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AGWATER SOLUTIONS
Improved livelihoods for smallholder farmers

LIVELIHOOD ZONES ANALYSIS

A tool for planning agricultural water management investments

Ethiopia

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in consultation with FAO, 2011

IWMI International Water Management Institute
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About this report

The AgWater Solutions Project aimed at designing agricultural water management (AWM) strategies for smallholder farmers in sub Saharan Africa and in India. The project was managed by the International Water Management Institute (IWMI) and operated jointly with the Food and Agriculture Organization of the United Nations (FAO), International Food Policy Research Institute (IFPRI), the Stockholm Environmental Institute (SEI) and International Development Enterprise (IDE). It was implemented in Burkina Faso, Ethiopia, Ghana, Tanzania, Zambia and in the States of Madhya Pradesh and West Bengal in India.

Several studies have highlighted the potential of AWM for poverty alleviation. In practice, however, adoption rates of AWM solutions remain low, and where adoption has taken place locally, programmes aimed at disseminating these solutions often remain a challenge. The overall goal of the project was to stimulate and support successful pro-poor, gender-equitable AWM investments, policies and implementation strategies through concrete, evidence-based knowledge and decision-making tools.

The project has examined AWM interventions at the farm, community, watershed, and national levels. It has analyzed opportunities and constraints of a number of small-scale AWM interventions in several pilot research sites across the different project countries, and assessed their potential in different agro-climatic, socio-economic and political contexts.

This report was prepared as part of the efforts to assess the potential for AWM solutions at national level. The livelihood zones analysis divides the country in a series of areas where rural people share relatively homogeneous living conditions on the basis of a combination of biophysical and socio-economic determinants. It describes the main sources of livelihood of rural populations (by category of people), their natural resources base, potential and key constraints to development. It analyses the relation between people and water and helps understanding to what extent and how water can be a factor for development.

Contents

Abbreviations and acronyms

BBM	Broad Bed maker
CBPB	Contagious Bovine Pleuropneumonia
FAO	Food and Agriculture Organization of the United Nations
NGO	Non-governmental organization

Livelihood systems analysis

LIVELIHOOD ZONE 1

Lowland mixed – Sesame livelihood system

This livelihood zone covers the woredas of Kafta, Humera, Tsegedie and Wolkeit and belongs to the traditional climatic zone of 'Kolla' (lowland). The livelihood zone is classified as hot-warm semi-arid lowlands. There are extensive plains covered with bush, scrub and acacia. The hottest months are between April and June with temperatures rising to 42 °C, and 25 and 35 ° C between June and February. The zone has a distinctly unimodal rainfall pattern and agricultural crop production is exclusively dependent on the major rains the *kiremt* between June and September. Total annual rainfall ranges between 400–650 mm. The zone is drained by the tributaries of the Tekeze river, which has fertile black cotton soils, clay loam and red clay soils.

The zone has become a resettlement area and is a sparsely populated with considerable agricultural production potential.

Mixed farming with crop and livestock production provides the major livelihood, while the economy is centered on the production of the oil crop sesame, which is one of the country's major export commodities. Sesame is produced both by small-scale and large-scale farmers with 42 and 58 percent share respectively. Production techniques and methods used by both large-scale and traditional small-scale farmers are similar, the only major difference being the use of tractors by large-scale farmers for ploughing and seedbed preparation. Sesame production is highly labour intensive, most of these highly paid labourers are imported from other areas during the peak seasons.

The main livestock in the zone are cattle and shoats, which are mostly traded with Sudan across the border. There is abundant grazing and browsing for livestock. The major production challenges are bovine and ovine pasteurellosis, lump skin diseases and trypanosomiasis.

A serious problem in the zone is water for livestock and domestic use. Water is purchased from privately owned, hand-pump operated wells using scarce open water sources.

Sesame is the main agricultural product. It is exported over two major routes: to the central market in Addis Ababa and to the Sudan across the border. The zone is quite well connected by all-weather roads.

Landholding and family size varies considerably with wealth group. The very poor households cultivate 1 to 2.5 ha of land, while the better off cultivate between 10 and 22 ha.

LIVELIHOOD ZONE 2

Northern mixed midlands livelihood system

This livelihood zone includes the woredas of Ganta Ahferom Debay Zena and Atsbi Womberta,. Worie Lehe, Kola Tembein, Samre, Tahtay Kararo, Tahtay Maychew, Wukro, Degua Tembein and Adwa. The zone is warm to cool, moist mid-highlands with a long, unimodal rainfall pattern. This livelihood zone covers wide areas of the Tigray central highlands, which has highly variable topography, with moderate temperatures (Woynadega) and some areas with a hot climate (Kola). Agricultural production is entirely supported by the '*kiremt*', main season, June to September rains between 500-700 mm/year; although there are pockets utilizing the very short rains for planting of long-season crops. The main crops grown include maize and sorghum, as well as teff and finger millets. The main livestock include cattle, shoats and donkeys. The area is dominated by infertile clay and sandy soils, the vegetation cover is dominated by bushes, scrubs and acacia trees. The very poor may own from 0 to 0.25 ha, while the better off between 1 and 2 ha.

The area is generally food deficient because of a combination of factors including low soil productivity resulting from poor soils, high population density, striga weed infestation, the livestock diseases pasteurollosis and Blackleg. Activities that support livelihoods are honey production and migration of labour force outside the livelihood zone. Main destinations for migrating workers are the large- and small-scale sesame production areas in the neighbouring woredas.

Worie Lehe and other rivers draining into the Tekeze river system provide the major surface water resources.

LIVELIHOOD ZONE 3

Northern cereal pulse mixed livelihood system

The livelihood zone fully or partially covers the woredas of Belesa, Beyda, Dabat, Debark, Janamora and Ziquala and represents the highlands around Gondar. The agri-ecological zone is warm to cool, moist mid-highlands with unimodal rainfall pattern. The topography is hilly and mountainous at the foot of the *Ethiopia Highlands* highest peak the Ras-dashen. The livelihood zone has a relatively long rainy season, from May to September. Agricultural production is fully dependent on the *kiremt* (main season) rains that support a moderately productive mixed farming system. The main cultivated crops include wheat, barley and beans. The major soil types in the livelihood zone are moderately fertile clay, vertisols and clay loam soils.

