

*Community profile and settlement dynamics in four
Woredas of Oromiya National Regional State: Dallo
Mena, Harana Buluq, Goba and Nansabo*

FARM Africa and SOS Sahel Bale



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I. Summary

- 1. The study on community profile and settlement dynamics of four Bale Eco-Region Sustainable Management Program (BERSMP) focal Woredas in the Bale and Arsi Zone using land use/land cover (LULC) change was conducted. Eight Kebeles were considered in this study. The current study dealt with issues such as mapping of community mobility, LULC changes over time based on interpretation of Satellite images and its subsequent quantification. Semi-structured questionnaire was used to collect data on settlement patterns and community mobility.*
- 2. In almost all Kebeles of the selected Woredas in this study, two patterns of seasonal mobility were recorded. The communities of the two Kebeles, i.e., Wabera and Chirri, of Dollo Mena move to different directions depending on the season. This movement is induced by scarcity of natural resources such as grazing areas for their livestock. As a result, people of Wabero Kebele move to the neighbouring highlands such as the National Park itself in search of grazing areas and Hora (natural mineral waters), collect honey and coffee from November to April. Hora is shown to be below standard for human consumption but highly recommended for livestock. Although the details of the pattern of mobility are different in both Wabero and Chirri Kebeles, the similar general pattern was observed for the latter Kebele. In both Kebeles, people move to neighbouring lowlands from May – June to look for good grazing areas and Hora. Furthermore, whereas there is no new settlement in Wabero Kebele, the villages in Chirri such as Hiliye, Malka Funani, Qorke Harawa and Qorke Beelbaa were created during 1998. In all mobility events, the head of the family takes strong family members with and leave others in the permanent residential areas.*
- 3. This two times community mobility is not restricted to both aforementioned Kebeles. Although the details are different especially in relation to the months of mobility, two patterns of community mobility driven by limitations of natural resources were also recorded for Shawe Kebele in Harana Buluq Woreda. The first mobility takes place from December to March and is to the highlands of the same Kebele while people of this Kebele move to Harawa Kale part of the same Kebele and to neighbouring Kebele such as Dallo Baraki from April to June. Shawe Kebele is endowed with high number of Hora which is very essential for drinking by their livestock. On the other hand, people of Kumbi Kebele in the same Woreda exercise only one time mobility to highlands within the same the Kebele itself in search for sufficient grazing areas for their livestock. This mobility event also induces the movement of people from the neighbouring lowland, e.g. Sodo Lalaftu and Bukaye Kebeles to occupy evacuated areas by people from Kumbi Kebele. Furthermore, there is a migration of people from Sidama Zone (Southern Nations, Nationalities and Peoples National Regional states, SNNP) and other parts of Oromia mainly from Harerghe to the Harana Buluq Kebele.*
- 4. Community mobility in Ititu Kebele takes place twice in a year. First, people move to the Bale Mountains National Park, namely, to Sannatti Plateau to look for reliable grazing areas their livestock and Hora e.g. Hora Batu and Bishan Guracha (a glacial lake at about 4000 m a.s.l. on Bale Mountains). The second direction of movement is to lowlands where there are usually many livestock populations gathering at the same place for Hora. This practice may spread contagious diseases and degrade the*

environment. Given the proximity of this Kebele to Goba town, encroachment into the natural forest is remarkable.

- 5. The current study has also dealt with two Kebele, i.e., Harawa Kuni and Huro Bero from Nansabo Woreda of Arsi Zone, which is also a focal areas for BERSMP. The movement of people of Harawa Kuni Kebele in relation to limited resource as a function of the dry season is confined to the Kebele itself. They move to areas of the Kebele such as Dila, Handara and Bilacha from October to May. Areas such as Maqala and Wacufa of the neighbouring Kebele Huro Baro Kebele receive communities of Harawa Kuni between October and April. It has been also reported there is a significant migration of people from the SNNP (Bensa Woreda) to this Kebele. Similarly, the movement of people of Huro Bero Kebele of the same Woreda takes place between October and April, which is a dry season. Owing to the topographic diversity of this Kebele movement of people during the dry season in search for grazing areas for their livestock is confined to the Kebele itself, i.e., there are highland and lowland areas in the Kebele and the movement is exercised by the lowland inhabitants.*
- 6. The household survey has yielded interesting results, i.e., only small proportion of houses was constructed 20 years ago while others are about five years old. Noteworthy is that houses in rural areas are younger than those in urban areas. Furthermore, the current study found that only 84% of the houses in the study area reportedly occupied throughout the year. It is also to be noted that the proportion of houses that are occupied on a seasonal basis are different in different areas, e.g. 40% (Chirri Belbela & Ejere), 37% (Chirri Wurawira) and 17% (Wabaro Kebeles). In all Kebeles subjected to this study, houses were constructed without a prior consent of legal institutions, i.e., without any exception all houses have been constructed on individual basis.*
- 7. Remarkable changes in LULC of the study Woreda were inferred following the analysis of Satellite images of 1986 and 2006. In all study Woredas, there are significant changes in the proportions of cropland over time although the details in relation to direction of expansion and figure of these changes are different. For example, croplands have increased by about 10% both in Dallo Mena and Harana Buluq. In both of these Woredas the areas of forest converted to cropland are comparable. On the other hand, about 65% of cropland was created between 1986 and 2006 by human activities in Goba Woreda. Furthermore, about 1% of each of woodland and bushed grassland was also converted to exotic plantation in this Woreda. In Nansabo Woreda, about 17% of forest and 9% of mixed woodland and grassland have been converted to cropland. All these recorded changes in LULC were human-driven and used as a proxy to understand settlement dynamics since the latter is manifested through opening up of forests for cultivation*

1. Introduction

The Bale Mountains area, with the Bale Mountains National Park at its heart, boasts a unique environment and wildlife. On the other hand, Bale Mountains encompasses the most extensive afro-alpine environment in Africa but anthropogenic threats to its resources are growing at an alarming rate. Furthermore, the mountains house endemic fauna and flora on

one hand and they are the main sources of major rivers which are closely linked to the livelihood of the surrounding lowlands. Therefore, Bale Mountains can be called as a water tower of lowlands and sustainable uses and management of their resources are critical for continuity of livelihoods at the surrounding lowlands.

Bale Eco-Region Sustainable Management Program (BERSMP) aims at protecting the Bale Mountains eco-region and ensuring the economic and social well-being of communities dependent on the ecosystem's natural resources. The project promotes community-based natural resource management and increase cooperation between government and communities through the development of land use plans and participatory monitoring. This project is a joint Program of FARM-Africa and SOS Sahel Ethiopia, working in Oromiya National Regional State especially focusing on Bale and western Arsi zones. BERSMP has planned to conduct study on community profile and settlement dynamics in four Priority Woredas of the project area. The four Woredas are: Dallo Mena, Harana Buluq and Goba in Bale zone; and Nansabo in western Arsi zone (Fig. 1).

Communities make seasonal mobility between highlands and lowlands to obtain feed and water for animals as part of resource management practices in the area. In most of the cases houses were built in forest lands by individuals without the consent and permission of legal institution. Population has increased in the areas as a result of immigration and normal population growth. This has caused rapid conversion of forest land to cropland; the rate at which forests have been converted within 15 years period is very high compared to other areas in Ethiopia.

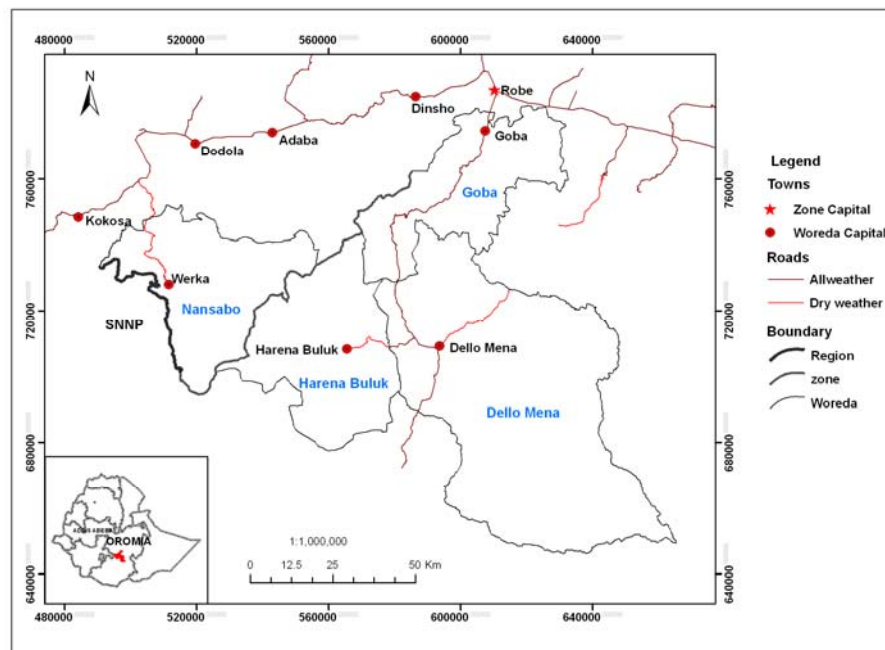


Fig. 1. Location map of the study sites.

2. Objectives of the study (as per the TOR)

- Conduct a secondary data review of settlement patterns and dynamics in Bale, including population estimates.
- Produce land use/cover map as a proxy for settlement dynamics of the 4 priority Woredas (Dallo Mena, Harana Buluq, Goba and Nansabo) of BERSMP, from Landsat images of 1986 and COLOUR satellite image of 2006/7.

- Calculate and map land use/cover change from 1986 to 2006/7.
- Map settlement mobility in terms of permanent and temporary settlement
- Carry out a settlement survey by giving emphasis to settlement planning system and land use

3. Methodology

The following methodologies were used to collect data. These are participatory mobility mapping, interpretation of satellite image and household interview (only in Dallo Mena). Community mobility mapping was conducted by selecting two Kebeles from each Woreda where time, direction and reason for mobility were recorded. Remote Sensing (RS) and Geographical Information Systems (GIS) technologies were used to map settlement dynamics in the study Woredas using land use/cover change as a proxy.

Moreover relevant literatures from the project office, Woredas, Zones and Regional offices were concisely reviewed to complement the findings. Each method of the study is elaborated in the subsequent sections:

3.1 Participatory mobility mapping

Participatory mobility mapping was conducted in all priority Woredas, namely, Dallo Mena, Harana Buluq, Goba and Nansabo by selecting two Kebeles from each Woreda. The selected Kebeles were Wabaro and Chirri in Dallo Mena, Qumbi and Shawe in Harana Buluq, Ititu and Fasil Angaso in Goba and Harawa Quni and Huro Baro in Nansabo. From each Kebele 10 to 15 people (women and men; all age class) were asked to sketch location of village and mobility direction on the ground using locally available materials. During mapping leading questions were raised for discussions focusing on settlement dynamics and seasonal mobility. Some of the major questions were: 1) When and to where people move from where they are seasonally? 2) Why people move? 3) Is there any new settlement between 2000 and 2007? If yes, where? Finally the sketches were copied, photographed and used to compliment image interpretation and analysis.

