
Yayu Coffee Forest Biosphere Reserve
Nomination Form

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Cover photo: The cover photo shows an overview of Yayu forest (core area), participants of a consultative meeting in Yayu town, and a farmer ploughing land with oxen in the transition area. The pictures were taken in April and May 2009 by Detlef Overmann.

Maps: All maps used in this nomination form were prepared for the purpose of this application by team members of the CoCE research project, mostly by Mr. Fite Getaneh.

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This nomination has been made possible by the Yayu Coffee Forest Biosphere Reserve Management Unit, which comprises of:

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Foreword by H.E. President Girma Wolde Giorgis

This nomination of the Yayu Coffee Forest Biosphere Reserve is one of the first initiatives from Ethiopia to register a site as a UNESCO Biosphere Reserve. It is the outcome of many years of research on wild coffee and forest biodiversity by Ethiopian scientists and their partners, and intensive discussions and deliberations by relevant stakeholders, local authorities and the community.

Biodiversity, with its three elements of genetic, species and ecosystem diversity, is the basis of human life. It provides food, medicine, fuel and many other products for human beings and their livelihoods. Hence, the conservation of biodiversity is essential, now and for future generations. It is a well known fact that that our country, Ethiopia, is endowed with a great biological diversity. There are many species of plants, animals and micro-organisms found in our country. Ethiopia is also one of the ancient centers of human civilization, where agriculture originated thousands of years ago. Coffee is one of the crop plants that originated in Ethiopia.

Despite the enormous socioeconomic and environmental contributions of biodiversity it has been subject to loss and degradation, due to various reasons. In particular, population growth and their demands, coupled with poverty, have led degradation of many natural ecosystems and loss of biodiversity. As a result, most landscapes are already transformed and dominated by the human population, in many parts of the country. Loss of biological resources leads to the loss of the means of livelihood for the people, who are directly or indirectly dependent on it.

The coffee forests in Ethiopia, which harbor the last remaining wild Arabica coffee populations and other useful plant species, are among the most affected natural ecosystems, mainly due to deforestation. An increased scarcity of land for agriculture and other uses, coupled with a rising human population, means that the pressure on forests and biodiversity continues. The top priority question in Ethiopia, and for that matter across the globe, is how to reconcile the conservation of biodiversity with development. Experience from the global network of UNESCO Biosphere Reserves has demonstrated that biosphere reserves can promote and demonstrate a balanced relationship between people and nature. Given the importance of the coffee forests for conservation, development, commerce, scientific research and training, management of the Yayu Coffee Forest as a UNESCO Biosphere Reserve will serve as a model site for sustainable development in our country.

I have been following the developments of the Yayu Coffee Forest Biosphere Reserve Initiative since 2006. I am pleased that this nomination has been successfully compiled. I commend the steps taken for this nomination to be transparent and in the interest of the people of the region and government of Ethiopia. I strongly recommend recognition of the proposed biosphere reserve by UNESCO for the benefit of our people, the environment and the future of the coffee industry world-wide. The planned sustainable development approach is in-line with our government policy, particularly our Sustainable Development and Poverty Reduction Program.

Girma Wolde Giorgis, President

The Federal Democratic Republic of Ethiopia

PART I: SUMMARY

1. PROPOSED NAME OF THE BIOSPHERE RESERVE:

[It is advisable to use a locally accepted geographic, descriptive or symbolic name which allows people to identify themselves with the site concerned (e.g. Rio Platano Biosphere Reserve, Bookmark Biosphere Reserve). Except in unusual circumstances, Biosphere Reserves should not be named after existing national parks or similar administrative areas]

Yayu Coffee Forest Biosphere Reserve

2. COUNTRY:

Ethiopia

3. FULFILLMENT OF THE THREE FUNCTIONS OF BIOSPHERE RESERVES

(Article 3 of the Statutory Framework presents the three functions of conservation, development and logistic support. Explain in general terms how the area fulfills these functions.)