Despite the relatively abundant rains and moderate fertility, the zone faces recurrent food crises. Crop pests and diseases are the major factors affecting crop production. Sheep, cattle and horses are the major livestock kept in the livelihood zone. Springs and rivers provide the main sources of water for livestock and human consumption. The primary factors affecting livestock production include shortage of animal feed and grazing, diseases such as anthrax, Blackleg, Foot-and-mouth, parasites, Rinderpest

and pasteurellosis. Very poor households with families of between 3 and 7 own 0 to 1 ha. Better off households have families of between 6 and 10 and own from 1.5 to 2.5 ha.

Steep slopes and mountainous topography coupled with high population cause serious shortage of land.

This is a livelihood system in the subafro-alpine agro-ecologies, where sparse vegetation cover is dominated by the production of barley and sheep. This area is 3 000 m above sea level with precipitation of over 1 400 mm. One or two crops of barley are produced and highland sheep and goats dominate livestock production.

LIVELIHOOD ZONE 4

Northwest lowland sorghum/sesame mixed livelihood system

The woredas included in the livelihood zone are Kamashi, Guangua, Dibate, Bulen, Assosa, Bambasi, Belojegonfoy and Agelo Meti. The livelihood agro-ecological zone belongs to the hot-to-warm, humid lowlands and partly to the hot-warm, sub-humid lowlands. Temperatures range between 20 and 25 °C during May to October and between 35 and 40 °C from November to April. The rainy season spans May to October with an average annual rainfall between 900 and 1 200 mm.

This zone borders the states of Oromia and Amhara and Sudan, belongs to the Benishangul central Kolla region. Although there is huge irrigation potential with the numerous rivers criss-crossing the zone agriculture remains totally rainfall dependent. Plains and undulating land dominate the topography while the vegetation in most of the woredas is mainly bamboo forest and bush scrub. Black vertisols and sandy clay soils are the dominant soil types. Regardless of the high agricultural potential, the area suffers from intermittent food deficits mainly caused by conflict and unrest.

This is a mixed farming livelihood zone in which crop and livestock production provide the main livelihood base for communities. Wild food gathering plays a supplementary role to livelihoods in the zone. The main crops are sorghum, sesame, finger millet, Niger seed and groundnuts. Sesame and sorghum are mainly produced for sale, while the rest of the crops are produced for home consumption.

Armyworm, bollworm, termites, stalk-borer, late blight and smut as well as weed infestation are among the major challenges faced in the livelihood zone. Cattle, goats and sheep are the main livestock resources. The rivers of Dabus, Dedesa, Beles Chankur m Keteb and Abay (Nile) are the main surface water resources. Other natural resources such as gold, marble, fish, Gum Arabic are believed to exist in large quantities. Access to market and transport infrastructure is fair.

Very poor households have families of 3 to 5 and own from 0 to 2 ha, while better off households with 8- 10 family members may own 4 to 6 ha.

LIVELIHOOD ZONE 5

Western Coffee/Maize livelihood system

The livelihood zone comprises the woredas of Ale Ayra Guliso, Begi, Bench, Bila Seyo, Borecha, Bure, Cheta, Chora, Dale Sadi, Darimu, Decha, Diga, Ganji,Dawo dale, Gechi, Gera, Godere, goma, Guto Wayu, Haru, Hawa Welel, Jarso, Jimma Argjo, Jimma Horo, Kersa, Lalo Asabi, Lalo Killie. Limu Kosa, Limu Seka, Mana, Mana Sibu, Meanit Goldiiya, Menit Shesha, Metu, Nunu Kumba, Sayo, Sekuru, Setema, Sheka, Shewa Bench, Sibu Sire, Sigmo, Supena Sodo, Sylem, Tiro Afeta, Yayu Andyeki.

There is a high level of forest coffee production along with spices that are collected from the forests for market. Permanent crops are produced such as Ernest around homesteads.

The agro-ecological zone warm to cool sub-humid; midland ('Woynadega') with undulating topography. Maximum temperature ranges between 25 and 28 °C in February with minimum temperatures from 10 to 15 °C in September. The vegetation cover is a mix of natural coffee forests and bush scrub.

The geographic features include rivers and mountains. The dominant soil types are fertile sandy loam soils with high productivity. This is a one-season rainfall area; the extended rainfall period starts in April until the end of November. The *Ganna,* min rains, fall from June to September and merge with the *Arfasa* (small rains, March to May). Crop production is totally dependent on rainfall.

Maize, sorghum and finger millets are grown for home consumption, while coffee and eucalyptus are produced for cash. Other major natural resources in the livelihood zone are gold and bamboo. Major crop production constraints in the livelihood zone are weeds, wild animals, coffeeberry disease and stalk borer.

The main livestock are cattle, sheep, goats, donkeys and chickens. Major sources of water for humans as well as livestock during the wet season are minor rivers and seasonal pools, while major rivers are the only water sources during the dry season. Trypanosomiasis and Contagious Bovine Pleuropneumonia (CBPB) and anthrax affect livestock production.

The livelihood zone is moderately populated and with moderate access to markets. Families in very poor households range from 4 to 6 and cultivate between 0.5 and 1 ha. The better off in the livelihood zone have family sizes of between 7 and 9 and own 2.5 to 4.5 ha.