3.2 Interpretation of satellite image

Remote Sensing (RS) and Geographical Information Systems (GIS) technologies were used to map settlement dynamics in the study Woredas. A combination of Landsat Satellite image of year 1986 with spatial resolution of 30 meter and SPOT Satellite image of year 2006/2007 with spatial resolution of 10 meter were used for analysis. Both datasets were provided by the BERSMP. First the images were geo-referenced and clipped to the respective Woreda boundaries to delimit and cut out the study Woredas. A false colour composite of the images were created and geo-referenced on Universal Transverse Mercator (UTM) projection. In this method spectral signatures were developed from the specified locations that were verified to be settlement site known as “training sites”. A Global Positioning System (GPS) was used for collecting data from the training sites.

Initially, it was planned to analyze changes in settlement areas in the study areas. But it was not possible to distinguish most of the settlement sites that were selected for ground truthing or training sites due to the following reasons: 1) settlements in the study areas are very scattered so that the resolutions of the images are not suitable to identify most of the training sites, and 2) a relatively well clustered settlement areas that are situated in forests are not

imaged probably due to presence of trees with large canopy covers around them. This fact was realized during the fieldwork when ground truthing was done. For example Cironta village in Nansabo Woreda was taken for ground truthing but not visible in the images.

What is really visible on the ground and on images is cropland. In cropland tree populations are well-spaced or thinly scattered compared to those around settlement areas. Moreover, cropland dynamics is a logical consequence of settlement dynamics. Field observation and discussion with farmers showed that as soon as houses are constructed in forest lands the settlers start to clear forests to open up croplands mainly at around their homes. As they adapt to the new area and their family sizes increase their cropland area will also expand at the expense of forest. Since new settlers usually hold few or no animals they will not clear forests to get grassland. Consequently the focus of image analysis was shifted from analysing settlement dynamics to using Land use/ land Cover Change as a proxy to infer settlement. This is because land use/land cover change is closely linked to human driven activities such as settlement, expansion of cultivated lands and conversion of the natural ecosystem into secondary woodlands following deforestation.

The Landsat image of 1986 was linearly enhanced and classified using unsupervised classification algorithm in ERDAS IMAGINE 9.1 software and vectorized. The result of the classification and false colour composites of bands 7, 4, 2 in RGB (Red, Green, Blue) order of the images were exported to ArcGIS 9.2 software. Similarly, land use/ cover data and false colour composites of Colour images of bands 4, 3, 2; in RGB (red, green, blue) order were exported to ArcGIS 9.2. The satellite images were visually interpreted and manually digitized on screen into different land use /Cover Classes. After obtaining land use /cover data layers of years 1986 and 2006/7 in ArcGIS 9.2, database for the land use /cover changes were produced using techniques of overlay analysis. Finally magnitude of change in land use /cover over the study years was calculated and presented in Tables and figures.

3.3 Household interview

The objectives of this survey were to: 1) identify when the sampled households have constructed the current house they live in, 2) assess if the house is temporarily or permanently occupied, 3) figure out if permission is required to construct house and, 4) know if there is settlement planning system in the study sites. To meet these objectives, settlement survey was conducted in Dallo Mena Woreda in six areas. Sampling was done in such a way that three urban areas and three rural areas were selected from the Woreda. Consequently Dallo, Deyu and Chirri Sefera were among the sample sites from towns but Chirri Belbela and Ejere, Chirri Wurawira and Wabaro were the rural sample Kebeles. 30 households were randomly selected from each of the six settlements for interview (Please see Annex 1 for the questionnaires). This makes the total survey households 180 people. Data gathered through semi-structured questionnaires were summarised using Microsoft Excel Spreadsheet.

4. A brief review of settlement patterns and dynamics in Bale Zone

Ethiopia has faced recurrent food shortages which could be traced back to 242 B.C. (Webb and Von Braun, 1994). To alleviate this problem, the country has developed various development policies and strategies, one of which is a Resettlement Policy.

Ethiopia is experiencing an unprecedented population growth which in turn is vulnerable to all problems associated with the imbalance between population size and natural resources necessary to sustain it. This accelerated population growth has resulted in reduced land

holdings, deterioration of environment and uncontrolled population mobility to relatively resource rich areas.

Community mobility in the form of resettlement (self- or government-sponsored) is part and parcel of the country's history. The first Government sponsored resettlement has taken place during the imperial period. The second massive community mobility was witnessed during the Derg Regime. Furthermore, the current Government has also advanced resettlement programs between 2003 and 2006 with the core concept of poverty alleviation, i.e., communities move from drought prone areas to virgin and fertile areas with abundant rainfall and areas with less demographic pressure on natural resources. For example, this internal migration was designed by the Government to cope with problems of land degradation where people move from agriculturally poor highlands to fertile lowlands (Haile, 2003). There are several case studies of resettlements in different parts of Ethiopia, e.g. Konso (Kloos et al., 1990). Internal migration associated with economic conditions at a household level is a salient feature of life in developing countries (Gurmu et al. 2000). Furthermore, internal migration has improved living conditions of migrants over non-migrants (Mberu, 2006). But it has been often induced due to shortage of natural resources for their livestock in the context of Bale Zone.

In general, resettlement in Ethiopia both in the past and present was executed at the expenses of natural resources, mainly forests, and aggravated environmental degradation and has reduced quality of life.

When the scale is reduced to Bale Zone, there are very limited studies addressing resettlement. Recently, the resettlement of Shanaka in Agarfa was dealt with and it has been variously reported that there was no conflicts between the settlers and host communities.

The extent of settlement in Bale Mountains National Park was depicted in Fig. 2. During year 2007, the number of households in the Park was found to be 2955. The impact of human settlement on degradation of biodiversity and natural ecosystem on Bale Mountain National Park is evident. Generally, the park has three major structured vegetation zones, i.e., the lower (afro-montane forests), middle (*Erica* forest) and upper (afro-alpine meadow). The upper one is mainly used as a grazing land.

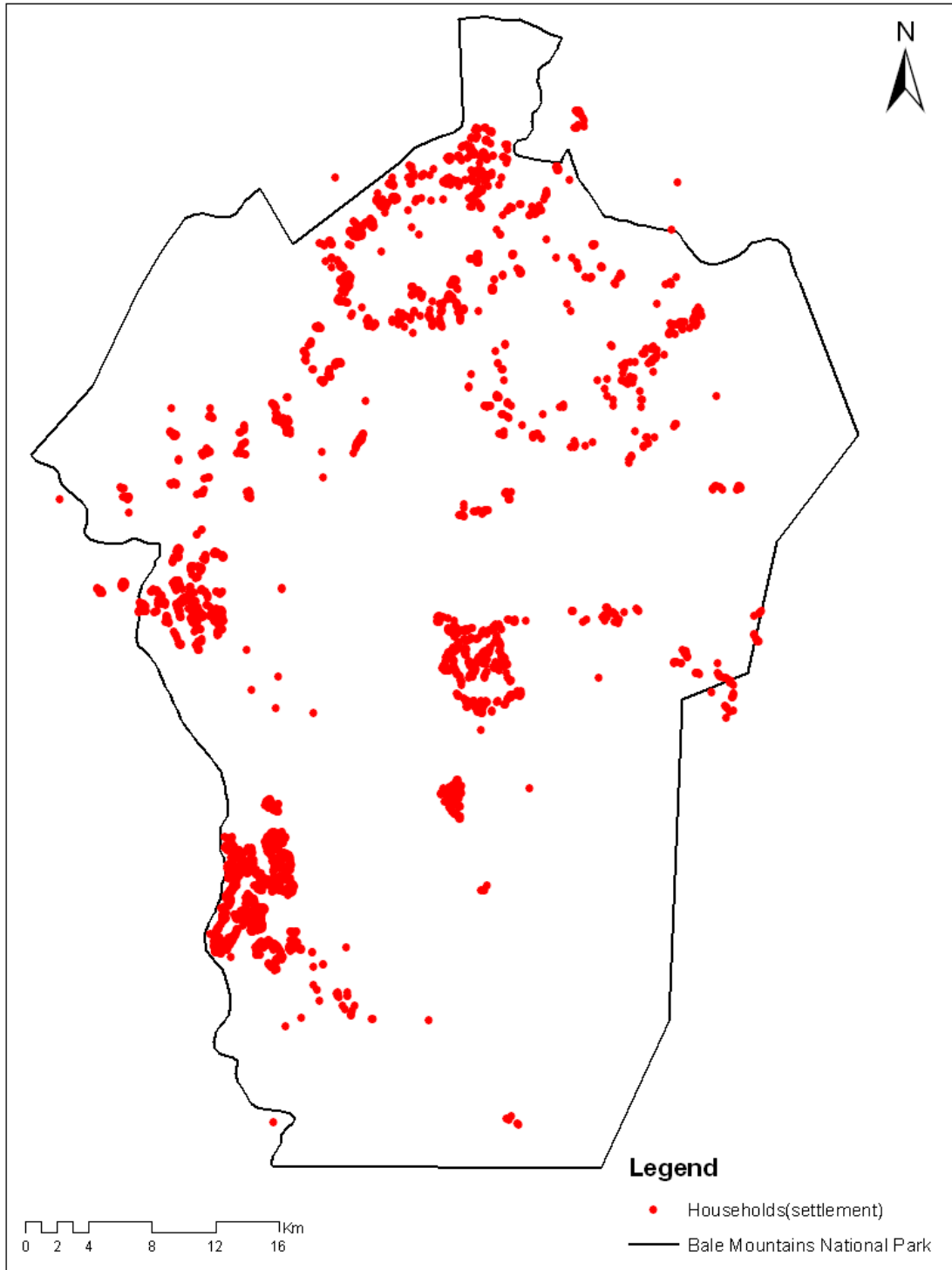


Fig. 2. Settlement distribution in the Bale Mountains National Park in the year 2007 (Source: Bale Mountains National Park).

5. Populations of the Woredas

The population size of the Woredas subjected to the current study was compiled from secondary data acquired from secondary data. This same figure was checked against the data obtained from the Office of Bale Eco-Region Sustainable Management Program (BERSMP) and presented in Table 1.