3.1 "Conservation - contribute to the conservation of landscapes, ecosystems, species and genetic variation"

(Stress the importance of the site for conservation at the regional or global scales)

The proposed Yayu coffee forest biosphere reserve is in the Illubabor Zone of Oromiya Regional State, in the south-western part of Ethiopia. The area is drained by small rivers like Geba, Dogi, Saki and Sese, which discharge into Baro River. Baro River is one of the major tributaries of the river Nile. The proposed biosphere reserve covers 167,021ha, which contain landscape elements of regional, national and international importance. The most important landscapes are forest, agricultural land, wetland, and grazing land. Parts of the forest and agricultural land of the Yayu area are designated as National Forest Priority Areas (NFPA). Due to its national and international importance, one part of the forest has also been designated as a site for wild Arabica coffee (*Coffea arabica*) conservation as a gene reserve by the Government of Ethiopia since 1998: i.e., the Geba – Dogi Forest Coffee Conservation Area. The latter is supported by the European Union and Government of Ethiopia. Moreover, the whole landscape is part of the Eastern Afromontane Biodiversity Hotspot which is one of the 34 globally important and yet threatened areas for biodiversity conservation.

The forest areas are further categorized into undisturbed natural forest, semi-forest coffee systems, managed for coffee production and old secondary forests. These forests have local importance for coffee, spices, honey and wood production. They also have regional and even international importance for provision of ecosystem services like watershed protection (run-off control, water infiltration, soil retention) in the Nile Basin.

The agricultural land consists of mainly smallholder farms with diverse crops and homegardens. Most crops are traditional landraces. The croplands, homegardens, the managed forests and the natural

forests, altogether form a characteristic cultural landscape in the region, depicting domestication stages and evidences of agricultural evolution.

There are over 450 higher plants, 50 mammals, 30 birds, and 20 amphibian species, occurring in all habitat types within the proposed biosphere reserve. Preliminary studies of spiders have recorded a number of genera, and some of these genera are assumed to be new to Ethiopia, including the likelihood that some are new to science (Aklilu 2006).

Altogether, there are over 100 endemic species of plants, birds and mammals. There are also 44 threatened species (IUCN Red list) in the area, which include two bird, two mammal and 40 plant species. The number of threatened species is likely to be higher when the status of other species are determined.

The Yayu forest is an important gene pool for Arabica coffee, and other plant species important as food (including famine food) and agricultural and forestry purposes. The agricultural landscape surrounding the forest area is also important for the conservation of cultivated landraces of coffee, anchote (*Coccinia abyssinica*), Oromo-Dinch (*Plectranthus edulis*), *Dioscorea* spp. and other crops.

Most important of all is the Arabica coffee genetic resource, which represents a local, regional and globally significant resource for the sustainable development of coffee. Ethiopia is the center of origin and main area for the occurrence and diversity of Arabica coffee, which dominates 69% of global production and 75% of the world market value. Outside Ethiopia, wild Arabica coffee is only known from old records in south-east Sudan and Kenya (only Mt. Marsabit). Healthy and diverse wild populations of Arabica coffee are still found in the forests of Ethiopia.

Recent studies during a six-year research project on the conservation and use on the wild and cultivated Arabica populations revealed that Yayu forest is unique in three ways:

- It has the highest abundance of wild Arabica coffee, inside Ethiopia and throughout the natural range of this species, in the most intact and undisturbed forests (Gole 2003; Senbeta 2006; Gole et al. 2008).
- The wild coffee populations in Yayu forest are the most genetically diverse and unique, when compared with other wild coffee populations from different forest fragments in Ethiopia (Tesfaye, 2006).
- The wild populations of *Coffea arabica* in Yayu have the closest relationship to *C. eugenioides*, with which they share a common ancestor. This makes the populations at Yayu unique, and perhaps the oldest and most direct descendants from its diploid progenitors.

Maintaining the genetic variation of Arabica coffee at Yayu forest could have significant implications for coffee crop development and the mitigation of climate change via selection of genetic material.