LIVELIHOOD ZONE 6, 16 AND 17

6. Northern pastoral livelihood system; 16: Gambella agro-pastoral livelihood system; 17: Southern pastoral livelihood systems

This livelihood category represents the western and southern pastoral areas including Livelihood Zone 6 (southern); Livelihood Zone 16 (western) and Livelihood Zone 17 (northwestern). Under Livelihood Zone 6 are the woredas of Arero, Bako Gazer. Basketo, Bena, Bero, Chereti, Dire, Dolo Odo, Filtu, Gambela

Gelila, Goro Baqaqsa, GuradamoleHamer, Kuraz, Moyale, Telteleyabelo. Woredas under Livelihood Zone 16 are Abobo, Akobo, Andercha Anfilo, Bero, Dima, Gambela, Gidami, GogItang, Jikawo, Jor, Maji and Surma. Livelihood Zone 17 includes the woredas of Alefa, Chilga Guba, Kurmuk, Metema, Quara, Sanja, Sherkole and Tsegede. The three categories share common features such as the practice of some form of pastoralism in combination with other livelihood activities.

The zone under 6 predominantly belongs to the agro-ecological classification of hot to warm sub-moist lowlands, while the zone under 16 is under the agro-ecological class of hot to warm sub-humid lowlands. Livelihood Zone 17 falls under the categories of hot-to-warm, semi-arid lowlands and hot-to-warm arid lowland plains. The main livelihoods are pastoralist and agro-pastoralist. Where practiced crop production plays a varying supplementary and risk-minimizing role. Although the bulk of pastoralists' food is derived from livestock production with various herding practices, cereals and pulses obtained by trade play a significant role. Wild fruits contribute to the diet of pastoralists, particularly during periods of disaster and drought.

The pastoralist production system serves as source of draught animals and other livestock products for highland and lowland sedentary farmers. Trans-boundary trade in the border areas of Kenya and Somalia significantly contribute to pastoralists' livelihoods. Collecting of some forest products such as incense, Gum Arabic, Gum Olbanin, Gum Opoponex from Acacia Senegal Boswelia spp. and Comiphora spp. supplement pastoralists' livelihoods. As a result of increasing pressure on the livelihoods in the system, the number of Woredas being declared as food insecure is growing

With riverside cultivation (crop production/Fishing systems), Livelihood Zone 16 has some distinctive features. Defining features of this system of production are: livelihood patterns based on recession agriculture along the flood plains of river embankments and fishing practiced with the seasonal movements of livestock when people move closer to or further away from river banks following seasonal river flow levels.

Cropping activities are carried out about 150-200 m along both sides of the riverbanks twice a year. Most cultivated land is directly sown using a dibbling system (3-4 seeds per hole) without any form of land tillage.

The first (main season) planting is carried out between the second week of April and the second week of May. Early-maturing varieties of crops are planted to avoid flood damage in August. The second cropping season starts in October, after the floods have receded when residual moisture is used. Crops cultivated include maize, sorghum, sesame, and groundnuts, cowpea, rice, tobacco and beans. Harvest is carried out in December and January.

Productivity is very low as a result of soil-borne pests and diseases since there is no soil exposure to sunlight. Household food and dietary needs are supplemented by fishing, which is practiced by almost all members of the family. Mango trees that are planted along riverbanks serve to supplement household consumption and provide a source of additional income. The cultivated plot sizes along the riverbanks are so small because of the seasonally high concentration of people

Livestock production is the main source of livelihood, while fishing and crop production play a supplementary role.

Seasonal runoff along the banks of major rivers support production activities and determines the livelihood pattern. During the peak rainfall seasons, because of flooding of large areas, people and livestock move from low-lying areas to higher altitudes. When water levels return to normal they carry out crop production, which is supplemented by fishing. No deliberate water control and management interventions are carried out.

The livelihood system for zone 17 is increasingly acquiring features of neighbouring Livelihood Zone 1, where sesame production and trade play a significant role in the local economy.

LIVELIHOOD ZONE 7

Eastern highland mixed livelihood system

This livelihood zone represents a large part of the eastern highland complex with diverse agro-ecological features. Agro-ecologies include warm-to-cool, arid, mid-highlands (towards the northeastern tip of the livelihood zone); warm-to-cool, sub-humid, mid-highlands in the north; warm-to-cool, humid, mid-highlands towards the east and central parts; hot-to-warm, sub-moist lowlands, as well as hot-to-warm, moist lowlands towards the south. This is a predominantly mixed production system based on the production of a wide spectrum of crops and the rearing of livestock.

The woredas included under this livelihood zone are Adaba, Amaro, Amigna, Arbe Gona, Aroresa, Aseko, Bekoji, Boke, Chiro, Chole, Darolebu, Dodola, Fedis, Gedeb, Ginir, Goloodo, Gololcha, Goro, Guradamole, Habro, Hager Mariam, Kochere, Kofele, Kokosa, Konso, Kuni, Lagahida, Liben, Melaka Balo, Meda Welabu, Mennana Arena, Merti, Mesela, Meyu, Nensebo, Odo Shakiso, Raytu, Robe, Selahad, Seru, Shirka, Sinana, Sude and Tena

LIVELIHOOD ZONE 8

Awash pastoral/agricultural system

This livelihood zone is part of the huge pastoralist system in the eastern parts of the country commonly referred to as the Afar Depression. The woreds of the livelihood zone are Afambo, Amibara, Awash Fentale, Aysaita, Bure Mudaytu, Chifra, Dewe, Dubti, Fentale, Fursi, Mile, Simurobi and Telalak. With an average altitude of between 330 and 350 m above sea level, the vegetation is a mix of shrubs, bushes and pastureland. The livelihood zone belongs entirely to the agro-ecological zone of hot-to-warm arid lowlands. This predominantly pastoralist area is becoming increasingly an area for large-scale agriculture based on irrigation. Huge farms producing cotton, sugar cane and horticultural crops function parallel with the pastoralist mode of production of indigenous Afar communities.

Water availability determines, to a great extent, production and movement patterns of pastoralists and agro-pastoralists. Water (rainfall) is generally scarce and temperatures are very high. Availability of surface and groundwater is highly variable. Despite the shortage of water, water control is only limited to small, traditional ponds and irrigation plays an insignificant role. Exceptions here are medium- and large-scale irrigation developments in parts of the livelihood zone. The very low rainfall and runoff from the highlands are the main sources of water, which determine livelihood and movement patterns of pastoralists and agro-pastoralists.

