PARTICIPATORY RURAL APPRAISAL REPORT: DERA DISTRICT

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Lists of Abbreviations and Acronyms

ABW	African Bollworm
ACSI	Amhara Credit and Saving Institute
AGP	Agricultural Growth Programme
ANRS	Amhara National Regional State
CASCAPE	Capacity Building for Scaling Up of Evidence-Based Best Practices in Agricultural Production in Ethiopia Project
DA	Development Agent
FDRE	Federal Democratic Republic of Ethiopia
FTC	Farmers' Training Centre
ISFM	Integrated Soil Fertility Management
NGO	Non-Governmental Organisation
PA	Peasant Association
PRA	Participatory Rural Appraisal
WUR	Wageningen University and Research Centre
WVE	World Vision Ethiopia

Executive summary

The study *woreda*, Dera, is located in the Amhara regional state of Ethiopia, and is a part of the south Gonder zone. Dera is bordered to the south by the Abay river (which separates it from the east Gojam), to the west by Lake Tana, to the north by Fogera, and to the east by Estie. In the project *woreda*, the scarcity or abundance of natural resources was critically studied in the community using resource mapping and subsequent discussion. Arable land, grazing land and water resources were identified as scarce resources, while a shortage of cultivated land was considered the most critical concern for young farmers. Compared to other land uses, the forest area constituted the smallest share. Some climax forest (rich in diversity) administered by the government and the church were found in a few areas, and, eucalyptus plantations were found commonly around homesteads. The most important sources of energy are wood from eucalyptus plantations grown around the homestead, and cow dung. The use of crop residues, especially maize stalks, is another source of energy. The main sources of potable water in the project area are natural springs and capped wells.

Water for irrigation is considered as one of the most important resource that enables crops to be produced more than once a year. However, not all the *kebeles* in the *woreda* have the same potential for irrigation water. The study revealed that Jigna and Korata *kebeles* have good irrigation potential. Irrigation water management practices in the study area are traditional and are based on the local knowledge of the farmers. Most of the farmers irrigate their fields without considering irrigation scheduling, crop water requirements and irrigation methods. Water users' associations prepare irrigation schedules regardless of the type of crops irrigated and the size of the fields. The major soil types are nitosol and vertisol, with nitosol accounting for a higher proportion. Vertisol is mostly found close to Lake Tana. Farmers described the low levels of productivity in terms of many interrelated factors. They considered the loss of soil fertility to be the major cause of declining productivity. This is thought to result from repeated cultivation, erosion, and removal of all crop residues for use as animal feed and fuel.

The farming system of the study areas is characterized by crop-livestock mixed farming. Farm households depend mainly on crops both for food and cash income. Adoption of improved technologies is minimal due to weak extension services, and lack of awareness among both extension workers and farmers about technologies from different sources. Although cooperatives exist in the study area, their contribution to improvements in agricultural productivity are poor, mainly due to poor managerial skills and a shortage of capital. Credit facilities are available in the study areas. The main institutions that provide credit for farmers are cooperatives and the Amhara Credit and Savings Institute (ACSI). The main suppliers of agricultural inputs are service cooperatives and private traders. Cooperatives usually supply fertilizers and improved seeds of field crops, while private suppliers deliver pesticides and improved vegetable seeds. Farmers explained that the input systems from cooperatives are characterized by delays and poor quality seeds, while inputs from private sources are costly and also of poor quality. The study further revealed that the marketing system in the study areas is inefficient due to low product prices, market dictation by middlemen and wholesalers, and poor access to transportation, especially in Korata *kebele*.

Four types of cropping season are known in the study areas, namely main season (rain-fed agriculture), residual moisture, full irrigation in the dry season and recession farming. Residual moisture is common in Jigna *kebele,* while recession agriculture is common in Korata *kebele*. Different constraints reduce crop production and productivity in the study area. The most important of these are low soil fertility, lack of improved varieties (for most crops), insect pests, diseases, lack of improved agronomic practices such as appropriate seeding rates and planting methods, cropping systems, and method, frequency and timing of irrigation. The study revealed that crop pests are the major production constraints in the study areas. The major insect pests include stem borers on maize, red teff worm on teff, African bollworm (ABW) on

chickpea, aphids on field pea and grass pea, different aphid species on head cabbage, wilt complex on chilli pepper, bulb rot on shallot, and late blight on potatoes. Wilt complex on chilli pepper was the most devastating disease experienced in recent times.

Natural pastures and crop residues are the major feed sources for animals in the project areas. Most natural pasture lands are overgrazed, gully formed and silted by floods during the rainy season. In addition to this, because of the increasing population, grazing pasture lands have been converted to crop land. Animal diseases (internal parasites and contagious diseases) are a serious problem in the *Woreda*. Due to an absence of animal health clinics in some *kebeles*, animals have been taken to the *woreda* clinic for examination and treatment. A shortage of drugs is common, and farmers are forced to purchase tablets and injections from private drug vendors at prohibitive prices.

1. Introduction

Agriculture is the source of livelihood for the overwhelming majority of Ethiopia's population. It employs over 80% of the labour force and on average contributes 45% of the national annual GDP. High population growth (at a current annual rate of 3.3%), recurrent drought (Deressa and Hassen, 2009), and low productivity of crops, all pose huge challenges to Ethiopian agriculture in meeting the food demand of the country. This wide gap between food production and food demand can be narrowed through intensification of agriculture (Wallace and Knausenberger, 1997).

The Amhara National Regional State (ANRS) is one of the nine regional states of the Federal Democratic Republic of Ethiopia (FDRE). In geographic terms, the ANRS is located between latitude 90 21' to 140 0' North and longitude 360 20' to 400 20' East. The total area of the Amhara region is estimated to be 170,752 square km. Nearly 87% of the region's population lives in the rural areas with its livelihood mainly depending on agriculture and related activities. Owing to the various biophysical and socio-economic challenges, the region is one of the poorest in the country. The causes and the intensity of poverty in the region can most readily be attributed to the low performance of agriculture: the sector which defines and leads the regional economic structure. The low returns from agriculture are attributed to factors including erratic rainfall, prevalence of pests and diseases, scarcity of farmland, soil erosion and degradation, lack of improved technologies, lack of supportive services, and poor socio-economic infrastructure. The concerns about smallholder agriculture in this region from the academic and development points of view can, therefore, no longer be ignored.

The Capacity building for scaling up of evidence-based best practices in agricultural production in Ethiopia (CASCAPE) project is a joint project between the governments of Ethiopia and The Netherlands. It is financed by the Ministry of Foreign Affairs in The Netherlands. The project is intended to support an effort to enhance agricultural production and productivity in Ethiopia through support for an Agricultural Growth Programme (AGP). Accordingly, six Ethiopian universities (Bahir Dar, Haramaya, Hawassa, Jimma, Mekelle, and Addis Ababa Universities) and Wageningen University and Research Centre (WUR) (The Netherlands), and five regional research institutes cooperate in implementing the project.

Dera *woreda* is one of the intervention areas of the project, under the supervision of Bahir Dar University. Mixed crops and livestock dominate the agricultural production systems of the *woreda*. Describing the existing production systems, their management and utilization helps in the identification of potential research and development agendas. Conducting research supported by diagnostic surveys will also help with adoption of technology, and with change to a problem oriented and demand driven system. No significant effort has yet been made to describe and understand the farming systems, their agricultural constraints and opportunities in order to bring the problems forward for research and development interventions. With this background and justification, the CASCAPE project conducted PRA surveys, together with Bahir Dar university, to characterise and analyse the production systems so as to identify areas of potential and constraint, and the best directions for future research and development in the intervention area.

1.1 Objectives

The main aims of the CASCAPE project are to enhance agricultural growth and achieve food security by identifying bottlenecks for agricultural productivity, identifying evidence-based best practices, and gaining a better understanding of the success factors for up-scaling of best practices in the agricultural sector.

In order to achieve the intended missions of the project and to make the interventions demand driven and participatory, a general understanding of the farming system is essential. With these justifications, PRA surveys were conducted in four selected rural *kebeles* or peasant associations (PA) in Dera *woreda,* namely; Jigna, Korata, Gelawdewos and Shime, with the following objectives:

- To identify constraints, potential opportunities and intervention points for the improvement of agricultural production and productivity of the area;
- To get an insight into, and clear picture of the farming system of the area;
- To identify best practices, if available, employed to tackle agricultural problems being addressed:

1.2 Methodology

Participatory Rural Appraisal (PRA) tools and techniques were employed to facilitate the discussions with farmers. The techniques were used to collect primary information from farmers in a participatory fashion. Secondary data were obtained from published and unpublished sources. The main sources of secondary data for this study were *woreda* and *kebele* level offices of agriculture. Along with secondary data collection, discussions were held with development agents and experts, and key informants, to obtain as much information as possible about the farming systems of the study area.

1.3 PRA tools used

PRA tools and techniques adopted by the team are indicated as follows

1.3.1 Resource mapping

This method was used to assess the availability of natural resources in the area. Farmers were asked to draw a map of their village and mark available resources or land use types using locally available materials (rope, stick, stone, tree leaf, grass, soil and card) on a clean piece of ground. Participant farmers selected one person among them to draw the map with their guidance. The selected farmer first drew the boundaries of the *kebele* using rope. Farmers complemented and corrected each other to draw an accurate boundary.

Following the completion of the boundary, they located available roads (both asphalt and all weather roads) using sticks as a reference points to mark different settlements (*gott*) in the *kebele*. The different villages were located by writing the name of the village on a piece of card. Using the villages and roads already drawn as a reference, seasonal and permanent rivers were then added. Then, the different land use types: grazing land, forest land and crop land were marked using grass, tree leaves and soil respectively. Finally, they marked the area under irrigation. After the map was completed, participant farmers made comments and added the final details.

1.3.2 Social mapping

First, farmers were asked to identify social and economic service giving institutions/organisations and farmers' groups available in the area. Subsequently, using the resource map as a base, farmers marked the identified institutions/organisations and farmers' groups.

1.3.3 Actor landscape

With the facilitation of one of the PRA team members, farmers were asked to identify institutions or organisations working with the community or in the *kebele*. The name of each organisation or institution was recorded on a separate piece of card. Then, farmers identified the most important ones from the comprehensive list and the reason why they considered them important. The note takers wrote down all the information as the farmers' discussions progressed. Following this, a big circle was drawn on the ground with rope to represent the entire farming community of the *kebele*. The facilitator read the name of each institution or organisation written on the cards, and asked participants to place the cards inside the circle, close to the circle or at varying distances from the circle, to show the importance and degree of contact/co-operation of the organisation with the *kebele*. The nearer the distance from the big circle a card was placed, the more important the institution is, and farmers placed institutions which they consider unimportant furthest away from the big circle. The most important institutions were placed inside the circle.

1.3.4 Problem ranking matrix

This important tool was used to identify and prioritise agricultural production problems in the area. The PRA team spent almost a whole day, which was half of time allotted for one *kebele*, conducting this exercise. Firstly, farmers were asked to fully identify agricultural production problems. Then, the PRA team organised the list of problems into a manageable size by merging similar or related ones. The final list was presented to the participant farmers for comment. After getting the farmers' consent, a comparison of the problems was made by presenting them to the farmers two at a time. Scores given to each problem were added and ranked according to their scores. Finally, the rank obtained by each problem was discussed by the farmers to ensure that they agreed with the results.

1.4 Methods of data analysis

The data collected from all sources were analysed using both qualitative and quantitative methods of data analysis. Descriptive statistics were employed to analyse the quantitative data. Simple graphs, charts and tables were also used to systematically present the results of the survey.

2. Description of the *woreda* and Selected *kebeles*

Dera is one of the *woredas* in the Amhara region of Ethiopia. Dera forms a part of the south Gonder zone, and is bordered to the south by the Abay river which separates it from the east Gojam. To the west it is bordered by Lake Tana, to the north by Fogera, and to the east by Estie. Dera *woreda* covers a total area of 158,948 ha, of which 35% is plain, 20% is mountainous, 18% is gorges and 27% is undulating. The altitude of the *woreda* ranges from 1,500 m to 2,600 m above sea level while the annual average rainfall is 1,250 mm. As to the agro-ecology, 85% is *Woynadega* while 15% is *dega* (source: *Woreda* office of agriculture). There are 32 *kebeles* in the *woreda,* of which 29 are rural *kebeles* and 3 are town *kebeles*. The total population of the *woreda* is 259,113 of which 132,367 are male and 126,746 are female. The number of households in the *woreda* is 51,129 of which 45,757 are male headed and 5,370 are female headed (source: *Woreda* office of agriculture).

