The cropping systems

3.2.1.1 The garden

The garden (*darensa*) which girdles the dwelling, consists of some food crops intended for subsistence farming (cabbage, marrows, corn, tubers, sugarcane) and of cashcrop (citrus fruits, banana trees, avocado trees, spices). The garden receives a lot of animal manure (of which a part runs off directly from the house by a channel) and household refuse.

Work in the garden daily is (plantation, harvest, weeding...), and completed by the woman with a small claw with two fingers.

The fruits are generally sold on the tree before small merchants come to harvest it. The farm gate price is two to three times lower than the selling price on the market of Boditi. Many of these fruit trees were planted at the time of a recent movement of diversification, in particular under the impulse of the NGO Inter Aide. The majority of these trees are not productive yet (especially mango trees).

All the farms also have some seedlings of coffee-trees, generally intended for the subsistence farming of grains but especially of leaves consumed in the form of infusion. The yield of coffee-trees is weak in the area because of the coffee bean disease which prevails since the years 1970.

The spices are brewed with coffee leaves for the family. But certain farms have micro plots. Thus, they sell a part of the production on the markets, in July.

The food crops established in the garden make it possible to vary the food.

The maize permits to accompany the exit of bridging period in June. Indeed, this plant receives a lot of manure and thus, free harvest starts earlier than in the close fields.

The sugarcane is a cash crop for the farmers not having cattle (sale on plant). The owners of bovines use it for the fattening of oxes or to feed the cows in lactation.

Lastly, some marrow seeds can be sown. They are very appreciated with wafers of corn (*kita*) in December.

A special place to multiply sweet potatoes is also present in the garden. Sweet potatoes are planted there between March and June over one 5 years period. The leaves are regularly collected to be transplanted in the fields. At the end of 5 years, the site is moved.

The size of gardens is very variable (between 1 and 25 ares) and is directly related to the total area of the farm. We did not establish a direct correlation between the size of the garden and the diversity of the practised crops. The largest gardens make it possible to release more important incomes, but they have the same crops as smallest, in different proportion.

We observed attempts at diversification on behalf of some farmers. Some manioc, other garlic, tobacco or beets, even carrots. They are isolated initiatives in our area and they should be encouraged.

3.2.1.2 The ensete field

The ensete field, led in monospecific plantation, consists of a very great varietal diversity. Each variety has a different interest for the peasants. Thus, the latter make their plot of ensete according to specificities that they seek : savour, tolerance with the diseases, productivity...

Among these varieties, the farmers distinguish the males (*atouma uta*) and the females (*macha uta*). The female varieties (for example *Botia*), whose it is possible to consume the pulp roots, have the reputation to give a more sweetened *kotcho*. The male varieties (for example *Ankoua*, *Suzuma*, *Hauled*) are only consumed at a more advanced stage in the form of *kotcho*.

The multiplication of the ensete is vegetative and is carried out by the production of cuttings starting from the underground bulbs. The cycle of growth of the ensete consists of five stages :

The *Hata* stage: in October, the bulb of a seedling from 2 to 3 years is cut into two. After drying with the sun, the two parts, named *hata*, are then planted in the garden on a prepared and manured (since August) site. At the end of approximately one month, the first rejections appear (between 20 and 50 by *hata*).

The *Bachechua* stage : the first transplantation of the young seedlings *hata* takes place at the beginning of the small following rainy season, between January and February. The rejections are mended in maize and take then the name of *bachechua*. Its leaves are cut before transplantation so as to limit the water losses. This phase lasts approximately two years.

The *Gardoua* stage : final transplantation takes place between January and February of the third year. The seedlings take the name of *gardoua* then. The seedlings have between three and five years.

The *Aïta* stage: stage during which the ensetes are sufficiently masts to be consumed in the form of *kotcho*. The seedlings are between five and seven years.

The *Wossa* stage: name given to the ensetes after the appearance of the flower. It takes place approximately four years after final transplantation. The seedlings have between seven and nine years. This stage is seldom reached in our study area.

This cropping system, exclusively manual, is a very strenuous work. The farmers use a claw with two fingers for the realization of the various cultivation operations. The plantation of the *hata* realized in October and the transplantations carried out between January and February are two work peaks for the male in this cropping system. An annual ridging is carried out between September and October. It allows to hide the adventitious and the animal manure deposited around the seedlings (*gardoua* and *aïta*) between July and August. This operation needs also a lot of work.

Drainage canal of dejections from the house towards the plot of enset



Women making *kocho*

Source : E. Le Gal, N. Molinier, 2006

The plot of ensete receives a lot of manure. With each transplantation, women prepare a place where they put the animal manure (approximately two baskets each time). Moreover, each *aïta* receives approximately a basket of manure per year, during August and July, i.e. almost the whole manure produced on the farm during this period.

Few crops residues are recycling in the plantation because they are intended to feed the cattle.

The ensete is a multi-purpose plant.

Its principal function is dietary. However, although having constituted the main part of the population food supply during several years, the ensete is not the first food crop of the peasants any longer. It is harvested only for special events (Maskal and Christmas) and to face situations of food shortage (bridging time). In the first case, the ensete is consumed as *kotcho*, *bulla* or *godeta*. The *kotcho* is a starch pulp fermented, obtained by scratching the internal part of the pseudo-trunk and by scraping the bulb. The fermentation of pulp requires two to three weeks to give a consumable good. The *bulla* is a juice extracted from the pulp by pressing with the feet. It is elutriated then dehydrated. It is a snuffed food intended for special occasions or the special guests. The *godeta* is a crushed and fermented bulb. These preparations are carried out preferentially with the male varieties with at least four years old seedlings. The harvest of the females seedlings takes place mainly between March and May. In this case, only the bulb is consumed boiled. This practice makes it possible to ensure the food of the family when the other food resources are exhausted.

The fresh leaves are used for packing food, dishes and "umbrellas". They are especially a source of auxiliary fodder for the cattle, primarily in dry season.

The fibres resulting from the dehusking of the sheaths are used to make bags, cords or plaits.

Some peasants have a micro plot of ensete. Its size never exceeds 10 ares. They contain an hundred seedlings of which oldest reach seldom the stage *Wossa* (i.e. the optimal age to obtain a good yield of *kotcho*). Almost all the farmers only have some young seedlings, not exceeding the stage *gardoua* and disseminated in the maize field. No farmer earn any income of this plantation. Totality of the products and under products is intended for auto consumption.

Whereas the ensete has many advantages, particularly on the nutritional level, it would be thus interesting to explain the decrease of this crop during last decades.

On the one hand, the progressive reduction of the farms size through the division of the fields for rising generations has generated the reduction of the area of ensete plots.

In addition, the success of this cropping system is based on an important contribution of animal manure. Maintaining the herd which provide the animal manure, making it possible to correctly fertilize a plot of 10 ares, needs 50 ares of pasture (from our estimations). However, in a context of reduction of the size of farms, no farmer has such surface of grazing land. To own cattle is thus reserved to the farmers who are able to buy fodder i.e. the richest. About half of the farmers that we met do not have enough bovines thus manure thus ensete field.

Moreover, in almost all the cases, owners have to face "a vicious circle" which prevents them from reconstituting a productive plot of ensete. During one year particularly hard (bad harvest, prolonged by bridging time), the families can be brought to consume a great part of their "capital ensete", sacrificing even their older seedlings, as a last resort. Following that, they do not have new seedlings to plant in October. Even if they succeed in getting bulbs, it would be necessary to wait four years before obtaining new ensetes which could make it possible to ensure the renewal of the plot. However, this delay is too long and the young seedlings will be consumed as boiled roots (harvested at three years) before being consumable as *kotcho* (seedlings harvested starting from 4 years).

Lastly, a reason that strongly contributed to worsen this situation is the lack of interest that the local development organizations take in this plant. Indeed, the bacterial disease devastates the plots in a recurring way. Currently, even if some people start to be interested in it, no cultivar resistant has been found.

3.2.1.3 The « close field » system with organic manure (*mata gadia*)

These plot, with a lot of manure (animal manure, compost) and located near the dwelling can be considered as the pantry of the farm. They ensure a production spread out over the year for people (local variety of maize, bean, sweet potato, pea, broad bean) and animals (foddering with maize leaves and crop residues)(*Cf appendix 2*).

These "close fields", whose manure is produced on the farm, have priority in the assignment of the working capital at the time of sowing. This explains why the more distant fields can be given in share-cropping if the means of production of the farmer are not sufficient any more.

The numerous cultivation operations are manual, and need a lot of work. They can be compared with gardenning.

The types of rotation generally met are:

//Maize+haricot bean /pea//Maize+haricot bean/pea//

//Maize +haricot bean/sweet potato//sweet potato /sweet potato

//Maize + haricot bean/pea, fava bean//sweet potato/sweet potato

There exist many alternatives.

The **maize** is sown during the small rainy season between February and March. The varieties used are:

Generally a **local variety**, called *Wolayta* maize, resulting from the varieties popularized by the WADU and which come from Kenya. It has a 6 months long cycle and the seedlings reach two meters. This size makes them sensitive to the violent downpours but provides a large quantity of biomass. This maize is generally sown with high density, which requires in April a regulation of density. This practice makes it possible at the same time to select the fertile seedlings (the percentage of fructification is rather weak) and to provide fodder to the cattle at the beginning of growth of grass period.

Some farmers use **seeds of second generation** of maize BH (hybrid, from the technical packages) which gives similar yield to those of the local variety, without providing an equivalent quantity of fodder. The cycle, shorter, is 5 months long.

The tillage is meticulous. The harvest by pulling up the preceding crop (always a tuber or a leguminous plant) which allows a first loosening of the soil makes it easier. The number of cultivation operations changes according to the freetime between the harvest of the preceding crop and the sowing, and the availability of the oxes. Before each tillage, women bring manure on their back from the house to the field.

In **tillage by light animal traction**, after two to four passages with the swing-plough, the maize is sowed just when the rains start. Sowing is carried out in line to reduce the amount of seed. This operation needs two people. The first one makes the furrows so that the second one deposits the seeds there. The seeds are then hidden by a superficial passage with the swing-plough (length adjustment of the swing-plough is possible) between the lines. When the peasant must carry out this operation alone, it can practise a broadcast sowing to save time.

In **cultivation by hand**, the soil is generally worked only once, using a large two fingers claw. For sowing, two options are possible for these farmers. Some carry out a direct drilling, then cover the seeds using the small two fingers claw. Others wait until the owners of oxes finished their sowing in order to "borrow them" in exchange of one day of work. In this case, they carry out a cheaper sowing but take the risk not to establish their crop on time and thus to obtain worse results.

A first hoeing, carried out with the small two fingers claw, takes place between two weeks and one month after sowing. The weeds are put on side and are distributed to the animals. A second hoeing accompanied by a ridging carried out by hands, is realized two or three weeks later.

The harvest of maize is free, daily and is spread out from June until September. The ripe ears harvest is almost never possible because all is consumed before the date of ripening. The plants are cut to half using a toothed knife. Concerning the exported part, the ears are consumed roasted by the family (approximately 15 ears per day for a family of six people), while the residues are given to the animals, what constitutes a very important source of fodder. The lower part of the seedling is left on the field. It will be used as tutor with pea and broad bean then as firewood.

The haricot bean is very often sown in mixed cropping with maize but the quantity sown is in general very weak. Indeed many farmers think that there is competition between the two plants. The bean is sown just after the sowing of maize, by broadcast sowing. Its harvest takes place at the end of April by pulling up because its cycle is very short (3 months). The residues are given to the animals. The bean is consumed boiled. It can be consumed with maize, what is called *koka*. This dish is granted to the workers of the mutual aid groups.

The broad bean and the pea are leguminous plants with short cycle (3 to 4 months) sowed in July and harvested in October for pea and November for broad bean. The cultivation operations are the same. The farmers carry out a direct drilling of maize, in a soil that has not been worked since the second hoeing. The seeds are then covered using the small two fingers claw, which allows a weeding of the field. Harvest is daily and is carried out especially by the children, who come to feed themselves directly in

the plot when they come back from the school. The residues are distributed to the animals.

The **sweet potatoes** are the first food crop of our study area. Indeed, their cultural cycles are often shifted compared to the seasonal cycles of all the other plants. So their harvest is possible when the food resources are exhausted : during April, March and May (bridging period) and during November and October between harvests of small and long rainy season.

The farmers use several varieties of which they make a clever mix.

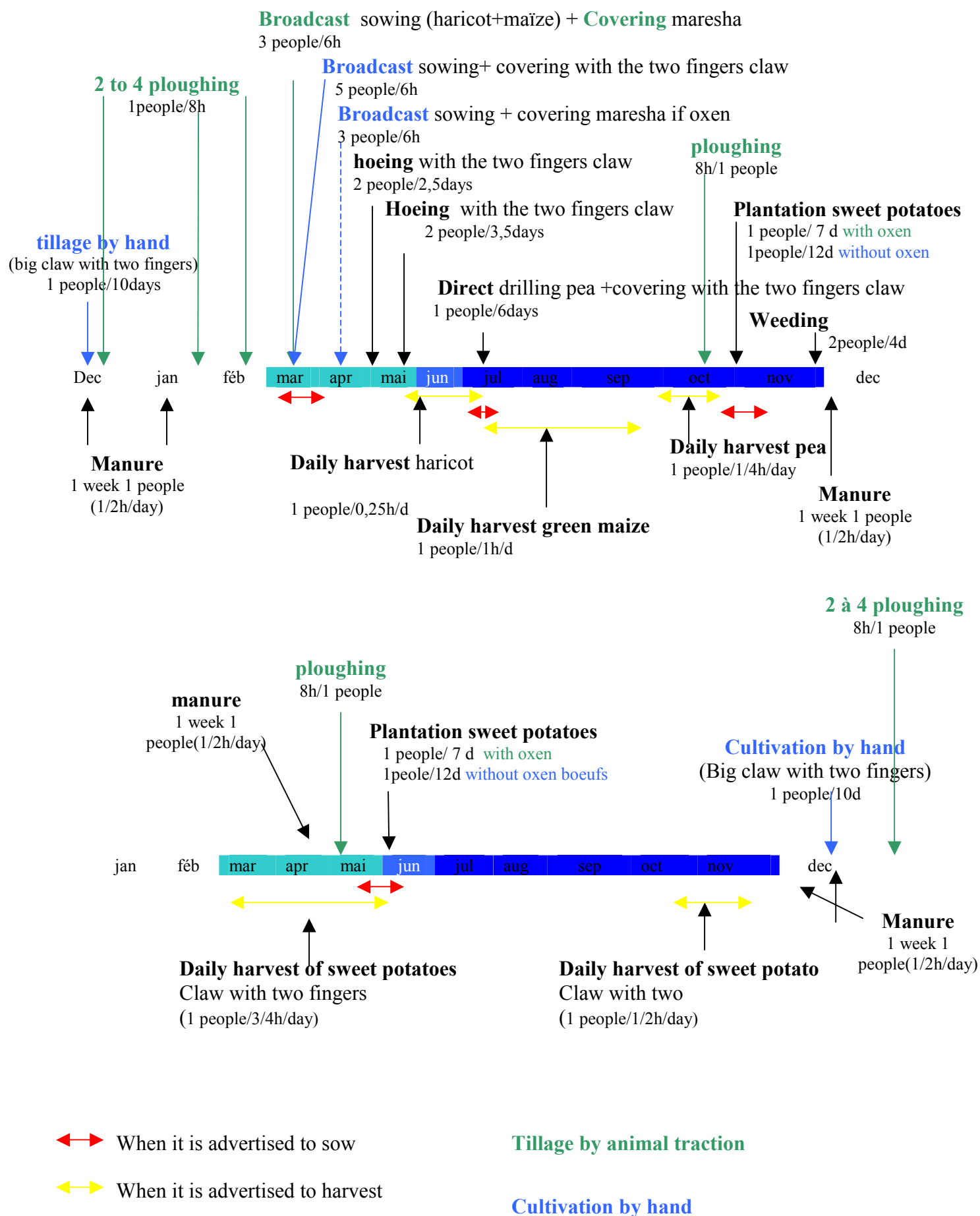
The ***pita*** : variety with short cycle (3 months) which produces small tubers with yellow flesh. They must imperatively be harvested at the end of their cycle, beyond which they rot in the soil.

The ***gadissa*** : variety with long cycle (5 months) which produces larger tubers with white flesh. They can be harvested in a spread way. There are two types of *gadissa*: that of the small rainy season or *gasey* and that of the great rainy season or *gandija*.

The peasants takes into account the characteristics and complementarities of these various varieties which they have at their disposal. It helps to correlate the periods of harvest to their food needs.

The sweet potato crop is carried out by plantation of the vegetative parts which are used as cuttings. They come from the multiplication place located in the garden or from the harvest of the previous cycle. They can also be bought to small merchants but only in rare cases. One needs about thirty brewed for planting 0,25 ha what costs 7 € to the farmer. To compare, for planting the same area with maize, that costs him 2 €. It is one of the reasons why the peasants carry out successive sweet potato cycles, in order to always have cuttings with lower cost (another reason is the impossibility of leaving a naked field whereas the food requirements are not met). This is carried out in spite of push back year n-1 which behaves like the weeds for the plants of season n.

Figure 9 : Crop management sequence maize+haricot/pea/sweet potato//sweet potato//



Case of crop rotation: //Maize +haricot bean /sweet potato//sweet potato/sweet potato//

A sweet potato of *gadissa* variety is planted in May, just after the harvest of bean. The plantation of the cuttings is very meticulous, because of the embarrassment caused by the maize seedlings that exceed the stage three leaves and of the necessary precaution not to damage them. The plantation is carried out with the small two fingers claw.

Being given that the soil was already enriched with animal manure before the sowing of maize, these sweet potatoes do not receive additional manure. They are harvested daily by the women in October with the two fingers claw.

A couple of days later, the plot is fertilized and then worked once with the swing-plough. In the case of cultivation by hand, the new cycle of sweet potato is established after working the soil once with the two fingers claw. Time is restricted because the dry season approaches. This manual work thus determines the area which is possible to sow. The cuttings resulting from the tubers collected previously are planted during November-december. Organic manure is applied until the sheets cover completely the ground (each day, half of the manure collected in the dwelling is intended for sweet potato). A manual weeding can be carried out by pulling up during January. The weeds are totally exported. Harvest takes place between April and May and is rather difficult because the soil is dry. Moreover yields are weak. However, this harvest is decisive to cope with the bridging period for almost all of the farmers. As the period of establishment of maize is over, farmers again carry out a sweet potato cycle with the same variety, which will give them a harvest in October. The cuttings of this cycle will be used to establish a cycle of sweet potatoes during the dry season.

An alternative can be brought by the farmers who use the *pita* variety in October. The use of this variety supposes to have oxes because the favorable calendar window is very narrow. Indeed, this new cycle must be established just after the harvest of previous sweet potato while having worked the soil, what is impossible in the case of cultivation by hand. This sweet potato could be collected in January-February, what is particularly interesting since the plot will be released with the arrival of the first rains. Then, the peasant will have the possibility to choose his crop rotation according to his situation (funds, results of the previous season...), without having a plot monopolized for sweet potato until October. The possession of oxes thus constitutes a considerable comparative advantage.

Case of rotation : //Maize+ haricot/pea, fava bean//sweet potato/sweet potato//

A sweet potato of *gadissa* variety can be planted just after the harvest of pea. Most of the time, this practice is possible only for the farmers having oxes. Indeed, the pea is harvested at the end of October and farmers have to plant sweet potatoes at the latest in November to be sure to have a harvest during the wedding time. The crop management sequence is similar to that previously detailed. The farmer carries out a second sweet potato cycle that he plants in May because the period of sowing (maize, haricot bean) of small season is over and that it is necessary to maintain a reserve of cuttings.

An alternative is observable when the farmers plant a *pita* in October. Harvest takes place in January-February and makes it possible to carry out a cycle of seasonal culture.

The area with sweet potato is always limited by the significant work needed by this kind of crop. In order to spread their work schedule and harvests, the peasants thus

realize one to three sweet potato cycles per year on reduced areas. Thus, the plots of sweet potato seldom exceed 80 ares (whereas maize areas can reach 200 ares).

Some farmers have a small piece of **taro**. Although it is a "sure" crop as well as the enset, this crop is currently decreasing in our area of study (Mr. Pommelec, confirmed by discussions with the farmers). Indeed the taro presents the drawback to immobilize a plot during almost a year (a cycle is 10 months long) and to require a high quantity of organic manure.

Lastly, some farmers, in particular those committed in the project of Inter Aide have a small plot of **yam** (never higher than one are). It seems that the technique of minis set popularized by the NGO did not work this year. According to the farmers, the seedlings "would have died by drying" but we did not succeed in determining the reasons.

The fact that the soil is almost permanently covered (associations, overlapping of the cycles, cultures of inter season) limits losses by erosion and avoid the seeds to be dragged by streaming. The very intensive management (up to 4 harvests per year) of these plots makes it possible to reach a high added value per hectare and ensures a significant high calorie production.