The extremely low level of precipitation has a bimodal nature, occurring in two distinctly separate rainfall seasons. Generally, the livelihood zone towards the eastern highland escarpments receives more rain than areas towards the east. The livelihood benefits from runoff coming from the highland escarpments and the Awash river, one of the country's largest rivers, which is the major source of water for livestock and human consumption as well as the large-scale irrigation schemes.

The distinctive feature of this system of production is the extensive transhumance-based livestock production livelihood pattern, which is practiced under relatively harsh (hot and dry) climatic conditions, with a sparse population and poor integration of markets.

Pastoralists have developed highly efficient production systems based on generally sustainable natural resources management and, in particular, opportunistic management of rangelands (wet and dry season grazing areas). Pastoralists can be classified as comparatively wealthy, holding substantial assets in the form of livestock. The poor have small herds and flocks, those who more or less rely on sale of their labour for a living are increasingly engaging in crop production.

Livestock production is the major means of livelihood for pastoralists and agro-pastoralists, crop production playing only a supplementary and risk-minimizing role where it is practiced. Although the bulk of pastoralists' food is derived from livestock production, based on diverse herding practices, cereals and pulses obtained through trade also play a significant role. Wild fruits contribute to the diet of pastoralists particularly during periods of disaster and drought.

The pastoralist production system serves as a source of draught animals and also other livestock products for highland and lowland sedentary farmers. Irrigated and rainfed crop production, combined with livestock rearing, mainly cattle and shoats, provide the major livelihood basis. There are both large-scale government and privately operated farms in the zone focusing on the production of cotton and horticultural crops. Tendaho, and middle Awash agricultural development farms, are among the major farms in the zone. An increasing number of households are taking up irrigated crop production as a means of livelihood because of the frequent natural hazards that have led to widespread food insecurity. Most households in the livelihood zone purchase additional grains from markets to supplement their livestock-product based diets. Very poor households receive in kind from middle income and better-off households.

Livestock and people move along the banks of the Awash river during dry seasons and move out again when the Awash river begins to flood its banks. Infrastructure and road connectivity is comparatively fair

because the main road from Addis to Djibouti passes through it so the woredas are connected with all-weather roads.

Very poor households have family sizes of 5-7 while better off households have family sizes of 9-11. Poor households have 5-8 shoats while better-off households own 30-50.

LIVELIHOOD ZONE 9

Meher/Belg transition livelihood system

The livelihood zone occupies a narrow strip of highland escarpment dividing the central highlands and the eastern lowlands. Agro-ecologies represented in the livelihood zone are mainly warm-to-cool, moist, mid-highlands and warm-to-cool, sub-moist, mid-highlands. This is among the livelihood zones with characteristically bimodal rainfall pattern and two crop production seasons, the *Belg* and the *Meher*. Woredas with areas falling under this livelihood zone include Ambalage, Angolela Tera, Argoba Special, Artuma Fursi, Asagirt, Bati, Berehale, Dalul, Dawa Chefa, Debre Berhan, Debre Birhan Zuria, Dessie, Dessie Zuria, Dewe, Efratana Gidim, Endamahoni, Enemay, Jile Timuga, Kewet, Koneba, Megale Mojana Wedera, Ofla, Raya Azebo Tehuledere, Woldya and Werebabu.

The topography of the livelihood zone is mountainous and hilly with plains in some places. The livelihood zone is largely deforested vegetation is comprised of bushes and shrubs. The river systems include major rivers such as the Borkena and Chefa. The soils are sandy, sandy clay and sandy loam with moderate fertility.

Crop production is the major economic activity, while livestock production is significant among wealthier households. Crop production is dependent on the major rains of *Kiremt* occurring from July to September, the *Belg* rains from February to April play a supplementary role. There are, however, some pockets in which irrigated agriculture is practiced. The livelihood zone receives an average annual rainfall of about 726 mm. Rainfall is unimodal and there is a single harvest of both short and long-cycle crops.

Major crops cultivated are sorghum, teff, vetch and maize. Cattle, goats and sheep are the main livestock in order of importance, while wealthier people also keep some camels. Among the major challenges of the livelihood zone, in order of importance are shortage of and erratic rainfall, crop pests and diseases, livestock diseases and floods. While crop and livestock sales bring the wealthier farmers most of their income, the poor heavily rely on paid work in local fields and safety net programmes.

Very poor households have family sizes of 4 to 6, while the better off have larger family sizes ranging between 7 and 9. Very poor households cultivate between 0 and 0.75 ha, while the better off own 1.5 to 2 ha.

LIVELIHOOD ZONE 10

Northeastern pastoral livelihood system

This zone includes extreme arid and hot areas east of the pastoralist Livelihood Zone 8. Woredas included are Afdem, Afdera, Ayisha, Dembel, Elidar, Erebti, Erer, Ewa, Gulina, Habru, Miesso, Teferi Ber and Teru. The agro-ecology is hot-to-warm arid lowland plains all woredas experience extreme dry and hot climatic conditions with temperatures in excess of 30 °C. The livelihood zone ranges from 116 m below sea level to 700 m above. The Asale and Afdera lakes are found in the livelihood zone. The total annual rainfall is less than 250 mm. Seasonal streams flowing from both the western and eastern plateau usually dry up upon reaching the sandy plains and the lakes.

Pastoralism is the main livelihood with camels, sheep and goats being the most important livestock species on which the zones livelihoods are based. Migration of people and livestock towards the edge of the escarpment takes place during the dry season. Purchased cereals supplement the pastoralists' food, which is based on livestock products. Chronic water shortages, recurrent drought and livestock diseases are the main challenges of the livelihood zone.