Table 1: Land use pattern of Dera woreda

Land use	**Area coverage(ha)**
Annual crops	66,131
Perennial crops	5,553
Grazing land	9,764
Forest land	6,834
Bushes and Shrubs	15,372
Road	2,254
Westland	15,105
Covered by water	7,201
Construction and Settlement	11,513
Others	19,221

2.1 Jigna *kebele*

The total geographic area of the *kebele* is estimated to be 1,650 ha, of which 1,319 ha is arable land, 296 ha grazing land, and 35 ha forest. The topography of the *kebele* is 100% plain. The number of households in the *kebele* is estimated to be 1,492 of which 1,209 are male headed and 283 are female headed. The total population of the *kebele* is 6,624 of which 3,358 are male and 3,266 are female. The annual maximum and minimum rainfall of the *kebele* are 1,200 to 1,000 mm, respectively, while maximum and minimum temperatures range from 36^{o}C to 24^{o}C.

2.2 Korata *kebele*

The total area covered by the *kebele* is estimated to be 2,609 ha, of which 2,202 ha is arable land, 232 ha is grazing land and 245 ha is forest. The topography of the *kebele* comprises 61% plain, 30% undulating, 6% is gorge and 3% wetland. The number of households in the *kebele* is estimated to be 1,849 of which 1,651 are male headed and 198 are female headed. The total population of the *kebele* is 9,245 of which 4,823 are male and 4,422 are female. The maximum and minimum temperatures of the *kebele* are 29^{o}C and 23^{o}C, respectively, and the maximum and minimum rainfall are 1,000 mm and 750 mm, respectively.

2.3 Gelawdewos *kebele*

The total area covered by the *kebele* is estimated to be 3,744 ha, of which 2,821 ha is arable land, 135 ha is grazing land and 650 ha is forest. The topography of the *kebele* comprises 25% plain, 60% undulating, 5% gorge and valley, and 10% mountainous. The total population of the *kebele* is 7,338 of which 3,793 are male and 3,545 are female. The number of households in the *kebele* is estimated to be 1,616 of which 1,411 are male headed and 205 are female headed. The maximum and minimum temperatures of the *kebele* are 25^{o}C and 18^{o}C, respectively, and the average annual rainfall is 1,250 mm. The altitude range of the *kebele* is 2,200 to 2,600 m. above sea level.

2.4 Shime *kebele*

The total area covered by the *kebele* is estimated to be 3,054 ha of which 2,729 ha is arable land, 79 ha is grazing land, 80 ha is forest, 45 ha is gully and gorge, and 121 ha is settlement. The topography of the *kebele* comprises 20% plain, 65% undulating, 5% gorge, and 10% mountainous. The number of households in the *kebele* is estimated to be 2,520 of which 2,128 are male headed and 392 are female headed. The total population of the *kebele* is 14,125 of which 8,005 are male and 6,120 are female. The maximum and minimum temperatures of the *kebele* are 23^{o}C to 13^{o}C, respectively.

3. PRA Results

3.1 Environmental conditions

3.1.1 Environmental conditions Jigna *kebele*

The scarcity or abundance of the natural resources were critically assessed by the community using resource mapping followed by group discussion. Water resources have become a major source of conflict in the *kebele*, as water shortages are becoming more serious each year, especially for the production of irrigated crops. The main problem is that downstream farmers run short of irrigation water because upstream farmers use more than their share. Shortage of land was also found to be of critical concern, leaving many young farmers landless.

As the *kebele* is vertisol dominated, the formation of big gullies that reduce the area of farmland and grazing land has become a major issue. High livestock populations cause overgrazing of commonly administered natural pasture, reducing the amount of feed available throughout the year. Mismanagement is as severe a problem as the small area available for grazing. Overgrazing and erosion caused by animal tracks thus contribute to the degradation and poor productivity of grazing land.

Although, the average land holding of the *kebele* is 1.5 ha, the amount held by different groups in society is not uniform. The variation was particularly evident between the poor and rich farmers with landless young farmers being a special case.

Farmers classify their land fertility into two categories; those lands which are found in plain areas are fertile due to sedimentation from upper catchments, while gently sloping land is relatively infertile. The fertility of the land is generally decreasing. Even though most of the farmers cultivate their land without application of fertilizer, some farmers are using fertilizer and they achieve better yields than those not using fertilizer, proving that the soil fertility status is declining regardless of sediment deposited from the upper catchments. Decisions about what types of crops are sown in each growing season were made by consultation within the family, especially the spouse for male headed households, while for female headed households, the decisions are made by the head herself. These decisions consider the land suitability for the production of different crops. Most of the land in this *kebele* is allocated to rice production as it is not suitable for the production of a diversity of crops.

The major sources of energy are fuel wood from eucalyptus plantations grown in the homesteads, and cow dung. The use of crop residues, especially the stems of maize is another source of energy. The main sources of potable water in the project area are natural springs and capped wells. The availability of water differs from village to village, and women and children are usually more responsible for collecting cow dung and water.

A shortage of grazing land is not a problem, but its management causes many problems. The fact that grazing land is administered as a communal resource has caused more problems than benefits. The natural pasture is being degraded because it has been grazed throughout the year without rest, resulting in overgrazing and trampling. This uncontrolled grazing sometimes extends beyond the carrying capacity of the grazing land. It also affects the natural biodiversity of pastures leaving them dominated by weeds. Conversion of grazing land to crop land was mentioned as one of the major problems that will hinder future livestock production.

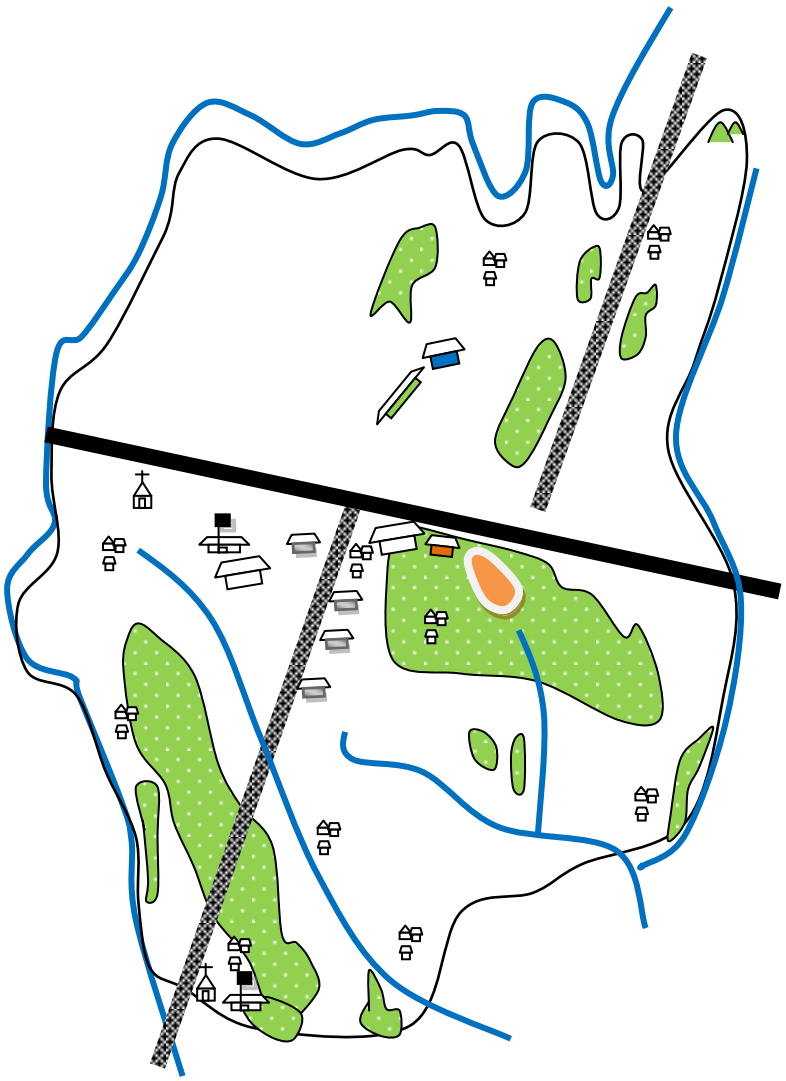

Figure 1: Resource Map Jigna *kebele*

Table 2: Summary of findings - resource availability, Jigna kebele

No	Items	Findings
1	Abundant resources	-------
2	Scarce resources	Water and land
3	Problematic resource	Land reduction by gully formation
4	Access to land per community group	Not equal
5	Fertility distribution of the land	Not uniform
6	Decision making on land allocation	Based on discussion and decision among all family members
7	Collection of firewood	All family members are responsible
8	Collection of water	Women and children are mainly responsible
9	Livestock grazing	Mostly on communal land and small number of private grazing lands
10	Environmental constraints	Gully formation and free grazing

3.1.2 Environmental conditions in Korata *kebele*

In this *kebele*, grazing land, arable land and water were described as as scarce resources. Shortage of cultivated land is the most critical concern for young farmers. The result of pair wise problem ranking indicated that shortage of irrigation water is also a high priority problem. This is due to the drying up of most of springs and rivers in January.

Shortage of arable land not only affects the landless youth but also other groups in the community. Declining soil fertility and also increasing family sizes mean that the land cannot produce enough. The livelihoods of families currently depend on the same farmland that was allocated 15 years ago. Overgrazing of commonly administered natural pasture caused by high stocking levels reduces the amount of feed available throughout the year. Arable land holdings among the different groups of society were not uniform in this *kebele*. The variation between poor and rich farmers was particularly evident, with landless young farmers being a special case. The average land holding size for the poor was less than one ha, while the rich had arable land holdings of up to three ha.

Farmers identified four categories of soil, namely: vertisol (*walka*), red soil (*lem borebor*, which is supposed by farmers to be fertile), red soil (*bork borebor*, which is supposed by farmers to be less fertile), and sandy soil (*chencha*). Red clay soil is the most dominant soil in the *kebele* of which the low fertile soil (bork borebor) accounted larger proportion. According to farmers' experience, vertisol ranks first in terms of fertility, *lem* soil is the second in fertility, *bork* is the third while *chencha* soil has the lowest fertility. However it is important to note that the definition used by farmers to classify agricultural land based on soil fertility is only to indicate the existing variation in soil type. No crop fields are

cultivated without fertilizer except backyards that benefit from continuous application of manure and compost. The decision on what type of crop to be sown in each growing season was made by consultation of the spouse. This decision took into consideration the appropriate rotation and also the area of land held by each household. If the household landholding size was small, stable crops such as millet and maize were mostly preferred.

The major sources of energy are fuel wood from eucalyptus plantations grown in the homesteads, and cow dung. The use of crop residues, especially the stems of maize is another source of energy. The main sources of potable water in the project area are natural springs and capped wells. The availability of water differs from village to village, and women and children are usually more responsible for collecting cow dung and water.

The grazing land problem in Korata *kebele* is similar to Jigna *kebele*; the natural pasture was found to be highly degraded because it has been grazed throughout the year without rest, resulting in the depletion of the grass cover through trampling. This uncontrolled free grazing sometimes extended beyond the carrying capacity of the grazing land. It also affected the natural biodiversity of pastures, leaving them dominated by weeds. Conversion of grazing land to crop land was described as one of the major problems that will hinder future livestock production.