	<i>Per ha</i>		<i>Value</i>		<i>Productivity/day</i>	
	Days of work	yield kg	Added Value €/ha	Energetic 10³kcal/ha	€	10³kcal
<i>Sweet potatoe/maize+haricot/SP//</i>	388	140qx SP 120kg haricot 14 qx maize	580	25136	1,5	64
<i>Sweet potato/maize+haricot /fava b+pea//</i> <i>maize+haricot /favab, pea//</i>	308	30qx SP 120kg haricot 14 qx maize 200 kg pea 300 kg fava b	331	10617	1	34
	140	120kg haricot 14 qx maize 200 kg pea 300 kg fava b	241	7203	1,7	51
<i>Taro</i>	299	60 qx taro	600	6780	2	23

Figure 10 : Yield and productivity for close fields with organic manure

Source : E. Le Gal, N. Molinier, from our field inquiries and FAO datas

Lateral transfers of fertility (deposits of the dejections collected in the dwelling) and vertical (presence of trees and shrubs in edge of plots) as well as the atmospheric nitrogen fixation by leguminous seem to ensure a good renewal of the soil fertility.



Free harvest of maize



Pea mixed with maize already harvested

Manure application on a plot of sweet potatoes



Maize killed by the hailstorm



Source : E. Le Gal, N. Molinier, 2006

3.2.1.4 The system distant field with chemical fertiliser (*haho gadia*)

These fields, "distant" from the farm of a hundred meters which receive mineral fertilizers (DAP and urea) are cultivated with pure cultures which are partly intended for the sale.

The monetary costs of cultivation are more important than on the close fields, that is why these plots will be yielded in share-cropping if the owner does not have enough working capital.

These fields are extremely fragmented (size of a field about a few ares), what testifies to a will of safety by spreading the risks related to the climatic risks.

The farmers use the two rainy season to cultivate. It put them under different agro-ecological conditions (temperature, duration and quantity of rains) and enables them to adapt the choice of the crop to their monetary calendar (tax, refunding of the credit, festivals). We thus propose to study the cultures of first and second season in order to better understand the choices of the farmers.

The first cropping season (*gaba*)

Almost all the crops have a short cycle (3 months). Sowings are gathered around the arrival of the first rains, but always after the sowing of maize of the close field. They are generally intended for subsistence. The free harvest (daily) practised from May (bean), allows the progressive exit of the bridging period.

The main crops are bean, barley, and red tef. All are from a local variety. Because of a strong parasitic pressure, the broad bean and the pea are less frequently sown, in spite of the cheap operational costs (no fertilizers) and of their good dietary value. The choice of crops for the first season depends mainly of the availability in working capital (context of strong food demand and high price of the seeds) and the food needs (the bean is the best compromise today : average costs and free harvest from the beginning of May).

The second cropping season (*sela*)

Some of the crops are there with a longer cycle (5 months). They must answer three great priorities: to ensure food, to obtain cash (payment of the taxes and refunding of the credits in November), and to constitute a fodder stock (straws) for the dry season. The choice is thus directed often towards pea, broad bean, wheat, barley and tef (red or white), almost exclusively of local variety. Indeed, as we explained previously, the delays of distribution of the technological packages by the government are chronic (wheat arriving at the sowing time of tef). It adds the lack of confidence to the lack of access in the peasant's communities. They are respectively sown from the end of June to the end of August and the favorable calendar windows last approximately 15 days each time. As the majority of the loans are carried out in March (sowing), the capacity to buy inputs depends mostly on the results of the first cropping season (as a part is often intended for the sale).

Crop sequence

As the peasants are very flexible to adapt their crop "from season to season" according to the climatic risks (delay of the rains, strong hailstorm), technical problems (missed coming up) and of their treasury, it is rather difficult to determine fixed crop rotations. Generally, the farmers alternate cereals with leguminous.

The successions mainly practised over two years are as follows:

//haricot/wheat//haricot/white tef// barley/red tef//haricot//red tef
//barley/pea//red tef /barley//

In the case of climatic accident or of lack of working capital, some plots are planted with sweet potato, at lower cost (no chemical fertilizers), but it implies a strong work.

It is also frequent to observe a cycle of sweet potato inserted between the two rainy seasons (dry season). If the harvest is early (finished in March), it is possible to have directly a following bean. If not, the plot will be left free (end of harvest April-May) and will be sown for the second cropping season.

	<i>Per ha</i>		<i>Value</i>		<i>Productivity per day</i>	
	Days of work	yield kg	GAV €/ha	Energy 10³ kcal/ha	€	10³ kcal
<i>Haricot/white Tef</i>	194	720 kg haricot 815 kg tef	205	5380	1	28
<i>Haricot/wheat</i>	151	720 kg haricot 804 kg wheat	169	5660	1,2	37
<i>Barley/pea</i>	82	1 qal barley 750 kg pea	223	4746	2,7	58
<i>Red tef/pea</i>	120	736 kg red tef 750 kg pea	215	3840	1,8	32

Figure 11 : Yield and productivity for distant fields with chemical fertilizer

Source : E. Le Gal, N. Molinier, from inquiries with farmers and FAO datas

The cultivation

This operation aims to break up the soil in order to prepare the seedbed and to prevent the appearance of weeds. These last, as well as the crop residues, can be harvested at the time of this operation to be given to animals.

The farmers with oxen work these plots with the swing-plough (pulled by two oxen) which furrows but does not turn over the soil, what requires a repeated number of cross passages. It needs six to ten hours to plough 0,25 ha and the number of runs varies from one for pea to six for tef. These cultivation operations take place between November and March and June and August. The ploughing start the day following the harvest and finish the day of sowing. Usually, two weeks separate two ploughs.

The farmers in cultivation by hand complete often only one cultivation with a large claw with two or three fingers during the same periods. It needs approximately ten times more time than in animal traction to work the same area (either 10 days for 0,25 ha). Nevertheless they have the possibility to get a pair of oxen at least once per cropping season with one working day returned to the owner by borrowed ox.

The main points of the crop management sequences

Sowings are carried out by a group of three people from the family or a group of mutual aid.

One people ploughs (special adjustment of the *maresha* in short position) to prepare the seedbed. Directly behind him, a people sows seeds and another fertilizers. It is a broadcast sowing. Lastly, the seeds are covered by a run of the plough, helped of both others with a two fingers claw.

In the case of tef, the tillage is very meticulous. A fourth people carries out a levelling of the seedbed, with his feet and removes all the small residues of weeds before sowing. Moreover, as the seeds are tiny, it is impossible to locate the already sown zones, which requires a squaring of the ground (furrows).

In the case of pea or broad bean, there is no fertilizer apply.

The farmers in cultivation by hand carry out a direct drilling and the seeds are covered with the small two fingers claw.

The **weeding** is carried out with the two fingers claw as soon as the first weeds appear. Three additional weeding can be carried out thereafter, every fifteen days, according to their increasing. In the case of tef, the meticulous weeding is carried out by pulling up with the hand.

The **harvest**, which must be carried out in one day, requires the family labour and sometimes some peasants who come "to help". These helpers receive in addition of the meals, one brewed of straw or the authorization to cut the remaining weeds to feed their animals.

The cereals are cut in the middle with a toothed knife. Stubbles will be hidden the following day, during the post-harvest plough. The leguminous are entirely dug up, with the hand.

The crop residues are directly distributed to the animals (case of the first cropping season) or stored in the dwelling on raised boards, "hay loft", to be distributed in January (case of the second cropping season).

Figure 12 : Crop management sequence //haricot/wheat// with tillage by animal traction

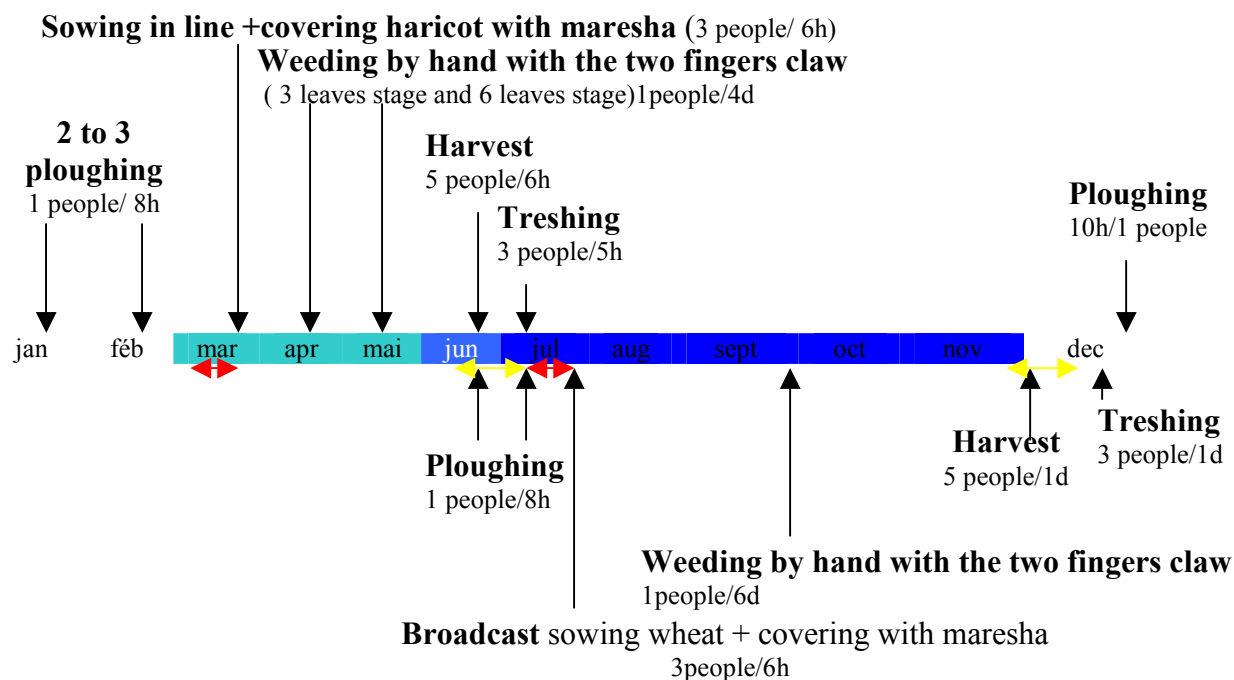
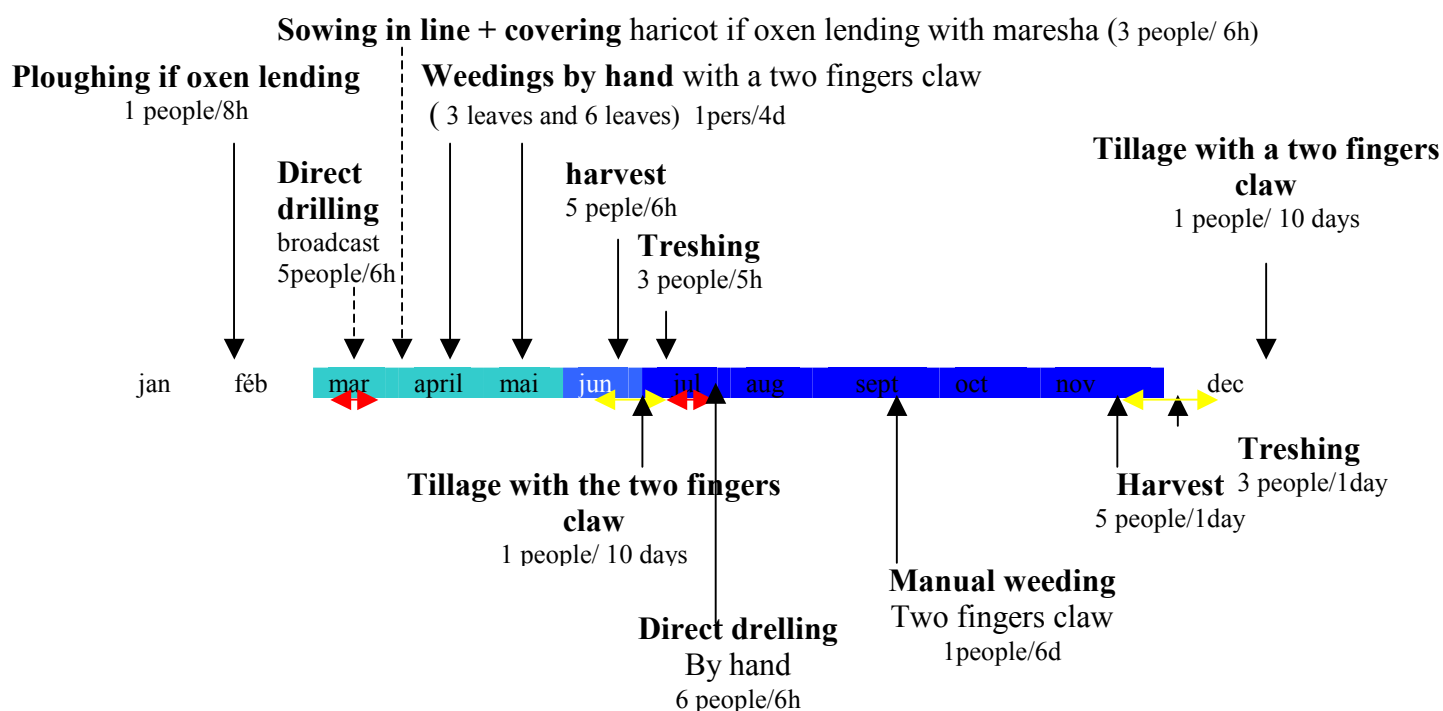


Figure 13 : Crop management sequence //haricot/wheat// with cultivation by hand



↔ When it is advised to sow

↔ When it is advised to harvest

The threshing is carried out on the small esplanade located in front of the dwelling. Leguminous and barley are beforehand put to dry on a *lesia*, a kind of scale made for the occasion. The threshing is generally carried out using two simple wood sticks, which requires a lot of energy. It is a male task as well as female. Sometimes, the farmers who have oxen use them for threshing by trampling wheat or tef. The poorest peasants often ask to help for this kind of operation because they are remunerated by one brewed of straw. They are then placed in bag, in order to be later sold or consumed. Conservation is never longer than two months.

The removal of biomass is very important : leguminous are torn off, tef is cut at its base, the other cereals are cut at the middle, and the weeds coming from the weeding are generally given to feed the animals.

There is no restitution for these plots. The **reproduction of the fertility** thus rests on a mineral fertiliser apply. However, we didn't succeed in establishing clear relation between amount of manure applied and yield obtained. We also previously detailed our difficulties to establish precise yields. Moreover, it exists in our area of study a great variability concerning the soil amendment carried out. This is related on the one hand to the availability in working capital. Indeed, many farmers entrusted us that they were conscious of applying "*an amount lower than the recommendations*" because they did not have cash enough, but according to them, "*a small amount is better than nothing!*". In addition, this variability depends on the strong effect of streaming (seeds are dragged out). Indeed, other farmers assert to apply an amount higher than what would be sufficient in order to compensate for these losses. We can not thus conclude to a good reproduction of the fertility in these fields.



Broadcast sowing of white tef

A run with the swing-plough



Collective labour : manual covering (two fingers claw) after direct drilling of wheat



Preparation of the seedbed



Threshing of haricot

Source : E. Le Gal, N. Molinier, 2006

3.2.1.5 The familial undivided grassland

Farmers carry out a tethered rearing on those grazing, or animals are kept by the children. There are not any borders really marked. But reference marks are observable, such as small ways, which separate the whole undivided plot between various families, if the dwellings of two lineages are organized around the same grazing. On this grazing, the animals of the adjacent dwellings are authorized to graze without restriction. Management is common, but can sometimes lead to conflict if stocking rate becomes too high (inequality of the number of heads of cattle between the various families, and thus inequality on the resource management). The farmers who don't have cattle often allow their neighbours to put their animals, without requiring anything in return.



Children keeping an eye on the cattle

Source : E. Le Gal, N. Molinier, 2006



The system meadow

It consists in small plots located near the house. They appeared under the DERG, further to the reduction of fodder availabilities. There, the farmers carry out two to three cuts per year (between June and September) after an exclosure of a few months. The fodder harvested during the rainy season is directly distributed to the animals. A part of the last mowing can be placed in the "hay loft". The meadow is fertilized by a direct addition of dejection, after each cut if the manure is available.

Meadows are sometimes out of the farm, what results from the redistribution of the land. Euphorbiums are planted there to mark the borders.



Fertilization of the meadow thanks to an application of animal dejections

Source : E. Le Gal, N. Molinier, 2006

3.2.1.6 The plot of eucalyptus, trees and hedgerow landscape : vertical occupation of the territory

The area planted with eucalyptus is directly related to the total area of the farm. Its wood is mainly used as firewood but can also be useful as timber. It is seldom sold. The farmers who have larger plots keep one part as long as they can to decrease the expenses of construction of the tukul, which takes place every 10 to 15 years. Some farmers do not have any plot of eucalyptus, so they glean under neighbours and on the Damota volcano to collect firewood.

Moreover, farmers can pawn this plot, and just like the plots with annual crops, what is used only in last resort. It is rented for a period from three to five years and the owner must refund the sum perceived to recover it. The trees can also be sold standing. The price then depends on the time left to the purchaser to cut the trees, that can be from a few weeks to several months, even years. Lastly, farmers recognize the depressive effect of this tree cropping on the fertility of the contiguous soils. But in this context of shortage of firewood, the eucalyptus, with fast growth, only remains a possible alternative.

The firewood supply is crucial and the replacement of this tree with fast growth by another equivalent species, but non depressive for the soil, has to be done immediately. Inter Aide, relayed by the government, diffuses the variety *Gravillea robusta* which seems to meet these needs. Small plantations, in edge of dwelling spread in the area. The popularization of this species thus has a very good range. Despite of that, the seedlings are still too young to be used. The comparison of production in real conditions is not yet possible, and *Gravillea* has not already been planted at the expend of the plots of eucalyptus.

Trees and hedge surround the farms. Sometimes, some trees are planted in a scattered way in the garden and close fields. They are primarily fodder tree and/or intended for timber. In addition to the vertical transfer of fertility ensured by these trees, their leaves constitute an subsidiary fodder in dry season for some species. They are mixed with the daily allowance (straw, *dupa* and ensete leaves). This make it possible to reduce the costs of breeding in period of shortage of fodder, but the farmers consider

them essential in term of quantity but not of quality of the ration. The stronger density of these hedges around the garden forms also a protection against wild animals.

Some families own like a "tree heritage", made up of species famous to make good timber. Those trees, they inherited or planted during the division the land (1975), have never been cut. That ensures a safety margin in the case of "hard event" since in a context of reduction of wood resources. Indeed, whereas buildings are increasing in the close cities, the price of the trees is more and more high. We did not take in account the economic value of the latter in our modeling since their value is "inestimable". Indeed, nobody trade it and the trees are only cut in special cases: construction of farms, urgent needs in cash (wedding, death, problem of decapitalisation). This "standing saving" is recognized by all the farmers, but it supposes to have enough area (at the expend of grazing, crop or firewood), and margin of manoeuvre not to sell it before term. This inheritance is found thus by the richest peasants.

3.2.1.7 Criteria of differentiation between farms on the cropping systems

The assignment of the **working capital** is firstly given to the close fields with organic manure. The distant fields are thus put in share-cropping by the farmers who don't have the working capital necessary to cultivate it. So the cash that a farmer has, limits him to choose the plantations (taro, yam, tef and barley have high operational cost) and the area that he can sow.

Moreover, the **possession of bovines** is a major indication of differentiation between the different farm's cropping systems. On the one hand, having bovine means to have organic manure, this allows to sow a greater area of «close» fields, or to improve their fertility and thus the results. In addition, the possession of a yoke or a part of a yoke is determinant for the establishment of cycles of inter season (very narrow calendar window between harvest of second season and establishment of sweet potatoes in dry season). Lastly, the period, duration and date, during which farmers have access to oxen determines the success of the establishment of their culture and thus influence strongly the yield. For example, a lot of farmers "oxenless" can have a yoke if they give a working day in return. However, the latter must wait until the owner of oxen finished cultivating his own plot before using them, what forces them to sow out of favorable calendar window. The ownership of oxen thus represents a significant comparative advantage, more especially as it also determines the total area that a peasant can cultivate.

Only a few farmers manage to **save seeds** but for a duration which never exceeds a few weeks. A common practice is to sow a very small plot with barley or tef in the first rainy season in order to constitute a small stock for the sowing of the second rainy season. As the period of time is very short and that there are other food availabilities, peasants *"are not tempted to eat them"*.

We have calculated that a farmer who saves seeds for the distant field can increase his Added Value by 15%. The support in this field is thus of significant interest.

The NGO Inter Aide, conscious of this major stake for the peasants, encourages the latter to gather themselves to save wheat. They feed the stock done by the farmers with "improved" seeds. According to our investigations, although the peasants find these new varieties less tasty, they are unanimous to appreciate the savings that they realise (10 kg of wheat saved allows to sow 12 ares by saving 1 €, which is equivalent to 6 meals for a family).