Cognizant of the importance of the forest for coffee gene conservation, the Government of Ethiopia has, demarcated part of Yayu forest as coffee gene reserve area.

Most parts of the forest and its riverine ecosystems have not yet been adequately studied. Studies to date have focused mainly on the plants themselves; more important information is expected to be revealed with further studies.

3.2 "Development - foster economic and human development which is socio-culturally and ecologically sustainable".

(Indicate the potential of the proposed biosphere reserve in fulfilling this objective).

The Yayu area is one of the major priority areas for coffee production, according to 'development corridors' identified by the regional government. Over 20,000 tons of coffee are produced annually in the six districts (woredas- as they are called locally) of the biosphere reserve area. There is also a plan by the regional government to expand the buffer zone by planting local landraces of coffee and shade trees in the transition areas. Such intervention has three functions: income for the farmers from coffee, conservation of local coffee types (landraces) on farms, and expansion of forest cover (to counter deforestation)

Coffee farmers are producing spices, like cardamom (*Aframomum corrorima*), pepper (*Piper capense*), and honey from the forest. In the transition area, government and NGO development agents are promoting fruit tree plantations, for coffee shade and fruit production.

The Illubabor Branch of the Oromiya Forestry and Wildlife Enterprise has established forestry plantations and has plans to establish more in degraded and steep-slope areas in the region. This creates job for farmers, and a local forest industry, whilst protecting the watershed. It also encourages farmers to plant trees on degraded areas for income generation. It has an overall impact of increased economic activity in the area.

Coffee production is expected to increase from the current 20,000 tons/year to 40,000 tons/ year within ten years. In order to improve coffee quality an international NGO called TechnoServe is introducing wet processing machineries and organizing farmer groups and private companies, with funding from the Gates Foundation.

The Ethiopian Coffee Forest Forum initiated a specialty coffee marketing programme called "Darara Buna" coffee, to link producers with high segment consumers by labelling coffee produced in the biosphere reserve. Together with the Center for Development Research, University of Bonn, this marketing strategy is being developed to support in-situ conservation of wild coffee by improving income generation from coffee management outside the coffee forest conservation areas.

Agriculture is the main source of income in the area, serving peoples' cash and subsistence needs. Sustainable agricultural development will be promoted by the Ethiopian Coffee Forest Forum by using compost from coffee bushes and other agricultural bi-products.

Examples of current and potential activities in the area are:

- Darara Buna Coffee: a special brand name for coffee coming from the prospective Yayu biosphere reserve to be marketed locally and internationally and designed to contribute to a conservation and development programme in the area for creating alternative incomes.
- Community Development projects by the Menschen für Menschen (MfM) Foundation (http://en.menschenfuermenschen.com/) with a multitude of activities in the areas of health, education, water supply, agroecology, social security and women empowerment.
- Agricultural development extension programmes by offices of the Bureau of Agriculture and Rural Development.
- Coffee planting in degraded forest margins, along with planting of indigenous trees for shade, which eventually contributes to reforestation and buffer zone expansion outwards, by local government CIP-IV Geba-Dogi Forest Coffee Conservation project and ECFF.
- Apiculture/beekeeping, which is complementary with coffee production, by MfM Foundation and regional government.

Additionally, the proposed biosphere reserve has a future potential in promoting economic development through:

- Certification of coffee and other products like honey or organically grown crops can help to achieve premium prices on the market. There is a growing demand for such high-quality products in urban areas, as reported by Ecological Products of Ethiopia Ltd (ECOPIA Ltd).
- Eco-tourism development: the diverse coffee production culture, unique forested and agricultural landscapes, waterfalls, historical sites and caves, as well as unique forest birds and other animals are some of the major tourist attractions. This can promote further development of infrastructure, such as lodges.

3.3 "Logistic support - support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development".

(Indicate current or planned facilities).