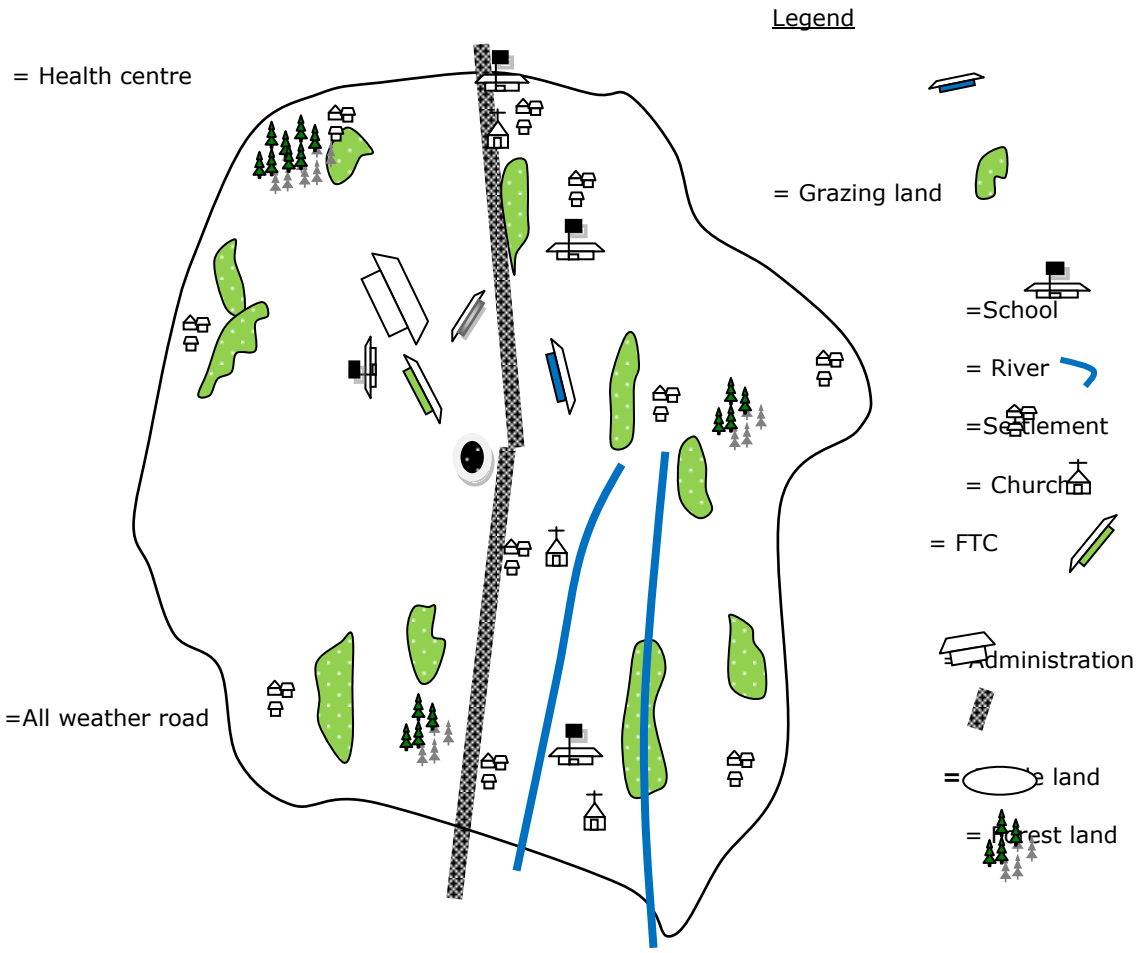

Figure 2: Resource Map Korata *Kebele*

Table 3: Summary of findings resource availability ,Korata kebele

No	Items	Findings
1	Abundant resources	-------
2	Scarce resources	Water and land
3	Problematic resource	Land, due to declining soil fertility
4	Access to land per community group	Not equal
5	Fertility distribution of the land	Not uniform
6	Decision making on land allocation	Based on discussion and decision among all family members
7	Collection of firewood	All family members are responsible
8	Collection of water	Women and children are mainly responsible
9	Livestock grazing	Mostly on communal land and small number of private grazing lands
10	Environmental constraints	Flooding and free grazing

3.1.3 Environmental conditions in Gelawdewos *kebele*

Shortage of arable land not only affects the landless young farmers, but also other groups in the community because the fertility of the land is declining and population pressure is ever increasing. The livelihoods of families currently depend on the same farmland that was allocated 15 years ago. The topography of this *kebele* is dominated by hilly and mountainous terrain, therefore unlike the previous *kebeles,* the severity of soil erosion was observed to be severe because it is aggravated by slope factors. The formation of gullies has resulted in reductions of the areas farmland and grazing land. The productivity of arable land has been further constrained by the limited erosion control measures and also by the destruction of the physical soil and water conservation measures constructed in the past years.

The farmers perceived that soil and water conservation campaigns initiated by the government were a good start in reducing soil erosion and learning from past mistakes. The coverage of these measures is, however, restricted to the pilot watershed. Thus, compared to the magnitude of the problem, the effects of these campaigns were insignificant. Other erosion control measure and soil fertility improvement measures that will protect the soil against the erosive force of rainfall such as minimum tillage, mulching, and cover crops are not yet understood or practiced.

Overgrazing of commonly administered natural pasture by high livestock populations reduce the amount of feed available throughout the year. This overgrazing and trampling lead to degradation of pasture and reduced productivity of livestock. Farmers used traditional diversion from the *Gosho* river, and water pumped from the larger *Gumara,* river for irrigation. Only the villages in the north-west part of the *kebele* benefited from irrigation.

Compared to other land uses, the forest area constituted the smallest share. One area of climax forest, rich in biodiversity and administered by government and church, indicates the natural resources of the

area if left undisturbed. Forest provides environmental services and magnificent natural scenery because of the mosaic of exotic species such as *Podocarpus falcatus*, '*Zigiba'*, *Olea africana*, '*Woyira*', *Apodytes dimidiata*, *Donga*, *Schefflera abyssinica*, *Getem*, *Buddla polystachya*, *Atiquar*, *Prunus africanus*, and '*Tiquir Enchet'*.

Arable land holdings were not uniform among the different groups in society. The variation was particularly evident between poor and rich farmers, and landless young farmers are a special case. The average land holding size for poor farmers was less than one hectare, the middle group could have arable land of up two hectares and the well-to-do farmers, although few in proportion, could have as much as three hectares of arable land. Those male or female households with arable land before redistribution also benefited from the redistribution, because it was made in proportion to the previous holding regardless of gender. Therefore, there are female households with as much as three hectares of arable land. Higher officials from the former regime (the so-called 'bureaucrats') have an average of one hectare of land.

Farmers identified three categories of soil fertility, namely, fertile, medium and infertile. The proportional distribution of these fertility categories as estimated by the farmers was 5% for fertile land, 10% for medium and the remaining 85% infertile soil. This demonstrates the decline in soil fertility. It is important to note, however, that the definition used by farmers to classify agricultural land based on soil fertility only covered that land on which crops are grown without the application of fertilizer. Under this definition, farmers claimed that only backyard land that benefits from continuous application of manure and compost can be considered as fertile, while other farmlands were classified as having medium or poor fertility because of the continuing, long-term decline of soil fertility caused by soil erosion and leaching of nutrients from exhaustively cultivated land.

Farmers' decisions about what types of crop should be sown in each growing season were made by consultation of the spouse. This decision took into consideration the appropriate rotation and also the area of land held by each household. If the household landholding size is small, crops which are considered to be stable are preferred, but they are grown continuously without any sort of rotation that might have a positive impact on the soil fertility.

An energy shortage was apparent during the rainy season. The major source of energy is eucalyptus from plantations grown in the homestead. A small number of people also used branches of trees from farmland, and cow dung. The use of crop residues was minimal in this *kebele* because maize stalks are the preferred fuel, and relatively little maize is grown here. The main sources of potable water in the project area are natural springs and capped wells. The availability of water differs from village to village, and the longest time required to fetch water was estimated to be two hours for a round trip. Women and children are usually responsible for collecting water.

In most villages, although excessive amounts of grazing land are not available, it is not, on the other hand, in critical shortage. Rather, it is the way it is being administered that creates problems. Grazing land is managed communally, and lack of control leads to overgrazing. Illegal expansion of arable land by trespassers also contributed to the shrinkage of grazing.

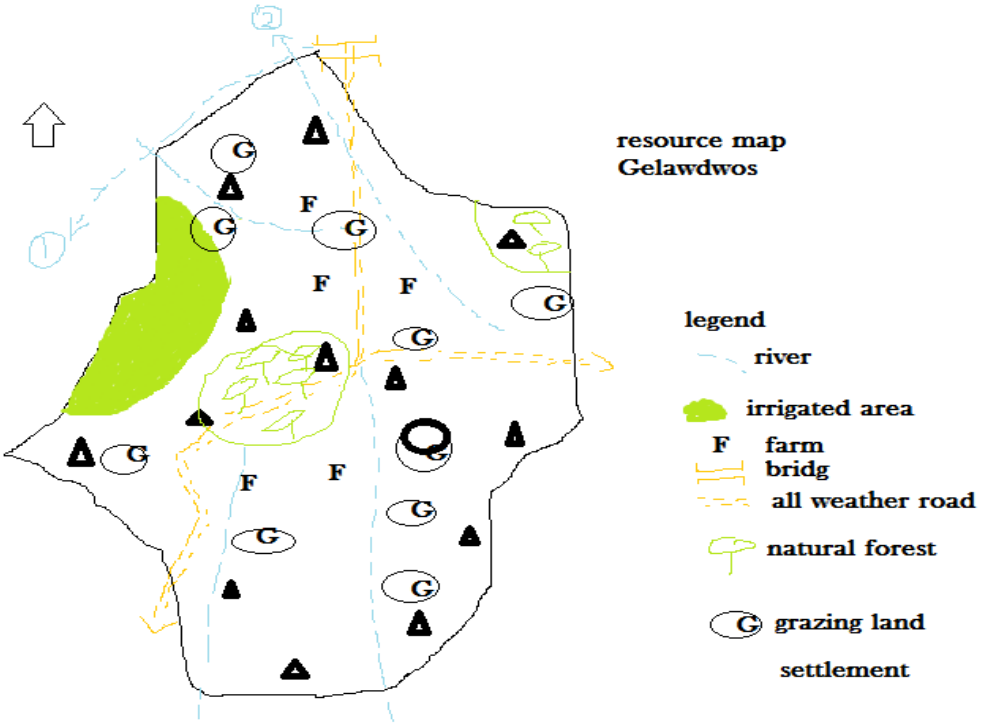

Figure 3: Resource map Gelawdewos *kebele*

Table 4: Summary of findings - resource availability, Gelawdewos kebele

No	Items	Findings
1	Abundant resources	-------
2	Scarce resources	Water and land
3	Problematic resource	Land due to declining soil fertility
4	Access to land per community group	Not equal
5	Fertility distribution of the land	Not uniform
6	Decision making on land allocation	Based on discussion and decision among all family members
7	Collection of firewood	All family members are responsible
8	Collection of water	Women and children are mainly responsible
9	Livestock grazing	Mostly on communal land and small number of private grazing lands
10	Environmental constraints	Erosion and free grazing

3.1.4 Environmental conditions in Shime *kebele*.

Land is a scarce resource in Shime, like the other *kebeles*. Because of continuing population growth, this problem is critical for young farmers who received no land during redistribution 15 years ago. Scarcity of water, for livestock and people, during the dry season has also become an increasingly common phenomenon. The topography of the *kebele,* which is dominated by hilly and mountainous terrain, causes severe soil erosion and formation of gullies that reduce the area of available farmland and grazing land. The productivity of arable land has been further constrained by limited erosion control measures, and also by the destruction of the physical soil and water conservation measures constructed in past years. Overgrazing of communally administered natural pasture by the high livestock population reduces the amount of feed available throughout the year. Compared to other land uses, the forest area constitutes the smallest share but Eucalyptus plantation around homesteads is a common practice. Arable land holdings among different groups of society were found not to be uniform. The variation was particularly evident between the poor and rich farmers with a special case for the landless young farmers.

The effects of rugged topography and excess rainfall mean that soil erosion is the main problem of the area, leaving the soil depleted and infertile. Although 98% of the land is red soil and 2% is brown, within red soil, farmers classify their soil as fertile (*lem*) and poor soil (*bork*), based on the colour of the soil and level of organic matter. Farmers reported that *lem* soil is relatively fertile with good organic matter content and a dark red colour, but *bork* soil is characterized by its deep red colour with very little organic matter content. *Lem* soil requires less fertilizer than *bork* soil, but gives a better return. The fertility of the soil is generally declining each year due to severe erosion, continuous crop cultivation and decreases in soil management practices such as rotation with legumes, and leaving crop residues on the land for nutrient recycling. Decisions about what type of crops should be sown in each growing season were

made by consultation with the spouse. This decision took into consideration the appropriate rotation, the suitability of land for each crop and also the area of land held by each household.