The poor in the livelihood zone have 6 to 7 family members, while the middle and better-off have 8 to 10 and 11 to 13 family members respectively. The poor own 10 to 15 shoats and 1 to 3 cattle, while the middle wealth groups own 55 -60 shoats, 6-8 cattle and 6-8 camels. The better off own 100-140 shoats, 14-16 cattle, 14-16 cattle, 14-16 camels, 2-4 donkeys and 2-4 pack animals.

LIVELIHOOD ZONE 11

Eastern chat/sorghum highland mixed livelihood system

This livelihood zone has distinct livelihood and cropping patterns, which are essentially an extension of the central and eastern Ethiopian highlands. The woredas under this livelihood zone are Bedeno, Deder, Doba, Girawa, Goro Gutu, Gursum, Haro Maya, Jijiga, Kebri Beyah, Kersa, Kombolcha, Kurfa Chele and Tulao. Agro-ecology is predominately warm-to-cool, arid, mid-highlands. The agro-ecology at the foot of the mountainous terrain belongs to the class of hot to warm, moist lowlands.

LIVELIHOOD ZONE 12

'Ogaden' pastoral livelihood system

This livelihood zone comprises areas commonly referred to as the 'Ogaden' (Somali region) with extensive sandy lowland plains with very high temperatures and very low rainfall. Some large rivers such as the Wabe Shebele Genale Dawa comprise the major surface water resources. The woredas included under this livelihood zone are Afder, Aware, Bare, Boji, Debeweyin, Danot, Egehabur, Degehamedo, Dihun, Doloby, East Imi, Elkere, Ferfer, Fik, Geladin, Gerbo, Gode, Gudis, Kebridahar, Kelafo, Meyumuluka, Mustahil, Segeg, Shekosh, Shilabo, Warder and West Imi. The predominate topography

are plains with some hilly and undulating areas. The agro-ecology of the livelihood zone is hot-to-warm, arid, lowland plains. Bushy vegetation covers (sometimes thick) the livelihood zone. The extremely meager rainfall has a distinct bimodal pattern with the main rain *Dir* occurring March to mid-May and the small rain *Karan* during July to September.

LIVELIHOOD ZONE 13

Highland mixed – teff livelihood system

This livelihood zone includes the early settlement central and northern highland complexes in which sedentary agricultural production has been practiced for centuries. Major agro-ecologies in this livelihood zone include cold-to-very cold, sub-moist, subafro-alpine-to-afro alpine; cold-to-very cold, moist, subafro-alpine-to-afro alpine; warm to cool, sub-moist, mid-highlands; warm to cool, moist, mid-highlands and hot to warm, moist, lowlands. The livelihood zone receives relatively abundant rainfall on which agricultural production is dependent. Areas of the livelihood zone towards the east experience bimodal rainfall patterns, while those towards the western parts have unimodal patterns, the Min rains (*Kiremt*) dominate in both cases.

Woredas under this livelihood zone are Abay Chomen, Abe Dongora. Abichuna Gena, Akaki, Alem Gena, Ambassel, Ambo, Ameya, Ankasha, Awebel, Bahir Dar, Bahir Dar Zuria, Bako Tibe, Banja, Baso Liben, Becho, Berehna Aleltu, Bibugen, Bugna, Bure Wombera, Chelya, Dangila, Dano, Dawo, Dawnt Delanta, Deby Telatgen, Debre Markos, Debre Tabor, Debre Sina, Dega Damot, Degem, Dehana, Dejen, Dembecha,Dembia, Dendi, Dera, Ejere, Enarj Enawga, Enebsie Sarmider, Estie, Fagita Lakoma, Farta, Fogera, Gera Midir, Gerar Jarso, Gida Kiremu, Gimbichu, Ginde Beret, Gishe Rabel, Goncha Siso Enessie, Guduru, Guzamen,Hulet Ej Enesie, Ibantu, IlluJarti, Jeldu, Jimma Haro, Jima Rare, Kelela, Kembebit, Kutaber, Kuyu, Lay Betna Tach Bet, Lay Gaynt, Legambo, Limu, Machakel, Mama Midir, Mekeda, Merawi, Meta Robi, Moretena Jiru, Mulona Sululta, Nono, Quarit, Samre, Sayint, Sekela, Sekota, Shebel Berenta, Simada, Siya Debirna, Tach Gayint, Tenta, Wadla, Walisona Goro, Walmera, Wara Jarso, Wegede, Wonchi, Woreillu, Weremo Wajietur, Wuchalena Jido and Yaya Gulele.

In the zone rainfed production of a wide-range of highland cereals (teff dominated) and pulses using deeply entrenched, traditional crop and livestock husbandry practices under temperate climatic conditions in the highlands, in which long years of extractive forms of production, high population and livestock densities have led to advanced levels of natural resources degradation characterize the system of production.

The basis of the livelihood system is the production of cereals, pulses and oil crops along with livestock that is kept on natural pasture and crop residues. Before the depletion of the natural forest cover to its present precarious level, sale of fire wood and wood for construction as well as sale of forest products used to contribute significantly to farmers' livelihoods. Farmers in this system are also engaged, to a certain extent, in petty trade to augment their income.

Rainfall, which has a unimodal pattern in the north and northwest, and bimodal in some central, southern and southeastern highlands, determines production and livelihood patterns. Increased natural resources degradation and climate change, and associated rainfall variability, have induced some degree of small-scale irrigation development and water control. The need to intensify agricultural production to meet the demands of rapidly growing populations in this livelihood zone prompted some degree of irrigation development and water control. Most of the traditional and modern small-scale irrigation development activities are concentrated in this livelihood system.

The high level of runoff and irrigation potential remains mostly untapped. Drainage associated problems; vertisoils that occur in considerably large area in the livelihood zone, are serious challenges constraining production. Although some efforts to improve drainage techniques, such as the Broad Bed maker (BBM), have shown some signs of success in improving workability of the soils and extending the growing period, their up-scaling remains a challenge. Declining organic matter content and mulch in the soil as a result of the unsustainable agronomic practices have reduced effective utilization of soil moisture in many parts of the livelihood zone.