Table 1. Male and female Populations of the study Woredas based on population census of 1994.

| Woreda | Female | Male | Total | HH size | Area(Km2) |
|-----------------|--------|-------|-------|---------|-----------|
| Nansebo | 24122 | 23902 | 48024 | 9824 | 1699 |
| Dallo Mena | 21789 | 22651 | 44440 | 9965 | 4835 |
| Goba | 30666 | 28362 | 59028 | 13144 | 1637 |
| Harana Buluq | 14382 | 14827 | 29209 | 6493 | 1931 |

6. Results of the current study

6.1 Seasonal mobility

6.1.1 Dallo Mena Woreda

Two patterns of seasonal mobility were identified in both Wabaro and Chirri Kebeles. The first and most important one is mobility to the North direction (Highlands) between November and April. During this time household leaders along with strong family members (usually boys) take their animals to the neighbouring areas in Goba Woreda, the National Park and Manyate area of Chirri Kebele (Figures 3&4). The purpose of this is to get better feed and shade for animals, gather coffee and honey. Very important factor is also to get salt water known as *Hora* (Affan Oromo) for their livestock which is available at Dhoqe, Higana and Saaqata sites. The second pattern involves evacuation of Goba Woreda, the National Park and Manyate sites and mobility to southerly direction (lowlands) that takes place during May to June. During this time people move their livestock to either lowlands of their respective Kebeles or to other neighbouring Kebeles to graze and feed salty ground/soil known as *haya* or *sogida* (Affan Oromo) to the animals.

During both events most families do not entirely evacuate their residences but the relocated people create temporary shelters known as *godoo* (Affan Oromo) in the new sites. Pregnant women, old people and students usually stay at permanent homes. In both Kebeles the whole relocated people and animals return to permanent homes between July and August because during this time of a year feeds are also available here.

Most settlement villages were created during the Resettlement Program of Ethiopia in 1981. But in Chirri Kebele villages such as Hiliye, Malka Funani, Qorke Harawa and Qorke Beelbaa were created after 1998. There was no report of new settlement in Wabaro Kebele.

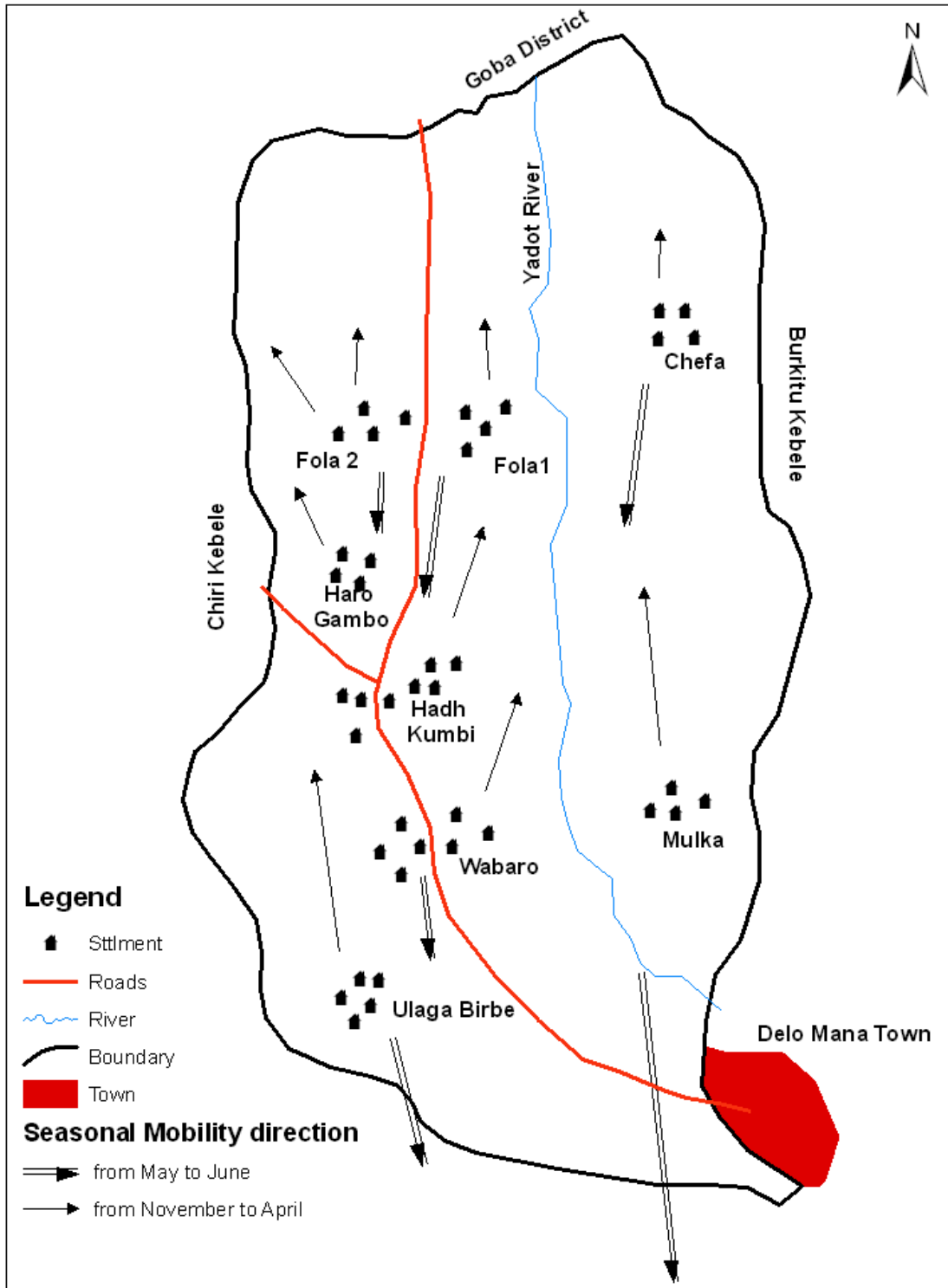


Fig. 3. Seasonal Mobility of community in Wabero Kebele.

Both Wabero and Chirri Kebeles are neighbours and they have exhibited different patterns of seasonal mobility.

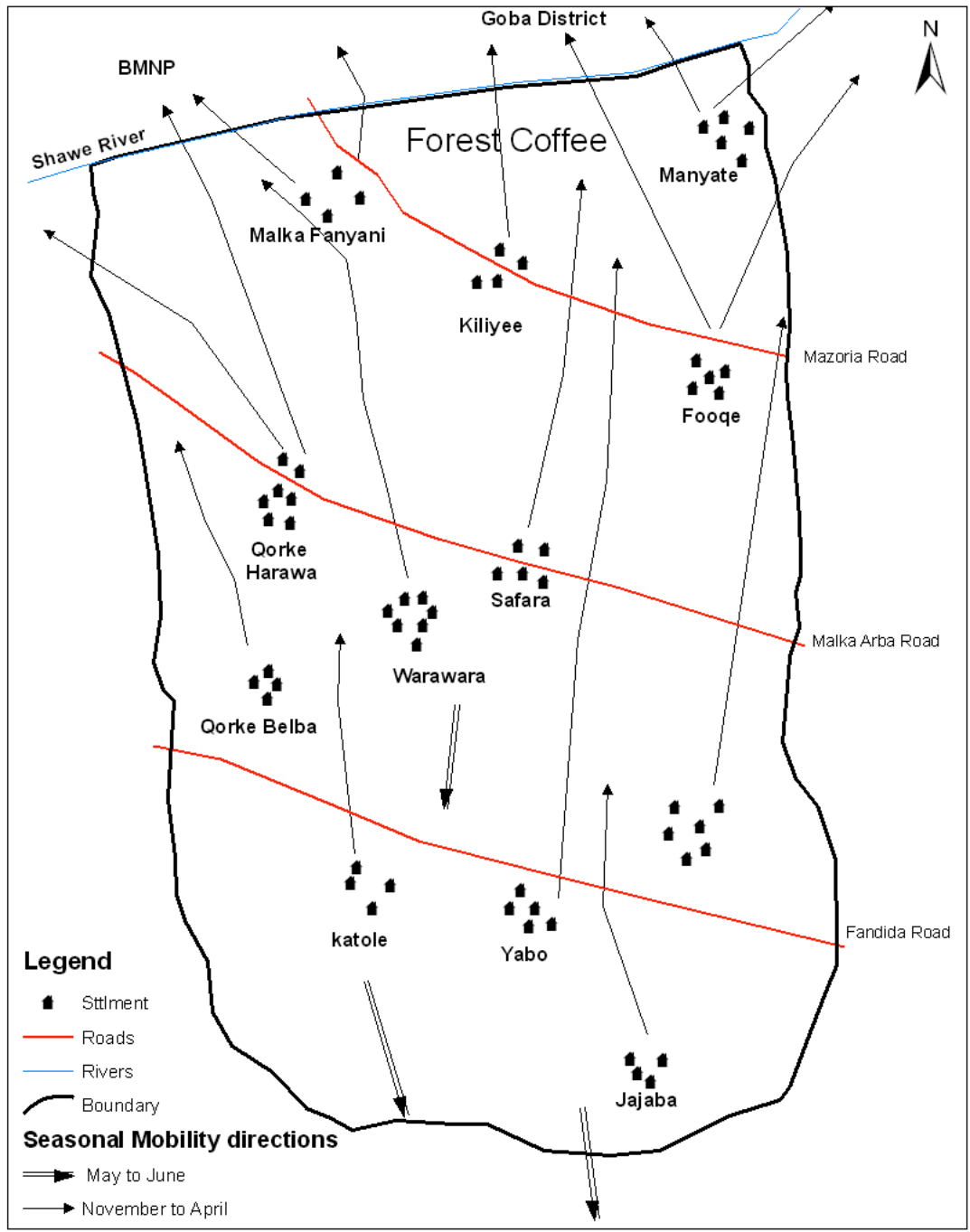


Fig. 4. Seasonal Mobility of people of Chirri Kebele.

6.1.2 Harana Buluq Woreda

In Kumbi, communities exercise one-time mobility (Fig. 5) to highlands and forest areas between November and March within their Kebele in search for better grasses, shade and *Hora* (salty water) for their livestock and to collect honey. That is, these people do not move outside of their Kebele mainly because of the abundance of resources. Noteworthy is that Coffee is not grown in the highlands of this Kebele. Seasonal mobility of the Kumbi

community also induces the movement of people from the nearby lowland Kebele, namely Bukaye Kebele, who will temporary occupy the evacuated spaces.