As in other *kebeles*, the major source of energy is wood from Eucalyptus plantations grown in the homesteads, and the main sources of potable water are natural springs and capped wells. The availability of water differs from village to village. Women and children are usually responsible for collecting water while firewood is the responsibility of the whole family. Uncontrolled free grazing, and illegal expansion of arable land by trespassers was found to affect the size and productivity of grazing land, as in other *kebeles*.

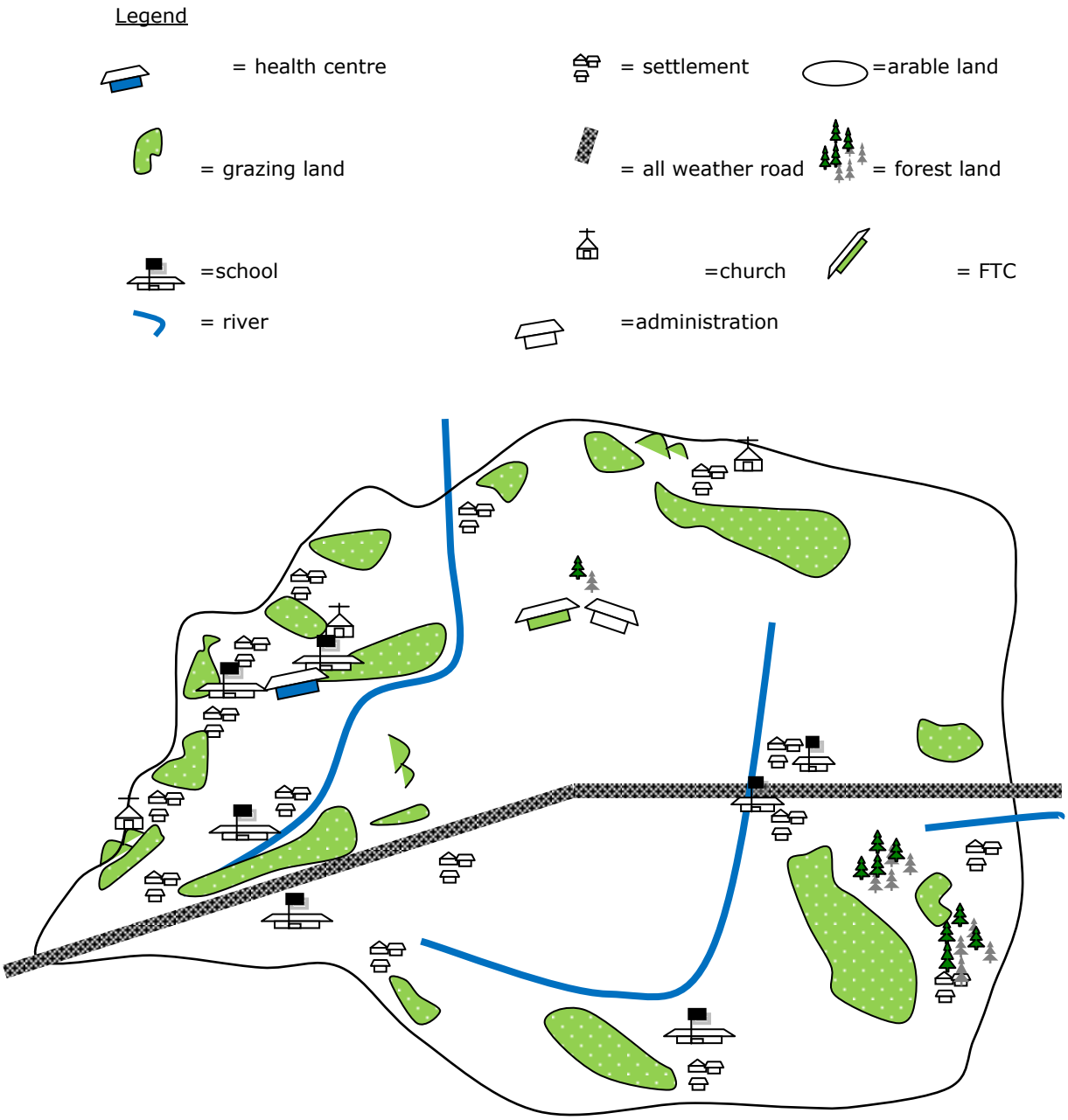

Figure 4: Resource mapping, Shime *kebele*

Table 5: Summary of findings - resource availability, Shime kebele

No	Items	Findings
1	Abundant resources	-------
2	Scarce resources	Water and land
3	Problematic resource	Land due to declining soil fertility
4	Access to land per community group	Not equal
5	Fertility distribution of the land	Not uniform
6	Decision making on land allocation	Based on discussion and decision among all family members
7	Collection of firewood	All family members are responsible
8	Collection of water	Women and children are mainly responsible
9	Livestock grazing	Mostly on communal land and small number of private grazing lands
10	Environmental constraints	Erosion and free grazing

3.2 Socio-economic conditions

Discussions about socio-economic conditions were initiated by encouraging PRA farmers to draw a social map indicating the boundaries of the *kebele* in relation to social interaction. The social map included the socio-economic institutions which are found within the *kebele*. The maps revealed that basic institutions such as schools, churches, FTCs, *kebele* administrations, a health centre and so on are found in every *kebele*. On the other hand, some institutions such as market places, animal health posts, and some NGOs are found only in some *kebeles*. After mapping, semi-structured interviews were conducted. The findings of the semi-structured interviews are summarised by *kebele* in this section.

3.2.1 Socio–economic conditions of Jigna *kebele*

The socio-economic boundaries of Jigna *kebele* are wider than the physical boundaries of the *kebele*. The reason is that there is frequent interaction on many issues such as marriage, *idir, ikub, debo* and so on with the nearby villages of other *kebeles*. According to the perceptions aired by farmers in PRA discussion groups, the number of households, the total population and the average family size within a typical household are all growing in the long term. They also underlined that family planning efforts by the government and other organisations promoting birth control, have had no significant effect in reducing the rate of increase in population growth. The main concern about population growth is the parallel growth in the number of landless farmers. Livelihood throughout the *kebele* is based mainly on mixed agricultural production, in which crop production and animal husbandry are practiced side by side. The productivity of agriculture is being challenged by several constraints, which in most cases are interlinked.

In addition to agriculture, petty trading is exercised by some, especially the landless young farmers, as an alternative livelihood.

ACSI and cooperatives, are serving as the major sources of finance for farmers. There are, however, problems in the credit services provided by ACSI and the cooperatives. The main problem with ACSI is related to the low level of credit available to individual farmers. According to them, the amount is insufficient for an individual farmer who is trying to expand his farming practices in multiple disciplines, such as fattening and irrigation. Some farmers in the *kebele* also complained about the higher interest rate, 18%, although this complaint was not accepted by all participants, because The ACSI interest rate compares favourably with those of informal creditors. The credit service delivery system of cooperatives also has problems. The first is the inefficiency observed in the system. Farmers are made to go time and again to cooperatives to get the credit. This wastes the farmers' time and resources that would otherwise be invested in their farms. This problem is aggravated by the lack of a cooperative in the *kebele*. It is located 6km away in Hamusity town, in another *kebele*. The second problem in the credit delivery system of cooperatives is related to the lower level of credit that the cooperatives provide for their customers. We confirmed these discussions in meetings with the input and credit departments within the *woreda* agriculture office. According to them, the delay in input credit is a deliberate policy to encourage farmers to buy in cash rather than expecting credit every time. The other reason forcing them to make delayed disbursements is incomplete or delayed repayments by the farmers of the previous seasons' loans. The regional government borrows from the banks by providing its annual budget as collateral. That means that any delay in loan repayments by farmers has a big influence on the development efforts of the regional government.

The market in this context refers to the delivery to and purchase of different inputs and outputs by the farming community. The commodity exchange system has problems which are challenging potential improvements in the livelihoods of the farming community to a great extent. Investigation of the market for farm outputs revealed a problem in that the grain merchants usually fix prices. Because of loan repayments, farmers are forced to sell their farm outputs at harvest time. That means that more agricultural outputs are available in the market than the buyers can buy at that point in time. Hence, farmers lose their bargaining power because of huge over-supply. On the other hand, grain merchants benefit from being few in number, and strengthen their power to fix the price. This great imbalance in bargaining power between grain merchants and farmers makes the price go down to a level that cannot cover the production costs. The Jigna *kebele* is known at regional and country level for its vegetable and fruit production, which uses the Gumara river for irrigation. However, there is a long term and clearly understandable problem of an unfair market for these products. Policy makers and other stakeholders have talked too much about it, but nobody has yet emerged with concrete solutions. According to the producers, the problem is created by collusion between brokers and merchants. They negotiate with each other and decide on the price without involving the producers.

On the demand side, because of technological improvements, farmers feel they need more and more industrial outputs. This side of the market also has problems, however, that are obstacles in the way of improving the livelihoods of farmers. The prices of industrial outputs such as iron sheeting, clothing, household items and so, on increase at a growing rate. Furthermore, the supplies of some industrial materials such as sugar and oil are sometimes disrupted. The shortage in supply provokes farmers into dealing with illegal merchants and suffering high prices and low quality.

3.2.2 Socio-economic conditions of Korata *kebele*

As in Jigna *kebele*, the boundaries of the Korata *kebele* with regard to social interaction and social services are wider than the physical boundaries of the *kebele* produced during the social mapping exercise. In our personal observations, we were also able to understand that institutions such as schools, clinics, and water points are serving many people who live beyond the boundaries of the *kebele*.

According to the perceptions of farmers in the PRA discussion group in Korata *kebele*, the number of households, the total population and the average family size within a typical household are all growing in the long term.

Livelihoods are based mainly on agricultural production, in which crop production and animal husbandry are practiced side by side. This was also confirmed by the extension department within the *woreda* agriculture office and by our personal observations. The productivity of agriculture is, however, being challenged by a number of constraints, which in most cases are interlinked.

ACSI and cooperatives are serving as the major finance sources for farmers. The low level of credit available to individual farmers from ACSI was, however, described as a major problem. During the discussion it was mentioned that the maximum amount is not more than 3,000 Birr (112 euro). This is insufficient for an individual farmer who is trying to expand his farming practices in multiple disciplines, such as fattening and irrigation. The first and biggest problem related to the cooperatives' credit service is the delay in the time of delivery of credit for agricultural inputs. It is usually delivered towards the end of the sowing season. This forces farmers to practice late sowing, which causes the later development of many crop diseases and pests. The result is an overall decline in productivity and the prevalence of long-term poverty.

Investigation of the market for farm outputs revealed a problem in that the grain merchants usually fix the price. Because of loan repayments, farmers are forced to sell their farm outputs at harvest time. That means that more agricultural outputs are available in the market than the buyers can buy at that point in time. Hence, farmers lose their bargaining power because of huge over-supply. Farmers also mentioned that the cooperatives cannot assist them if market failure affects the farm outputs. This is because cooperatives are not well organised to cope with the negative influences of grain merchants. Looking at the demand side, the prices of industrial outputs such as iron sheet, clothing, household items and so on, which farmers require on a day-to-day basis, are increasing at a growing rate.

Some farmers also complained about the absence of a market place in their *kebele* or nearby areas. According to them, the long distances they travel, the transport costs, the means of transport and the time spent in transporting their farm outputs to, and the industrial commodities from, the market were a real difficulty. This also has considerable influence on the bargaining power of farmers, especially those who produce fruit and vegetables.

3.2.3 Socio-economic conditions of Gelawdewos *kebele*.

The socio-economic conditions of this *kebele* are similar to the other *kebeles*, and because of many social and economic interactions with the nearby areas, the social map is wider than the administrative map of the *kebele*. The population size, the family size within a typical household and the number of households are increasing every year. All residents are Amhara and the only religion is the Ethiopian Orthodox Church. The main sources of credit for the smallholder are The Amhara Credit and Saving Institution (ACSI) and the cooperatives. The smallholder farmers in the *kebele* are facing huge market problems because the prices of their outputs are far too low. This is a result of untimely selling, and imbalances between demand and supply. On the other hand, the prices of the industrial products needed for day-to-day life are increasing every year.