3.2.1.8 Performances of the various cropping systems

The way that the peasants share out the labour force and the working capital between close and distant cropping system depends mainly on its localization compared to the dwelling and on the quantity of manure available. The added value earned per are on the close fields is approximately one third higher than the one earned on the distant fields because of the great complexity (mixed intercropping) of the implemented systems. The peasants thus practise in priority this cropping system.

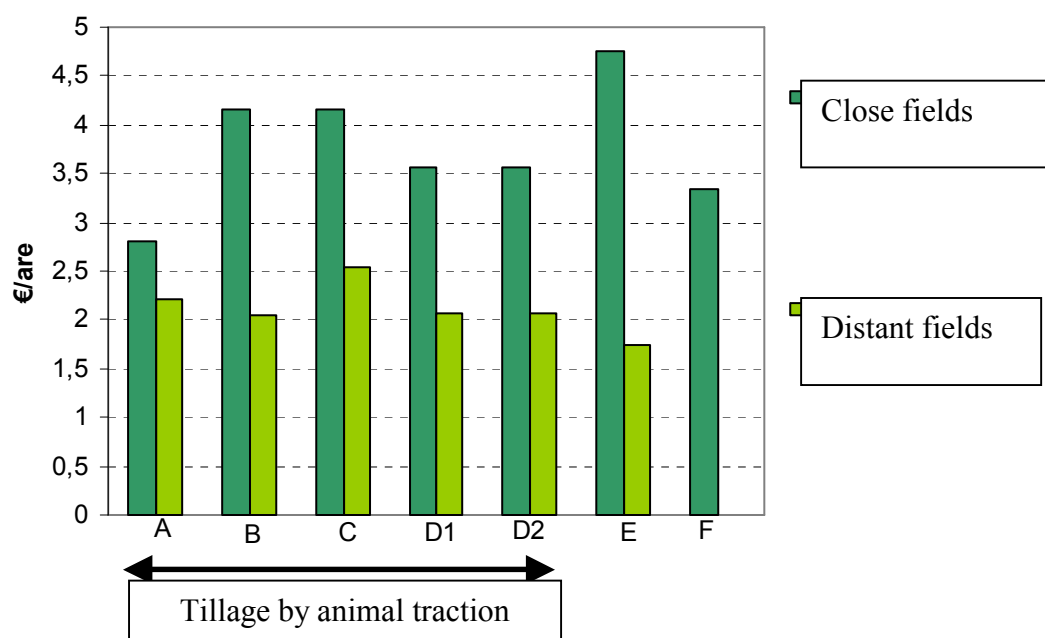


Figure 14 : Land productivity for close and distant fields

Source : E. Le Gal, N. Molinier, from our inquiries with the farmers

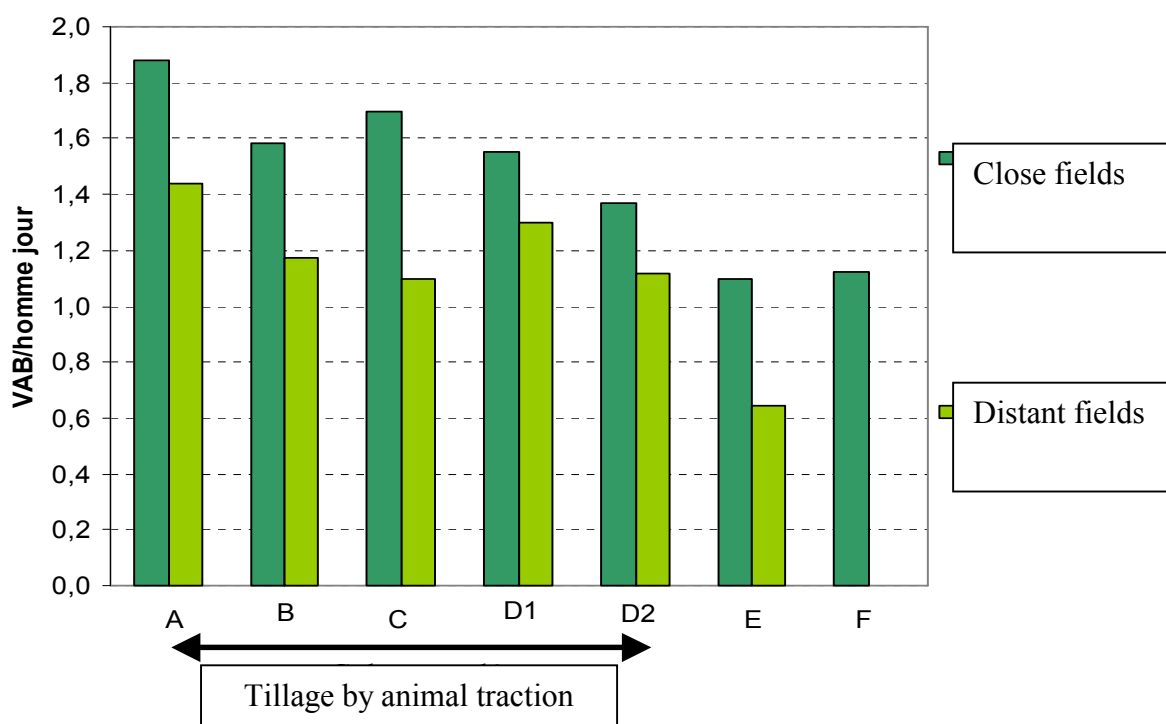


Figure 15 : Labour productivity for close and distant fields

Source : E. Le Gal, N. Molinier, from our inquiries with the farmers

With regards to the close fields, there are only few differences between farmers. Nevertheless, the cultivation of sweet potato in dry season which needs a lot of work (case E) or the cultivation of "high added value" crops but which require a great quantity of manure and work like the taro (cases B and C) make it possible to explain the strongest added values released per unit of area. However the remuneration of the labour force is lesser (especially for E with sweet potato).

On the distant fields, the observed results are partly vague since it was impossible for us to determine differences of yield between cultivation by hand and cultivation with oxen. Thus, the released added values are almost the same, more especially as the crops and their selling price hardly change from one kind of farmer to another (no surveyed farmer saves its harvest beyond one month).

3.2.2 The livestock farming systems

Almost all the farmers have a small number of animals (ovine, bovine, poultries) in property or in contract with fruit share. The herd management system is not far from a "zero grazing" system. Animals are tethered rearing or kept under surveillance on the undivided grazing during the day and housed-animals at night in the dwelling. The animals enter twice a day the dwelling to receive there their feed ration.

The animals are carried out to the river or the nearest water point once a day. There isn't any young cowherd nor shepherd, but children of the neighborhood can share in the task to carry out the whole herd with each other, turn by turn.

3.2.2.1 The bovine system

Few bovines come today from the pure local race (*zebu abyssinica*). Many result from crossings carried out with the races Friesian and Jersey during the 80's.

Fodder is distributed in the small boxes of the stalling. It is mainly made up of :

- **Crop residues** : they come from the free harvest of maize, bean, pea, broad bean and sweet potatoes. This spreads out the fodder availabilities during the rainy season. The tubers of sweet potato of the garden are systematically distributed at the time of the harvest to get cuttings for the plantations of October. In dry season, the straws stored at the end of the second cropping season are distributed in mixed ration.

- **Weeds** daily harvested during the weedings (the farmers do not use weedkillers for this reason) and on the edge of fields

- Foliages of fodder trees standing in edge of the farms or plots

Because of the fodder shortage, there is in this area an important market of fodder (*dupa*) during the dry season. The peasants of the upper agro-ecological stage come to sell this gramineous harvested between December and January which abounds there. The greater part of breeding costs is due to the purchase of *dupa* between January and April. Moreover, many farmers who don't have any animals, the poorest in general, rent a part of their small plots of meadow or cut grass to sell it during the rainy season.

Peasants supplement the rations with a powder made up primarily of barley and maize, the *fruschka*, and of "salted soil", equivalent to a stone with salt, rich in minerals. The *fruschka* is distributed to the cows during lactation, and the oxen the days of ploughing. It is distributed during the rainy season, but never in dry season.

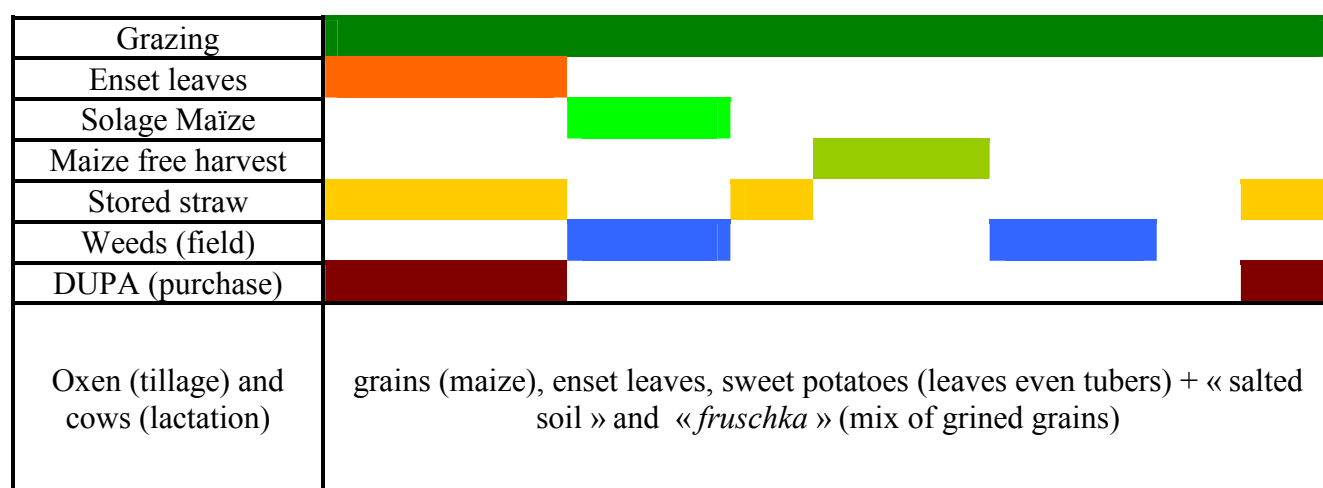


Figure 16 : Current forage calendar (bovine, ovine)

Source : E. Le Gal, N. Molinier, from our inquiries with the farmers

In spite of the efforts carried out by the farmers to improve their ration, the cows have a weak milk yield (2L/day against 4L/day under the imperial regime) and middle prolificity (extension of the time between tow calvings from 16 to 20 months). The hand milking is carried out three times per day. It is initiated and concluded by the calf, but it was impossible for us to define with precision the proportion of milk which returns to him. Milk obtained is seldom consumed by the family. Three days of milking are necessary to make a small slab of butter (150 to 250g) which will be sold on the local markets. The “whey” is usually consumed by the children. The lactation lengh is about 8 months and during this period, the family is sure to earn a small regular income (the sale of butter is generally entirely spent on the same market for the family needs : maize, salt, kerosene...). The butter will be divided into two in the case of share breeding.

Few diseases hit the bovines in the area, and animal husbandry and care are almost inexistent. Deaths of adult bovines are often fast and unexplained. Usually, it appears when the livestock is turn out to the grass at the begining of the rainy season ("disease of the blue tooth") but we did not determine the reasons of that. As regards with the calves, the peak of mortality is rather at the end of the dry season and just after the weaning. The young calves have thus a "particular" treatment in order to decrease the risks of death. They receive, in addition to the basic diet, leftovers (coffee leaves, spices, salt) in a wood pot and maïze according to the availability.

Distribution of solage maize to a calf



Harvest of weeds in the edge of fields

Cow in stalling in the house

3.2.2.2 The ovine system

Almost all the farmers own a sheep, most of the time a suckling ewe. The livestock management is close to the bovine one. Concerning fodder, sheep do not eat straw of barley and only few sweet potatoes, but they profit from extra food like grain according to the harvests (a handle per day during these periods). Milk is not consumed by the family, it is reserved for the lambs. The lambing rate is about 1,5 lambs per ewe per year. This suckler lamb will be sold between 6 and 12 months. There is seldom more than one ewe by farm, but the sale of the lambs represent a significant advantage because it permit to cover a part of the operational costs in March, and thus to decrease taking out. (cf appendix 3)

3.2.2.3 The fattening system

The fattening relates to the sheep as well as to the bovines. The fattening relates to culled animals, male and female and is spread over three months. The animals receive in stalling better rations. The foddering is improved :

- in quantity: two to three brewed per day (instead of one), composed of stems and leaves of maize, crop residues, mown grass, weeds and ensilage leaves
- in quality: during the second and third month, sugarcane, sweet potato and grains (maize primarily) are added

A bar of Alvidisor is given each month. It is a product which it is possible to get in the veterinary center of Boditi, and on the markets. It could be hormones to make oxen take volume quickly (these plates are also used after drying off to lead the females to return in heat).

We can find fattening by various types of farmers : with owners who manage to keep the animal until the end of its career, with farmers who have capital and who buy an animal at low prices to fatten it and resell it at once after, releasing a strong margin, and with small farmers which takes an animal to share, only during the fattening time. In this last case, the expenses are equally divided. The owner (generally "notable" or rich peasant) and the guard share the value taken by the animal during these three months (selling price - value of arrival in the owner). It is a way of slow capitalization for these small farmers, often without animals, and they can then take advantage of their fodder potential.

3.2.2.4 The poultry system

Some farmers also have poultries, seldom more than three per farm. Generally the children are looking after them. They sell the eggs and the chickens on the markets to buy their school stuffs. All the production is dedicated to the eggs, except during 3 months when the little stock breeder let the chickens grow to sell them in Meskel in September.

The poultries are free during the day and put in the dwelling at night as far as it is possible. They receive some food complements like grain (according to harvests) and residues of the coffee ceremony.

This type of breeding doesn't need a lot of labour neither in capital but its slow development is related to the very high rate of mortality (70%). The pressure of predatory, eagles and ferrets is very strong and cause a lot of havocs.

3.2.2.5 Criteria of distinction between farms about the livestock farming system

In this context of fodder shortage, the major factor of differentiation is based on the capacity of the farmers to feed their animals. This capacity depends:

- of his total area, because food is based on the one hand on the pasture and on the other hand on the distribution of crop residues

- of its working capital : indeed, the purchase of grass in dry season is a practice extended to all the area. It represents a significant cost for the peasants, especially in food welding period (up to 10 € of grass dupa per capita of cattle).

Thus, a good quality foddering makes it possible to increase the dairy production (which can vary until 50 % from one farmer to another) and to decrease the death rate at exit of dry season.

The margin of manoeuvre of the peasant will determine his livestock management. Thus, number of them are obliged to sell the young animals very early (1 year, post weaning), and at very low price. Many can not keep the female calves until their age of production. It explains the frequent incapacity to renew the herd with its descendants. The poorest farmers, who have no another choice than buying young animals (from 1 to 2 years), cheaper, are only rarely ensured of being able to keep them until they become productives (ploughing for the bulls, reproduction of the heifers).

The capacity to support these costs of breeding is thus determining. We calculated that the introduction of fodder hedges by NGO Inter Aide makes it partly possible to decrease the expenditure related to the purchase of fodder in dry season (approximately 1/3 less). It remains nevertheless to characterize the improvement of the ration of the animals (fodder values) by these well accepted plants, still not controlled by the farmers yet.

3.2.3 A close association between agriculture and breeding

3.2.3.1 Management of the fertility and transfers of biomass

The current farms are in crisis regarding the fertility management. While the majority of the biomass transfers are concentrated towards the close fields, the distant fields "are impoverished". Indeed :

- all the crop residues are exported towards the dwelling (fodder)
- the minerals resulting from chemical fertilizers are frequently carried by streaming on the most sloping plots.

All this contributes to strongly limit "the preceding effect".

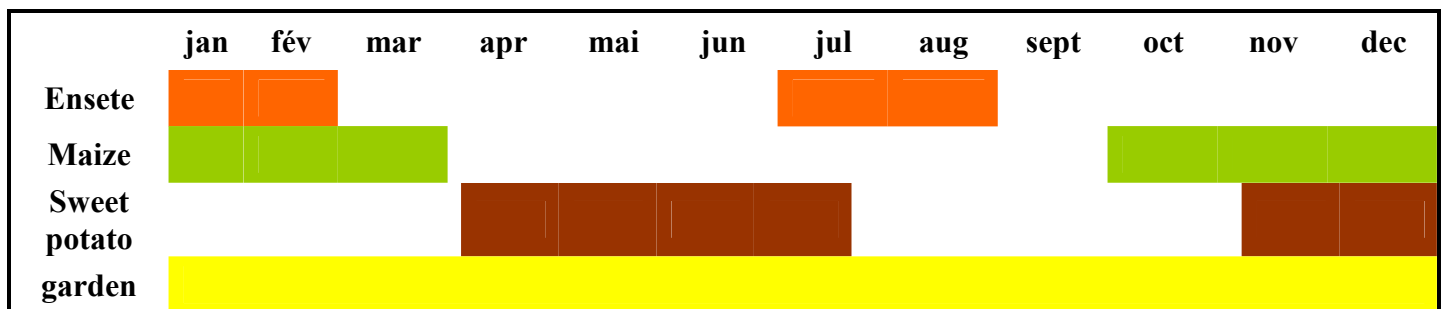


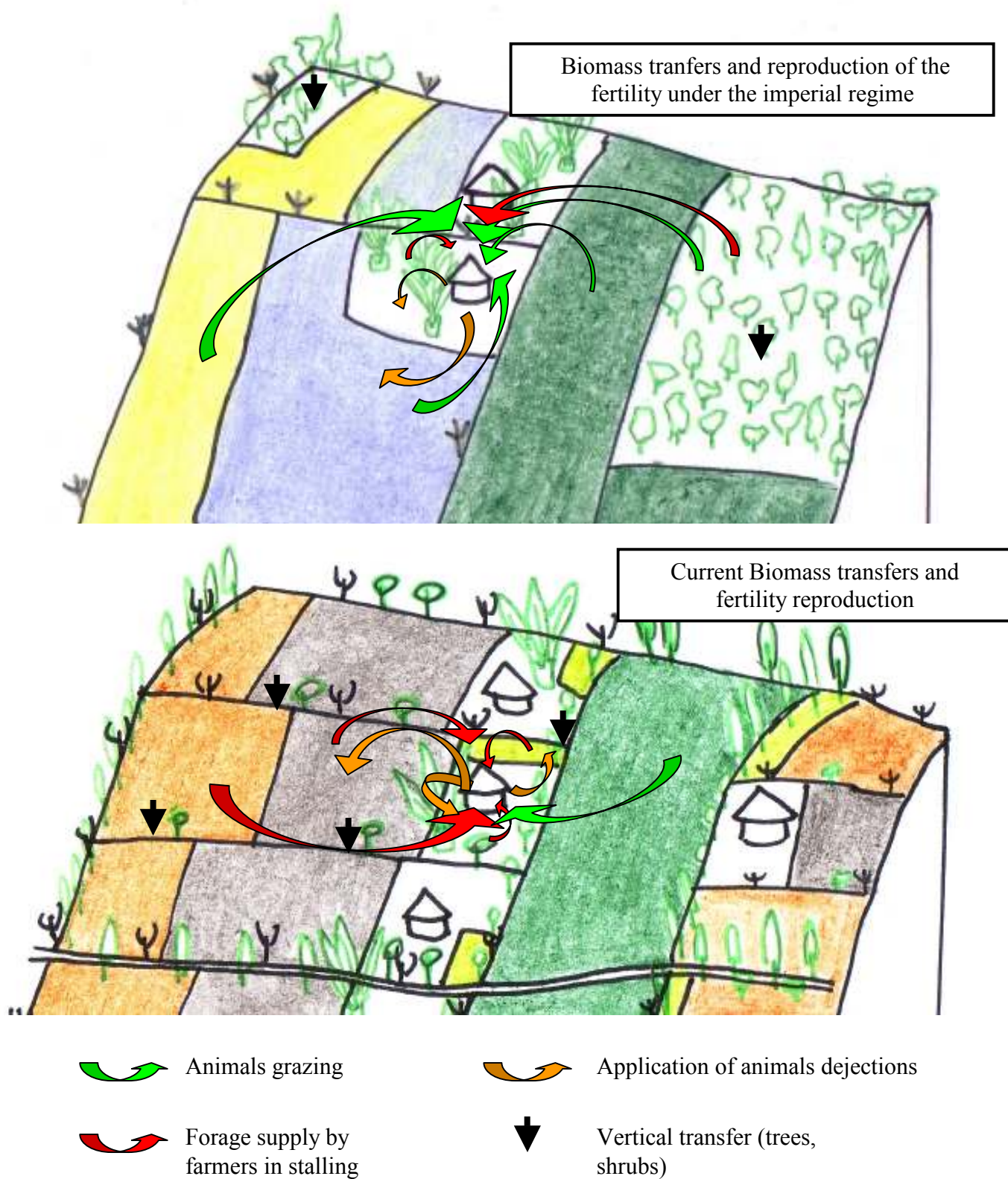
Figure 17 : management of the organic manure application on the farm

Source : E. Le Gal, N. Molinier, from our inquiries with the farmers

The renewal of the fertility on the distant fields is thus problematic because it depends on the contribution of expensive inputs and whose access is not very democratic.