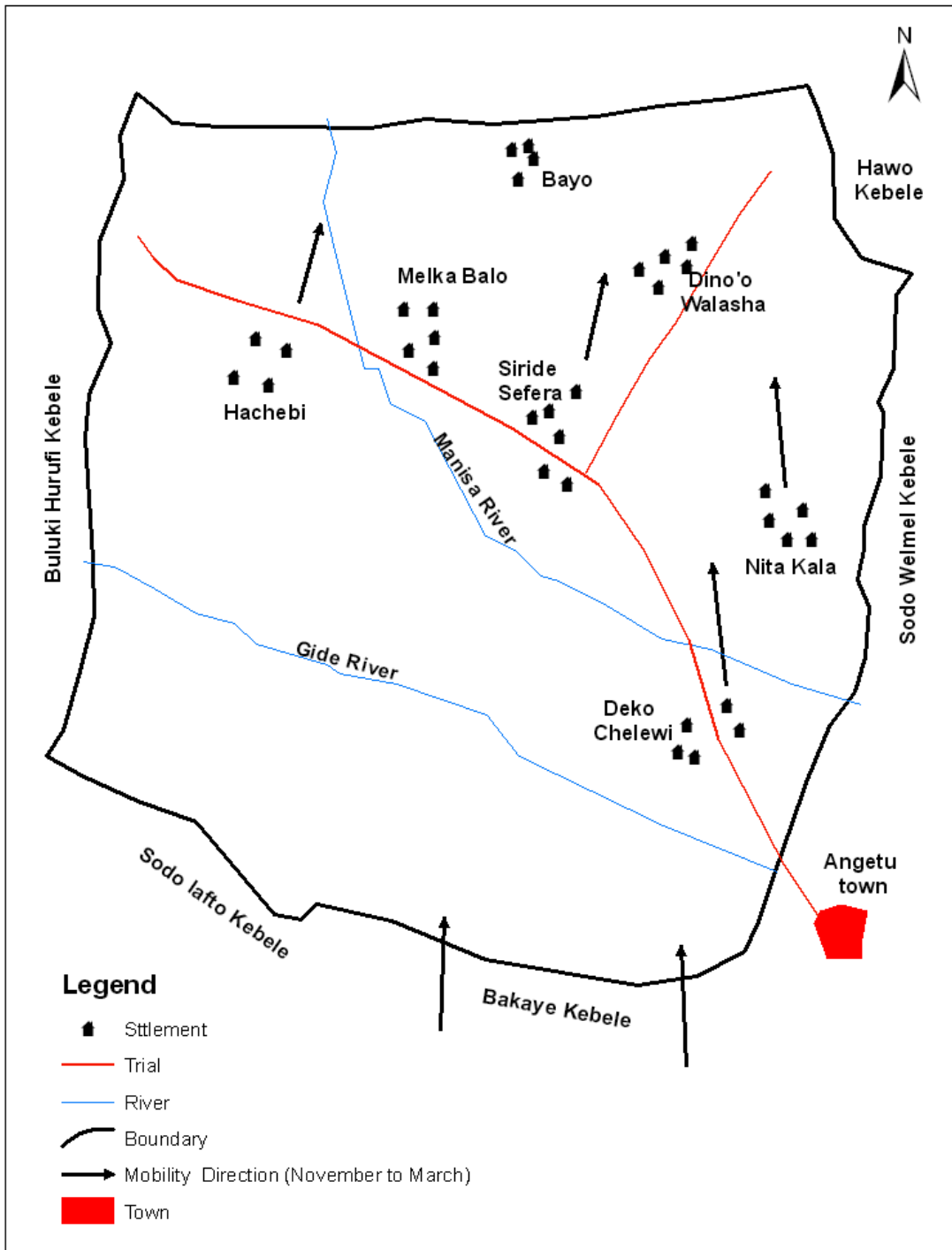


Fig. 5 Seasonal mobility of people of Kumbi Kebele. Note that inhabitants of the nearby lowland Kebele (Bukaye) temporarily move into the emptied space.

On the other hand, there is influx of people from the Southern Nations, Nationalities and Peoples' (SNNP) Regional State (Sidama zone) and other parts of Oromiya (Hararghe and

Shewa) to Harana Buluq. The new settlers move to this part of Kebele and compete for the same resources with local people.

In Shawe Kebele, there are two patterns of seasonal mobility of people (Fig. 6).

These are:

1. During the rainy season (December to March) where people move to highlands of this Kebele in search for better grasses, shade, *Hora* and honey collection.

2. On the other hand, dry season (April to June) induces the movement of people to Harawa Kale part of this Kebele and the neighbouring Kebele (Dallo Baraki). It should be also noted that people from Dallo Baraki and Malka Arba also move to the lower part of Kumbi Kebele in search for grasses for their livestock in this season. Remarkable is the presence of a handful of *Hora* (Salty water) in Shawe Kebele, e.g. Doka, Horsise Gudda, Horsise Tika and Tuta (Fig. 6)

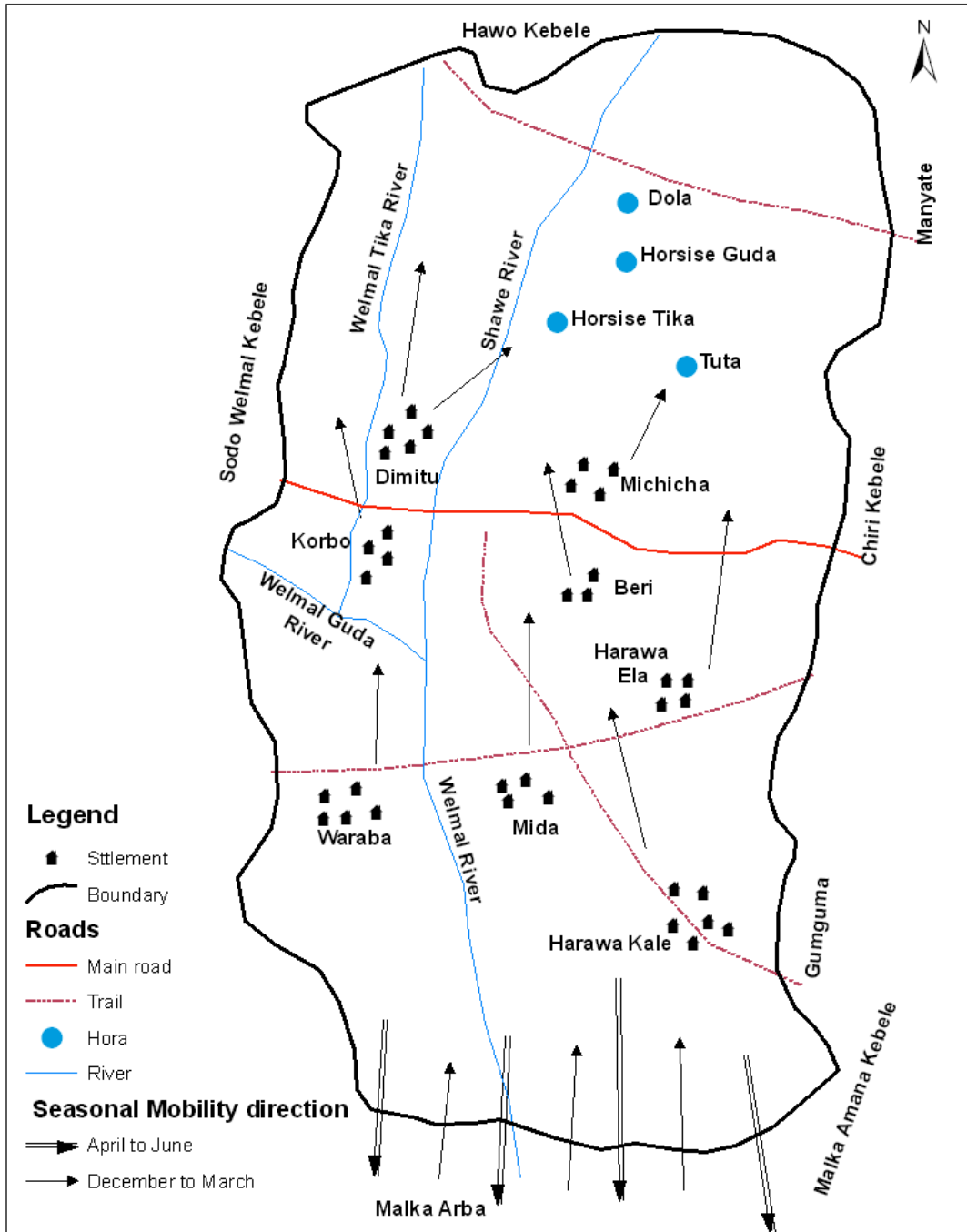


Fig. 6. Seasonal Mobility of people of Shawe Kebele.

During both mobility seasons, not all members of the families are evacuated their residences. Pregnant women, old people and students usually stay at the permanent homes. But the other members of the families create temporary shelters (*godo*, Oromiffa) at the new locations. In both Kumbi and Shawe Kebeles, both people and animals return to their permanent residences at times when grasses are available.

Most settlement villages were created during Villagization Program of Ethiopia at about 1981 E.C. In spite of the influx of people to Shawe Kebele, there was not any new settlement area reported. The mapping groups indicated that the resettlers have self-resettled in the existing villages.

6.1.3 Goba Woreda

Ititu Kebele is situated between Goba town and Sannetti Plateau. People of this Kebele move to Sannetti Plateau to get grasses and *Hora*, namely, Hora Batu and Bishan Guracha (Fig. 7) from November to March (Dry season). During the rest of the year, people move to lowlands of Waltai Aziza and Tesha Kebeles in Goba Woreda and Sinana Woreda to use *Hora* at Muxiqiso site. During the second pattern of mobility large number of animal gather in small area causing overgrazing and trampling of grasses. During wet season controlled grazing is practiced at permanent residences. The existing settlement sites (including Goba town) have expanded to this Kebele due to an increase in population sizes. Therefore, population pressure is induced both by natural growth and resettlement.