LIVELIHOOD ZONE 14

Horticultural (Enset/cereal) mixed livelihood complex

This livelihood zone mainly belongs to the production system commonly referred to as the horticulture (Enset complex). The agro-ecology is warm to cool, moist, mid-highlands. This livelihood zone is characterized by very high population density and intensive landuse by small-scale farmers.

This livelihood zone includes the woredas Akilina Mohr, Angacha, Alaba, Alicho Woriro, Andercha, Angacha, Badawacho, Bita, Bule, Cheha, Chena, Dalocha, Dara, Daramalo, Ela, Enemorna, Gena Bosa, Gewata, Gimbo, Gofa Zuria, Goro, Gumer, Hulla, Humbo, Isara, Kacha Bira, Kedida Gamela, Kemba, Kindo Koisha, Kokir, Kokir Gedebano. Lanfero, Limu, Lomo Bosa, Mareka Gena, Masha, Melekoza, Menjiwo, Misha, Nono, Ofa, Omo Sheleko, Selti,Sodo, Sodo zuria, Soro, Telo, Tocha, Ubadebrtsehay, urga,Wenago, Virgachefe and Zala.

This system of production is based on a combined use of the hand hoe and the animal-drawn plough ‘Maresha’ for the production of mainly horticultural crops (Enset, coffee, chat, root crops and fruits) as well as a moderate amount of cereals and pulses with multiple cropping practices. Livestock production is an integral part of the system that is increasingly being restricted to stall and restricted feeding of animals because of the scarcity of land, which is the result of extremely high population densities. These areas, which benefit from prolonged moist periods, have the highest land utilization/productivity rates, while labour productivity is lowest as a result of the very high ratio of adult labour to land. ‘Enset’ (False banana) is the most important food crop, while cattle at higher altitudes, coffee and other cash crops such as sugar cane in mid to low altitude areas serve as sources of income. Land-holding size is relatively larger in high altitude areas reaching up to 1.5 ha per household, while it is only about 0.5 ha in medium and low altitude areas.

Enset is mainly planted as a homestead crop along with some cereals and pulses. The crop is planted in small plots in the field and provides the most important basis of livelihood in the system. It is supplemented by livestock production and/or cash crops, depending on the agro-ecologies. No livelihood is provided from the collection of honey and other forest products because the natural vegetation has disappeared. Trade has been constrained because of poor infrastructure development, is emerging as an area of economic activity after recent improvements in road communication. Land degradation is increasing caused by the very high pressure from the growing rural population and some weather irregularities that occur in this system of production, the level of poverty and food insecurity.

LIVELIHOOD ZONE 15

Rift Valley livelihood system

This livelihood zone is part of the Great Rift Valley depression with high concentration of freshwater lakes. Hot to warm, humid, lowlands, hot to warm moist lowlands and hot to warm sub-moist lowlands make up the agro-ecology of the livelihood zone. The topography is predominantly plains with undulating features and acacia trees, bush and grasslands dominate the vegetation cover. Most of the fresh water lakes of the Rift Valley area are concentrated in this livelihood zone making it an attractive destination both for local and international tourists.

Major rivers include Bulbula, Meki, Huluka and Harakelo. The livelihood zone is a sanctuary for wild life, especially for a variety of birds including migratory. In addition to the huge geothermal potential the area is also endowed with soda ash. The *Ganna* is the major rainy season that extends from June to September, while *Arfasa* is the minor rainy season occurring from March to April. The soils of the livelihood zone are sandy and less fertile. Although the livelihood zone has huge grazing potential, it is frequently affected by moisture stress.

The livelihood zone is a food deficit zone receiving food aid during drought. Maize is the major cultivated crop, while haricot beans are grown for income. The low level of soil fertility, coupled with moisture stress, keep agricultural production and productivity very low. There is an increased flow of investment into irrigated agriculture both by large-scale as well as small-scale farmers.

The main types of livestock kept include cattle and shoats in a free grazing system. Main sources of water during the rainy seasons are rivers, surface rainwater, seasonal ponds and community ponds. During the dry season rivers and community ponds become the only sources of water. Water quality is affected by the high fluoride content, which is a problem for human health. Market access in the livelihood zone is good.

ANNEX 1 – LIVELIHOOD ZONES ATTRIBUTE TABLE - GENERAL CHARACTERISTICS

Livelihood zone	Main climate	Main water source for agriculture	Main sources of living (type of production, income typology, etc.)	Main type of soil	Main crops		Farmers typology				
					Rainfed	Irrigated	A	B	C	D	E
1	Arid: (Hot-warmsemi-arid lowlands agro-ecology)	Rainfall Unimodal Meher-Major rains) rainfall (June July August (350-750mm), shallow wells for domestic use	Mixed system -Livestock, crop production Livestock dominated bycattle and Shoats	Moderately fertile Black clay	Sorghum & sesame		0	0	<5%	70%	25%
2	(Tepid to cool moist mid highlands agroecology)-humid, unimodal & bimodal	Rainfall Long Unimodal rainfall (May, June July August, September ,	Moderately productive mixed farming Crop production	Moderately fertile,clay, vertisol and clay loam, medium textured	Cereals & pulses	Vegetables, maize	3%	15%	80%	2%	0
3	(Tepid to cool moist mid highlands agroecology)-humid, unimodal & bimodal	Rainfall Long Unimodal rainfall (May, June July August, September ,	Moderately productive mixed farming Crop production	Moderately fertile,clay, vertisol and clay loam, medium textured	Cereals & pulses	Vegetables, maize	3%	15%	80%	2%	0
4	Hot and warm climate	Rainfall	Farmers, and traders		Teff, sorghum,maize and serials			10	80		
5	(Tepid to cool sub humid mid highlands agro-ecology)	Rain, groundwater, surface water Unimodal Rinfall one of the highest 1200-1700) long rainy season April-October - one agricultural season	Coffee, spices , maize, fruits, vegetable major coffee producing area. Cattle and shoats are the main livestock	Red clay soil Loam soil with moderate productivity	Coffee, Chat maize, sprices, cereals, root crops	Vegetable			97	3	