3.2.4 Socio-economic conditions of Shime *kebele*.

The socio-economic condition of this *kebele* is similar to the other *kebeles*, Because of many social and economic interactions with the nearby areas, the social map is wider than the administrative map of the

kebele. The population, the family size within a typical household and the number of households are all increasing each year. The main sources of credit for the small holder are The Amhara Credit and Saving Institution (ACSI) and the cooperatives. The smallholder farmers in the *kebele* are facing huge market problems because the prices of their outputs are far too low. This is a result of untimely selling, and imbalances between demand and supply. On the other hand, the prices of the industrial products needed for day-to-day life are increasing every year

The Ethiopian Orthodox Church is the only religion in the *kebele*. All residents are Amhara, where the female households are living in the same settlements as other community members. Livelihood is based mainly on mixed agricultural production, in which crop production and animal husbandry are practiced side by side. However, the productivity of agriculture is being challenged by several constraints, which in most cases are interlinked. In addition to agriculture, petty trading is exercised by the farmers as an alternative livelihood option, although margins are low,.

3.3 Actor landscape

3.3.1 Jigna *kebele* actor landscape

The table below shows the institutions, organisations and groups who are working with the *kebele* community, and the responsibilities of each organisation. Separate discussion groups of male and female farmers identified the relative importance of these organisations As shown in the Venn diagram below, men and women farmers identified World Vision, the health post, the farmers' training centre, Amhara Credit and Savings Agency, the *kebele* administration, and *idir* as important, and they placed them inside a big circle representing the *kebele* community. They also placed the remaining institutions outside the circle at varied distance. The nearer to the circle the more important the institution is thought to be. The very basic reasons for the selection of these organisations as the most important by both groups were their ability to respond to farmers' problems, needs and interests (problem solving capacity) and close contact with the community. Most of the time such organisations work independently. In some cases there are organisations and groups who work in close cooperation with each other. For example, World Vision Ethiopia works with the *kebele* administration, farmers' training centre, schools and health workers. Similarly, the farmers' training centre, *kebele* administration and church are also working together.

Table 6: Actor landscape of Jigna kebele

No.	Organisations	Role and responsibility
1	World Vision Ethiopia (WVE)	Construction of potable water supply, common community toilet , school, family planning, agricultural activities
2	Health post	Provision of health extension service such as distribution of malaria medicine, training, contraceptives, door to door advisory service
3	Farmers' Training Centre (FTC)	All agricultural activities
4	Public School	Education
5	Police	Peace and security
6	Cooperative	Supply of agricultural and commercial inputs
7	Amhara Credit and Saving institute (ACSI)	Credit and savings service
8	*Kebele* Administration	Administration
9	Church	Religious service
10	Edir	Social service in times of bad and good conditions
11	Youth Club	Mobilisation of youth issues and development
12	Women's Affairs	Women's awareness and empowerment
13	Animal health post	Veterinary service

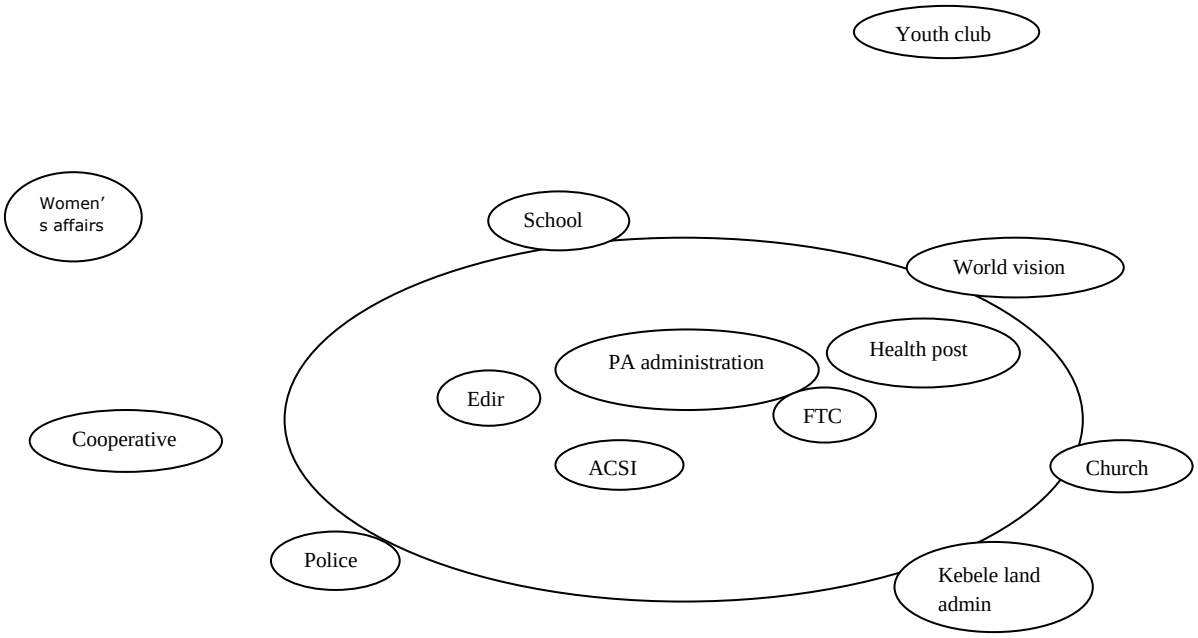

Figure 5: Venn diagram showing perceived importance of institutions in Jigna *kebele* according to the discussion group of men

3.3.2 Korata *kebele* actor landscape

As shown in Table 7, there are 13 institutions or groups working in or with the community. Separate groups of men and women farmers identified the most important institutions and placed them inside the circle. The only difference observed between the two groups was that men considered the community water management committee as most important whereas women did not identify it and they placed it outside the circle. The reason is that women are not involved with the committee, which administers water during the night time when it is dangerous for women to use it.

Table 7: Institutions, organisations or groups who are working in Korata kebele

No.	Organisations, institutions and groups working with community	Role and responsibility
1	World Vision Ethiopia (WVE) project	Construction of potable water supply, common community toilet, school, family planning, agricultural activities
2	Health Extension	Provision of health extension service such as distribution of malaria medicine, training, contraceptives, door to door advisory service
3	Farmers' Training Centre	All agricultural activities
4	Public School	Education
5	Police	Peace and security
6	Cooperatives	Supply of agricultural and commercial inputs
7	Amhara Credit And Saving Agency	Credit and saving service
8	*Kebele* Administration	Administration
9	Church	Religious service
10	Edir	Social service in times of bad and good conditions
11	Youth Club	Mobilisation of youth issues and development
12	Women's Affairs	Women's awareness and empowerment
13	Health post	Health service

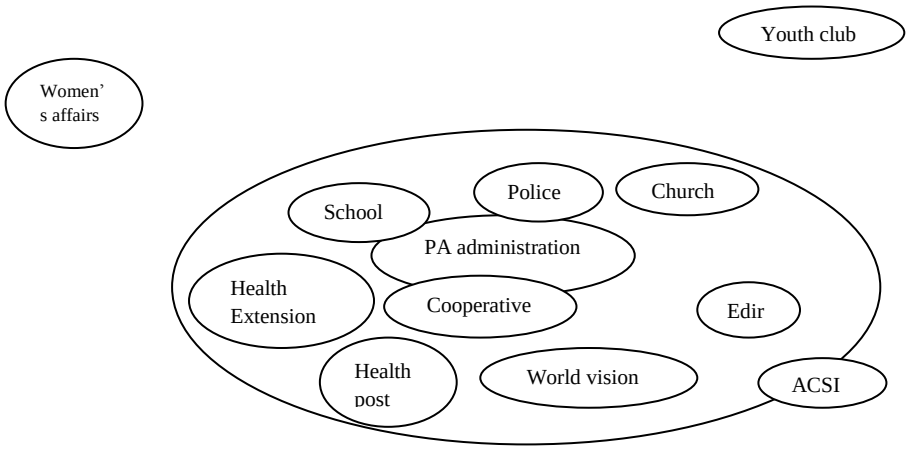

Figure 6: Venn diagram showing perceived importance of institutions in Korata *kebele* according to the discussion group of men

3.3.3 Shime *kebele* actor landscape

Separate groups of men and women farmers identified 14 different formal and informal institutions and farmers' organisations. As in the other areas, farmers identified the most important institutions and placed them inside a big circle. The remaining ones were placed outside the circle based on their relative importance, with institutions placed closer to the circle being considered more important. As in the other *kebeles*, such organisations work independently most of the time. In some cases, however, some organisations and groups work in close cooperation with each other. For example, the farmers' training centre, *kebele* administration, cooperative and church all work together on a regular basis.

Table 8: Institutions, organisations and groups who are working in Shime kebele

No.	Organisations	Role and responsibility
1	Health Extension	Provision of health extension service such as distribution of malaria medicine, training, contraceptives, door to door advisory service
2	Farmers' Training Centre	All agricultural activities
3	Public School	Education
4	Police	Peace and security
5	District Office of Agriculture	Periodic supervision and technical backstopping
6	Farmers' cooperatives	Supply of input and commercial goods
7	Amhara Credit And Saving Agency	Credit and savings service
8	*Kebele* Administration	Administration
9	*Kebele* Land Administration	Administration of land related issues
10	Church	Religious service
11	Edir	Social service in times of bad and good conditions
12	Youth Club	Mobilisation of youth issues and development
13	Women's Affairs	Women's awareness and empowerment
14	Community Leaders	Conflict resolution

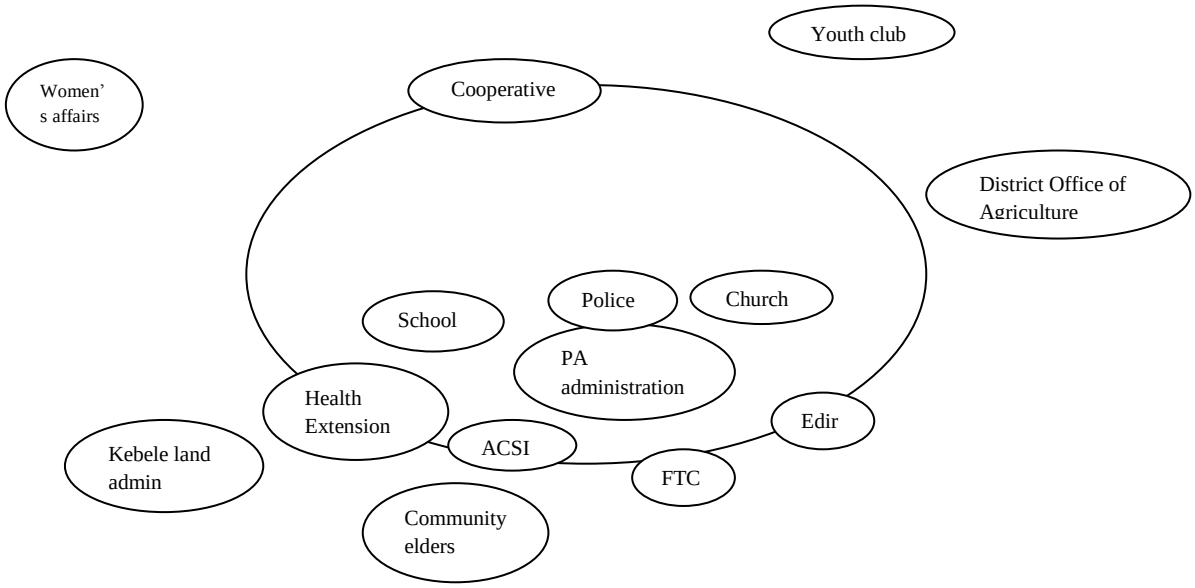

Figure 7: Venn diagram showing perceived importance of institutions in Shime *kebele* according to the discussion groups of men and women combined

3.3.4 Gelawdewos *kebele* actor landscape

Separate groups of male and female participant farmers discussed the relative importance of institutions and organisations working in the *kebele*. The results obtained from each group were almost identical. The only difference was that the women's group considered health extension as most important to them. Women farmers explained that health extension workers are delivering services for the empowerment and improvement of rural women, such as an advisory service and awareness about family planning, home management and energy saving technologies. The main reasons for the selection of these organisations were their reliable delivery of services, advice, awareness and their problem solving capacity in close contact with the community.