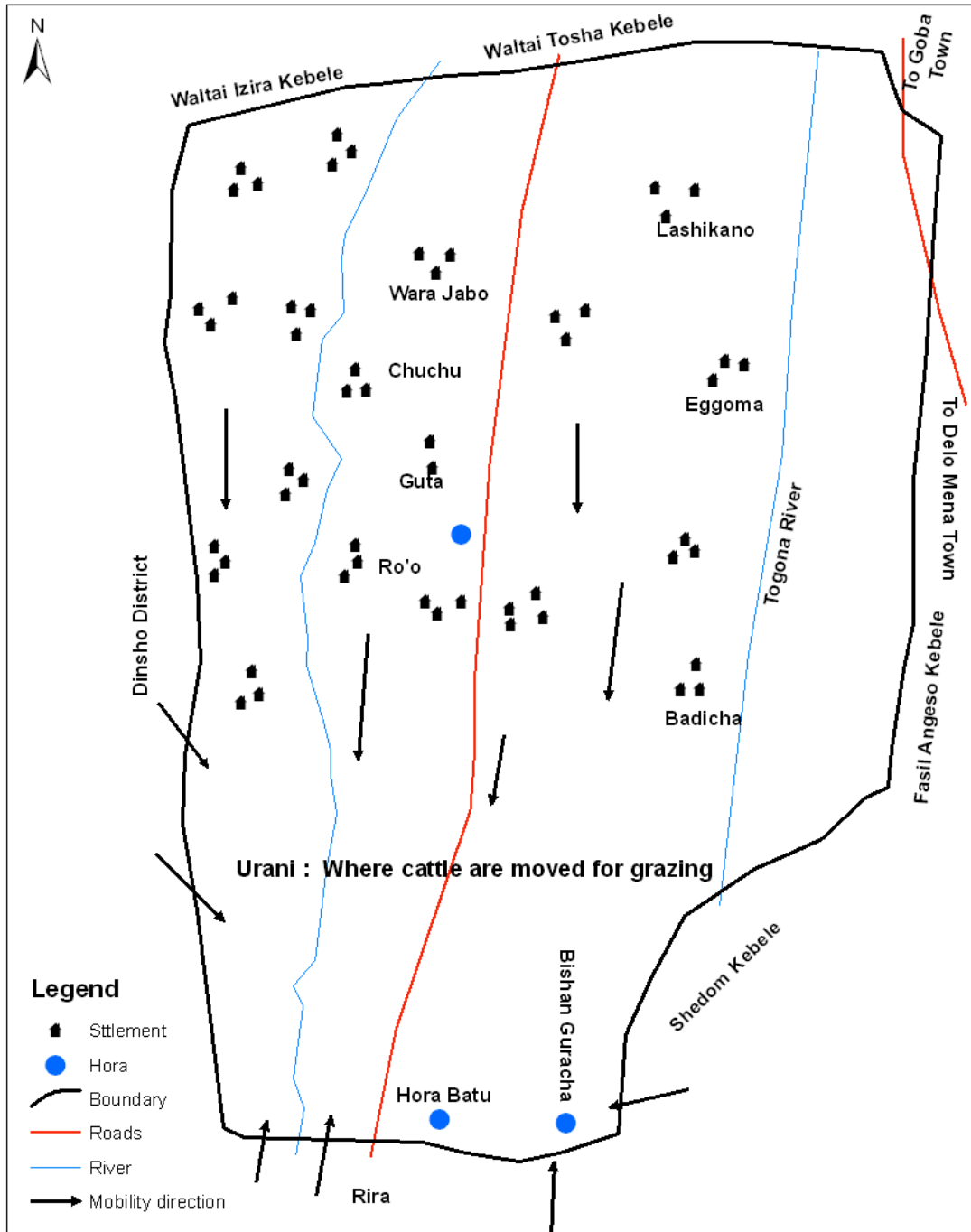


Fig. 7. Seasonal mobility of people of Ititu Kebele.

Given the proximity of this Kebele to Goba town, forest encroachment as a source of cash through selling fuel wood is remarkable. During the Derg Regime, community and private woodlot plantations were practiced in different areas in this Kebele. Community plantations have been encroached but private woodlots are relatively well protected and managed.

Community mobility map was not drawn for Fasil Angaso Kebele because it was not possible to get both development workers and the required number of community members; community leaders who can mobilize people were in training in Goba town. Field observation, however, show that Fasil Angaso and Ititu are adjacent to each other and may follow similar patterns of mobility. Forest encroachment in Fasil Angaso is severe and new settlements are apparent in forest areas.

6.1.4 Nansabo Woreda

Seasonal mobility in Harawa Kuni is only once in a year and mainly takes place within the Kebele itself. During the dry season (October to May) people in the lowland areas move to Dila, Handara and Bilacha areas of this Kebele in search of grasses for their livestock (Fig. 8). But people of Weymenta and Ansho travel to Maqala and Wacufa areas of Huro Baro Kebele between October and April. During the remaining months of the year most of the people return from their temporary settlement to their permanent residential areas owing to availability of grasses.

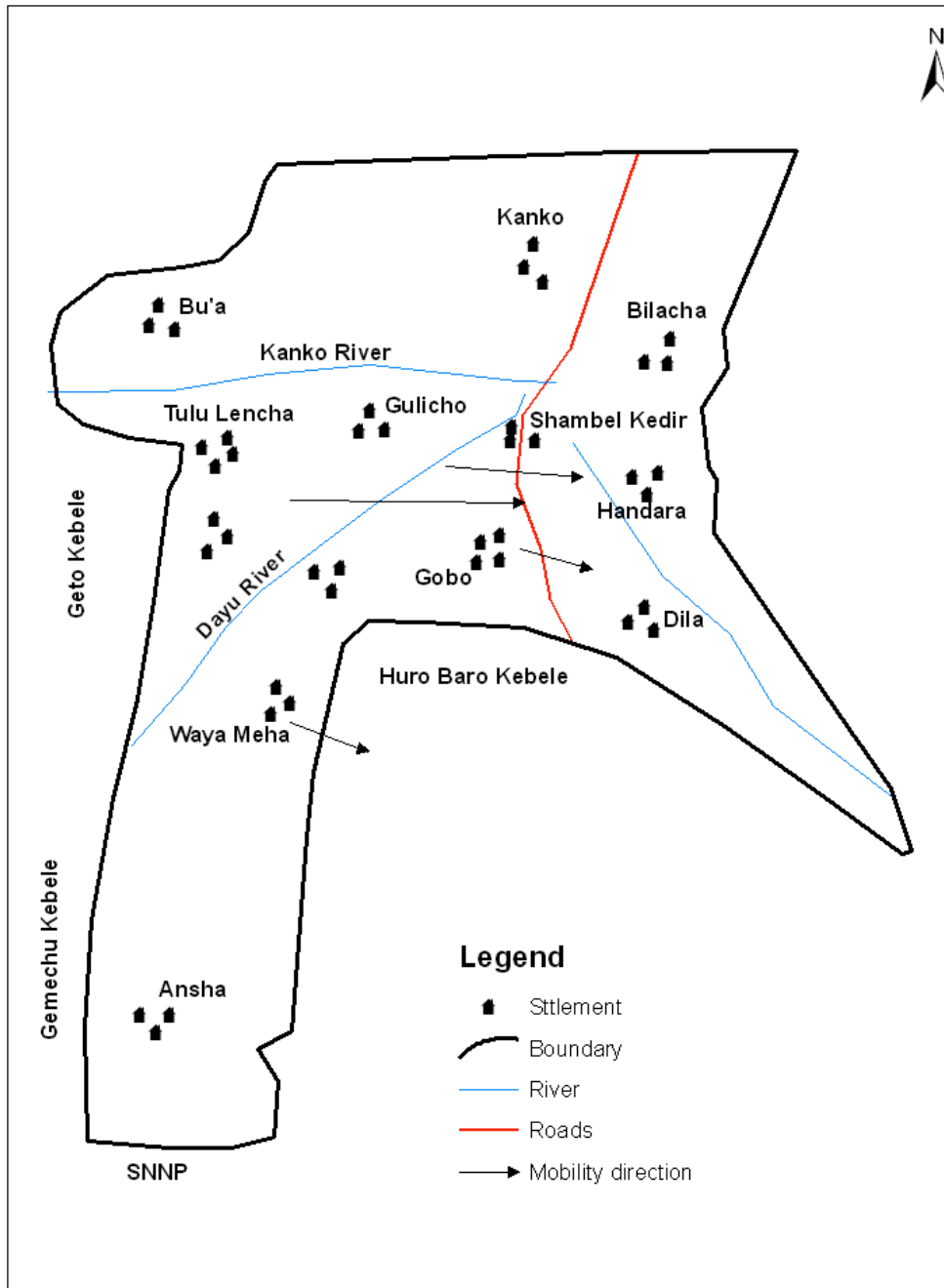


Fig. 8. Seasonal mobility of people of Harawa Kuni Kebele.

The mapping team has pointed out that several people from SNNP Regional State (mainly Bensa Woreda) have been settling at their discretions in this Kebele and compete with the indigenous communities over grasses and farmlands. This practice has severely damaged forest resources of the area. Girma (2007) has also reported similar illegal influx of people to Harana Buluq Woreda in general and to this Kebele in particular. Such unplanned settlement and competition for natural resources will have severe environmental and socio-economic implications.

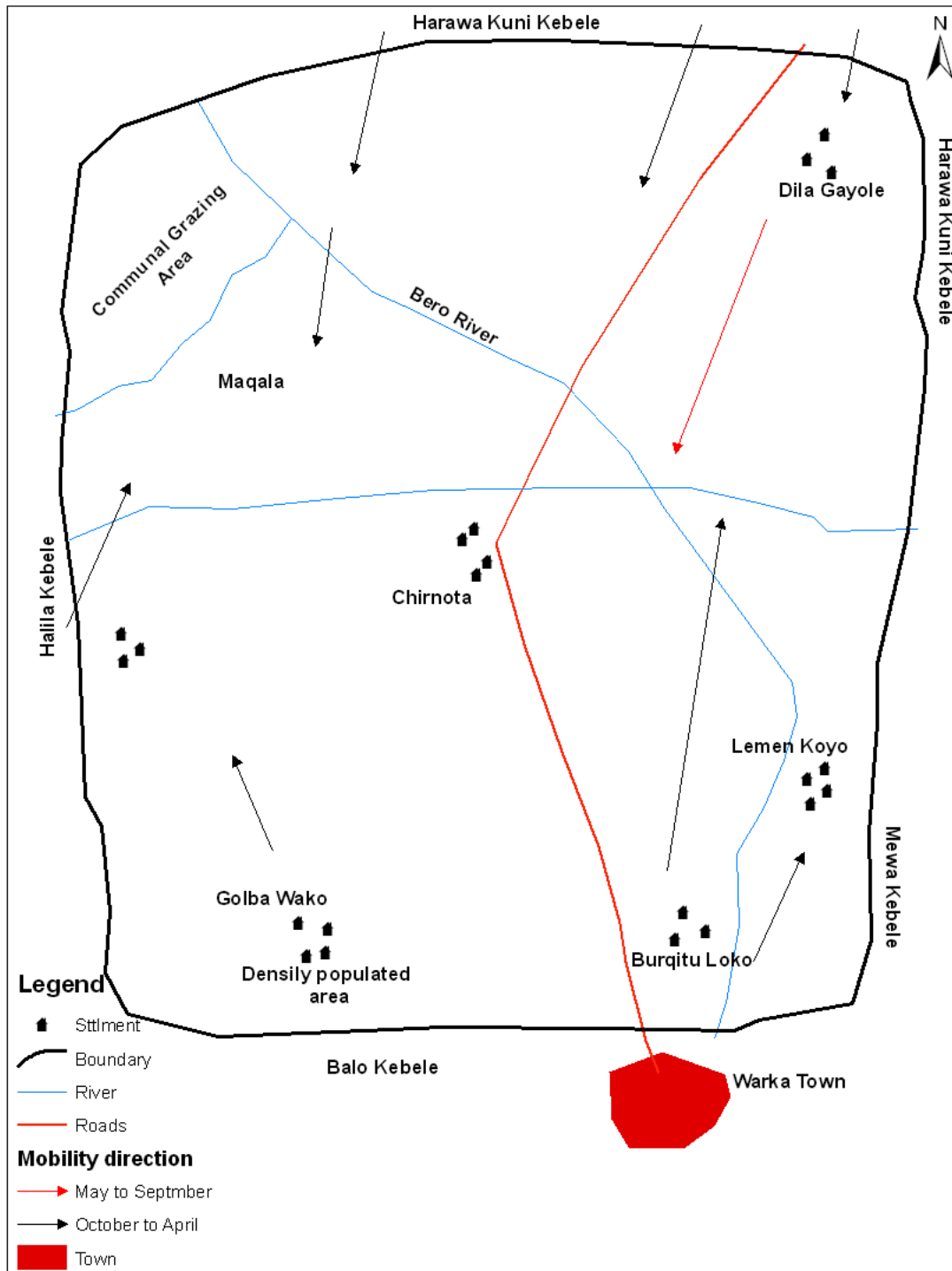


Fig. 9. Seasonal mobility of people of Huro Bero Kebele.