There are various environmental education and special information dissemination activities in the proposed biosphere reserve. These include education activities by the Ethiopian Coffee Forest Forum (ECFF), the Geba-Dogi Forest Coffee Conservation Project, as well as schools, and environmental education club activities. Some of the special environmental education activities include a Children Talent award competition in graphic arts/painting/poems and performance arts (songs and dancing), which is organized by ECFF.

For adults in the area of the proposed biosphere reserve, ECFF has programmes on para-ecologist training focusing on forest resources assessment, inventory, monitoring and the dissemination of biodiversity, forest and environment-related topics. Literate farmers with at least elementary school education qualify for the training. For the continuity of such activities and up scaling of its experiences, ECFF is currently raising funds to establish the Darara Buna Conservation Research and Education Center. The center is expected to be fully operational within three years (by 2012).

The Geba-Dogi Coffee Forest Conservation Project has been conducting public awareness events and environmental education for adults and youth since 2002. Historical sites like the Gada assembly of the Illu Oromo, scenic views, water falls and historical caves have been identified and are being promoted as tourist and educational sites by the culture and tourism office, local administration and ECFF.

The Darara Buna Conservation Research and Education Center will be used as training center for handicrafts and organic agriculture, and as field school for experts, development agents, community members and decision makers of the region, and from outside. Land has been made available for this center. The Mayor of Yayu has set aside a two hectare plot of land in Yayu town where the center will be built.

Based on a preliminary survey conducted in 1998, Yayu forest was identified as conservation area for coffee genetic resources in Ethiopia along with two other forest areas, Berhan-Kontir and Boginda-Yeba (Teketay et al. 1998). Since 2000, different research activities have been conducted by Ethiopian and German Universities, with research focusing on Yayu and other remnant coffee forest areas. Research work on Yayu forest started through a doctoral study at the Center for Development Research (ZEF) of the University of Bonn (Gole et al. 2002; Gole 2003). Based on this initial research, a collaborative research was initiated by German (mainly ZEF and other institutes of the University of Bonn) and Ethiopian research institutions (Institute of Biodiversity Conservation, Addis Ababa University, Haramaya University, Jimma Agricultural Research Center) to conserve and sustainably use the forest and coffee genetic resources in Ethiopia. The interdisciplinary project "**Co**nservation and use of wild populations of ***C****offea arabica* in the montane rainforests of **E**thiopia (CoCE)" started

in 2002 (www.coffee.uni-bonn.de). The research activities in the first phase of the project, CoCE-I (August 2002 to June 2006), were carried out with the aim to assess the diversity and economic value of the montane rainforests and the wild coffee gene pool, and to develop model concepts for their conservation and use, based on the in-situ conservation of the genetic diversity of *Coffea arabica* linked to the conservation of species diversity of the forest. In particular, the first phase involved six sub-projects with focus on:

- forest biodiversity assessment (floristic investigations),
- coffee genetic diversity,
- coffee drought tolerance,
- diseases of coffee,
- the economic values of coffee genetic resources and the coffee forest,
- and an institutional analysis of coffee forest users and organisations.

The second phase of the project, CoCE-II (August 2006 to December 2009), focuses mainly on implementing research, by education, training, awareness raising events and by developing adequate incentive mechanisms for conservation.

The CoCE research findings have shown that there is: (1) a high genetic diversity in the wild coffee populations at Yayu, (2) high flowering plant species diversity, and (3) that the presence of coffee has helped to conserve the remaining forest resources through traditional management practices for coffee production by the local community. More importantly, we are now in the position to say with some degree of certainty that the remaining rainforests of south-west Ethiopia still exist because of the occurrences of wild coffee. Reversely, lacking financial resources for conservation incentives, a lack of income alternatives, natural and politically designed population pressure, and insecurity of land tenure are just some of the factors which keep the pressure on the forest resources of south-west Ethiopia including the Yayu area. Consequently, the concepts required for conserving and sustainably using the forest resources include information and awareness building, adequate incentive and financing mechanisms, as well as strengthening institutions. In the project, 31 and 13 young Ethiopian (33) and German (11) scientists were trained at MSc and doctoral level, respectively.