Table 9: Institutions, organisations or groups who are working in the kebele

No.	Organisations/institutions/groups working with community	Role and responsibility
1	Animal health centre	Animal health service
2	Health Extension	Provide health extension service like distribution of malaria medicine, training, contraceptives, door to door advisory service
3	Health post	
4	Farmers Training Centre	All agricultural activities
5	Public School	Education
6	Police	Peace and security
7	District Office Of Agriculture	Periodic supervision and technical backstopping
8	Cooperatives	Supply of agricultural and commercial inputs
9	Amhara Credit And Saving Agency	Credit and saving service
10	*Kebele* Administration	Administration
11	*Kebele* Land Administration	Administration of land related issues
12	Church	Religious service
13	Equib	Traditional saving
14	Edir	Social service in times of bad and good conditions
15	Youth Club	Mobilisation of youth issues and development
16	Women's Affairs	Women's awareness and empowerment

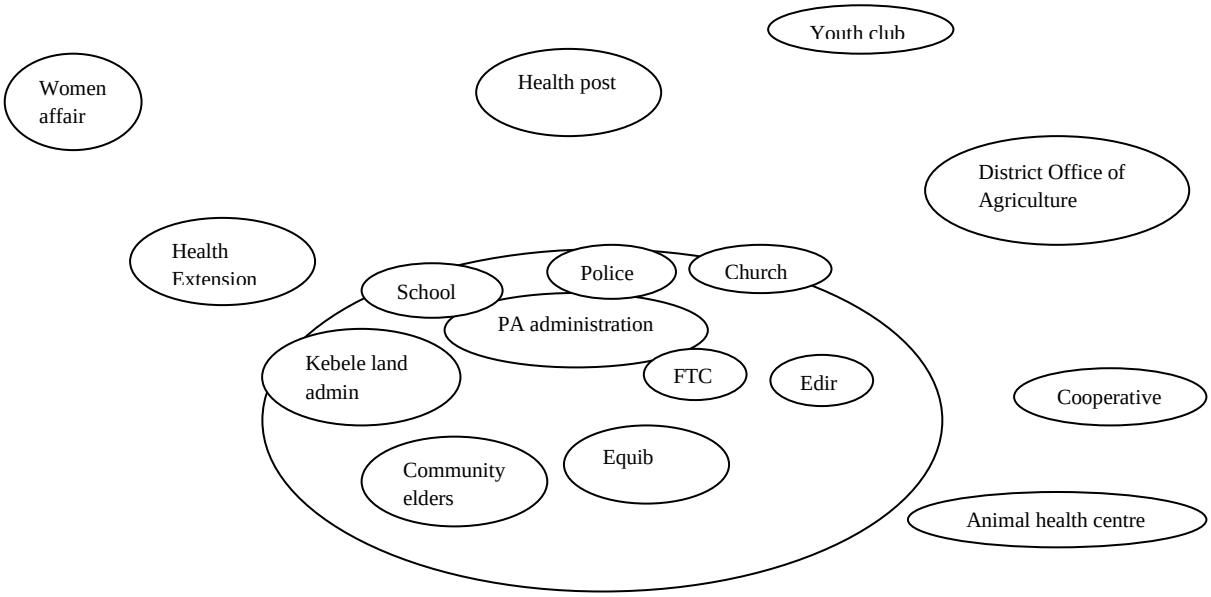

Figure 8: Venn diagram showing perceived importance of institutions in Gelawdewos *kebele* according to the discussion groups of men and women combined

3.4 Agricultural production conditions

The farming system of the area is mixed crop-livestock production. Crop production covers a wide range of crops which include both cash and food crops. Production practices are, however, poor; for example, the use of unimproved, low yielding cultivars is common. In addition, most crop fields are inadequately weeded, and most annual crops are sown using the broadcast method. Livestock provide inexpensive and easily accessible inputs required for crop production such as draught and threshing power, while crop production supports livestock by providing crop residues that supplement the livestock feed. After crops are harvested, livestock are allowed to graze on the weeds and remaining crop stalks on the croplands. Livestock manure is mainly used for homestead gardens and sometimes for farm fields away from the home garden. Moreover, subsistence farmers in the study area derive much of their income from livestock.

3.4.1 The main cultivated crops in Jigna *kebele*

Major crops grown in the area are rice, millet, maize and teff under rain-fed conditions. This *kebele* also has extensive irrigated areas covering more than 1,000 ha, mainly implemented by motorised pumps and hand-dug wells. The principal crops grown under irrigation are tomato, shallot, head cabbage, maize,

barley, potato, garlic, fenugreek, pepper, emmer wheat and bread wheat. Chick pea and grass pea are also produced using residual moisture and either double cropping or relay cropping.

Table 10: Jigna kebele: major Crops grown under rainfed condition in 2003/2004 cropping season

Major crops	**Area coverage(ha)**
Maize	160
Millet	390
Teff	144
Rice	950
Chick pea (residual moisture)	85
Grass pea (residual moisture)	250
Total	1,979

Table 11: Jigna kebele: Irrigable land 2003/2004 cropping season

Crops	**Motorised pump**	**Hand-dug well**
Tomato	418	317
Shallot	623	15
head cabbage	28	130
Potato	33	--
Barley	55	--
emmer wheat	28	--
bread wheat	17	--
Pepper	8	9
Garlic	23	10
Fenigerreek	12	
Cotton	--	10
Total	1245	491

Table 12: The main Livestock kept in Jigna kebele.

Type	No.
Ox	1,712
Cow	1,228
Bull	602
Heifer	798
Calf	989
Sheep	1,349
Poultry	2,901
Mule	7
Donkey	527
Tradition bee hives	523
Modern bee hives	2

3.4.2 Prevalent cropping practices in Jigna *kebele*

Three types of cropping seasons are known in the *kebele*, namely the main season (rain-fed agriculture), residual moisture cropping and dry season cropping.

The most dominant system is the main cropping season, when crops are entirely grown under rain-fed conditions. Each household which owns irrigated land also has rain-fed land within or outside the irrigation scheme. Rice, teff, finger millet and maize are the major crops in this system of production. This cropping operation (from land preparation to harvesting & threshing) is accomplished from February to December.

The most common crops grown under the residual moisture cropping system are chickpea and grass pea. These are sown after the harvest of rice, millet and teff fields in a double-cropping system. Farmers occasionally also practice relay intercropping of rice with grass pea. Rice is planted in June, and at the time of weeding in August or September, grass pea is over sown. When the grass pea is at the vegetative stage, the main rice crop matures and is harvested. The grass pea continues to grow in residual moisture, then is harvested later.

Irrigation during the dry season starts with land preparation soon after harvesting the crops grown in the main season or on residual moisture. The irrigation schemes mostly use motorized pumps and hand-dug wells. Farmers use the Gumara river as a water source for motorised pumps during the dry season, while farmers without access to river water use hand-dug wells. Some farmers with motor pumps also use hand-dug wells as an additional source of water for either supplementary irrigation when the river dry, or for separate irrigation of fields in addition to water pumps. Planting dates can be staggered from January to March, depending on crop type. One crop field can be cultivated using both a hand-dug well and a motor pump, which is why the total irrigable land is slightly higher than the total land coverage of the

kebele. The major crops grown under irrigation are tomato, shallot, head cabbage, maize, barley, potato, garlic, fenugreeek, pepper, emmer wheat and bread wheat.

Land preparation is carried out using a pair of oxen with the traditional beam and plough (*Maresha*). Land preparation starts immediately after harvesting the previous season's crops. Depending on the precursor crop and the degree of weed infestation of the fields, for most crops the number of ploughings varies, from three to five, until the seedbed becomes fine and ready for planting. The number of times a field is ploughed also varies with crop type. Because the soil in the *kebele* is entirely vertisol, ploughing is difficult during dry periods as it shrinks when dry. The sowing procedure varies with crop and soil type. The most common types of sowing employed in these areas are hand broadcasting. Row planting has become a common practice for maize and for horticultural crops in dry season crop production.

Crop rotation is not a common practice as the soil is not suitable for the cultivation of a diversity of crops and most of the land is allocated for rice production each year. However, some farmers practice rotation of niger seed preceding millet and grass pea preceded by rice. Mixed cropping is not a common practice except for grass pea relay cropping on rice fields.

3.4.3 Prevalent Livestock practice in Jigna *kebele*

Farmers rear cattle, sheep, donkeys and mules in the study *kebele*. Poultry and honeybees are also common. The main available feed resources in Jigna *kebele* are the communal uncontrolled, free and private grazing lands, but these feed resources are managed traditionally, and mixing and overstocking of livestock causes overgrazing problems. During summer, the farmers' plains face severe feed scarcity because their pastures in these areas are flooded. During this time, animals cannot be kept on the plains and the main sources of feed are crop residues and hay. Unlike the other *kebeles,* goat rearing is not common in this *kebele* as the agro-ecology is unsuitable. Although, there are many bee hives in the *kebele*, modern methods are rarely used. Animal diseases (internal parasites and contagious diseases) are a serious problem in the *kebele* as there are marshy areas bordering Lake Tana.

3.4.4 Agricultural production constraints in Jigna *kebele*

During the pair wise ranking exercise, farmers identified 14 major agricultural production constraints. Among these, irrigation problems, marketing problems, crop pests, loss of soil fertility and poor access to transport ranked one up to five, respectively. Lack of improved varieties (for most crops), and lack of improved agronomic practices such as appropriate seeding rates and planting methods, cropping systems, and method, frequency and timing of irrigation were also identified as major production constraints. The major crop pests include stem borers on maize, red teff worm on teff, African bollworm (ABW) on chickpea, aphids on grass pea and head cabbage, wilt complex on chilli pepper, bulb rot on shallot, late blight on potatoes and head blast on rice and millet. Wilt complex on chilli pepper was the most devastating disease experienced in recent times. Most natural pasture lands are overgrazed, gully formed and silted by floods during the rainy season. In addition to this, because of population growth, grazing pasture lands are converted to crop land. Animal diseases (internal parasites and contagious diseases) are a serious problem in the *kebele*. Shortage of drugs is common and farmers are forced to purchase tablets and injections from private drug vendors at prohibitive prices.

Table 13: Pair wise ranking of the major agricultural production problems in Jigna kebele

No	Problem	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Score	Rank
1	Shortage of improved seed	x	2	1	4	1	6	7	1	9	1	11	1	1	1	7	7
2	Crop pests		x	2	4	2	6	2	2	9	2	2	2	2	2	10	3
3	Soil erosion			x	4	5	6	7	3	3	10	11	12	3	3	4^{+1}	10
4	Marketing problems				x	4	6	4	4	4	4	4	4	4	4	12	2
5	Shortage of irrigation equipment					x	6	7	5	5	10	11	12	5	5	5	9
6	Irrigation difficulties						x	6	6	6	6	6	6	6	6	13	1
7	Drinking water problems							x	7	7	10	11	12	12	7	6	8
8	Rice milling problems								x	9	10	11	12	13	14	0	14
9	Access to cooperative									x	10	11	12	13	9	4	12
10	Access to road (menad)										x	10	12	10	10	8^{+1}	5
11	Land shortage (young farmers)											x	12	11	11	8	6
12	Loss of soil fertility												x	12	12	9	4
13	Overgrazing													x	13	4	11
14	Access to artificial insemination														x		13

Table 14: Major agricultural production problems, causes, effects and suggested solutions in Gigna kebele

No	Problem	Cause	Effect	Possible solutions
1	Shortage of improved seed	Inadequate supply	Use of low yielding local varieties	- Selection of high quality field plants - Purchase from private supplier
2	Crop pests	- Poor management e.g. inadequate crop rotation - Lack of knowledge about the prevailing pests for possible control	Low productivity	- Use of chemicals for some pests such as shallot disease - Use of cow urine and wood ash mix to control aphids
3	Soil erosion	- Deforestation - Absence of control measures	Declining soil fertility	- Afforestation - Implelementation of control measures like soil bund
4	Marketing problems	- Selling of produce during harvesting time for loan repayment - Market dictation by middle men and wholesalers	- Declining Household income - Declining profitability of farm	- Extended time for repayment of loans - Introduction of contract farming, especially for vegetable crops - Government intervention in agricultural pricing
5	Shortage of irrigation equipment	- Lack of supplier - Lack of credit to purchase especially motor pumps	- Restricted growth of irrigation - Decline in potential production	- Supply by government through loans, especially for motor pumps

6	Irrigation difficulties	- Poor water management (seepage) - River water diverted from upper catchment	Terminal moisture stress	- Use of supplementary irrigation from hand-dug well - Use of irrigation dams through discussion with neighbouring *kebeles* and *woredas* - Use of less water demanding and short cycle crops
7	Land shortage(youth)	Population pressure	- Increased landless youth households - Declining household land holdings - Declining household income	- Shared in or rented in lands from female headed households - Engaging in petty trade
8	Loss of soil fertility	- Continuous cultivation of one crop, especially rice - Total crop removal - Free grazing	- Decline of productivity - Requirement for fertilizer application	- Use of compost - Use of chemical fertilizer

3.4.5 The main cultivated crops in Korata *kebele*

Major crops grown in the area are maize, millet, teff, niger seed, pepper, rice and barley under rain-fed conditions. This *kebele* also has a large area of irrigated land. The major crops grown under irrigation are khat, coffee, papaya, mango, barley, chickpea and grass pea. In addition, recession agriculture (crop cultivation on land that becomes available as the water recedes during the dry season) is a common practice. About 460 ha of land is cultivated using recession agriculture, and chickpea, grass pea, wheat, barley and maize are the major crops grown under this system.