6	Semi-arid to arid (Hot to warm sub-moist lowlands agro-ecology)	Surface and groundwater (trsditional ellas), small rainfall, water haversting 200-600mm rain, bimodal Long(March-May) short (June-August)	Mainly pastoralist and small scale agriculture (cattle, goats, camels, sheeps, maize, sorghum, (gold),Sorghum, Maize Teff)	Sandy, sandy clay soil	Maize sorghum sugarbe	Fruit vegetable	5		80	15	
7	Moist highland to semi arid land: (Tepid to cool humid mid highlands agro-ecology)	Rainwater, surface water Awash river, groundwater bimodal (February March) (July-September) annual rainfall 122-320mm. Large scale agriculture along the Awash	Cereals, livestock, spices, fruit and vegetable Sorghum, Maize and Teff are important crops. Goats and sheep, camel and cattle	Vertisoils , sandy soils	Wheat, barly, pulses, spices	Fruit vegetable			85	5	10
8	Semiarid: (Hot to warm arid lowlands agro-ecology)	River, rainfallrainwater, surface water Awash river, groundwater bimodal (February March) (July-September) annual rainfall 122-320mm. Large scale agriculture along the Awash	Cattle Camel, small ruminants, small/large scale irrigateed and rainfed agriculture, charcoal tarding	60% alluvial, 40% alluvial	Maize	Cotton, Sugarcane vegetables			60	20	20
9	Semi-arid : Tepid to cool sub moist mid highlands	Rainfall, irrigation unimodal June -September) also small showers in April. Unreliable 600-800mm, rivers, shallow wells, seasonal pools used in the dry season	Livestock(cattle sheep and goats), crop production	Fine to medium textured, clay rich soils	Maize, sorghum, cereals (wheat, Barly) & chickpeas	Vegetables, maize, chickpeas	20%	0	60%	15%	5%
10	Arid: (Hot-warm arid lowlands agro-ecology)	No water source Less than 200 mm of rainfall distictly bimodal	Camel, small ruminant	Vulcanic ashes &Sandy soils			100%				
11	Semiarid (Tepid to cool sub humid mid highlands agro-ecology)	Groundwater, rainfall bimodal rains (460-930mm) majore (June-august) minor (March-April)	Commercial agric, import-export Chat and Coffee major commercial crops	Vertisoil	Maize, sorghum	Vegetables, fruits, chat		15%	60%	25%	
12	Arid (Hot-warm arid lowlands agro-ecology)	Traditional wells and seasonal streams	Camel, small ruminant, cross-border trading	Sandy soil			100%				
13	Moist highland: (Tepid to cool moist mid highlands agro-ecology)	Rainfall, surface and ground water	Cerealspulses, livestock,incet,	Vertisoils , sandy soils	Cereals, teff, pulses, old crops, spices,	Vegetable			93	5	2
14	Moderate	Rainfall	Rain feed agricalture		Root crops, green pepper, maize and spices				80		

15	Semi-arid to arid	Surface water, rain water, ground water bimodal rains long (June-September), short (April-May) 500-800mm annual precipitation	Livestock (cattle, sheep, goats and chicken), vegetable, fruit, cereals	Sand and clay soils	Cereals, pulses, maize,	Vegetable, maize,			87	10	3
16	Semi-arid (Hot to warm sub humid lowlands agro ecology):	Surface water and rainfall 400-500mm rainfall bimodal, (March-May) (September-October)	Cross-border trading, fishing, agro-pastoral	Don't know	Maize	Coffe			90		
17	Semi-arid: Hot to warm sub-moist lowlands agro-ecology)	Unimodal rainfall (June-September) about 800mm	Farmers, and traders	Vertisol and Clay loam	Maize,sorghum. Fingermillets, Sesame cotton				80		

ANNEX 2 – QVELIHOOD ZONES ATTRIBUTE TABLE - BOCIOECONOMIC ASPECTS

Livelihood zone	Average landholding size (ha)	Main constraints for livelihoods	Level of food insecurity (high, moderate, limited)	Incidence of rural poverty (high, moderate, limited)	Market access (high, moderate, limited)		Rural pop density	Migration issues	% female-headed household	Other aspects	Notes
					Inputs	Outputs					
1	>2	Water shortage, erratic rainfall, economic & social infrastructure	Limited	Limited Very poor 20%, poor 30%, middle 30%Better-off20%	Moderate	Moderate	Sparcely populated	No	It is an issue	Effect of malaria epidemic, shortage of labor	
2	1	Shortage of cultivable land, erratic rainfall, shortage of water for agric, land degradation, poor infrastructure	High	High	Moderate	Moderate	Densely populated	Yes, exists	It is an issue	Shortage of agricultural land, lack of market for vegetables, traditional farm implements	
3	1	Shortage of cultivable land, erratic rainfall, shortage of water for agric, land degradation, poor infrastructure	High	High	Moderate	Moderate	Densely populated	Yes, exists	It is an issue	Shortage of agricultural land, lack of market for vegetables, traditional farm implements	
4	<2ha	Less land ownership, traditional farming	Moderate	Moderate	Low		Sparsely populated	Insignificant	No		

5	Coffee farmers are considered as traditional as their productivity is very low	3	Inefficient use of ressources, livestock desease		Moderate-good						
6	< 2 ha	Erratic rainfall and poor infrstructure, access to market and roads, low water development	Moderate with seasonal peacks	Moderat with seasonal peacks	Limited	Limited	Sparsely populated	Nomadic. Agropastoral migration	Low		
7		3	Lack of private land property rights (not all certified) and common lands = unappropriate land uses, moisture stress, inefficient use of ressources, infrastructure, market								
8	>1ha	Flooding, salinity, curlture (nomads)	Moderate	High	Moderate	Moderate	Low	Low	5		People use land for keeping cattle and work in large scale estate, nomads have not adapted tofarming
9	>1.5	Shortage of grazing land, erratic rainfall, shortage of water for agric, poor infrastructure	Moderate	Moderate	Moderate	Moderate	Moderately populated	Yes, exists	It is an issue	Effect of malaria epidemic, livestock disease, shortage of labor	