Research activities at Yayu forest recently joined an international research network, The International Forestry Resources and Institutions Network, through a project, on "The role of institutions for forest resource and livelihood management in East African forest landscapes". The objectives of the project are to: (1) strengthen research capacities, (2) build a training network, and (3) improve understanding of the role institutions and institutional change play for natural resource management and livelihoods in the Yayu forest area and other East African forest landscapes. The research project has three major thematic components: (1) participatory forest landscape assessment, (2) assessment of household data and livelihood strategies and (3) assessment and analysis of institutions affecting resource management and livelihoods. The project began in January 2009, and will be completed at the end of 2011. Scientists and students from Ethiopia, Kenya, Tanzania and Uganda are involved in the project.

A new implementation oriented (action) research and development work, supported through the GEF fund on "Mainstreaming agro-biodiversity", on Yayu forest for coffee and other areas for other crops has been initiated by Institute of Biodiversity Conservation, Environmental Protection Authority, Ministry of Agriculture and Rural Development, and the ECFF. It is expected to begin full activities by January 2010. The project has three components, namely: (1) enabling policy and institutional framework for *in situ* conservation of agro-biodiversity, (2) markets for agro-biodiversity friendly products to promote farmers uptake, and (3) crop wild relatives conservation in *in-situ* gene banks (set aside areas) that continue to provide a 'breeding ground for agro-biodiversity'.

4. CRITERIA FOR DESIGNATION AS A BIOSPHERE RESERVE

[Article 4 of the Statutory Framework presents 7 general criteria for an area to be qualified for designation as a biosphere reserve which are given in order below.]

4.1. "Encompass a mosaic of ecological systems representative of major biogeographic regions, including a gradation of human intervention"

(The term "mosaic" refers to a diversity of natural habitats and land cover types derived from human uses such as fields, managed forests, etc. The term "major biogeographic region" is not strictly defined but it would be useful to refer to the map of the "World Network of Biosphere Reserves" which presents 12 major ecosystem types at a global scale).

The proposed biosphere reserve is part of the Afromontane region. This region occurs across Africa from the north in Sudan to the south in the Cape region of South Africa, from east in Djibouti to the west in Cameroon. Over 50% of the Afromontane region with elevations above 1500 m occurs in Ethiopia. Most of these areas in Ethiopia have lost their original habitat types. Yayu forest is one of the few areas with original habitat types, and is of high significance for conservation of biodiversity in such eco-regions at national, regional and continental level.

The forest is also part of the Eastern Afromontane Biodiversity Hotspot. This is one of the 34 hotspot areas in the world, identified by Conservation International (Mittermeier et al., 2005). Most parts of this hotspot area fall within the Ethiopian boundary. Studies show that over 90% of the original habitats in the area have been changed.

The area is also an important catchments area of the Nile basin, with comparatively higher forest cover than any other area in Ethiopia (Gole, 2003). Many rivers originate, or drain this forest and others within the region, and flow into the Nile River. Being a high rainfall area (over 2000 mm/year), the contribution of water from the Ethiopian areas is quite high. In total, around 80% of the water flow in the Nile comes from the highlands of Ethiopia. Hence, sustainable management through a biosphere reserve approach can contribute significantly to the local and regional hydrology.

Being a diverse area in terms of plant and bird species, it is also part of different local and global conservation priority areas. It has been identified, for example as:

- a center of plant diversity (Barthlott et al., 1999),
- center of origin for crops (Vavilov, 1951),
- an important area for birds of Ethiopia (EWNHS, 1996) and Africa (Fishpool & Evans, 2001).

The Yayu forest is under a forest management practice with clear gradation of human intervention: forest gardens, semi-forest coffee production systems, and undisturbed forests with wild coffee populations and riverine vegetation. Outside the forest, the land is covered by a small-scale mosaic of different land-use types and intensities, such as annual crops, farm land with scattered trees (including agro-forestry), homegardens with coffee and shade trees, grazing land and fallows. This designation of landscape components matches perfectly with the biosphere reserve concept and offers a unique opportunity for sustainable development and conservation in a traditional human-transformed landscape within Ethiopia.