Table 15: Major crops grown under rain-fed conditions

Major crops	Area coverage(ha)
Maize	850
Millet	650
Teff	175
Niger seed	122
Pepper	82
Rice	80
Barley	52
Total	2,011

Table 16: Livestock resource

Type	No.
Ox	2,574
Cow	3,694
Bull	2,441
Calf	3,226
Goat	1,220
Sheep	1,287
Poultry	7,370
Mule	9
Donkey	950
Traditional bee hives	961
Modern bee hives	134

3.4.6 Prevalent crop production practices in Korata *kebele*

Three types of cropping seasons are known in the *kebele*, namely main season (rain-fed agriculture), recession agriculture and dry season cropping.

The main cropping season is the most dominant system, when crops are entirely grown under rain-fed conditions. Major crops grown in the area are maize, millet, teff, Niger seed, pepper, rice and barley. The cropping operation (from land preparation to harvesting & threshing) is accomplished from February to December.

Recession agriculture is a common practice. Farmers near the lake are not used to growing crops using irrigation because the fields remain moist and boggy most of the year. Instead, they use the residual moisture that is always available and also use the land that becomes available as the water recedes during the dry season. About 460 ha of land is cultivated using recession agriculture and chick pea, grass pea, wheat, barley and maize are the major crops grown under this system.

Irrigation during the dry season starts with land preparation soon after harvesting the crops grown in the main season. This *kebele* also has a large area of irrigated land. About 123 ha are irrigated by motor pumps, 187 ha by hand-dug wells, about 11 ha by river diversion, and about 35 ha by animal transportation, especially using donkeys to transport water from rivers and springs. The major crops grown under irrigation are khat, coffee, papaya, mango, barley, chickpea and grass pea.

3.4.7 Prevalent Livestock production practices in Korata *kebele*

Farmers rear cattle, sheep, goats, donkeys and mules in this *kebele*. Poultry and honeybees are also common. The major feed resources of livestock include, in order of importance, crop residues, natural pasture, hay and crop weeds. Unlike the other *kebeles,* a large number of modern bee hives is found, indicating that farmers in this *kebele* are becoming aware of the advantages of modern bee hives. Although the *kebele* has a high livestock population, the productivity of the livestock sector has been hindered by the lack of feed, both in quality and quantity. Farmers have also been unable to improve their breeds, and poor grazing land management is a major problem.

3.4.8 Agricultural production constraints in Korata *kebele*

During the pair wise ranking exercise, farmers identified 12 production constraints for agricultural production and productivity in the study area. High fertilizer prices, Low soil fertility, lack of improved varieties (for most crops), lack of irrigation water and marketing problems were ranked one to five in order of importance. Crop pests, lack of improved agronomic practices such as appropriate seeding rates and planting methods, cropping system, and method, frequency and timing of irrigation are further production problems. The major crop pests include stem borers on maize, red teff worm on teff, African bollworm (ABW) on chickpea, aphids on grass pea and head cabbage, wilt complex on chilli pepper, bulb rot on shallot, and late blight on potatoes. Wilt complex on chilli pepper was the most devastating disease that was experienced recently, and as a result most farmers have abandoned production of chilli pepper.

Most natural pasture lands are overgrazed, gully formed and silted by flooding during the rainy season. In addition to this, because of continuing population growth, grazing pasture lands are converted to crop land. Animal diseases (internal parasites and contagious diseases) are another serious problem in the *kebele*. Shortage of drugs is common, and farmers are forced to purchase tablets and injections from private drug vendors at prohibitive prices.

Table 17: Korata kebele: pair wise ranking of the major agricultural production problems

No	Problems	1	2	3	4	5	6	7	8	9	10	11	12	Score	Rank
1	Shortage of improved seed	x	2	1	1	1	1	1	1	9	10	1	1	8^{+1+1}	3
2	High price of fertilizer		x	2	2	2	2	2	2	2	2	2	2	11	1
3	Crop pests			x	4	3	6	7	3	9	10	3	3	4^{+1+1}	7
4	Marketing problems				x	4	4	4	4	4	10	4	4	8^{+1}	5
5	Shortage of Improved breeds					x	6	7	8	9	10	11	5	1	11
6	Livestock diseases						x	6	6	9	10	6	6	6	6
7	Grazing problems							x	8	9	10	7	7	4	9
8	Drinking water problems								x	9	10	8	8	4^{+1}	8
9	Shortage of irrigation water									x	10	9	9	8	4
10	Loss of soil fertility										x	10	10	10	2
11	Land shortage (young farmers)											x	11	0	10
12	Deforestation												x		12

Table 18: Major agricultural production problems, causes, effects and suggested solutions in Korata kebele

Problems	Cause	Effect	Possible solutions
Shortage of improved seed	- Inadequate supply for most of the crops - Lack of quality e.g. hybrid maize seed which is delivered by cooperatives	- Use of low yielding local varieties - Yield declining in using poor quality improved seed - Purchasing from private source especially vegetables with high cost and unreliable quality	- Introduction of improved varieties - Develop quality seed control mechanisms for both private, community and government suppliers
High price of fertilizer	- Not produced locally	- Most farmers are not able to apply enough fertilizer to their land	- Use of compost - Finding means of decreasing fertilizer price by the government
Crop pests	- Poor management e.g. inadequate crop rotation - Lack of knowledge about the prevailing pests for possible control	Low productivity	- Use of chemicals for some pests such as shallot disease - Use of cow urine and wood ash mix to control aphids - Drain water along slopes for the control of pepper wilt disease
Marketing problems	- Most farmers sell agricultural products immediately after harvest mainly for input loan repayment, causing unbalanced supply and demand - Poor access to nearby market, especially for vegetables	- Selling of agricultural products at low price - Declining household income	- Government intervention in agricultural product pricing - Creating market access, especially for perishable vegetables
Livestock diseases	The area near Lake Tana is a reservoir of animal disease	Livestock mortality	- Strengthen the capacity of the existing animal health centre

Grazing problem	- Free grazing - Conversion of grazing land to crop land	- Low productivity of existing grazing land - Feed shortage	- Reduce free grazing - Improve management of grazing land
Shortage of irrigation water	- Early drying of rivers and springs - Poor irrigation management (method, frequency, rate of irrigation, high seepage loss) - Poor access to motor pumps to use deep river water not suitable for traditional diversion	- Decline in irrigated crop production - Terminal water shortage as the river dries	- Construct modern irrigation schemes Use of modern irrigation technologies (method, frequency, rate of irrigation, etc) - Reduce water loss - Improve availability of motor pumps - Use of hand-dug wells as supplementary irrigation
Loss of soil fertility	- Soil erosion - Poor nutrient recycling; continuous removal of crop residues and weeds as sources of feed and energy - Continuous cultivation of millet and maize on the same land year after year	- Decline of productivity - High fertilizer demand of crop lands	-Practising anti-erosion measures - Use of compost and manure - Use of chemical fertilizer

3.4.9 The main cultivated crops in Gelawdewos *kebele*

The main cropping season is the most dominant system, when crops are entirely grown under rain-fed conditions. Major crops grown in the area are teff, wheat, potato and niger seed. Irrigation practice is also carried out in some pocket areas in about 114 ha of land in which potato is the common crop grown under irrigation.

Table 19: Major crops grown in Gelawdewos kebele

Major crops	Area coverage(ha)
Teff	348
Wheat	420
Millet	136
Barley	314
Maize	152
Potato	336
Niger seed	47
Linseed	79
Total	1,832

Table 20: The main livestock in Gelawdewos kebele

Type	No.
Ox	2,360
Cow	1,821
Bull	877
Heifer	872
Calf	1,170
Goat	1,161
Sheep	2,641
Horse	49
Mule	28
Donkey	552
Traditional bee hives	597
Transition bee hives	15
Modern bee hives	98

3.4.10 Prevalent crop production practices in Gelawdewos *kebele*

Almost all the households in this *kebele* are dependent on subsistence agriculture where average productivity has decreased substantially due to major constraints, particularly loss of soil fertility, land shortage and crop pest damage. The system of production is a traditional one in which ploughing, harvesting and threshing are done by human and animal power only. The *kebele* is characterized by a crop-livestock mixed farming system with a heavy accent on crop production. Sole cropping is the commonest type of cultivation system in which wheat, teff and barley are grown year after year. Although integration of pulses with cereals is practiced to improve soil fertility, the practice of crop rotation is declining due to the fact that pulses are less productive and susceptible to disease. Land preparation in the *kebele* is done by using the traditional plough drawn by two oxen. The frequency of ploughing varies from crop to crop and from one soil type to another.

The method of sowing for teff, finger millet, niger seed is by broadcasting, as these crops are difficult to plant in rows due to the small size of the seed. Thus, so far, planting in rows has been adopted for maize and it is advantageous for proper utilization of fertilizer, distribution of the seed and weeding.

Harvesting and threshing are the most labour intensive and time-consuming activities. Harvesting is commonly practiced using sickles, and threshing is done on agricultural ground cleaned compacted and plastered with cow dung. Harvesting in the *kebele* is most commonly practiced during October to December.

3.4.11 Prevalent Livestock production practices in Gelawdewos *kebele*

Subsistence smallholder mixed crop livestock farming is the major production system in the study area. Livestock play an important role in the economy of smallholder farmers in the *kebele*. The livestock production system is traditional, most breeds and production systems are multipurpose, supplying draught power, milk, meat, skin and hides**.** The manure from animals, particularly from large ruminants, serves as fuel and can also be used as fertilizer in the form of compost. The major feed sources are crop residues, natural pasture and hay.

3.4.12 Agricultural production constraints in Gelawdewos *kebele*

Pair wise ranking of the major problems in the farming community revealed that soil erosion, declining soil fertility and the high price of fertilizer were ranked the three most serious problems. Farmers identified the lack of access to improved varieties and poor quality seed of hybrid maize as the 8^{th} problems while crop pests and problems grazing land were selected as 9^{th} and 10^{th} crop production problems, respectively.