Figure 18 : Fertility management under the imperial regime and currently

Source : E. Le Gal, N. Molinier, from our inquiries with the farmers



3.2.3.2 Cash flow analysis

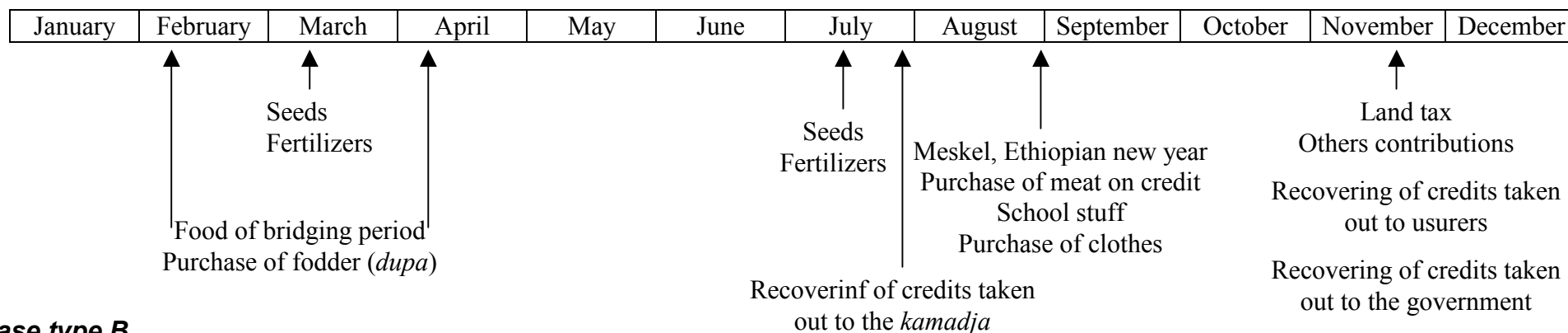
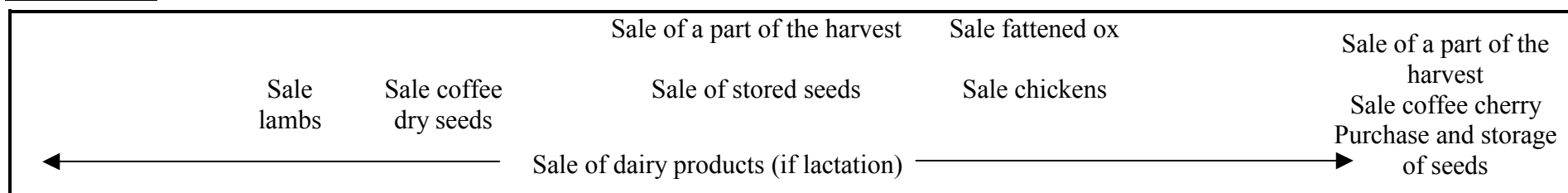
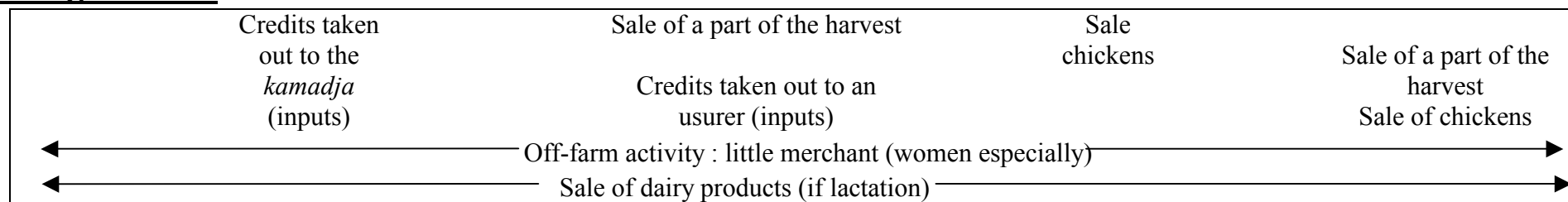
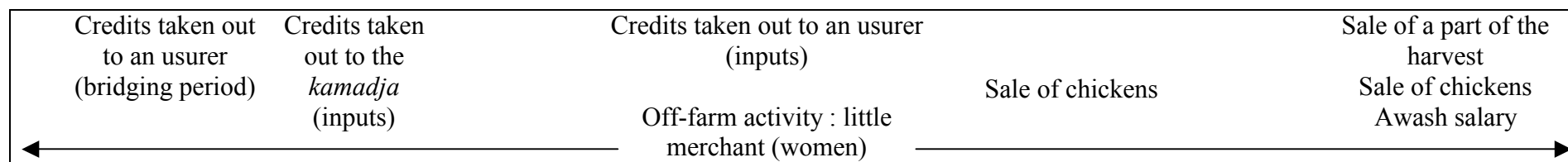
Credits to get seeds, inputs and to purchase food in wedding period are frequent and recurrent. There are expenditure that we can describe as fixed : September is a very expensive month (meat and tef for the festivals, clothing and school stuffs), and the wave of refunding of November (credits taken with the usurers, taxes).

The peasants must thus face many exits, with the resources they have. These last vary according to:

The **size of the land**, which influences the production and thus the possibility to save seeds and to reach food sufficiency. The frequency of the credits for the wedding period indicates that this resource is not sufficient for a great number of family.

The **animals**, which are perfectly integrated in the cash flow calendar. The sales of young animals (bovine, ovine, poultries) arrive at key periods of requirement in working capital. Products such as butter and eggs are sold regularly and in small quantity. The profits are directly reinjected in the purchase of food (maize, sweet potato). To manage its production implies nevertheless to support its costs, the major expenditure remaining the foddering of dry season.

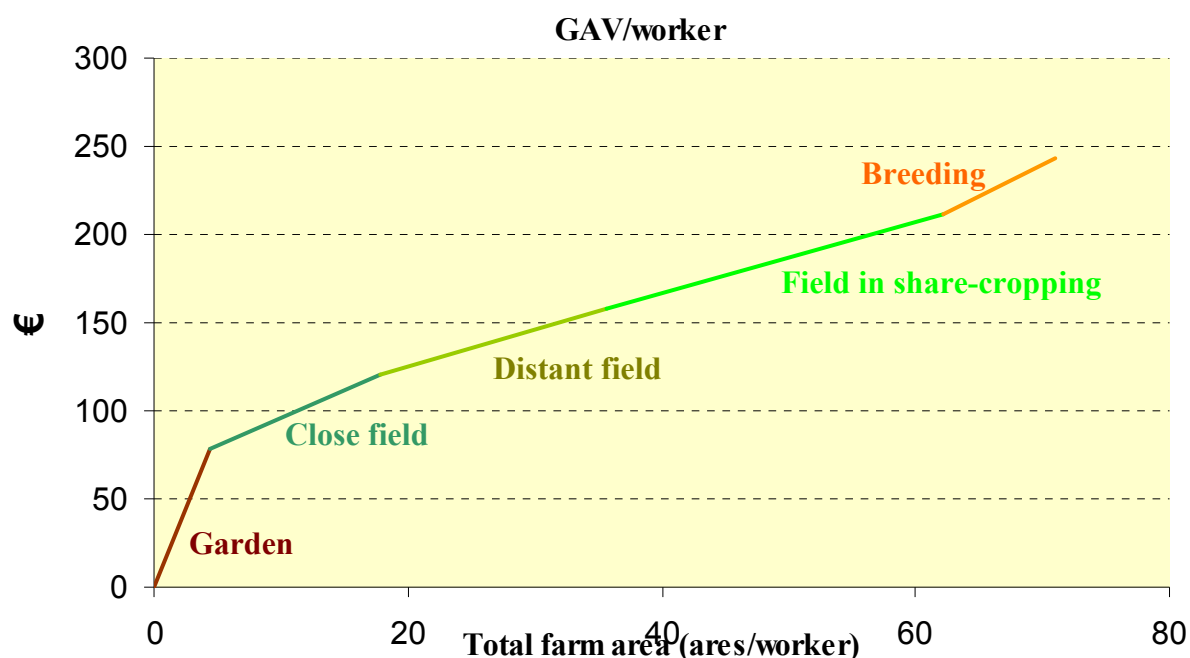
There is thus a narrow association between agriculture and breeding : as far as possible, the farmers try to sell their small animals at the period of purchasing inputs, while the sale of a part of harvests contributes to the purchase of fodder.

**Case type B****Case type C and D****Case type E and F*****A few examples of cash flow management***

3.3 FARM TYPOLOGY

Type A : Owners sharecroppers agro-breeders (3% of the farms)

These owners come generally from a family of independent farmers supported by the redistribution of the land during the DERG regime. The possession of a full yoke enables them not only to work their entire land but also to take others in share-cropping. They work thus between 1,5 and 1,8 ha. They have several cows (2 to 3) which are fed at lower cost thanks to a relatively important fodder area. Thus the young animals can wait to be sold at 3-4 years at high prices, or to be placed in contract. They are also owners of bovines that they place in other farms to share the usufruct with the share-farmer (two to three cows, five to seven calves and/or heipher). Their income, which is thus partly made up of added values created outside the farm, lies between 185 and 270 €/worker/year.



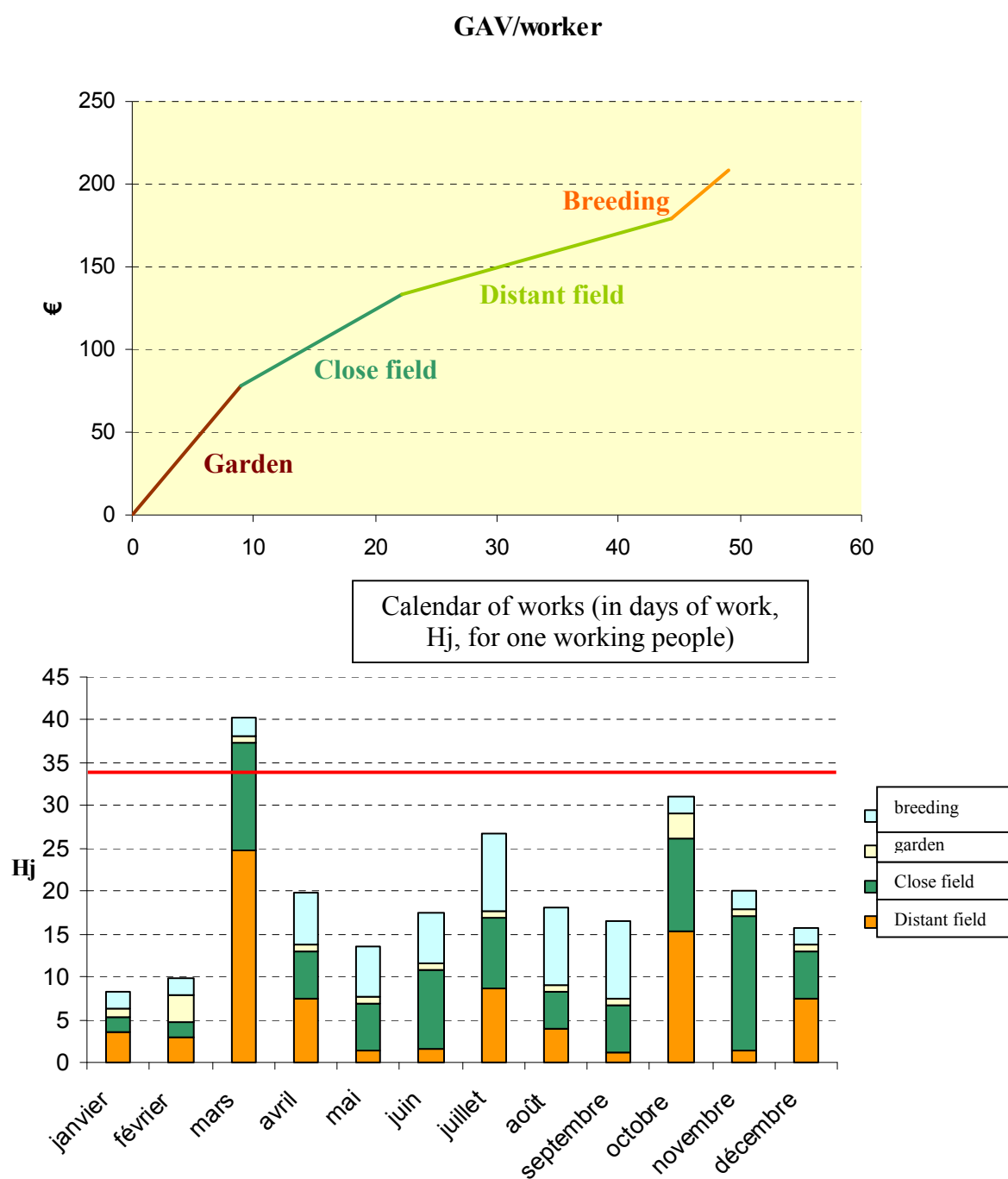
Farm type A				
workers : 2,25		Equipment: plough, tekia...		
Total farm area : 1,1 ha in ownership+ 0,6ha in share-cropping		Fixed capital depreciation : -33 €/year		
Cropping system				
Garden 0,1 ha	<i>Enset (6,5 ares)</i> <i>coffee, maize, avocado, sugar cane, orange, casava</i>		GAV : 175 €	
Close field 0,2 ha	GI (Gross Income): 65 € OC (Operational costs) : 8 €		GAV : 57 €	
Distant field 0,5 ha	GI : 162 €	OC : 38 €	GAV : 124 €	
Field in share cropping 0,6 ha	GI : 174 €	OC : 55 €	GAV : 119 €	
Trees 0,1 ha Eucalyptus				Total GAV CS : 475 €
Livestock farming system with 0,2 ha of grassland				
Bovines 2 oxen, 2 cows	<i>Dairy products</i>	41 €	<pre>graph TD Cow[Cow] -- "1 calf/20month 40% death rate" --> Calf[Calf] Calf --> Male[Male calf] Calf --> Female[Female calf] Male --> Bull[Replacement bull] Male --> SoldMale["50% sold (4 years old), or given to share the profit (3 years old)"] Female --> Heifer[Replacement heifer] Female --> SoldFemale["50% sold (4 years old), or given to share the profit (3 years old)"]</pre>	
	<i>Calves</i>	19€		
	<i>réform cow</i>	18 €		
	<i>OC</i>	20 €		
	GAV	59 €		
Ovines 1 ewe	Lamb	13,5 €	OC : 3 €	Poultry 1 hen GAV : 4 €
	réform ewe	0,5 €	GAV : 10 €	
Total GAV LFS : 73 €				
Total GAV : 548 €		TOTAL NAV: 581 €		
NAV/ha : 341 €		NAV/worker: 258 €		
Added value allocation				
Land tax 3 €	land in contract 60 €	maintenance 5 €		
Animals given to share the usufruct : at least 2 cows, 1 fattening calf, 1 ewe, some calves70 €				
Farm family Income : 513 €		FFI/worker : 228 €	Total Income/worker : 260 €	

		Garden	Close field	Distant field	Field in contract	Dairy products	eggs
Production	10 ³ kcal	1512	2268	3353	2130	231	8
	Proteins (g)	3512	376860	48730	55402	11760	13000
% self consumption		100	100	50	20	25	0

Number of adults who can leave on the farm : 6 to 10

Type B : Storage operating owners (5% des farms)

These owners are the descendants of independent farmers or tenants who succeeded in not decapitalizing their cattle and whose land was not divided by more than one generation since the agrarian reform. They have from 0,7 to 1,2 ha and half a yoke. Their farmwork planning is filled during their peak-time period of work, That is why they do not have an off-farm activity. They carry out a fattening of ox per year (for September). This enables them to constitute small savings with which they buy a few quintals of tef or maize at harvesting time (in December), to resell it at the time of sowing at a very high price. That permits them to cover the expenses of cultivation without resorting to credits. The agricultural income obtained from the farm is between 100 and 210 €/worker/year.



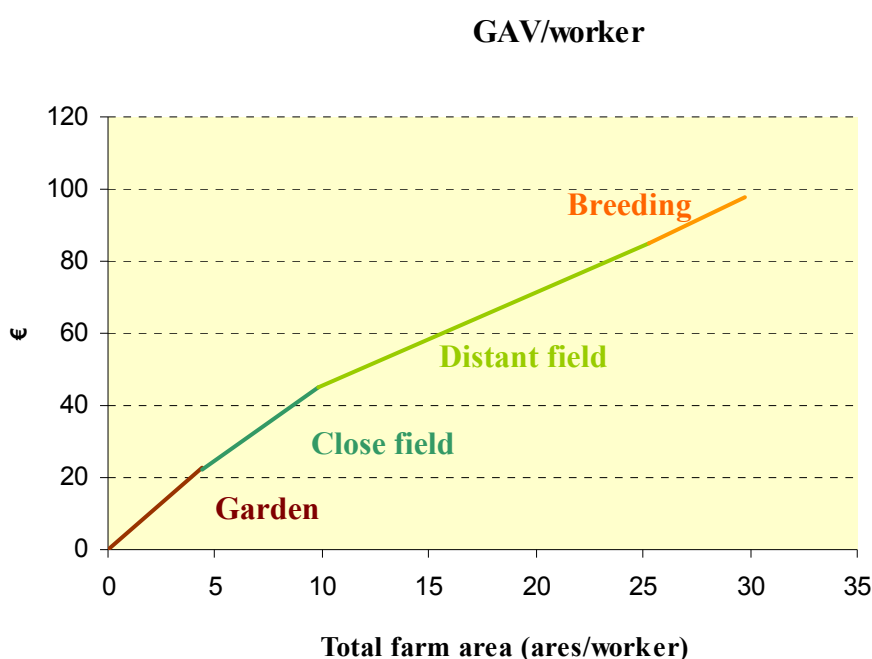
Farm type B				
workers : 2,25		Equipment : plough, tekia...		
Total farm area : 1,2 ha		Fixed capital depreciation : -13 €/year		
Cropping system				
Enset (7 ares)				
Garden 0,2 ha	Coffee, maize, avocado, sugar cane, orange, casava, pumpkins, banana trees		GAV : 176 €	
Close field 0,3 ha	GI : 138 €	OC : 13 €	GAV: 125 €	
Distant field 0,5 ha	GI : 135 €	OC : 33 €	GAV : 102 €	
Trees 0,1 ha Eucalyptus				Total GAV CS : 403 €
Livestock farming system with 0,1 ha of grassland				
Bovines 1 ox, 1 cow shared, 1 fattening	Dairy products	21 €	<div> <div> Réform fattening cow, 18 years old </div> <div> Cow 1 calf/20month 40%death rate </div> <div> Replacement Heipher </div> <div> Calf </div> <div> Female calf </div> <div> Replacement bull </div> <div> 50% sold at 3 years </div> </div>	
	calves	11 €		
	Réform cow	3 €		
	Fattening	40 €		
	OC	13 €		
GAV	62 €			
Poultry 1 hen	GAV : 4 €	Total GAV LFS : 66 €		
Storage of seeds : 40 €				
TOTAL GAV : 509 €		TOTAL NAV : 522 €		
NAV/ha : 435 €		NAV/worker : 232 €		
Allocation of added value				
Land tax 3 €	Animals in contract 15 €	Maintenance 10 €		
FFI/worker: 220 € FFI : 494 €				

		Garden	Close field	Distant field	Dairy products	eggs
Production	10 ³ kcal	1600	4316	3126	38	8
	Proteins (g)	3713	90456	41350	1960	13000
% self consumption		100	100	75	25	0

Number of adults who can leave on the farm: 7 to 8

Type C : farming owners, occasional off-farm occupation (10% of the farms)

These owners, descendants of independent farmers or tenants, the best well-off by the land reform, have from 0,6 to 1 ha and half an ox. They have animals on their farm in contract to share the usufruct (a cow and a ewe). The contribution of the distant field with mineral manure to the total added value is remarkable (compared to the close field with organic manure and the garden). This is linked to the need of liquidities to pay the taxes at end of the year. Indeed, the small outside activity carried out apart from the work peak-time, just makes it possible to buy foodstuffs for the family in period of welding. These owners thus depend strongly on the results of the distant field. For this reason they are very sensitive to bad harvests due to climatic accidents (they can lose the totality of the harvest). It is usual for these peasants to take out a credit a very high rates for the purchase of inputs. The total income of this type of peasants is between 75 and 150€/worker/year.