4.2 "Be of significance for biological diversity conservation"

(This should refer not only to the numbers of endemic species, or rare and endangered species at the local, regional or global levels, but also to species of globally economic importance, rare habitat types or unique land use practices (for example traditional grazing or artisanal fishing) favouring the conservation of biological diversity. Give only a general indication here.)

The area has an exceptionally high level of biodiversity. The forest vegetation is rich in plant species. Most tree species in the area are endemic to the Afromontane eco-region, while some are linking species of the Afromontane and dry peripheral semi-deciduous Guineo-Congolian forests and other eco-regions, like Sudano-Zambezian ‘super region’ (Friis, 1992; Gole, 2003).

Apart from its extraordinary landscape mosaic of forest, agricultural land and wetlands, the proposed biosphere reserve area contains the biggest tract of the last remaining intact Afromontane rainforests, with significant wild Arabica coffee populations. The reserve provides a critical habitat of sufficient size to promote the conservation of species diversity for Afromontane forest vegetation, particularly the genetic diversity of Arabica coffee.

The area is characterized by rich species diversity, with new species being identified regularly through ongoing research activities and inventories. Close to 300 species of plants were recorded from few sample plots within the area (Gole, 2003). In total, 450 higher plants, 50 mammals, 200 birds and 20 amphibian species have been reported in all habitat types within the proposed biosphere reserve (EWNHS, 1996).

Yayu forest is not only a National Forest Priority Area and a coffee gene reserve, but is also recognized as an important bird area (IBA) in Ethiopia, known as the Metu-Gore-Tepi IBA. It has 30 species of the total 48 Afrotropical Highland Biome bird species found in Ethiopia, i.e., bird species with restricted range of distribution to highland areas of above 1500 m. There are also forest specialists and Ethiopian endemic species like the black-headed forest oriole, and the Abyssinian catbird. Mammals include the civet cat -a natural seed dispersal agent for coffee and many primates like the Colobus monkey, baboons, and the velvet monkey.

The presence of wild coffee populations is one of the most notable features of the area. The forest is the natural habitat of Arabica coffee (*Coffea arabica*). Among all known wild Arabica coffee forests in Ethiopia (and worldwide) this forest has the highest coffee genetic diversity and very unique coffee gene pool.

The government of Ethiopia has designated 10,700ha as a coffee gene reserve, which is part of the core areas of the proposed biosphere reserve.

The proposed biosphere reserve includes

- Geba-Dogi Forest Coffee conservation area (coffee gene reserve) - which covers 10,700 ha of the core areas and the surrounding buffer zone and transition areas.
- Yayu National Forest Priority Area, which covers more than150,000 ha of forest.
- The whole region is part of the Eastern Afromontane Biodiversity area, which is one of the 34 globally important areas for conservation and yet is highly threatened.
- It is also part of the Ethiopian Center of crop origin and diversity, which is one of the 12 Vavilov centers worldwide.

The area is also known for its unique traditional coffee production practices. Traditionally coffee is produced by managing natural forests and coffee plants of wild origin. In traditional practice, some shade trees and understory vegetation, competing with coffee, are cleared, but maintaining some tree seedlings, some shade trees and all coffee plants. In areas where the density of coffee plants is low, wild seedlings are picked from unmanaged forest and planted in gaps. This system is called semi-forest coffee production system. There are also forest gardens, homegardens and plantation coffee in the proposed transition areas. Coffee production in the area represents a traditional land-use system with active domestication of wild Arabica coffee (development of landraces), providing agricultural evolution.

Because of the importance of forests for the livelihood of the people and their cultural practices, the area still maintains an extensive forest cover and, therefore, high biodiversity. For instance, the south-western part of Ethiopia as a whole has lost over 60% of its forest cover over the last 30 years. In Yayu, however, the loss is only 7% during the same period (Getaneh, 2009).