Table 21: Gelawdewos kebele pair wise ranking of the major agricultural production problems

No	problems	1	2	3	4	5	6	7	8	9	10	11	Score	Rank
1	Loss of soil fertility	x	1	1	1	5	1	1	1	1	1	1	9	2
2	High price of fertilizer		x	2	2	5	2	2	2	2	2	2	8	3
3	Shortage of improved seed			x	3	5	6	3	8	9	10	3	3	8
4	Crop pests				x	5	6	4	8	9	10	4	2^{+1}	9
5	Soil erosion					x	5	5	5	5	5	5	10	1
6	Drinking water problems						x	6	6	9	10	6	3^{+1+1}	6
7	Accessibility of grain miller							x	8	9	10	11	0	11
8	Livestock diseases								x	9	10	11	3^{+1}	7
9	Marketing problems									x	9	9	7	4
10	Land shortage (young farmers)										x	10	6	5
11	Overgrazing											x	2	10

Table 22: Major agricultural production problems, causes, effect and suggested solutions in Gelawdewos kebele

Problem	Cause	Effect	Possible solution
Loss of soil fertility	- Erosion - Removal of all crop residues for feed and firewood - Repeated cultivation, without giving time for the plot to recover (absence of fallowing and crop rotation). - Integration of legumes for soil fertility restoration is declining due to low productivity of legumes and susceptibility to pests as compared to cereals	- Declining crop production - Application of high dose of fertilizer to have reasonable yield has become essential	- Practise appropriate soil and water conservation measures - Use of compost and manure - Use of fertilizer - Use of crop rotation with legumes
High price of fertilizer	- Imported from abroad - Increasing demand - Long supply chain	- Use of sufficient fertilizer as needed by the crop has become difficult for most farmers - Decline of productivity	- Fertilizer subsidy - Use of compost - shorten the supply chain
Shortage of improved seed	- Lack of improved seed for most crops - Available improved seed of maize, wheat and teff have problems of quality for maize, disease susceptibility for wheat and poor adaptability for teff - Farmers have access to improved varieties of their interest like Kuncho teff variety and potato varieties	- Use of low yielding local variety - Decline in farm productivity - Decrease in household income	- Demonstrate and scale up improved varieties of different crops - Create local seed production and dissemination systems for those improved seeds which are not multiplied by either private or govt. seed sectors
Crop pests	- Continuous sole cropping of the same land repeatedly - Use of poor quality seed	Yield reduction	-Cultural practices such as ploughing and crop rotation - Find an appropriate chemical for each pest

Soil erosion	- Deforestation - Lack of appropriate erosion control measures	- Decline in soil fertility - Gully formation	- Use of appropriate soil and water conservation measures
Livestock diseases	- Shortage of feed - Lack of clean drinking water - Poor service by the existing animal health centre	- Livestock mortality - Decline in livestock productivity	- Strengthen the existing animal health centre - Improve availability of clean water
Marketing problem	- Price fixing by wholesalers - Harvest time selling of farm outputs due to need for loan repayment - Lack of government intervention - Weakness of cooperatives	- Selling of agricultural products at low prices - Decline in income	- Government intervention (in industrial commodities and inputs) - Strengthen cooperatives
Land shortage (young farmers)	- Population pressure - Unfair land distribution	- Considerable numbers of landless young farmers - Decline in household land holding - Migration of youth	- Rent or share in land from others - Engage in petty trade
Grazing problem	- Free grazing - Conversion of grazing land to pastureland - Grazing land invaded by weeds	- Feed shortage for animals - Animal disease and mortality - Declining animal productivity - Declining household income	Practicing rotation grazing - Improve the management of communal grazing land - Introduce and expand improved pasture varieties

3.4.13 The main crops cultivated in Shime *kebele*

The principal crops grown in the area are teff, wheat, millet, barley, potato, maize, linseed and niger seed under rain-fed conditions. Irrigation is also carried out in some small areas totalling about 220 ha. Potato is the common crop grown under irrigation, accounting for more than 90% of irrigable land.

Table 23: Major crops grown in Shime kebele under rain-fed conditions

Crops	Area coverage(ha)
Teff	633
Wheat	683
Millet	423
Barley	377
Potato	347
Maize	127
Linseed	226
Niger seed	110
Total	2926

3.4.14 The main livestock in Shime *kebele*

Farmers rear cattle, sheep, goats, donkeys, horses and mules in the study area. Poultry and honeybees are also common. The livestock production system is traditional and almost all of the breeds are local with low productivity. The livestock management system is traditional with poor quality and quantity of feed sources, and poor housing and veterinary services.

Table 24: The main livestock in Shime kebele

Livestock type	Number
Ox	2,635
Cow	2,316
Bull	837
Heifer	1,610
Sheep	2,836
Calf	1,641
Goat	1,067
Poultry	5,624
Donkey	778
Mule	53
Horse	24
Traditional bee hives	646
Transitional bee hives	1
Modern bee hives	36

3.4.15 Prevalent crop production practices in Shime *kebele*

The system of production is traditional, and ploughing, harvesting and threshing are done by human and animal power only. The *kebele* is characterized by a subsistence crop-livestock mixed farming system with a heavy accent on crop production. Land preparation in the *kebele* is done by using the traditional plough drawn by two oxen. The frequency of ploughing varies from crop to crop and from one soil type to another. The method of sowing is by broadcasting while row planting is adopted for maize, which is advantageous for proper utilization of fertilizer, distribution of the seed and weeding Harvesting and threshing are the most labour intensive and time-consuming activities. Harvesting is commonly practiced using sickles and threshing is done in agricultural ground cleaned, compacted and plastered with cow dung. Harvesting in the *kebele* is commonly practiced during October to December.

Farmers in the *kebele* predominantly practice a sole cropping system. Currently, with rising demand for agricultural land, fallowing is not practiced. The usual cropping systems in addition to sole cropping are crop rotation, which is used to restore soil fertility when farmers integrate pulses with cereals. Faba bean and field pea are the common legume crop used for crop rotation.

3.4.16 Prevalent livestock production practices in Shime *kebele*

Subsistence smallholder mixed crop livestock farming is the major production system in the study area. Livestock play an important role in the economy of smallholder farmers in the *kebele*. The livestock production system is traditional, most breeds and production systems are multi-purpose, supplying draught power, milk, meat, skin and hides**.** The manure from animals, particularly from large ruminants, serves as fuel and can also be used as fertilizer in the form of compost. The major feed sources are crop residues, natural pasture and hay.

3.4.17 Agricultural production constraints

Pair wise ranking of the major problems in the farming community revealed that high fertilizer prices, shortage of land, declining soil fertility, crop pests and poor access to improved seed were identified as the major crop production constraints in the *kebele*. Livestock disease and grazing problems were also raised as major production constraints.

Table 25: Sheme kebele pair wise ranking of the major agricultural production problems

No	problems	1	2	3	4	5	6	7	8	9	10	11	Score	Rank
1	High price of fertilizer	x	1	1	1	1	1	1	1	1	1	1	10	1
2	Loss of soil fertility		x	2	2	5	2	2	2	2	10	2	7^{+1}	3
3	Crop pests			x	3	3	3	3	3	3	10	3	7	4
4	Shortage of improved seed				x	4	4	4	4	9	10	4	5	6
5	Tiresome terres building					x	6	7	5	9	10	5	3	9
6	Drinking water						x	7	6	9	10	6	3^{+1}	8
7	Livestock diseases							x	7	9	10	7	4	7
8	Overgrazing								x	9	10	11	0	11
9	Marketing problems									x	10	9	6	5
10	Land shortage (young farmers)										x	10	1	2
11	Irrigation problems											x		10

Table 26: Major agricultural production problems, causes, effects and suggested solutions in Shime kebele

Problem	Cause	Effect	Possible solutions
High price of fertilizer	- Imported from abroad - Increasing demand - Long supply chain	- Use of sufficient fertilizer as needed by the crop has become difficult for most farmers - Decline of productivity	- Fertilizer subsidy - Use of compost - shorten the supply chain
Loss of soil fertility	- Erosion - Removal of all crop residues for feed and firewood - Repeated cultivation, without giving time for the plot to recover (absence of fallowing and crop rotation). - Integration of legumes for soil fertility restoration is declining due to low productivity of legumes and susceptibility to pests as compared to cereals	- Declining crop production - Application of high dose of fertilizer to have reasonable yield has become essential	- Practise appropriate soil and water conservation measures - Use of compost and manure - Use of fertilizer - Use of crop rotation with legumes
Crop pests	- Continuous sole cropping of the same land repeatedly - Use of poor quality seed	Yield reduction	-Cultural practices such as ploughing and crop rotation - Find an appropriate chemical for each pest

Shortage of improved seed	- Lack of improved seed for most crops - Available improved seed of maize, wheat and teff have problems of quality for maize, disease susceptibility for wheat and poor adaptability for teff - Farmers have access to improved varieties of their interest like Kuncho teff variety and potato varieties	- Use of low yielding local variety - Decline in farm productivity - Decrease in household income	- Demonstrate and scale up improved varieties of different crops - Create local seed production and dissemination systems
Livestock disease	- Shortage of feed - Lack of clean drinking water - Poor service by the existing animal health centre	- Livestock mortality - Declining livestock productivity	- Strengthening the existing animal health centre - Improving availability of clean water
Overgrazing	- Free grazing - Conversion of grazing land to pastureland - Grazing land invaded by weeds	- Feed shortage for animals - Animal disease and mortality - Declining animal productivity - Declining household income	- Practise rotation grazing - Improve the management of communal grazing land - Introduce and expand improved pasture varieties

Marketing problems	- Price fixing by wholesaler - Harvest time selling of farm outputs due to loan repayment - Lack of government intervention - Weakness of cooperatives	- Selling of agricultural products at low prices -Declining income	- Government intervention (in industrial commodities and inputs) - Strengthening cooperatives
Land shortage (young farmers)	- Population pressure - Unfair land distribution	- Considerable number of young farmers are landless - Declining household land holding - Migration of youth	- Rent or shared land with others - Engage in petty trade
Irrigation problems	- Practising traditional irrigation system - Poor access to motor pumps	- Decline in production of irrigated crops - Poor household income	- Construct modern irrigation scheme -Improve the accessibility of motor pump

4. Stakeholder workshops

4.1 Organisation of workshops and feedback received

After the completion of the PRA surveys, a workshop was organised at different levels to present the results of the PRA so as to have the views of different stakeholders. Summarised results of the PRA surveys were presented to various stakeholders comprising farmers, *woreda* and *kebele* administration, DAs, and *woreda* level experts during a scoping study session held in Dera *woreda*. Participants in the *woreda* identified and prioritised potential intervention areas and innovation themes that could address the problems and exploit existing opportunities on a commodity basis. Then, the results of the PRA surveys and scoping study at the *woreda* level were again presented and refined during a regional stakeholders workshop. Finally, the innovation themes were developed, taking into account comments and suggestions given by different stakeholders at *woreda* and regional level.

4.2 List of Innovation themes

1. Potato Innovation System Development
2. Validation of Improved Teff Technologies and Best Practices
3. Evaluation and Promotion of improved varieties of Barley with their Production Packages
4. Evaluation and Demonstration of Rice Technologies
5. Evaluation and Promotion of Pulse Crops (faba bean and field pea)
6. Integrated Soil Fertility Management (IFSM) and Soil Characterization
7. Livestock Feed Improvement for Enhanced Household Food Security

4.3 Best practices

During the PRA surveys, the team tried to identify the best practices of the farming community that can be used for further improvement and scaling up. According to farmers and experts, the following are best practices carried out by some farmers which should be scaled up by being adopted by other farmers.

- The protection of degraded grazing areas from any interference, and starting a cut and carry system to allow natural regeneration of grass. Fencing gullies to keep out intruders has contributed to speedy and cost-effective recovery. The protection of the natural forest compsed of climax species and adminstered by the church and government is effective because the community contributed their stake and showed their will.

- The use of motor pumps and hand-dug wells for dry season crop production should be extended. A considerable number of farmers are earning good money by using these methods to produce profitable vegetable crops such as head cabbage, tomato, shallot and others.
- The making and use of compost should be extended. Some farmers were able to prepare quality compost and apply this to their crop, resulting in better yields compared to crop fields where only inorganic fertilizer was used.
- Farmers in Jigna *kebele* believe that their farm land is fertile due to sedimentation from the upper stream, and as a result most farmers cultivate their crop without application of fertilizer. But some farmers are applying chemical fertilizer in their rice fields and have got a good return. In addition, research results from Adet research centre indicated a high response to fertilizer in this *kebele* for rice. Hence, fertilizer use on rice fields was found to be one of the best practices that should be validated and scaled up.
- Some farmers also solve the problem of seed quality in rice by selecting rice plants with a good stand and panicle size in the field, and threshing them separately to use as a source of seed for the coming season. This may be used as best practice to overcome the lack of good quality seed.
- Some farmers were able to control aphids on head cabbage by spraying a mixture of wood ash and cow urine. This may be used as best practice to solve the devastating aphid problem on head cabbage.
- Some farmers reported that application of chemical pesticides (Mancozeb or Ridomil) at different stages (seedling and vegetative) on shallot was found to control wilting disease of the crop. This may be used as best practice to control root rot of shallot.
- Fish production using artificial ponds was found to be one of the best practices.
- Honey production using modern bee hives with improved management was identified as one of the best practices. Some farmers are using modern bee hives and have got good production.
- Potato production using an improved variety with better management was identified as one of the best practices.

5. Evaluation of the PRA process by the team

A multidisciplinary team of researchers (agricultural economist, agricultural extensions, horticulturalist, agronomist, forester and animal feeds researcher) participated in the PRA surveys. The study employed Participatory Rural Appraisal (PRA) tools and techniques to collect primary information from farmers in a participatory fashion. Secondary data were obtained from both published and unpublished sources. The PRA process employed was evaluated by the team. The team agreed that the PRA process was sufficient to obtain enough information to characterize and analyze the production systems of Dera *woreda* and to identify major agricultural constraints, potentials and opportunities so as to provide direction for future research and development.

6. References

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