Farm type C					
workers : 2,25 Total farm area: 0,7ha			Equipment : plough, tekia, knives... Fixed capital depreciation : -2 €/year		
Cropping system					
Garden 0,1 ha		<i>Ensete (1 are)</i> <i>coffee, maize, avocado, sugar cane, pumpkins...</i>		GAV : 52 €	
Close field 0,12 ha		GI : 54 €	OC : 4 €	GAV : 50 €	
Distant field 0,35 ha		GI : 114 €	OC : 25 €	GAV : 89 €	
Trees 0,03 ha Eucalyptus				Total GAV CS : 191 €	
Livestock farming system with 0,1 ha of grassland					
Bovines 1 ox in contract, 1 cow in contract		<i>Dairy products</i>	21 €	<pre>graph TD H[heifer, 3 years] --> C[cow] C -- "1 calf/20month 40%death rate" --> MC[Male calf] C -- "1 calf/20month 40%death rate" --> FC[Female calf] MC --> S[Sold at two years old] FC --> S C --> RC[Réform cow fattening, 18 years]</pre>	
		<i>Calf</i>	7 €		
		<i>Réform cow</i>	3 €		
		<i>OC</i>	13 €		
		GAV	18 €		
Ovines 1 ewe		<i>Lambs</i>	13,5 €	<i>OC : 3 €</i>	Poultry 1 hen GAV : 4 €
		<i>réform ewe</i>	0,5 €	GAV : 10 €	
Total GAV LFS : 32 €					
TOTAL GAV : 223 € NAV/ha : 321 €			TOTAL NAV : 225 € NAV/worker : 100 €		
Allocation of added value					
Land tax 2,5 €		Maintenance 5 €		Animals in contract 11 € Interest with credit 6 €	
Off farm income					
Trade or handcraft : 20 €					
FFI : 201 €		FFI/worker : 89 €		TI/worker : 98 €/year	

		Garden	Close field	Distant field	Dairy products	eggs
Production	10 ³ kcal	630	1890	3200	38	8
	Proteins (g)	6706	41798	57591	1960	13000
% self consumption		100	100	50	10	0

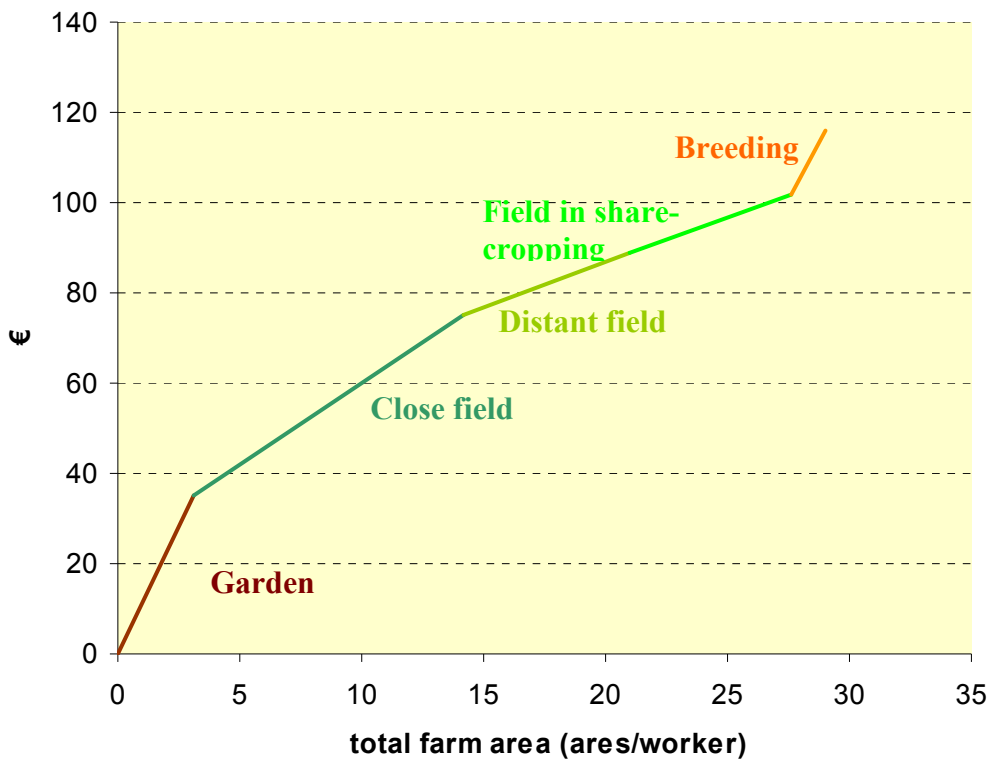
Number of adults people who can leave on the farm: 3 to 4

Type D : Small owners sharecroppers, off-farm occupation (25% of the farms)

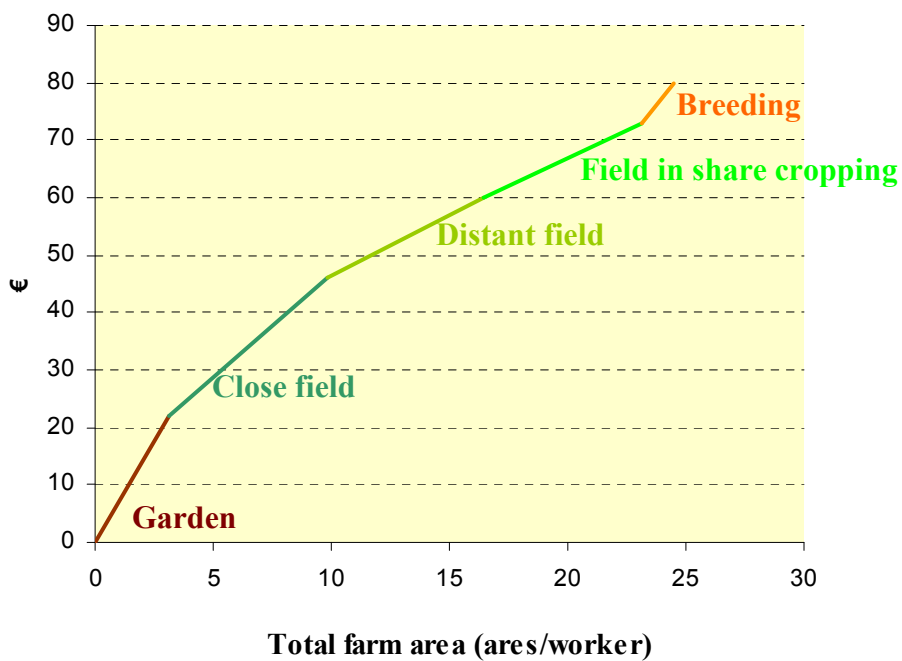
They are young farmers recently settled on land which were already divided at least twice. They inherited from their father of too small areas (between 0,1 and 0,25 ha) to use all the potential of their animal draught power. They have $\frac{1}{2}$ until one ox, what enables them to take lands in share-cropping. These young farmers indeed succeeded in capitalizing before their wedding, by carrying on a small activity of merchant with ass or a seasonal job in Awash. They cultivate today areas between 0,5 and 1 ha for the farmers of the D1 type who have a half yoke and between 0,3 and 0,7 ha for those of the D2 type who have a quarter of yoke. They can have a cow and/or a ewe in contract, but cannot keep calves beyond two years. The women have usually an off-farm activity (handicrafts, merchant). However, the resort to the credit with high rate is rather frequent.

These peasants, who have weak areas, maximize the added value obtained on the close field (with organic manure) compared to the distant field (with mineral manure) what is different from B and C. Indeed, they can carry out the cash crop, usually carried out on the distant field, on the land that they take in share-cropping. They however keep a small plot with mineral manure to secure an access to some money. This is due to the possible loss of the lands taken in share-cropping (the contract is renewed after each cropping season). The total income is between 90 and 170 €/worker/year for the peasants of the D1 type and between 65 and 100 €/worker/year for the D2 type. These peasants are thus in a very precarious situation and the loss of their ox because of a decapitalisation following an unforeseen event would be dramatic.

GAV/worker D1



GAV/worker D2



Farm type D1			
workers : 2,25		Equipment : plough tekia...	
Total farm area: 0,5 ha in property + 0,15 ha in share cropping		Depreciation of fixed capital: -3,5 €/year	
Cropping system			
Garden 0,07 ha	<i>Enset (4,5 ares)</i> <i>coffee, maize, avocado, sugar cane, casava, pumpkins</i>		GAV : 79 €
Close field 0,25 ha	GI : 99 €	OC : 10 €	GAV : 89 €
Distant field 0,15 ha	GI : 42 €	OC : 10 €	GAV : 32 €
Field in share cropping 0,15ha	GI : 41 €	OC : 11 €	GAV : 30 €
Trees 0,005 ha Eucalyptus	Total GAV CS: 230 €		
Livestock farming system with 0,03 ha of grassland			
Bovines 1ox, 1 cow In contract	<i>Dairy products</i>	21 €	<pre>graph TD Cow[Cow 1 calf/20month 40%death rate] --> Male[Male calf] Cow --> Female[Female calf] Male --> SoldMale[Sold at 1 year, post weaning] Female --> SoldFemale[Sold at 1 year, post weaning] Heifer[heipher, 2 years] --> SoldHeifer[Sold] Reform[Reform, 18 years old] --> SoldReform[Sold]</pre>
	<i>Calf</i>	7 €	
	<i>Réform cow</i>	3 €	
	<i>OC</i>	18 €	
	GAV	13 €	
Ovines 1 ewe	Lambs <i>réform ewe</i>	13,5 € 0,5 €	OC : 3 € GAV : 10 €
		Poultry 2 hens	GAV: 8 €
Total GAV LFS : 31 €			
TOTAL GAV : 261 € TOTAL NAV : 265 € NAV taking in acount the share cropping : 250 € NAV/ha : 385 € NAV/worker : 110 €			
Allocation of the added value			
Land tax 2 €		Interest on credit 5 €	
		maintenance 5 €	
Off-farm income			
Trade or little handycraft : 40 €			
FFI : 239 € FFI/worker : 106 € TI/woker : 124€			

		garden	Close field	Distant field	Field in share cropping	Dairy products	eggs
Production	10 ³ kcal	1405	3495	1284	428	77	16
	Proteins (g)	6986	82912	18668	12352	3920	26000
% auto-consumption		100	100	50	25	10	0

Number of adults who can leave on the farm : 5 to 6

Farm type D2			
workers : 2,25		Equipment : plough, tekia....	
Total farm area : 0,4 ha in property + 0,15 ha in share cropping		Depreciation of fixed capital : 3,2 €/year	
Cropping system			
Garden 0,07 ha	<i>Enset (3,5 ares)</i> <i>coffee, maize, avocado, sugar cane, pumpkins,casava</i>		GAV : 49 €
Close field 0,15 ha	GI:59 €	OC : 6 €	GAV : 53 €
Distant field 0,15 ha	GI : 42 €	OC : 10 €	GAV : 32 €
Field in contract 0,15ha	GI : 41 €	OC : 11 €	GAV : 30 €
Trees 0,005 ha Eucalyptus			Total GAV CS : 164 €
Livestock farming system with 0,03 ha of grassland			
Bovines 1ox in contract, 1 cow in contract	Dairy products 21 € Calf 7 € Réform cow 3 € OC 18 € GAV 13 €	<div><div>Réform, 18 years old</div><div>heipher, 2 years</div><div>Cow 1 calf/20month 40%death rate</div><div>Male calf</div><div>Female calf</div><div>Sold at 1 year , after weaning</div></div>	
Poultry 1 hen	GAV : 4 €	Total GAV CS : 17 €	
Total GAV : 181 € TOTAL NAV: 178 € NAV taking share cropping in account : 163 € NAV/ha : 296 € NAV/worker : 72 €			
Allocation of added value			
Land tax 2 €	Interest on credit 5 €	Animals in contract 12 €	Maintenance 4 €
Revenus extérieurs			
Small off-farm activity : 40 €			
FFI: 140 € FFI/worker : 62 € TI/worker: 80 €			

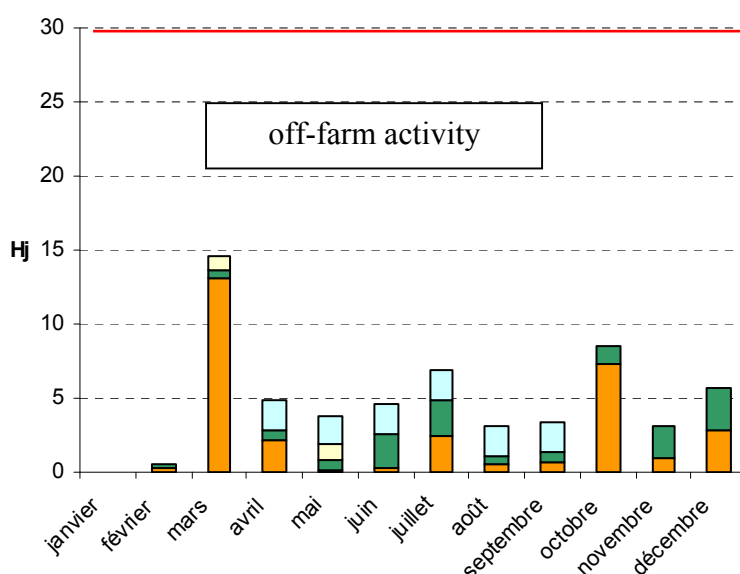
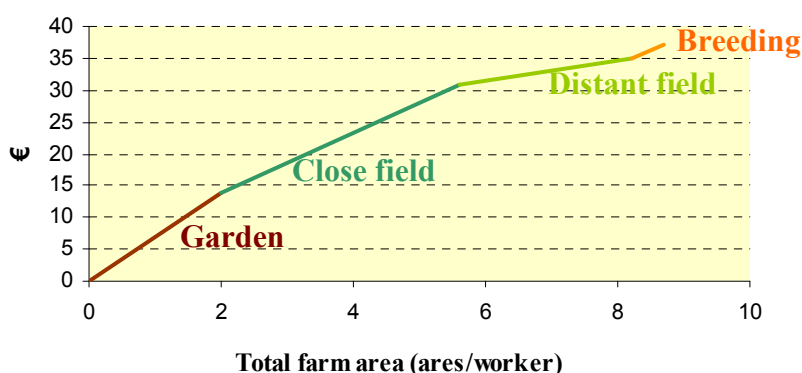
		Garden	Closse field	Distant field	Field in contract	Dairy products	eggs
Production	10 ³ kcal	1340	2279	1284	413	38	8
	Proteins (g)	13646	63370	18668	3668	1960	13000
% self consumption		100	100	50	25	5	0

Number of adults who can leave on the farm : 4 to 5

Type E : Micro farms, dual occupation (25% of the farms)

This type of farms refers to the young couples of the area of study who settle on the family land, already divided several times since the redistribution. They are often the descendants of independent small farmers or tenants, the least favoured by the land reform. They have thus less than 0,25 ha and cultivate by hand. However, they have access to a yoke at least once per cropping season, with the help of one working day returned to the owner for each ox borrowed. This is possible because their farmwork planning is not filled during work peak period (the maximum area that a farmer can cultivate in cultivation by hand is 0,4 ha). They have a ewe and a heifer in contract to share the usufruct, but have real difficulties to keep the latter until the age of production. The farmers of this type, in addition to a small food garden and close plot with manure, cultivate just a small plot with mineral fertilizer. Even if the gross added value obtained on the latter is low, it is very important to sow it for the farm management. Indeed, it makes it possible to constitute a small stock of straw for the foddering of animals in dry season. Their agricultural incomes are very weak (between 8 and 75 €/worker/year). They supplement it with an extra farm occupation passing thus to a total income ranging between 35 and 100€/worker/year. Off-farm occupation are variable (seasonal work in Awash during 3 to 6 months, logger, unskilled worker downtown, merchant with ass) and requires a heavy investment in labour force.

GAV/worker



Calendar of works (in days of work, Hj, for one working people)

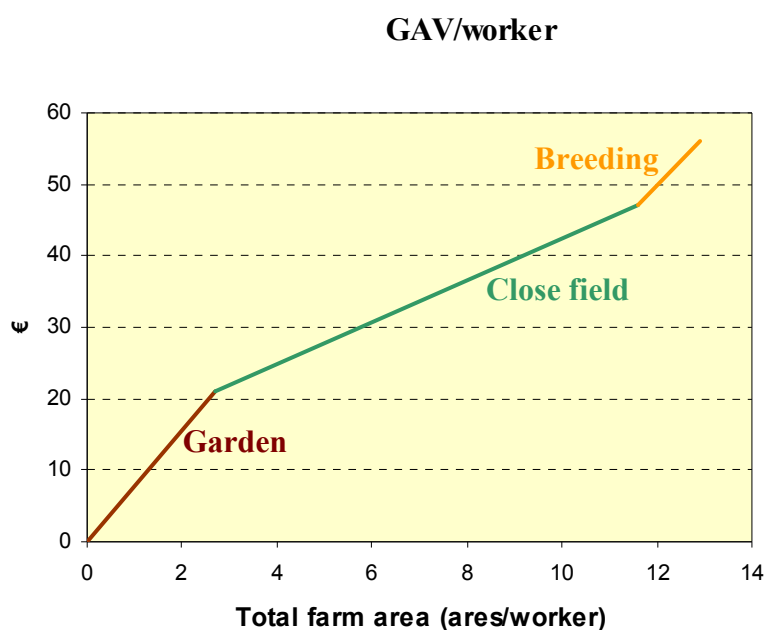
Farm type E			
workers : 2,25		Equipment : tekia...	
Total farm area : 0,2 ha		Depreciation of fixed capital : 2,3 €/year	
Cropping system			
Garden 0,045 ha		<i>Some enset</i> <i>coffee, maize, avocado, sugar cane, pumpkins,</i> <i>banana trees, orange...</i> GAV : 32 €	
Close field 0,08 ha		<i>GI : 39 €</i>	<i>OC : 1 €</i> GAV : 38 €
Distant field 0,06 ha		<i>GI : 15 €</i>	<i>OC : 5 €</i> GAV : 10 €
Trees 0,005 ha Eucalyptus		Total GAV CS : 80 €	
Livestock farming system with 0,01 ha of grassland			
Bovines 1 heipher in contract		<i>heipher</i> <i>OC</i> GAV	<i>Lambs</i> 13,5 € <i>Réform ewe</i> -0,5 € <i>OC</i> 3 € GAV 10 €
		<i>Ovines</i> 1 ewe	
		<i>14 €</i> <i>8 €</i> 6 €	
Total GAV LFS : 66 €			
TOTAL GAV : 96 €		TOTAL NAV: 94 €	
NAV/ha : 470 €		NAV/woker: 42 €	
Allocation added value			
Land tax 1,4 €	Animals in contract 14 €	Maintenance 3,5 €	Interest on crédit 4 €
Off farm income : 61 €			
FFI : 71€		FFI/worker : 32 €	TI/worker: 59 €

		Garden	Close field	Distant field
Production	10 ³ kcal	306	1580	331
	Proteins (g)	4977	34026	1280
% self consumption		100	100	75

Number of adults who can leave on the farm: 2 to 3

Type F : Owners giving their land in share-cropping, small off-farm occupation (25% of the farms)

These owners come as well from families of notable as of independent peasants or tenants. They underwent a decapitalization due to a large expenditure (wedding or death of a member of the family, disease...). These farmers do not have ox any more nor the working capital necessary for the purchase of seeds nor manure, so that they yield a part of their land in contract of share-cropping (with a farmer of the D type for example). They keep only a small food garden and a plot with organic manure that they cultivate by hand. Farms areas are between 0,2 and 0,9 ha. The women carry on a small outside activity in order to provide food needs for the family. The total incomes is between 40 and 110 €/worker/year

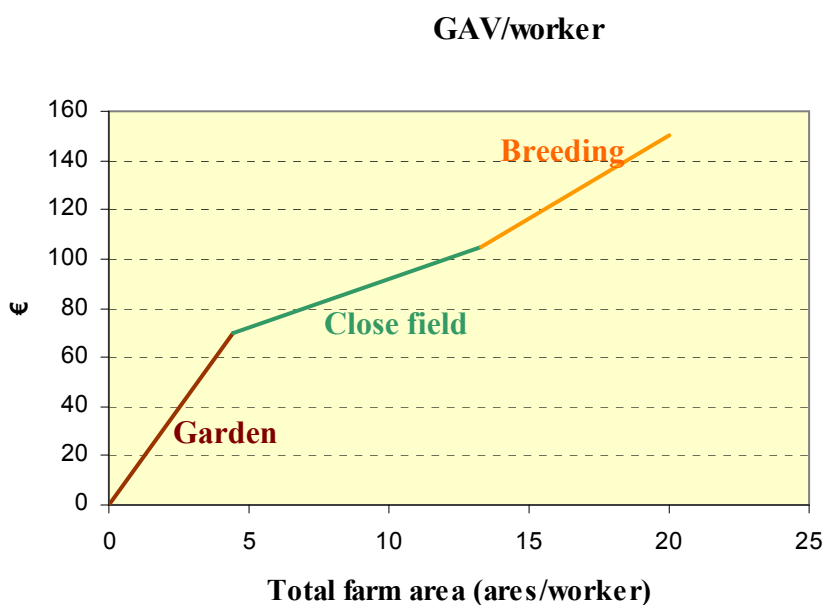


Farm type F					
workers : 2,25			Equipment : knife, tekia...		
Total farm area : 0,6 ha -0,3 ha given in share-cropping			Depreciation of fixed capital : 6 €/year		
Cropping system					
Garden 0,06 ha		<i>Few enset</i> <i>coffee, maize, avocad, sugar cane, pumpkins,</i> <i>banana trees, orange, tubers...</i>		GAV : 47 €	
Close field 0,2 ha		GI : 64 € OC : 5 €		GAV : 59 €	
Trees 0,01 ha Eucalyptus		Total GAV LFS : 106 €			
Livestock Farming system with 0,03ha of grassland					
Bovines 1 heipher in contract	<i>Heipher</i>	14 €	Ovines 1 ewe	<i>Lambs</i>	13,5 €
	<i>OC</i>	8 €		<i>Réform ewe</i>	0,5 €
	GAV	6 €		<i>OC</i>	3 €
				GAV	10 €
Total LFS GAV : 73 €					
TOTAL GAV : 126 €			TOTAL NAV : 120 €		
NAV/ha : 400 €			NAV/worker: 53€		
Allocation of added value					
Land tax 2 €		Animals in contract 14€		Maintenance 4 €	
Off-farm income					
Land rent 32 €		Trade or handycraft : 40 €			
FFI : 128 €		FFI/worker : 57 €		TI/worker : 75 €	

		garden	Close field	Field given in share cropping	eggs
Production	10 ³ kcal	615	3215	856	8
	Proteins (g)	857	47780	24704	13000
% self consumption		100	100	25	0
Number of adults who can leave on the farm : 3 to 4					

Type G : Notables yielding their land in share-cropping (1% of the farms)

They are "the non agricultural ones" of the area of study (teachers, male nurses...). They inherited familial lands, or they are sons of former independent great landowners who made studies and who carry out both the agricultural work and another activity. All yield a part of their land in share-cropping for lack of time to cultivate it themselves. Farm areas vary between 0,5 and 1 ha. The owners keep a large food garden and a close plot. Thanks to a high extra income (250 to 350 €/year), they buy many bovines on the local markets (Boditi). They keep approximately three cows in their house and place the others in share farming (type C, D, E, F). They allow thus many farmers who would not have the means of buying whole animals to have access to manure. The total incomes of these owners spread out from 430 to 610 €/worker/year.