Seasonal mobility in Huro Bero Kebele is only once in a year and limited within the Kebele itself (Fig. 9). During the dry season (October – April), people in lowlands move to the highland areas in search for grazing areas. These people move back to their permanent residential areas for the remaining months of the year because grazing areas are usually at good conditions at home.. As is the case for Harawa Kuni, the mapping team has underlined

that that several people from SNNP (mainly Bensa Woreda) exercise self settlement in this Kebele and compete with the indigenous people for natural resources. As a result, the forest cover and quality of the environment have been drastically changed over time. It should be noted the both Harawa Kuni and Huro Bero Kebeles are neighbour and share many mobility characteristics in common.

Field observation showed that most homesteads, croplands and grasslands are fenced on individual discretions (Fig. 10). Forestlands that are situated at around homesteads are also fenced. This practice was found to be a recent phenomenon in this Kebele but has covered most of the land use types. Before this practice people from the lowlands come over to this part of the Kebele to graze their animals. Currently, however, seasonal mobility to this area is restricted because of fencing practices.



Figure 10. Different land use types recently fenced by individuals (Location: Shambel Kedir)

6.2 Household interview

Most of the houses (63%) were constructed between 5 and 20 years. 24% of the houses were constructed very recently (five years ago) but only 13% of the houses (mainly in towns) are over 20 years old. Houses in rural Kebeles are relatively younger than those in urban Kebeles (Table 2). Whereas about 84% of homes were reported to be occupied the whole year, 40%, 37% and 17% of the houses in Chirri Belbela & Ejere, Chirri Wurawira, and Wabaro Kebeles, respectively were found to be seasonally occupied. It was also reported that young people with small family size do usually evacuate their permanent residential areas to seek grazing lands for their livestock and collect coffee beans elsewhere.

While 46% of the plots for house construction were allocated by Kebeles, about 23% of the homes were constructed on plots of land provided by own parents in all Kebeles. This figure for legal allocation of residential plots by Kebele or Woreda administration was obtained from Dallo and Deyu towns. In rural Kebeles, however, land redistribution was done during the Villagization Programme of Ethiopia in the year 1981 E.C. This form of land acquisition is remarkable in Chirri Belbela & Ejere, Chirri Wurawira and Chirri Sefera Kebeles. Some 31% of homes were constructed on lands that were acquired by personal arrangements, i.e., either by clearing of forests or through informal land transaction. In all rural Kebeles and Chirri Sefera houses have been constructed without the prior consent and approval of any legal institution; individuals make their own plan and construct houses. In Dallo Mena, land can be obtained through different modalities but the construction phase necessarily requires a prior consent of and permission from Kebele/Woreda administration. Ironically large number of houses was constructed on forest lands; 47% in Chirri Wurawira and 30% in Dallo town itself. Despite these high figures, some farmers were either reluctant to reveal that their

houses are illegally constructed in forest areas or self-defending on this issue anticipating any form of legal consequences.

Table 2. Year of construction, mode of land acquisition, construction permission, duration of a year occupied by a family members and former land use types of the respondents.

| Factor (variable) | Category | Number of respondent | | | | | | Total respondent | |
|----------------------------|-------------|------------------------------------------|--------------------------------|---------------------|------------------------------|-------------------|----------------------------|---------------------|------|
| | | Cirri Belbela & Ejere ^a | Cirri Wurawira ^a | Wabaro ^a | Cirri Sefera ^b | Deyu ^b | Dallo Mena ^b | No. | % |
| Year constructed (Y) | 0<Y≤5 | 12 | 6 | 13 | 12 | 1 | 0 | 44 | 24.4 |
| | 5>Y≤20 | 14 | 22 | 14 | 16 | 29 | 18 | 113 | 62.8 |
| | Y> 20 | 4 | 2 | 3 | 2 | 0 | 12 | 23 | 12.8 |
| Time occupied (T) | All time | 18 | 19 | 25 | 30 | 30 | 30 | 152 | 84.4 |
| | Seasonal | 12 | 11 | 5 | 0 | 0 | 0 | 28 | 15.6 |
| Allocated by | Kebele | 8 | 15 | 12 | 9 | 17 | 22 | 83 | 46.1 |
| | Family | 13 | 9 | 5 | 10 | 3 | 2 | 42 | 23.3 |
| | Oneself | 9 | 6 | 13 | 11 | 10 | 6 | 55 | 30.6 |
| Constn. permission | Necessary | 0 | 0 | 0 | 0 | 19 | 30 | 49 | 27.2 |
| | Unnecessary | 30 | 30 | 30 | 30 | 11 | 0 | 131 | 72.8 |
| Earlier land use | Forest | 1 | 14 | 6 | 8 | 9 | 10 | 48 | 26.7 |
| | Grassland | 18 | 8 | 7 | 8 | 18 | 9 | 68 | 37.8 |
| | Cropland | 11 | 8 | 17 | 14 | 3 | 11 | 64 | 35.5 |

^a Rural Kebele ^b Urban Kebele

6.3 Land Use/Cover (LULC) Change as an indicator of Settlement dynamics

In 1986, the majority of Dallo Mena area was covered by woodlands (70.8 %) followed by forest (15.7%) – Table 3 A & Fig. 11 A. Furthermore, mixed cropland and woodland have accounted for only about 2.3%.

Table 3. Areas of land use/cover types of Dallo Mena during 1986 (A) and 2006 (B) and land use/land cover change from 1986 – 2006 (C).

| No | Land use /Cover type | Area(Km ²) |
|----|----------------------|------------------------|
| 1 | Forest | 760.48 |
| | Mixed crop and | |
| 2 | Woodland | 113.37 |
| 3 | Woodland | 3422.19 |
| 4 | Shrubland | 539.03 |
| | Total | 4835.07 |

(A)

| No | Land Use/Cover type | Area(Km ²) |
|----|---------------------|------------------------|
| 1 | Forest | 723.24 |
| 2 | Woodland | 3253.70 |
| | Mixed crop and | |
| 3 | Woodland | 281.87 |
| | Disturbed Forest by | |
| 4 | annual crop | 37.24 |
| 5 | Shrubland | 539.03 |
| | Total | 4835.07 |

(B)

| No | Land use /Cover type | Area(Km ²) |
|----|-------------------------------------------|------------------------|
| 1 | Forest | 723.24 |
| 2 | Forest to Disturbed Forest by annual crop | 37.24 |
| 3 | Mixed crop and Woodland | 281.87 |
| 4 | Woodland | 3253.70 |
| 5 | shrubland | 539.03 |
| | Total | 4835.07 |

(C)

On the other hand, not only were the areas of forest and mixed cropland and woodland decreased and increased, respectively, but also a new land use/cover type (disturbed forest by annual crops) was detected during 2006 (cf. Table 3 B & Fig. 11 B). There was an apparent change in land use/cover in Dallo Mena (Table 3 C & Fig. 11 C). About 5% of what was woodland in 1986 (Fig. 11 A) has been converted to mixed crop and woodland. Similarly, about 5% forest has been encroached due to cultivation of annual crops (Fig. 11 B & C). Noteworthy is that mixed crop and woodland has increased by more than 100% which may show high human pressure on the natural resources in Dallo Mena.

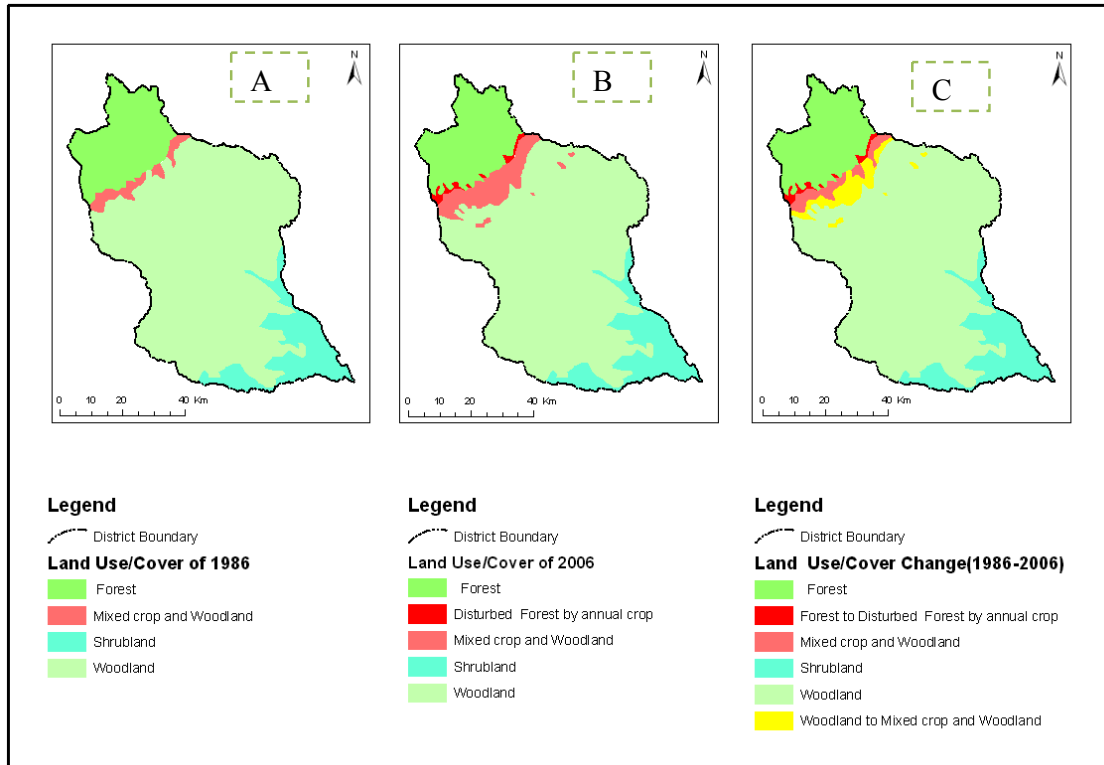


Fig. 11. Land Use/Cover maps of Dallo Mena Woreda for 1986 (A), 2006 (B) and LULC change from year 1986 – 2006 (C).