10	Clan holding	Harsh climate, salinity, vulcanic soil, access to marke	Low	High	Low	Low	Low	Low	5		Lack of awareness, cultural influence, marginal development activity
11	0.5	Land scarcity, degradation	Moderate	Moderate	High	High	Low	Low	5		
12	Clan holding	Water scarcity, insecurity	Low	High	None	None	Low	Low	5		Lack of awareness, cultural influence, marginal development activity
13		Land scarcity, degradation	Water logging, land fragmentation, inefficient use of water	High	Moderate-good						
14	<2ha	Rainfall, traditional agricaltural system, high population density	High	High	Moderate		High	High	A lot of farming activity is done by females		
15		Drought hazards, poor soil fertility, water quality	Moisture constraint, inefficient of water, price variability, poor guidance for irrigation schemes	High	Good						
16	<2 ha	Erratic rainfall and poor infrastructure	Moderate	Moderate	Limited	Limited	Low	Significant cross border, for labour and trade	Female cropping system, female own land		
17	<2ha	Rainfall, traditional agricaltural system, illegal trade	High	High	High (illegal)		Scattered	Significant cross border, for labour and trade	Low		

ANNEX 3 – EIVELIHOOD ZONES ATTRIBUTE TABLE - BATER-RELATED ASPECTS

Livelihood zone	Main water resources	Main water use (farming, livestock, domestic, etc.)	Main water-related constraints	Seasonality (bimodal, unimodal, etc.)	Frequence of droughts and dry spells	Frequence of floods	To what extent AWM can improve livelihoods	Local conflicts (competing uses) on water management	Level of AWM development (high, mediu m, low)	Surface water avail	Ground water availability	Level surface water exploitation	Level groundwater exploitation	Physical AWM potential	Reuse of water for agriculture	Water quality problems for agriculture (salinity, sodicity, etc.)	Ethnicity implications for AWM	Notes
1																		
2																		
3																		
4	GW , surface waterand rainfall	Domestic	Scarsity of water, malaria and tse-tse fly	Unimodal	Low	Low	If there is AWM, it is high	No	Low	High	High	Low	High	High	Low	Insignificant	Low	
5	Rain, groundwater, surface water	For all the above	Poor awareness of the resource, high cost for diversion and dam construction, topographic controll for low schem irrigation, poor extesion survice	Unimodal	Low	Low	Highly	None	Low	Good	Good	Low	Low	Medium	None	None	Limited	

6	Surface and groundwater, small rainfall, water haversting	Domestic, for livestock and limited for irrigation	Irratic distribution of water, salinity of groundwater at some places,	Bimodal	Medium	Moderate	Medium	Moderate for water resource and pasture land	Low	Moderate	Moderate	Low	Low	Medium	None	Localized salinity, sodicity	Moderate	Transboundary conflicts are also seen sometimes
7	Rainwater, surface water, groundwater	For all the above	Limited awareness of the resource, high cost for diversion and dam construction, topographic controll for low schem irrigation	Unimodal mostly and bimodal in some areas	Medium to high	Low	Moderate	None	Low to moderate	Good	Good	Moderate	Low	Medium	None	Not much	Limited	Landslide deforestation ,land degradation, soil erosion, surface water pollution around towns
8	Rivers, rainfall	Commercial agri, cash corp (sugar, cotton),livestock, farming	Soil salinity, flood, malaria	Bimodal	High	High	High	Small scale vs commercial	Medium	High	High	High	Low	High	No	No	No	
9																		
10	Rainfall	Localized ponds, cattle	Lack of water, soil salinity	Limited bimodal	High	No	Low	No	Low	No	Limited	Low	Low	Low	No	No	No	
11	Rainfall, groundwater	Commercial agri, livestock	Erratic rainfall, flood	Bimodal	Low	Medium	High	Low	Medium	Low	High	Medium	Low	High	No	No	No	Major water conservation works
12	No	Livestock	Lack of water	Bimodal	High	No	Low	No	Low	Low	High	No	No	Low	No	No	No	
13	Rain, surface and groundwat	Domestic, for livestock and limited for irrigation	Limited awareness of the resource, high cost for diversion and dam	Both unimodal and bimodal	Low	Low	Medium	None	Low	Good	Good	Low	Low	Medium	None	None	None	High soil erosion, land degradation, moderate

	er		construction, topographic controll for low schem irrigation															landslide
14	Rainfall, GW and surface	Agricalture and domestic	Land scarsity and over population	Bimodal	Low	Low	Low	Low	High	High	High	Medium	Low	Medium	Low	No	Low	
15	Surface water, rain water, ground water	For all the above	Limited awareness of the resource, limited topographic controll for low schem irrigation, localized groundwater and surface water salinity	Bimodal	High	Low	Highly	None	Mediu m	Modera te	Moderat e	High	Medium	High but good water manage ment	None	Salinity, sodicity	None	Care should be taken on irrigation water management to avoid salinity upconing soil incrustation, lake level reduction should be controlled
16	Surface water and GW	Mainly for domestic and livestock, fisherybut little for farming	Utilization problrm, malria	Unimod al	High	Medi um	If there is AWM, it is high	Low	Low	High	Moderat e	Low	Medium	Low	Low	Insignifica nt	Low	
17	Surface water, rainfall and bore hole	Rainfed agricalture	Capacity problem to utilize water	Unimod al	Low	Low	If there is AWM, it is high	No	Low	High	High	Low	Medium	Medium	Low	Low	Low	