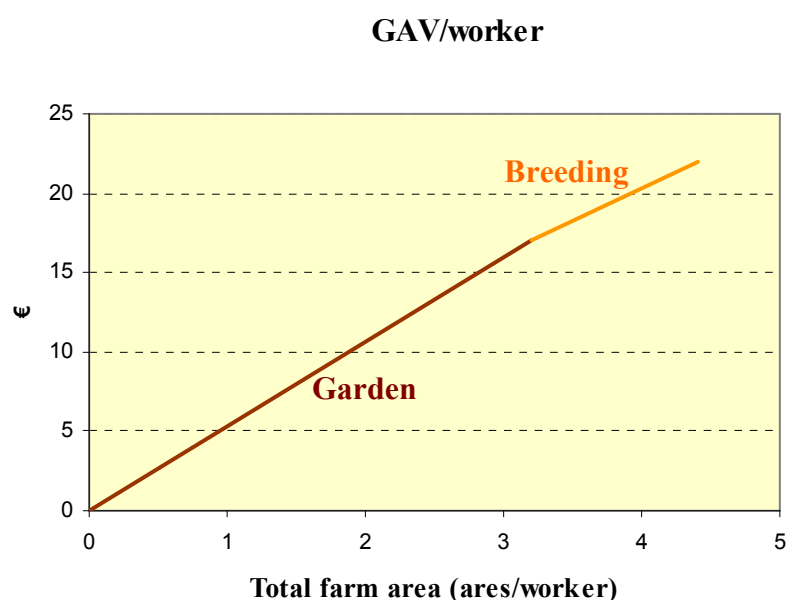
Farm type G					
workers : 2,25		Equipment : plough, ailea...			
Total farm area: 1,5 ha -1 ha given in share-cropping		Depreciation of fixed capital : 23 €/year			
Cropping system					
Garden 0,1 ha		Enset (10 ares) coffee, maize, avoacdo, pumpkins, papaya		GAV : 157 €	
Close field 0,2 ha		GI : 90 € OC : 10 €		GAV : 80 €	
Trees 0,05 ha Eucalyptus		Total GAV CS: 237 €			
Livestock farming system with 0,15 ha of grassland					
Bovines 2 cows		Dairy products 41 € calfs 19 € Réform cox 18 € OC 10 € GAV 69 €			
Ovines 2 owes		Lambs 27 € OC 6 € réform ewe 1 € GAV 20 €		Poultry 3 hens GAV : 12 €	
Total GAV LFS : 101 €					
TOTAL GAV : 338 €			TOTAL NAV : 315 €		
NAV/ha : 630 €			NAV/worker : 140 €		
Allocation of added value					
Land tax 3 €		Paiment of the labour force 5 €		Maintenance 4 €	
Off-farm income					
Animlas placed to share the usufruct : bulls, cows, calfs		250 €			
Remuneration of loans 100 €		Land rent 50 €		Off-farm activity 608 €	
FFI : 703€		FFI/worker: 312 €		TI/worker : 582 €	

		Garden	Close field	Field in share cropping	Dairy products	eggs
Production	10 ³ kcal	1502	2186	2855	308	240
	Proteins (g)	720	56710	82346	15680	39000
% self-consumption		100	75	50	50	100

Number of adults who can leave on the farm : 5 to 7

Type H : Widows yielding their lands in share-cropping, dual occupation (6% of the farms)

As we met in the type F, here the death of the husband causes a decapitalisation, and the absence today of male labour force does not make it possible to cultivate the whole owned land. Farming area is limited to a garden, because all the remainder is yielded in share-cropping. These farmers have a ewe and a young heifer. Just like the owners of the type F, it is rare to be able to keep the heifer until its setting in production. Farming area, lower than 0,07 ha, makes it possible to release very weak incomes (from 10 to 35€/worker/year). Even with extra incomes (land in rent and dual occupation), these women do not obtain a sufficient income to provide for their needs. The total income, between 75 and 95 €/worker/year, is indeed lower than the survival threshold (103 €/worker/year).



Farm type H			
workers : 1,25		Equipment : griffe à trois doigts, hache, couteaux....	
Total farm area: 0,4ha -0,33ha given in share cropping		Depreciation of fixed capital : 0,5 €/year	
Cropping system			
Garden 0,04 ha		<i>Few enset</i> <i>coffee, maize, avocado, sugar cane, pumpkins, banana trees, orange, tubers...</i> GAV : 39 €	
Trees 0,015 ha Eucalyptus		Total GAV CS : 39 €	
Livestock farming system with 0,015 ha of grassland			
Bovines 1 heipher in contract <i>heipher</i> <i>OC</i> GAV		<i>Poultry</i> 1 hen GAV 4 €	
14 € 8 € 6 €			
Total GAV LFS : 10 €			
TOTAL GAV : 49 € NAV/ha : 686 €		TOTAL NAV : 48 € NAV/worker: 38 €	
Allocation of the added value			
Land tax 1,4 €	Animals in contract 3 €	Maintenance 2 €	Interest on credit 3 €
Off-farm income			
Land rent 40 €		Trade or craft activity 25 €	
FFI : 39 €		FFI/worker : 31 €	
		TI/worker: 91 €	

		Garden	Fields given in contract
Production	10 ³ kcal	602	1420
	Proteins (g)	1613	36935
% self-consumption		100	75
Number of adults who can leave on the farm : 1 to 2			

3.4 ECONOMIC RESULTS AND ANALYSIS

3.4.1 Study of the Net Added Value (NAV) and of the farm family income per agricultural labourer

The Net Added Value represents the added value created on the whole farm. It takes in account the total added value created by the labour of the farmer, i.e. it includes the added value created on the cattle in contract, like on the land contracted in share-cropping.

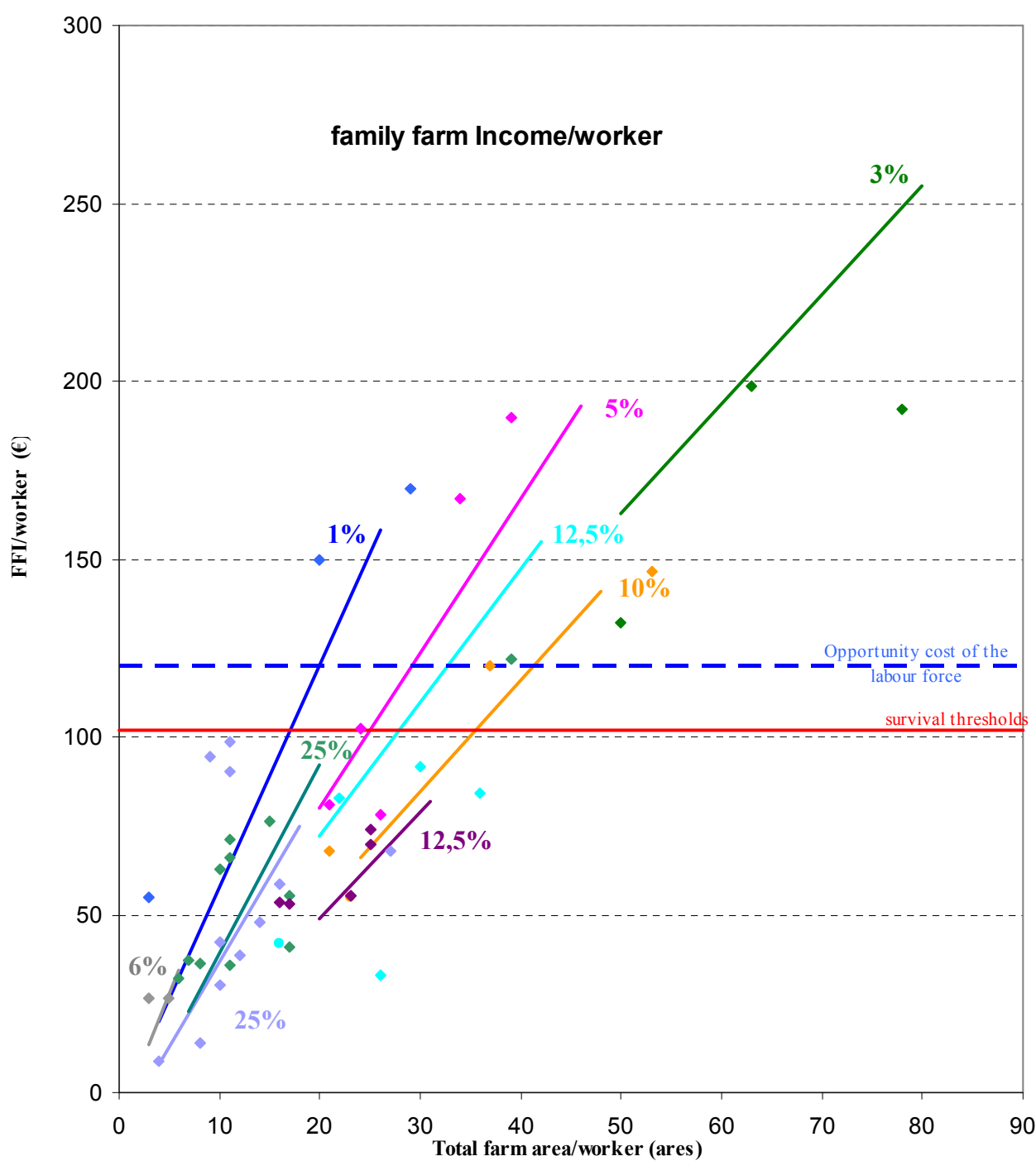
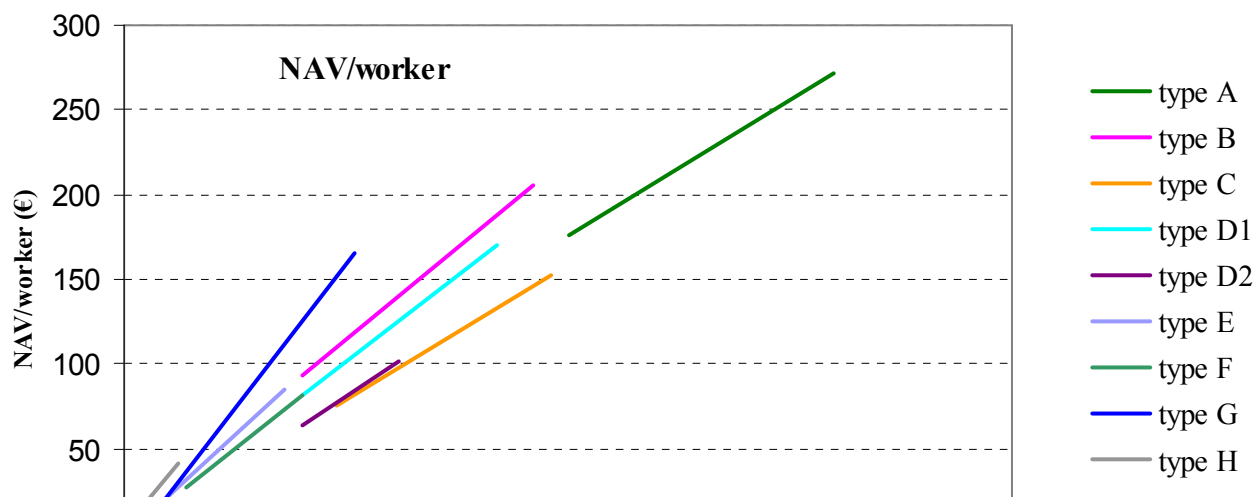
The difference observed between the net added value produced on the farm and the farm income earned by the peasants is related to the distribution of this added value. Indeed, half of the gross added value produced on the land in contract in share-cropping and on the animals in contract to share the usufruct pay the owner. Moreover it is necessary to take into account the interests to refund the credits taken out at high rates.

The slopes of the curves of sharecroppers (A, D1, D2) fall because of the land rent they must pay to the landowner (50% of harvest, except cost of the inputs). Concerning the farmers with animals in contract (C, D1, D2, E, F, H), it is the ordinate at the origin of the curve which decrease suddenly. Indeed, they have to give back an animal rent, which is almost half of the added value created. Thus, even if these types have almost the same productivities than the other categories of farmers, the rents (animal rent, land rent or combination of both) that they must give to the owner are such that their income is largely lower than the richness they created (NAV).

Only the types A and G release sufficient incomes to ensure the viability of their farm. They are in situation of accumulation. This has to be qualify in the case of A which is not sure to renew its contract of share-cropping from one season to another, and which could become vulnerable if he loses half of its farming area.

The types B, C and D1 are in intermediate situation, what means that these farms are weakened and not safe from a decapitalisation which would carry out them in type F or H in the event of hard blow (death, sale of oxen to pay debts).

The types E, F and H are below the survival threshold, what means that these farms are in a situation of great precariousness because they cannot survive with their farm incomes. In this case, the reproduction of the labour force requires either to fulfill some off-farm activities (D2, E and H), or to decapitalize (F). Thus, it is necessary to study the total farm incomes, in order to understand how these last farms are maintained in spite of a so weak farm income.



3.4.2 The contribution of off-farm incomes

The total income per worker modelization integrates the incomes earned outside the farm: payment for animals placed in another house (types G and A), land rent (types F, G and H) and off-farm employment (types C, D, E, F, G and H). It makes it possible to show that in spite of the addition of an external income, the majority of the farms are still below the survival threshold, i.e. in a critical situation.

How to explain then such a density of population in this context where neither the farm income and nor the total income make it possible to have a viable farm?

3.4.3 The impact of the SAFETYNET program

The objective of SAFETYNET program launched by the World Bank in 1998 is to enable the poorest not only to limit the decapitalisation in case of hard blow (bad year, death...), but also to invest in cattle in order to capitalize and not depend on the income of *Cash for Work* anymore to live.

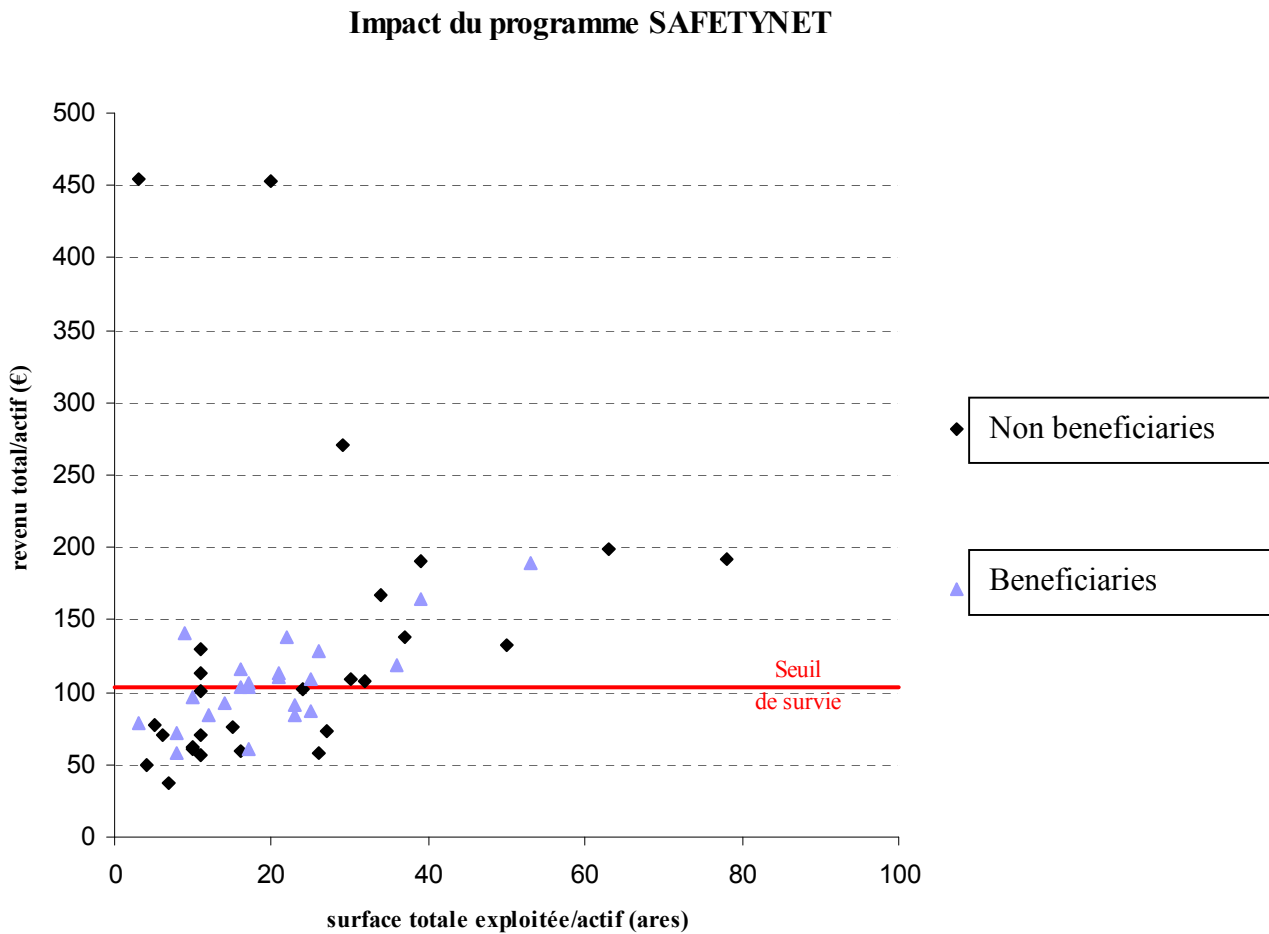
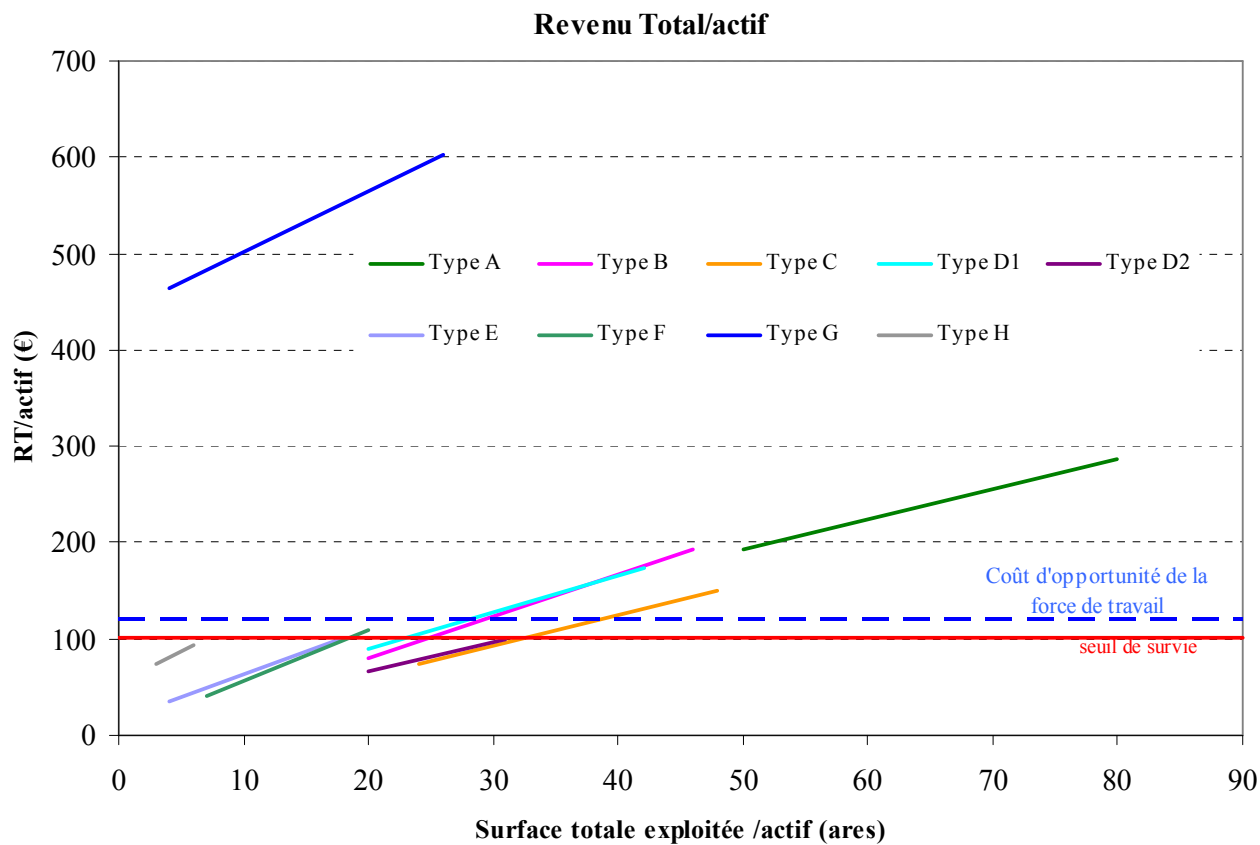
This graph presents the total incomes earned by the surveyed farms. It take into account the incomes of SAFETYNET (farms which are symbolized by a triangle). This objective, in the *kébélé* of Obe Jage, is thus not achieved since these incomes payed by SAFETYNET just enable them to reach the survival threshold.