Table 4. Areas of land use/cover types of Harana Buluq during 1986 (A) and 2006 (B) and land use/land cover change from 1986 – 2006 (C).

| No | Land Use/Cover type | Area(Km ²) |
|----|---------------------|------------------------|
| 1 | Forest | 1377.14 |
| 2 | Woodland | 521.99 |
| 3 | Wooded grassland | 35.12 |
| | Total | 1934.25 |

(A)

| No | Land Use/Cover type | Area(Km ²) |
|----|---------------------|------------------------|
| 1 | Forest | 1298.61 |
| 2 | Woodland | 516.02 |
| 3 | Crop land | 17.74 |
| 4 | Wooded grassland | 23.35 |
| 5 | Disturbed Forest | 78.53 |
| | Total | 1934.25 |

(B)

| No | Land Use/Cover type | Area(Km ²) |
|----|------------------------------|------------------------|
| 1 | Forest | 1298.61 |
| 2 | Forest to Disturbed Forest | 78.53 |
| 3 | Woodland | 516.02 |
| 4 | Woodland Crop land | 17.74 |
| 5 | Wooded grassland to Cropland | 17.74 |
| 6 | Wooded grassland | 23.35 |
| | Total | 1934.25 |

(C)

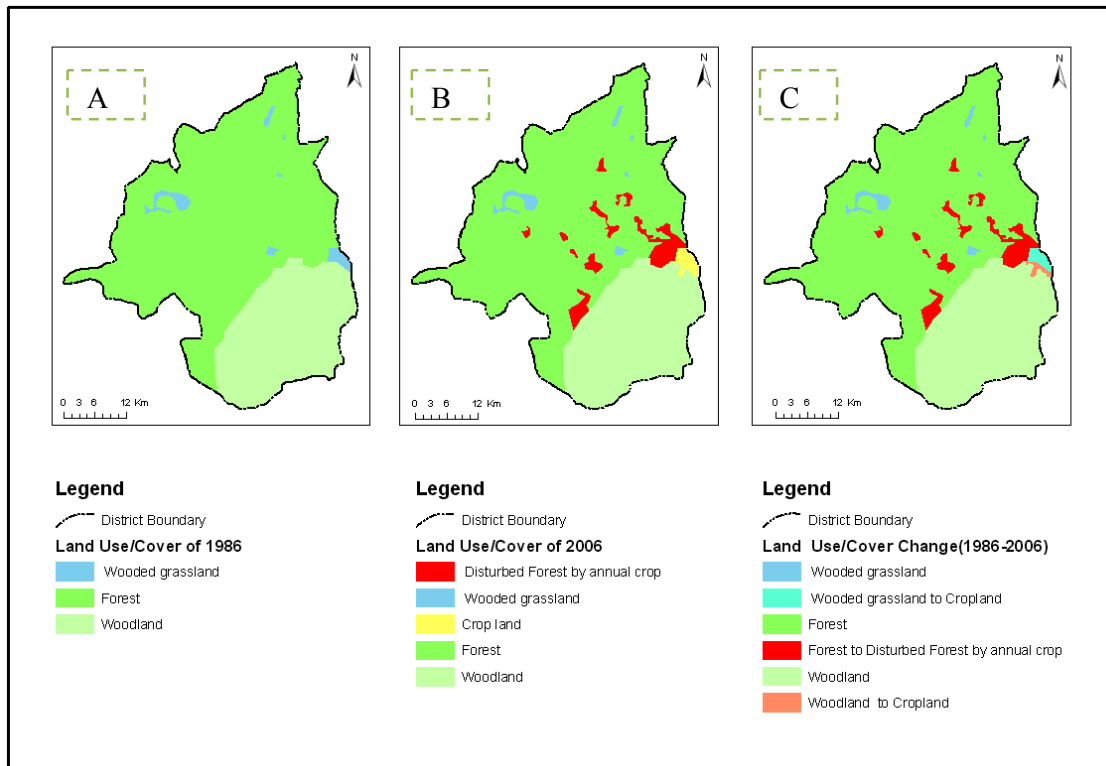


Fig. 12. Land Use/Cover maps of Harana Buluq Woreda for 1986 (A), 2006 (B) and LULC change from year 1986 – 2006 (C).

In Harana Buluq, whereas forest has constituted 71% of the total area, the contribution of woodland was about 27% in year 1986 (Table 4 A & Fig. 12 A). On the other hand, the cover of wooded grassland was only about 2% of the total area. The areas of forest, woodland and wooded grassland have been reduced by about 6%, 1% and 3.4%, respectively in 2006 (Table 4 B – C & Fig. 12 B – C). Furthermore, additional LULC types (cropland and disturbed forest due to cultivation of annual crops) have been detected from 2006 image. It is to be noted, however, that both wooded grassland and woodland have variously contributed to cropland (Table 4 C). Disturbed forest due to cultivation of annual crops has constituted about 6% in 2006 (Table 4 C & Fig. 12 C).

Seven distinct LULC types have characterized Goba Woreda during 1986 (Table 5 A & Fig. 13 A). The number of LULC types has dramatically increased to 10 by 2006 (Table 5 B & Fig. 13 B). The cumulative area of cropland has increased by over 10% although the contribution of forest, bushland and woodland has different values (Table 5 B). Furthermore, parts of the bushland and woodlands of Goba Woreda were also converted to exotic plantation (Fig. 13 C). The areas of, for example, *Erica* and *Helichrysum* have remained unchanged from 1986 – 2006 but remarkable grazing pressure has been noticed during the study. All these apparent changes in the LULC of Goba Woreda over 20 years signify active anthropogenic impacts on the natural resources which may have been brought about by expansion of settlement and subsequent cultivation areas.

Table 5. Areas of land use/cover types of Goba during 1986 (A) and 2006 (B) and land use/land cover change from 1986 – 2006 (C).

| No | Land Use/Cover | Area(Km ²) |
|----|--------------------------|------------------------|
| 1 | Cropland | 225.27 |
| 2 | Forest | 654.42 |
| 3 | Helichrysum/grazing land | 294.43 |
| 4 | Woodland | 162.28 |
| 5 | Erica/Grazing | 229.03 |
| 6 | Bushed Grassland | 51.71 |
| 7 | Settlement | 20.34 |
| | Total | 1637.47 |

(A)

| No | Land Use/Cover | Area(Km ²) |
|----|-----------------------------------|------------------------|
| 1 | Cropland | 239.59 |
| 2 | Forest | 610.83 |
| 3 | Helichrysum/Grazing land | 294.43 |
| 4 | Woodland | 114.49 |
| 5 | Erica/Grazing | 229.03 |
| 6 | Bushed Grassland | 36.73 |
| 7 | Disturbed Woodland by annual crop | 46.24 |
| 8 | Disturbed Forest by annual crop | 43.59 |
| 9 | Plantation | 2.20 |
| 10 | Settlement | 20.34 |
| | Total | 1637.47 |

(B)

| No | Land Use/Cover | Area(Km ²) |
|----|-----------------------------------------------|------------------------|
| 1 | Cropland | 239.59 |
| 2 | Forest | 610.83 |
| 3 | Forest to Disturbed Forest by annual crop | 43.59 |
| 4 | Helichrysum/grazing land | 294.43 |
| 5 | Woodland | 114.49 |
| 6 | Woodland to Disturbed Woodland by annual crop | 46.24 |
| 7 | Woodland to Plantation | 1.54 |
| 8 | Erica/Grazing | 229.03 |
| 9 | Bushed Grassland to cropland | 14.32 |
| 10 | Bushed Grassland | 36.73 |
| 11 | Bushed Grassland to Plantation | 0.66 |
| 12 | Settlement | 20.34 |
| | Total | 1637.47 |

(C)

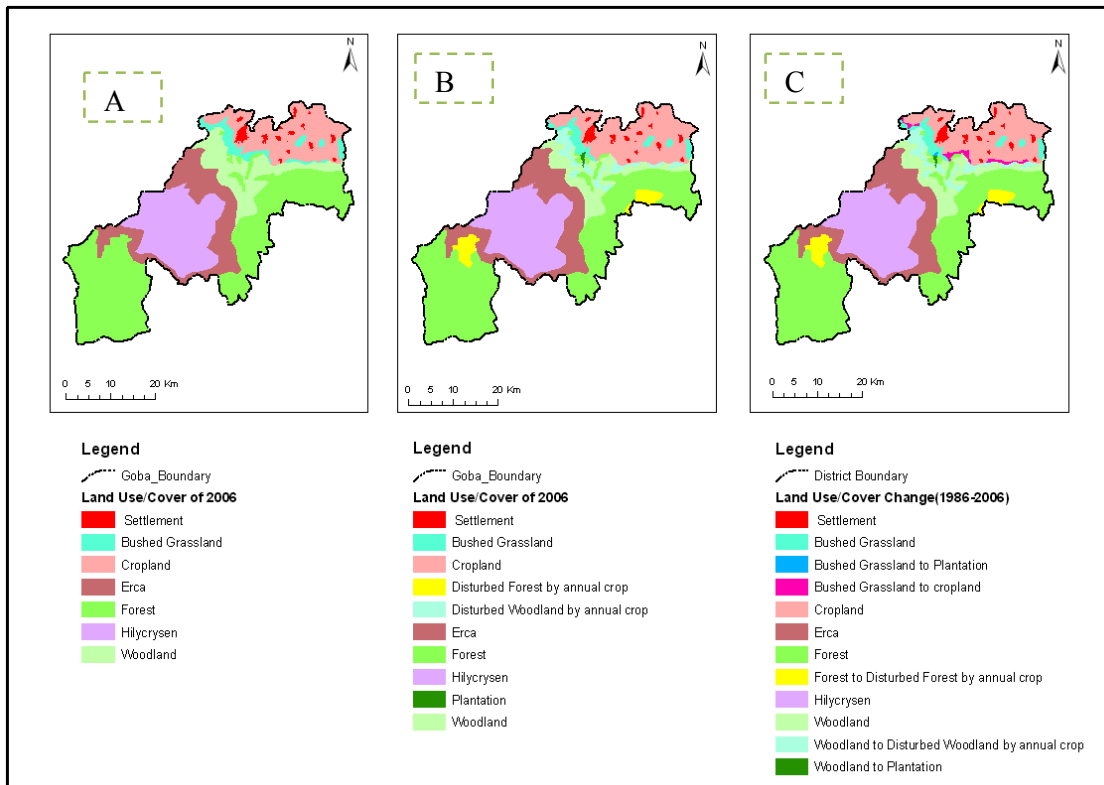


Fig.13. Land Use/Cover maps of Goba Woreda for 1986 (A), 2006 (B) and LULC change from year 1986 – 2006 (C).

In Nansabo Woreda, forest has constituted about 71% while both woodland and perennial crop, for example, has contributed a little more than 6% to the total LULC in 1986 (Table 6 A & Fig. 14 A). Grassland is only about 2% of the total area in this Woreda during the same year.

Although the areas grassland, woodland and perennial crops have remained unchanged during 2006 (Table 6 B – C & Fig. 14 B – C), about 17% of the forest and 9% of the mixed woodland and grassland has been converted to various cropland (Table 6 C & Fig. 14 C). These recorded changes of the LULC of the Nansabo Woreda could be used as a proxy indicator of expansion of settlement and cultivation fields at the expenses of forests and woodlands.