We did not include the SAFETYNET program in our modelization because the selection criteria of the farms do not correspond to our typology. They are rather obscure since all the types that we presented can benefit from the program while many farmers of the types E, F and H, the poorest according to our modelization, are excluded of this program.

The impact of this income payed by SAFETYNET seems to be very interesting if we focus on the use that the farmers do of this money. Indeed, we noted that a part of the peasants beneficiaries did not resort to credit to cover the expenses of first cropping season this year. Moreover, we met peasants, beneficiaries from last year, who have succeeded in investing in a ewe. The sale of the lambs enables them today to be a little more self-sufficient and a less dependent from credits.

In almost all the cases, these incomes payed by SAFETYNET are spent on the purchase of food for the family. However, the wages, payed approximately every three months, for six months, are around April and July, months of high food demand (welding period from March to May) and of sowing (April and July). According to the peasants, one of the first reasons of the spectacular prices explosion observed this year during the welding time would be related to the payment of these incomes (the merchants would increase their prices the day of payment of the wages and then they would maintain them high). Thus, the major part of the income was spent to compensate the prices rise, while for the non beneficiaries' peasants it was more and more difficult to face this big rise.

The study of these results partly enables to explain how the population keep on surviving in spite of the low incomes released by their work



We do not take into account the incomes earned by the farmers (cf graph) who benefit from the **second section** of the SAFETYNET program, launched in July in our area of study. This last is a loan of 160 € of cattle (an ox and a heifer). The criteria of selection once again seems to be obscure, because we noted that the beneficiaries belong to the types B to E.

The selected peasants go to buy animals with members of the SAFETYNET committee (mayor of Obe Jage, development agents of the government), who pay for him and sign a declaration of loan. This wave of purchase resulted first in taking part to the incredible rise of the prices observed this year.

This loan is likely to modify temporarily the proportions we announce in our typology. For example, this lately equipped farmers could recover their land given in share-cropping, and cultivate others.

Moreover, we fear that this equipment will put the farmers in a situation even more difficult than the current one. Indeed, to keep an animal on one's farm depends directly on the capacity of the peasant to support the costs related to the purchase of fodder. However, the majority of the farmer who benefit from this program is not able to support these costs. This can lead them either to get into debt, or to sell all or a part of the animal.

The beneficiaries are encouraged to yield a profit from this investment, by the agents of MoA : ploughing or reproduction, fattening and sale repeated in order to create a capital. However, a refunding, whom interest rate will be fixed only in one year, will be requested to them in two years. Thus, they will then have to possess a capital which exceeds the annual income of the majority of them. In front of the delicate farmers situation in the area, we could bet that this section can lead to new problems of decapitalisation.

From this analysis, it comes out that in addition to the types A, B and G, who are more well-to-do, thanks to speculations (storage of seeds, animals in contract), the majority of the farmers of the region are not safe from a decapitalisation. The types C, D1 and D2 are thus very vulnerable and the loss of the land in share-cropping, a climatic accident or a death in the family could lead them to the spiral of decapitalisation, which would make them evolve to the types E or F even H. So more than 75% of the farms of the studied area are in a process of impoverishment.

4 CONCLUSIONS DISCUSSIONS

The majority of the farms are in crisis and do not obtain sufficient incomes to reproduce their labour force. Some do not have sufficient areas to use the whole potential of their animal draught power (types D1, D2 and C). Others cannot structurally live from their farm (types E, F and H). In this case, area which has to be cultivated to exceed the survival threshold is very close to the maximum area that a farmer is able to cultivate. These farmers are thus obliged to find other sources of income. These last partly concern the young people who leave to search only temporary employment, because there is no viable migration opportunities in the area. Thus, this region already overcrowded can not empty.

Because of the progressive reduction of the size of the farms since the fall of the empire, the large majority of the farms of the area are in a critical situation. These are tiny farms whose area, lower than 0,5 ha does not make it possible to obtain a sufficient level of production to nourish the families in more than 75% of the cases (cf food balance per type in appendix). Then, the farmers are not only brought to consume a great part of their harvest but also to buy the majority of their food and seeds with credit.

This level of production, already insufficient, risks to decrease because of the crisis of fertility. Indeed, the number of bovines per peasant is decreasing because of the successive period of decapitalisation, of the rise of prices and the rarefaction of fodder. So the quantity of organic manure available decreases and becomes quite insufficient to renew the soil fertility.

The farms of the area are for the majority excluded from the access to chemical fertilizers through the credit. As they have only a small working capital and as the prices on the informal market are very expensive, it is difficult for these last to get enough fertilizer. To maintain the soil fertility thus seem impossible and the levels of yield are strongly threatened.

OUTLINES

City side :

To empty the countryside, it is necessary that the temporary departures become permanent. This supposes an urban development which would offer job opportunities in the industrial or tertiary field. However, Ethiopia “*is not involved in an uncontrolled urbanization*” (Gascon) and the urban development isn’t currently started. Thus, in the short term, it seems that the next generation is condemned to stay in the area.

Countryside side:

We’ve shown during our analysis that the historical evolution of the area led to weaken the ecosystem, more and more in demand. One of the consequences would be “the amplification of the phenomena of natural soil erosion under the action of winds, rains and streaming water, following the clearings, ploughings and overgrazing” (Mr. Dufumier, 2004).

With regards to our area of study, the reduction of the vegetation cover has to be qualified because of the bocage present on the territory, which gradually increase, reducing effectively the erodibility.

Moreover, the analysis of cropping systems shows that the garden and the close fields, significantly manured and whose soil is continuously covered of mixed crops with different stages, seem relatively protected from the impact of rain drops and thus from the running-off. The distant plots, however, exposed in period of strong rain (between first and second cropping season) are exposed to the aggressiveness of the rains. According to the topographic conditions, some plots are even more erodable than others.

Thus, the erosion is mainly **localised** in the distant plots. However, we've shown during this study that these last were less intensely cultivated by the peasants because they do not have enough means of production (working capital, manure necessary to the reproduction of the fertility, tools). An efficient erosion control would thus consists first to lift the factors that limit the intensification of the distant fields.

Does the project of erosion control carried out by the NGO Inter Aide make it possible to meet this objective?

The anti-erosion structures extended by Inter Aide consist in constructing a vegetalized ditch. This ditch stabilizes in about three years and allows the constitution of progressive terraces limited by filter grass bands.

We noted that the programme of soil conservation concerns the farmers of all the types that we presented (except types H and G). It thus affects also the poorest farms of our area, i.e. most vulnerable compared to the effects of erosion. Moreover, the anti-erosive structures which are drawn in agreement with the practical requirements of the peasants (cropping pattern, crop management...) are almost always carried out on the distant fields, i.e. where the plots are more exposed.

According to testimonies that we collected and the observations that we carried out, it seems that the realisation of the anti-erosive structures makes it possible to limit the losses (seeds and inputs) due to the run-off. By limiting these losses, the expenses of cultivation would be thus reduced. Nevertheless, it is still impossible to show the impact in quantitative term (yield increment, estimation of the reduction of the losses).



Wheat seeds held back thanks to the grass band

Source : E. Le Gal, N. Molinier, 2006

We also noticed that some farmers, involved in this project since the beginning (case of the Koysha village unit) are in a process of intensification on their distant fields (introduction of tubers, crop successions sweet potato/sweet potato normally reserved to close field, application of organic manure). This perhaps testifies of an “improvement” of these soils. According to our investigations, these peasants had bovines when they joined the project. Before the implementation of these vegetalized bands, the dejections collected were entirely intended to the garden and the close field. Once their soils protected, they modified the distribution of manure. It enabled them to extend their close field i.e. to intensify the distant field. These peasants have today, in comparison with the farmers located under the same agro-ecological conditions and with the same number of bovines but without any anti-erosion structure, a more important field with organic manure. For the farmers involved in the project without bovines, we did not observe such changes of practices.

We would thus suppose that the implementation of these structures would be a necessary but not sufficient condition to the intensification. Intensification would be indeed related to the level of capital of the farmer, in particular to the number of bovines.

However, we are not able to pronounce us definitively on the impact of these anti-erosion structures.

On the one hand, as we cannot evaluate quantitatively the impact of these vegetalized bands on the outputs, we cannot draw any conclusions concerning the farmers who haven't manure. In addition, in spite of the few cases where the evolution of the practices is notable, these situations seem insulated, since the majority of the peasants involved in the project did not finish the implementation of their structures (it

requires three years to become stabilized). Thus, this analysis will have to be supplemented with a study within two years in order to have a sample of beneficiaries farmers, in cruising speed, more important.

For the owners of bovines, this project seems to lead to a possible intensification of the distant field and this more especially because the major interest of these anti-erosive structures is linked with their vegetalisation of fodder hedges. We insisted a lot on the fact that fodder is one of the most important limiting factors of the current agrarian system. However, as we explained previously, the use of these fodder hedges would enable to save a third up on the fodder in dry season to feed bovines, but also to limit the export of the residues and thus to reduce the decrease of the organic rate of soils. This work on fodder could be supplemented with the increase of the potential of production of the small meadows. For example, the introduction of fodder leguminous or varieties of graminaceous with high fodder value (triticale) but not requiring chemical fertilisers could be envisaged.

The seeds conservation is a major stake for the peasants of Obe Jage who, for the majority, do not succeed in saving enough seeds from one season to the other. By supporting groupings of farmers to save stocks of seeds, the NGO Inter Aide can take part in limiting the credits (to purchase seeds at the sowing time). In addition, it can help the peasants to increase their freedom to manage their farm: the planning of rotations and the management of the rotations would from now on not be regulated any more by the availabilities in working capital at the time of sowing.

As regards to our area of study, farmers use this year a stock of wheat seeds saved since the harvest of December 2005. The peasants involved in this initiative we met told us not to have suffered from this "lack of grain".

Moreover, if all the peasants recognize an increase of their yield (the NGO supplements the stock with improved seeds), what we cannot confirm because of our difficulty several times evoked to establish precise yields, they regard as less tasty the produced grains compared to the local variety.

We also noted that the straw of wheat is not really used by the farmers thanks to the advices of the MoA. Thus, even if it appears essential to go on the actions begun on wheat, they could be extended to others crops. The barley could be interesting, because it has a good food and fodder value (straw), recognized by the farmers. However, the costs to cultivate it are higher than the other cereals (strong difference between sowing and harvest price and very high density of sowing), what limits its production. It would be thus very interesting to integrate it in the actions of Inter Aide. The bean, used by all the farmers and determining food to exit the wedding period could also enter within the framework of the priorities.

Other proposals

The access to fertilizer must be democratized in the region. Rather than a system of credit for these farms turned on the subsistence farming and with low income, it would be possible to implement subsidies by the State to lower their costs. Moreover, it would be necessary to reconsider the technological packages and to offer more flexible solutions to the farmers in term of quantity.

Small actions making it possible to decrease the painfulness of labour would enable to release time to carry on a small off-farm activity that gives an supplementation income but also to make the farming operations more effective. For example, the access to more powerful tools and means of transport for these farmers who have low

diversified tools and ridiculous means of transport (on Man's back) would be possible (ex: to facilitate transport of the manure for the women).

The delay on research concerning the onset must be filled. In agronomic research topic, an effort should be related to the study of the mixed cropping systems ignored from the agricultural development offices.

Lastly, the difficult access to animals (bovine, ovine) and thus to the manure put in a critical situation many farm considering the renewal of the fertility. Why not taking as a starting point the small animal breeding of guinea-pigs practised in Ecuador or in Peru under similar agro-ecological conditions? This small rustic herbivore, with a very high prolificity has the capacity to convert household refuse and crop residues into meat, but especially into recoverable dejections. These guinea-pigs, accessible to the poorest farmers could thus be a very productive and easily controllable breeding. (But what about the alimentary taboo?)

Thus, in spite of the Malthusians analysis, even if the land is rare and the farms increasingly reduced, margins of progress do exist!

APPENDIX

APPENDIX 1 : Longitudinal section and cross-section of the study region

APPENDIX 2 : Cropping schedule

APPENDIX 3 : sheep flock herding scheme

APPENDIX 4 : A mass of contracts

APPENDIX 5 : Tools : use, price, maintenance, depreciation

APPENDIX 6 : table of main technical and economic datas used for the calculation concerning the breeding

APPENDIX 7 : Table of the inputs price evolution during the year in the area of study

APPENDIX 8 : Table of technical datas concerning crops

APPENDIX 9 : Table of main species that can be cultivated in the region of study

APPENDIX 10 : Survival and renewal thresholds

APPENDIX 11 : Calculation method for worker numbers within the farm and for maximum area which can be cultivated per worker