Table 6. Areas of land use/cover types of Nansabo during 1986 (A) and 2006 (B) and land use/land cover change from 1986 – 2006 (C).

| No | Land Use/Cover | Area(Km ²) |
|----|--------------------------|------------------------|
| 1 | Forest | 1199.29 |
| 2 | Perennial crop | 102.67 |
| 3 | Mixed Wood and Grassland | 256.07 |
| 4 | Woodland | 103.59 |
| 5 | Grassland | 37.06 |
| | Total | 1698.68 |

(A)

| No | Land Use/Cover | Area(Km ²) |
|----|-----------------------------------------------|------------------------|
| 1 | Forest | 997.65 |
| 2 | Perennial crop | 102.67 |
| 3 | Mixed Wood and Grassland | 232.41 |
| 4 | Woodland | 103.59 |
| 5 | Grassland | 37.06 |
| 6 | Disturbed Forest by perennial and annual crop | 180.44 |
| 7 | Annual crop | 44.86 |
| | Total | 1698.68 |

(B)

| No | Land Use/Cover | Area(Km ²) |
|----|----------------------------------------------|------------------------|
| 1 | Forest | 997.65 |
| 2 | Forest to Disturbed Forest by perennial crop | 180.44 |
| 3 | Forest to Annual crop | 21.20 |
| 4 | Perennial crop | 102.67 |
| 5 | Mixed Wood and Grassland | 232.41 |
| 6 | Mixed Wood and Grassland to Annual crop | 23.66 |
| 7 | Woodland | 103.59 |
| 8 | Grassland | 37.06 |
| | Total | 1698.68 |

(C)

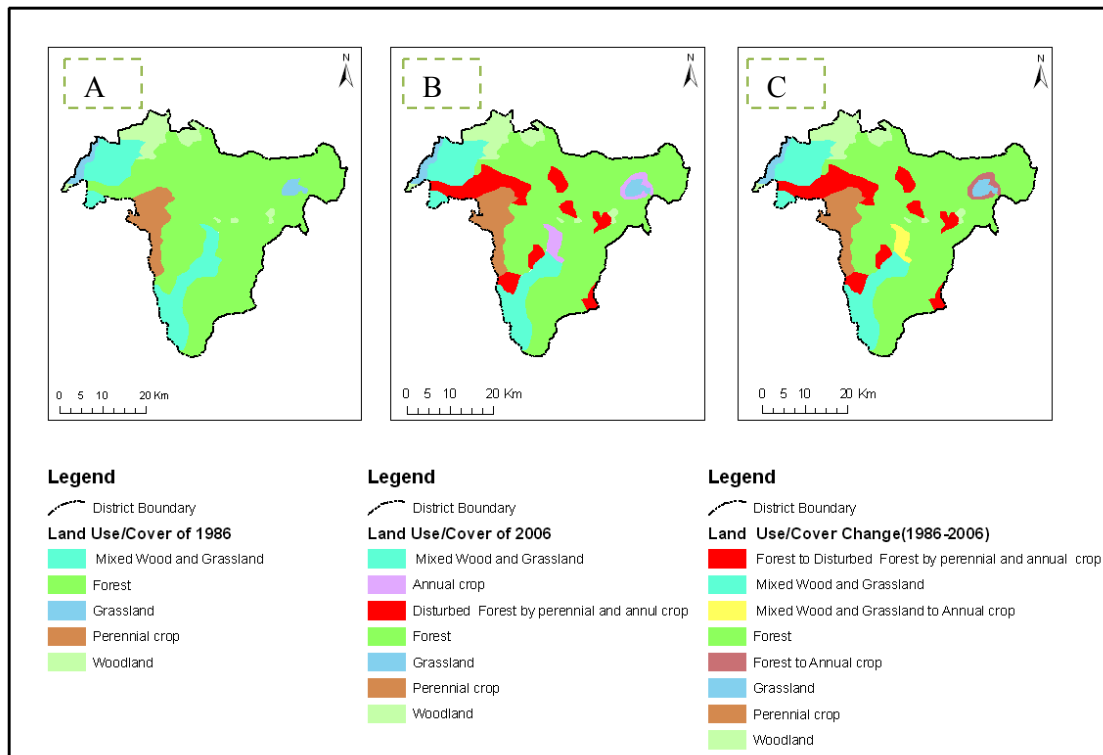


Fig. 14. Land Use/Cover maps of Nansabo Woreda for 1986 (A), 2006 (B) and LULC change from year 1986 – 2006 (C).

7. Discussion

Mobility of communities from one place to another in search of grazing areas for their livestock nowadays has proved socially hostile and environmentally expensive. When communities move from their permanent residential areas and temporarily settle in a new biotic environment they should cut trees and grasses to make temporary shelters. This practice has immediate negative impacts on biodiversity composition, function and structure of ecosystem and alters LULC of the area under question. Reports of Agriculture and Rural Development Offices of the Woredas dealt with in the current study have shown that an increase in a population size is coupled with a high number of livestock. Increased livestock number directly implies a high level of competition for the limited natural resources, for example, grazing areas and water sources. These cascading events could lead to severe conflicts among local communities themselves (livestock herders) and with immigrants (e.g. those coming from SNNP) and environmental degradation.

Fencing of different land use types in Harawa Kuni is a relatively new phenomenon. Most homesteads, croplands and grasslands are fenced on individual discretions and fencing forest areas, however, has started at a later stage. The mapping team has pointed out that several people from SNNP (mainly Bensa Woreda) have been settling by their own right in this Kebele and are fiercely competing with the indigenous communities for natural resources such as grasses and farmlands. They have also mentioned that their reports to local leaders to stop this apparent influx have not yielded any solutions. Therefore, fencing of plots in Harawa Kuni is attributed to this vivid unchecked influx of people from the neighbouring Regional State and is meant to discourage new immigration. Such unplanned settlement and competition for natural resources will have severe environmental and socio-economic implications. It, however, does not mean that compared to free access type of resources utilization, fencing causes misuse of resources on different land use types. What initiated fencing practice and its side effects (if at all) on grassland, cropland and forests resources calls for further study.

In rural Kebeles land redistribution was done during the Villagization Program of Ethiopia in 1981. Following the implementation of this Program many new households have been formed whose families have basis either within the study sites or in another place (outside study Woredas). Whatever their origin would be they need land for crop production, grazing and living. The absence of land redistribution after 1981 E.C. may have triggered forest clearing for two main reasons, i.e., (1) to meet their need for cultivation and (2) to make informal transaction for generating income. For example, 31% of homes in the study sites were constructed on lands that were acquired either by clearing of forest areas or through informal land transaction. In all rural Kebeles and Chirri Sefera town, houses were constructed without a prior consent and approval of any legal institution. Furthermore, the current study has noted that new families usually move away from residential areas of their parents and construct homes in the forest areas (Fig. 15) and continually expand their land holdings after clearing forests (Fig. 16).



Fig. 15. A recently constructed house in forest area in Kumbi Kebele, Harana Buluq.



Figure 16. Forest clearing and burning to open up cropland in Dallo Mena Woreda.

In all studied Woredas, there was a clear change in the LULC. For example, croplands of various types have been recorded. These croplands were resulted due to the conversion of forests, woodlands and wooded grasslands to cultivation following clearing. But the percentage of changes of different land use types to croplands was found to be variable among the studied Woredas (Table 7).

Table 7. Summary of LULC changes in the four Woredas of the study areas. NA = Not applicable.

| LULC Conversion types | LULC % conversion in each woreda | | | |
|------------------------------------------|----------------------------------|--------------|------|---------|
| | Dallo Mena | Harana Buluq | Goba | Nansabo |
| Forest to annual crops | 5 | 6 | 7 | 17 |
| Woodland to mixed woodland and cropland | 5 | NA | NA | NA |
| Woodland to cropland | NA | 1 | 28.5 | NA |
| Wooded grassland to cropland | NA | 3.4 | NA | NA |
| Woodland to plantation | NA | NA | 1 | NA |
| Bushed grassland to cropland | NA | NA | 28 | NA |
| Bushed grassland to plantation | NA | NA | 1 | NA |
| Mixed woodland and grassland to cropland | NA | NA | NA | 9 |

Although cropland expansion is a common trend elsewhere in the country such as Mettu area (Solomon 1994), Chemoga watershed (Gete 2000) and Fincha'a watershed (Bezuayehu 2006) the situation in these pilot Woredas is remarkable as well. This was most likely caused by those immigrants from different parts of the country who settle in the areas by themselves and high rate of population growth. It should also be stressed that consideration of forest lands as a free access resource in the Woredas must have further aggravated the expansion of cropland. Furthermore, the absence of enforced land use policy at both national and local

levels must have lead to cultivation of steep slopes which in turn subject the landscape to sever soil erosion and degradation.

Although LULC change is an indirect measure of settlement dynamics, it provides robust evidences on the footprints of active human impacts on natural resources. The latter are usually manifested through expansion of cultivation fields and new settlements following forest and woodland clearings. The current study clearly illustrates human-driven changes in LULC of the study Woredas.

Comments and Conclusion

Course images of 15 and 30 m resolution cannot be used for settlement mapping in situations like Dallo Mena, Harana Buluq, Goba and Nansabo Woredas because of two outstanding reasons. (1) Settlements in the area are scattered across landscape, not clustered. (2) Recently established villages are surrounded by trees with large canopy covers. Study of LULC changes could be a good alternative for analysing the impact of settlement dynamics across landscapes. A good reason for this is that when settlers construct homes they clear forests to open up croplands around homestead areas. They do not clear forest to create grassland; instead they let their animals graze in the forests.

In rural parts of the study sites settlements were created without any land use plan. Lands for constructing houses can be allocated by parents and through informal arrangements (deforestation and informal land transaction) without knowledge of land use planning. This mode of land acquisition is rather manipulative to resources and aggravates land degradation problems because it leads to forest clearing to adjust the lands for settlement and crop production activities.

Nowadays mobility of communities from one place to another to feed animals, collect coffee and honey has become socially hostile and environmentally disastrous. For instance, formerly stealing of coffee product which is under someone else's holding was unethical. Currently, however, this social value has been undermined leading to collection of green coffee beans. When coffee is harvested at green stage its quality drops and it consequently receives low market price. If such trend is allowed to take place, it will be disastrous both for the coffee plants and shade trees. When large number of animals moves to limited area competitions on grass and water (*Hora*) increases which could lead to overgrazing and over trampling of grasslands and water points.

Expansion of agricultural land which is mainly a function of unplanned settlements is the main causes of reduction in forest lands. Forests have become an open access type of use whereby people can practice any harmful activities such as forest clearing and setting on fire. Since land use planning policy is lacking in the pilot Woredas further undesired land use changes are imminent. But if such trend is allowed to occur the remaining forests will be at risk subjecting the rugged topography to land degradation problems.

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Annex 1. Questionnaire

1. Kebele Respondant's name
2. Sex Age
3. When was this house constructed (year)
4. Is this house occupied all year round? Yes/No If No, what months of a year this house being occupied?
5. How was this land plot allocated to you? Given by Woreda, Kebele, Family allocation or oneself. If the answer is different from the lists please mention the means of land acquisition.
6. Was any official permission needed to construct a house in this place? If yes, from whom, what is the procedure?
7. What was the land use on this plot before a house settlement? (Forest, Cropland, Grazing land).
8. What is the size of this land plot under your holding? Give estimated size in m².