APPENDIX 12 : the farm's income calculation

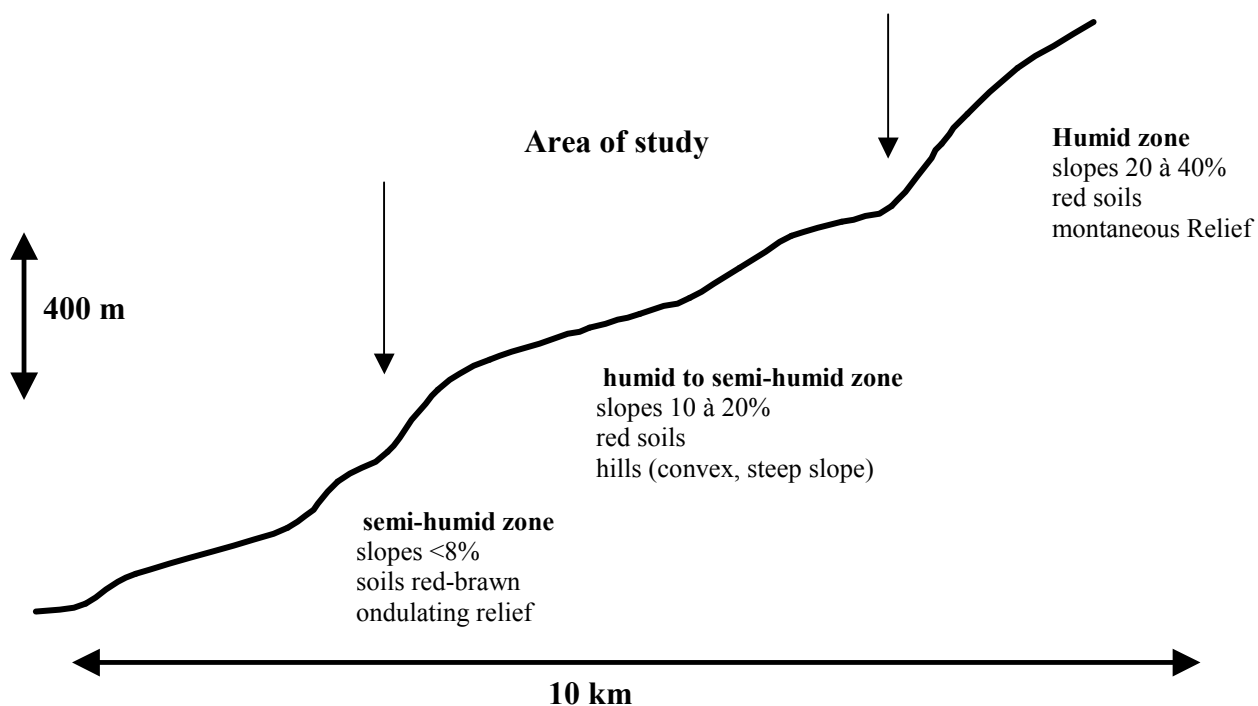
Appendix 1

LONGITUDINAL SECTION NORTH/SOUTH OF THE STUDY REGION

Paralell to the volcano axis

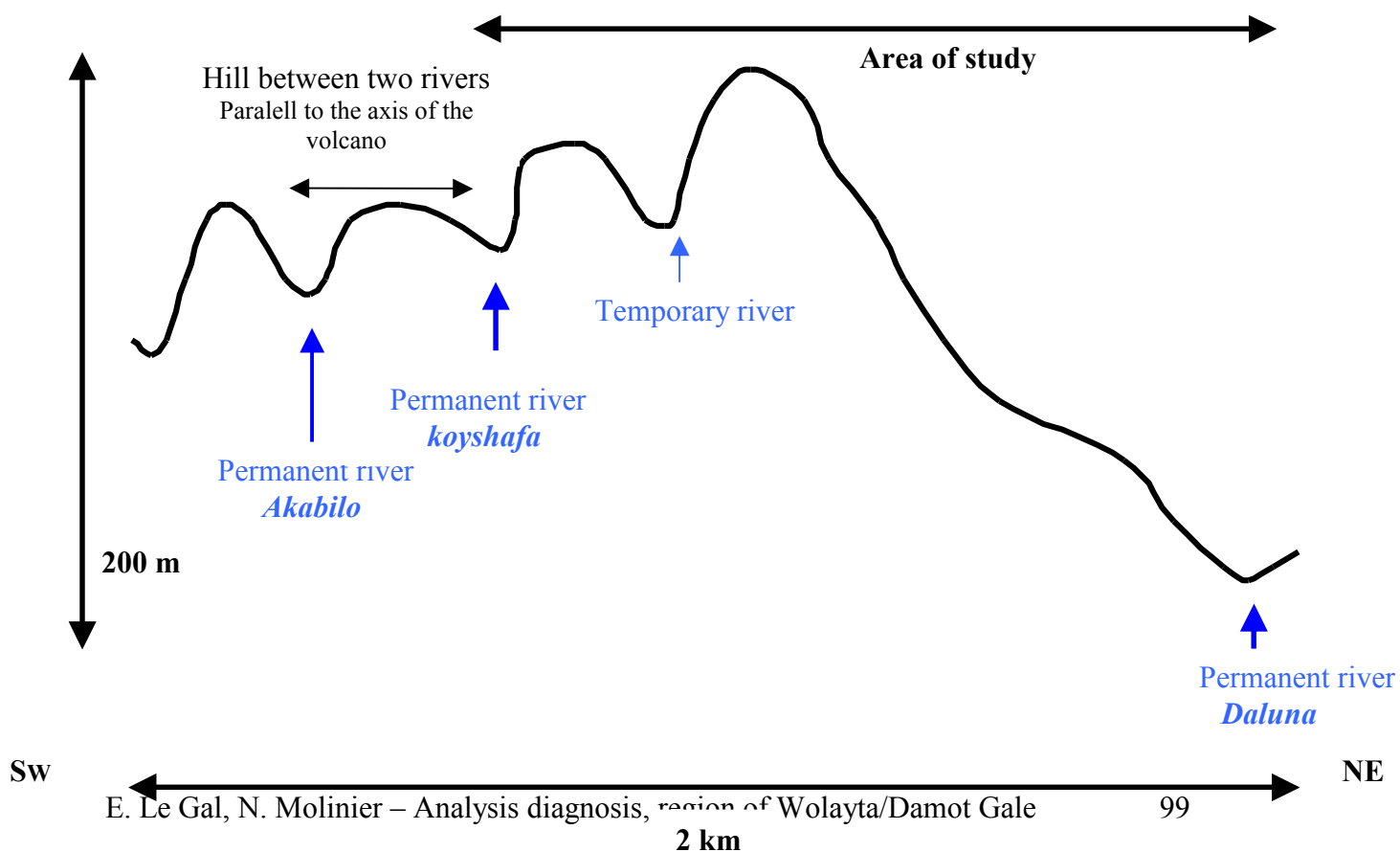
NORTH

SOUTH



CROSS-SECTION SOUTH-WEST/NORTH-EAST OF THE STUDY REGION

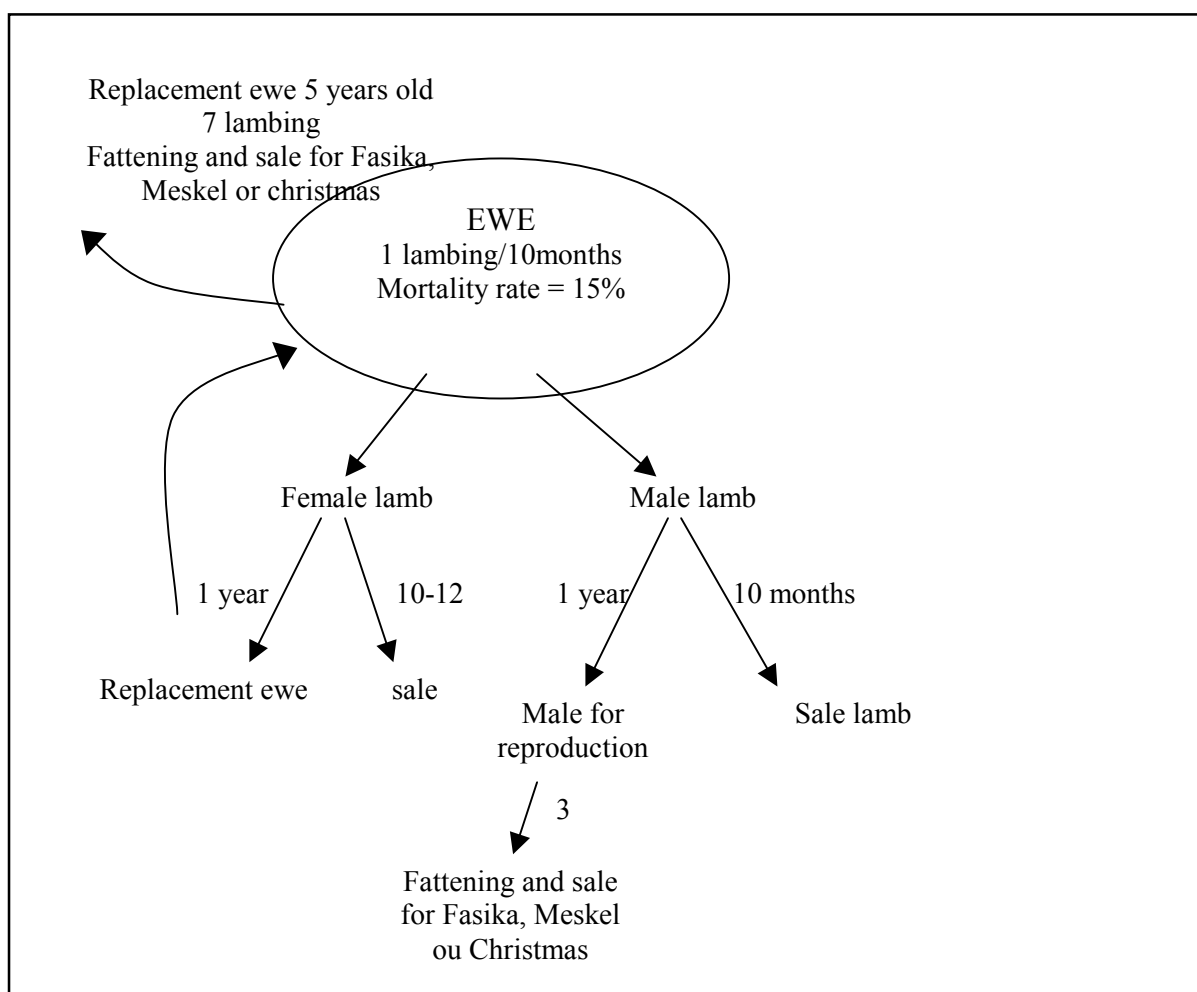
(Perpendicular to the axis of the volcano)



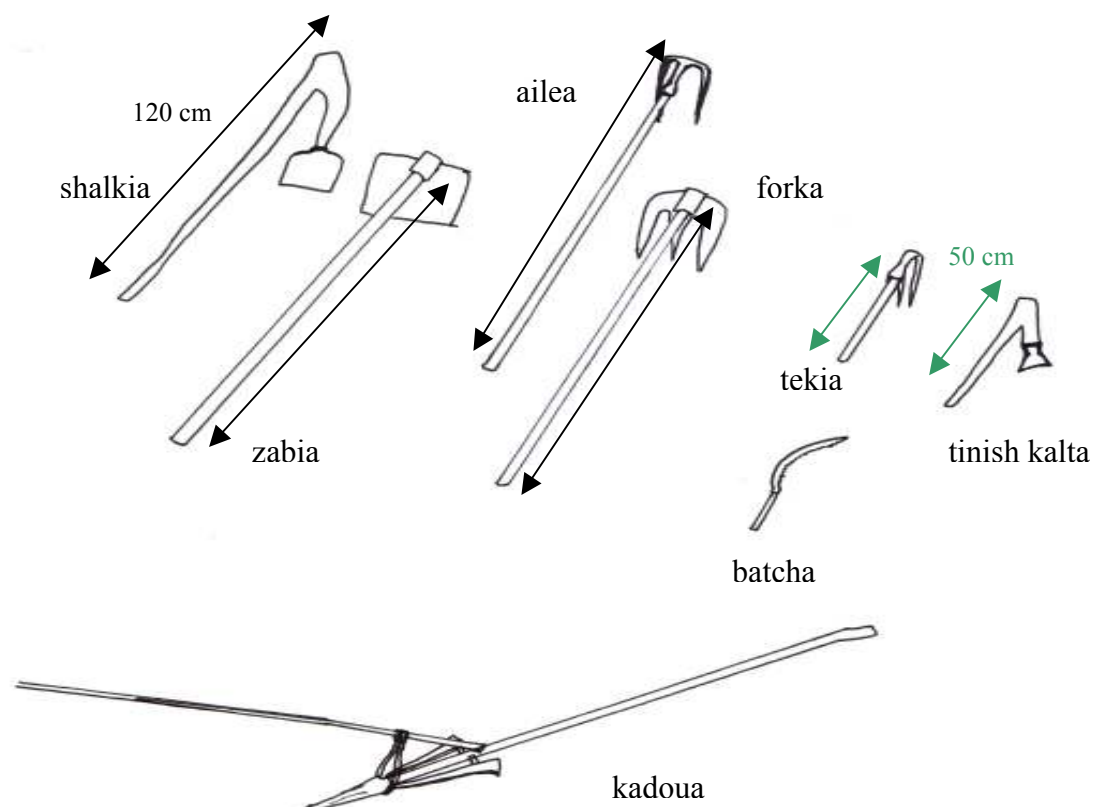
Appendix 2



Appendix 3 : sheep flock herding scheme



Appendix 5



tool		use	price	Lifespan (Year)	Maintenance (€)	Depreciation (€)
<i>Ailea</i>	Big two fingers claw	Plantation/harvest of tubers	1,8	18	0,04	0,1
<i>Akafa</i>	Shovel	Rehabilitation of anti-erosive structures	1,5	6	/	0,25
<i>Batcha Farenja</i>	Manufactured knife	Cereals harvest Weeding Fodder harvest	2	8	0,06	0,25
<i>Batcha Wolayta</i>	knife	Cereals harvest Weeding Fodder harvest	0,4	2,5	0,06	0,2
<i>Betia</i>	Axe	Cut trees	3	15	0,6	0,4
<i>Forka</i>	Big three fingers claw	Plantation/harvest of tubers	4	10	0	0,4
<i>Kadoua</i>	Plough	Ploughing	2	5	0,2	0,4
<i>Macha</i>	Knife for <i>kotcho</i>	Extraction of <i>kotcho</i>	0,6	5	0,1	0,1
<i>Magasia</i>	Saw	Sawing off	8	8,5	0,1	1
<i>Shalkia</i>	hoe	Mais harvest Trees plantation	1	14	0,25	0,07
<i>Tekia farenja</i>	Manufactured two fingers claw	hoeing, sowing, harvest	1	3	0,05	0,3
<i>Tekia Wolayta</i>	Two fingers claw	hoeing, sowing, harvest	0,5	4	0,05	0,1
<i>Tilik kalta</i>	Large axe	Cutting trees	1,5	17	0,1	0,1
<i>Tinish kalta</i>	Little axe	Cutting of branches	0,35	vie	0,03	/
<i>Zabia</i>	Big hoe	Working the land Cutting the roots	3	4	0	0,75

Appendix 6

AGE		PRICE €	PRICE MESKEL €
CALVES	7 months	8	
	9 months	10	
OXEN	2 years	20	15
	3 years	45	40
	4 years	50	
	5-6 years	80	
	7-8 years fattening	140	160
	10-12 years fattening	155	200
	10 -12 years	115	

DAIRY PRODUCTS	milk	0,1 € /kg
	« little milk »	0,04 €/kg
	butter	3€/kg

COWS	2 years	18	12
	3 years	20	15
	4 years	47	
	5-6 years	75	
	17 years fattening	95	110
	17 years	65	
LAMBS	10 weeks	9	
Ewe	1 year	12	
	5 years	10	
BELIER	1 year	10	
	4 years fattening	30	
POULTRY	hen 1 year	0,65	
	Coq 1 year	1	

CATTLE	lactation	8,25 months
	Duration between two calving	20 months
	Total milk production/ lactation	546 L
	Butter produced/lactation	14 kg
	Number of caves/cow	7
	Mortality ate of calves reform	40%
OVINES		17 years
	Duration between two lambing	10 months
	Number of lambs /ewe	7
	Mortality rate of lambs réform	546 L
POULTRY		5 ans
	Age of laying reform	8 months
	Number of eggs/ year	4 years
	Number of chicken/year/hen	100
	Mortality rate	10
		70%

Appendix 7: Table of the inputs price evolution during the year in the area of study

Products of the garden	price	datas
Coffee	0,6€/tree	
Enset	1,5-2€/aïta	660aïta/ha
Papaya	0,5€/tree	
Avocado<15 years	3,5€/tree	
Avocado>15years	7€/arbre	
Orange	5€/arbre	
Sugar cane	0,5€/plant	
Pumpkins	0,4€/sowed seed	
Casava	0,1€/plant	
Banana	1€/plant	
Guesho	1,5-3€/arbre	1 brassée = 1,5€
Sweet potato leaves	26€/ha	1 brassée = 0,2€, 132 brassée/ha
Cabbage		

Price (bi/kg)	jan	feb	mar	apr	may	jun	jul	aug	sept	oct	nov	dec
Fava bean	1,6	2					2,5		1,6			
Haricot	1,4	2,5				1,4		2,5		1,4		
Red tef	2	2,3						2,5		1,4		
White tef	2,3	3						3,2		2,3		
Wheat	1,5	1,6				2					1,5	
Pea	2						2,5				2	
barley	1,5							1,7			1,7	
Maize wol	0,4											
Maize glob	1		5				1					
Sweet potato	0,2	0,3								0,3		
potato	0,4	0,6			0,5		0,3		0,5			0,4
Potato wol	0,4											
DAP	4,5											
urea	2,6											

ANNEXE 8 : Table of technical datas concerning crops

Close fields with organic manure	Sowing (kg/timad)	Yield (kg/timad)
Maize wolayta	7,2	350
Haricot	8	45
Pea	20	100
Fava bean	13	150
Taro	280	1500
Igname	250	2500
Sweet potato Harvest in october		3000
Sweet potato Harvest in january		2000
Sweet potato Harvest in july		2500
Sweet potato in mixed cropping harvest in october		2000
Sweet potato in mixed cropping harvest in july		1500
Wolayta potato	250	1300
Potato	320	1600

Distant fields with chemical fertilizer	Sowing (kg/timad)	Fertilizer DAP (kg/timad)		Yield (kg/timad)
Haricot	12	11		204
Red tef	24	20		185
Barley	42	13		250
Maize global	19	12	12(Urea)	540
Pea	23			185
Wheat	19	11		201
White tef	16,5	14		180

APPENDIX 9 : Table of main species that can be cultivated in the area of study

	SCIENTIFIC NAME	WOLAYTA NAME	AMHARIC / ENGLISH NAME
TREES	Acacia abyssinia/albida	<i>Odoro</i>	<i>Girar</i>
	Cordia abyssinica	<i>Mogota</i>	<i>Wanza</i>
	Juniperus procera	<i>Tida</i>	<i>Tidh</i>
	Podocarpus gracilior	<i>Zegua</i>	<i>Zigba</i>
	?	<i>Zaguia</i>	<i>?</i>
	Ficus vasta	<i>Wola</i>	<i>Worka</i>
	Croton machrostachys	<i>Anka</i>	<i>Bessana</i>
	Erythrina abyssinica	<i>Korch</i>	<i>Korch</i>
	Olea africana	<i>Wera</i>	<i>Wyria</i>
	Gravillea robusta		
	Eucalyptus globulus	<i>Bota Zafia</i>	<i>Netch Bahirzaf</i>
	Euphorbia candelabrum		<i>Kulqual</i>
CROPS	Persea americana	<i>Avokado</i>	Avocado
	Musa acuminata	<i>Musa</i>	Banana
	Hordeum vulgare	<i>Banga</i>	Barley
	Phaseolus vulgaris	<i>Lokoma</i>	Haricot
	Vicia faba	<i>Bakela</i>	Fava bean
	Brassica oleracea	<i>Santa</i>	Cabbage
	Manihot esculenta	<i>Mitaboy</i>	Casava
	Coffea arabica	<i>Tuke</i>	Coffee tree
	Ensete vantricosum	<i>Uta</i>	Ensete
	Allium sativum	<i>Tuma</i>	Garlic
	Zea mays	<i>Badala</i>	Maize
	Mangifera indica	<i>Mango</i>	Mango
	Allium cepa	<i>Sinkrut</i>	Onion
	Carrica papaya	<i>Papaya</i>	Papaya
	Pisum sativum	<i>Atara</i>	Pea
	Solanum tuberosum	<i>Galla dono</i>	Potato
	Sorghum vulgare	<i>Maldua</i>	Sorghum
	Saccharum spp.		Sugar cane
	Ipomoea batatas	<i>Shukara</i>	Sweet potato
	Colocassia antiquorum	<i>Boyna</i>	Taro
	Eragrostis abyssinica	<i>Gashe</i>	<i>Tef</i>
	Triticum aestivum	<i>Guistie</i>	Wheat
	Coleus edulis	<i>Wolayta dono</i>	Wolayta potato
	Dioscorea spp.	<i>Boye</i>	Igname

Appendix 10 : Survival and renewal thresholds

To calculate this threshold, concerning the food, we considered the minimum daily needs of a family of two adults, one teenager and two young children (2,25 full-time workers).

	état	Daily needs (kcal/day)
man	Moderate effort	3000
woman	Moderate effort	2800
Children 10-12 years old	Light effort	2000
Children < 10 years old	Sedentary	1600

It is based on the typical food calendar of the inhabitants of the region. The consumption follows the harvests or the food stuff which are available during the bridging period (from February to the beginning of May).

The hard blow is calculated over 35 years, what is the middle duration with the same people managing the farm. Weddings and funerals are the major factors of decapitalization for the farms of Wolayta, that is why it is necessary to take it into account. A wedding or a funeral costs approximately 200€.

survival threshold	(€/year)
total	231
food	185
clothes	16
Kerosene, salt, soap	14,5
Contributions (<i>Idir</i> , school, others...)	2
Depreciation and maintenance <i>tukul</i>	6
Hard blow (over 35 years : 2 weddings, 1 funeral)	7,5

The survival threshold per full time worker is then : $231/2,25 = 103 \text{ €/worker}$

Estimation of the opportunity cost of the labour force :

Work opportunities exist in the towns, even if they are rare. Most of the time it will be little activities of merchant of butter in Addis Abeba, worker in Soddo or Boditi.

A full time worker earn **120€ per year**.

ANNEXE 11 : Calculation method to evaluate the number of full time worker within the farm and the maximum area which could be cultivated per worker

Determination of maximal area which is possible to farm

Even if farmers lend oxen between themselves, it is still difficult to find an ox (one day of work has to be given back for one ox loaned). When the farmers are ploughing between the two cropping seasons, their access is then a limiting step.

According to our investigations, farmers plough a plot each fifteen days. We want to determine the area which is possible to plough during this period.

Hypothesis :

- 1 ox works 6h/day, what corresponds to 19 ares.
- The farmer ploughs or works by hand 6 days per week (so 12 days during the two weeks).
- Working the soil by hand with the two fingers claw allow to do 2,5 ares per day.
- We add the area of eucalyptus and grassland, to the area which is possible to farm according to the means of production.

Maximal area which is possible to farm, taking in account the means of production :

<i>Area farmed max/worker</i>	Number of days with the plough	Number of days by hand	Area farmed (are)
2 oxen	12	0	2,8
1 ox	6	0	1,15
½ ox	5	0	0,95
0 ox	1	9	0,45

Estimation of the number of workers

We estimated that the number of workers necessary to have a good management of a farm is 2,25 :

- ¼ worker : a child is present 50% of his time on the farm. He takes part to the management of the cattle (harvest of fodder, livestock watering, watching over the herd)
- 1 male worker : he ploughs and carry out the cultivation operations
- 1 female worker : she cooks, take part to the management of the cattle and take care of the garden

APPENDIX 12 : Details of the economical calculations

Calculation of the Net Added Value (NAV)

$$\mathbf{NAV = GP - OC - Depreciations}$$

GP (Gross Product) = **PRODUCTION** × **PRICE** (sold and self consumed production)

OC (Operationnal Costs) = Seeds, fertilizer, insecticide, herbicide...

Depreciations = amortisation of fixed and biological capital (equipment, plantation, tools...)

Calculation of the Farm Familial Income (FFI)

$$\mathbf{FFI = NAV - T - I - S}$$

T = Land tax for the State

I = Interests on the credits taken out to usurers and/or kamadja

S = Sharecropping = part of the added value which is given to the sharecropping partner

Calculation of the Total Income (TI)

$$\mathbf{TI = FFI - Off Farm Income}$$

Off Farm Income = Land annuity for farmers who give their land without taking part in the production process, annuity of the animals placed in other farms. Off farm activity (handycraft, temporary work in Awash, little merchant, ...)

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Introduction.....	1
1 General framework of the study	4
1.1 Institutional context	4
1.1.1 Presentation of Inter Aide's activities.....	4
1.1.2 The demand : origin, transformation	4
1.2 Methodology.....	5
1.2.1 The agrarian diagnosis	5
1.2.2 Complementary study	6
1.2.3 The main difficulties we met	6
1.3 General presentation of the study region	7
1.3.1 Location of the study region	7
1.3.2 Bio-physical characteristics of the study region	9
1.3.3 Socio-économique characteristics of the study region	11
1.3.4 Farming activities and trade.....	12
2 Recent evolutions of agriculture in the study region	17
2.1 Introduction.....	17
2.2 The second reign of the negus Hailé Selassie : an agrarian system built on a feudal society (1941-1974)	18
2.2.1 The agrarian landscape	18
2.2.2 Social relationships	20
2.2.3 Livestock farming and cropping systems	21
2.2.4 Farm typology at the end of the 60's	24
2.3 The socialist regime (1974-1991).....	24
2.3.1 The agrarian reform and its consequences.....	24
2.3.2 The intensification of the regime (1980-1991).....	29
2.4 The liberal era (1991- today)	31
2.4.1 The market liberalization	31
2.4.2 Extention programs : Sasakawa/Global 2000	32
2.4.3 A new work intensification.....	33
2.4.4 Development of off-farm work and temporary migrations.....	34
3 The present agrarian system.....	37
3.1 Access to means of production	37
3.1.1 The land	37
3.1.2 The workforce.....	38
3.1.3 The capital.....	38
3.2 Cropping system, livestock farming system and management of the fertility	38
3.2.1 The cropping systems	39
3.2.2 The livestock farming systems	60
3.2.3 A close association between agriculture and breeding	66
3.3 Farm typology.....	70
3.4 Economic results and analysis	88
3.4.1 Study of the Net Added Value (NAV) and of the farm family income per agricultural labourer.....	88
3.4.2 The contribution of off-farm incomes	90
3.4.3 The impact of the SAFETYNET program.....	90
4 Conclusions discussions	93
APPENDIX :	110