4.3 "Provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale"

(Describe in general terms the potential of the area to serve as a pilot site for promoting the sustainable development of its region (or "eco-region")

The proposed biosphere reserve is found in a high rainfall area, with plenty of fresh water in perennial rivers and streams. The area is known for coffee production. Coffee is the main source of cash income (70%) for the local communities. Coffee production in the area is mainly forest-based and environmentally friendly. With increase in demand, however, there is the possibility of an intensification of coffee production. Oromiya Regional state produces 65 to 70% of the total coffee produced in Ethiopia, followed by the Southern Nations, Nationalities and Peoples Regional state (25%).

The establishment of a biosphere reserve in Illubabor zone will be an incentive to further explore and demonstrate approaches for sustainable development in the region. With the Yayu Coffee Forest Biosphere Reserve, management practices in the different management zones will be standardized, and monitoring conducted by the trained para-ecologist, with technical support from ECFF and relevant government offices in the area. The title of biosphere reserve itself is expected to create special niche markets for coffee, honey, spices and handicrafts from the area.

Coffee production and honey harvesting can create mutual benefits. Studies show (reference) that coffee yield can increase by about 30% if there are up to five beehives per ha. This can boost income from both coffee and honey.

There are ongoing initiatives by the Ethiopian Coffee Forest Forum and its partners in government, business and other non-governmental organisations, like the promotion of fruit, tree production, coffee quality improvement through processing, forest coffee certification, and standard development procedures.

The Darara Buna (http://dararabuna.googlepages.com/home) conservation and development programme approaches conservation of coffee forests by creating alternative incomes from agriculture, marketing of food products and handicrafts. It is still in a planning phase but has received much positive feedback as of today.

4.4 "Have an appropriate size to serve the three functions of biosphere reserves"

(This refers more particularly to (a) the surface area required to meet the long term conservation objectives of the core are(s) and the buffer zone(s) and (b) the availability of areas suitable for working with local communities in testing out and demonstrating sustainable uses of natural resources.)

The area demarcated as the proposed Yayu Coffee Forest Biosphere Reserve is mainly a forested and agricultural landscape. Undisturbed natural forests are mainly found along Geba, Dogi, Saki and Sese rivers. Forest areas managed for coffee production and agricultural areas are found on plateaus and gently sloping areas.

The proposed biosphere reserve has a total area of 167,021 ha. The core area represents intact undisturbed natural forests endowed with high abundance of wild populations of Arabica coffee and high biological diversity. The five contingent compartments of the core area cover 27,733 ha and hence provide appropriate and sufficient surface area to attain the conservation objectives of the

reserve. The buffer zone surrounding the core areas covers 21,552 ha and is composed of managed coffee forest (semi-coffee forest systems) by individual farmers. Considering the planned coffee planting and indigenous shade trees planting programmes of the government, the buffer zone is expected to expand outwards into the transition area, doubling its current size within ten years. This will ensure the economic and sustainable use of the reserve's biological resources, especially coffee. The transition area occupies 117,736 ha and contains crop-land, grazing-land, grassland, wetlands as well as urban and rural settlement areas. This zone is where all the human population in the biosphere reserve resides, and is therefore under intensive human use. This will provide an appropriate context for land-use related problem identification and participatory solution formulation.

Table 1. Size distribution of the different management zones

ZONE	*AREA*	*PERCENTAGE*
Core Area	27,733	16.6
Buffer Zone	21,552	12.9
Transition Area	117,736	70.5
Total	167,021	

4.5 Through appropriate zonation:
"(a) a legally constituted core area or areas devoted to long term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives" ?
(Describe the core area(s) briefly, indicating their legal status, their size, the main conservation objectives)

The core areas of the Yayu Coffee Forest Biosphere Reserve are devoted to the long-term protection of natural forests as part of the National Forest Priority Areas, which are under two legally binding regulations:

- the Federal Democratic Republic of Ethiopia's Forest Conservation, Development and Utilization Proclamation No. 94/1994, which was revised and replaced with the Forest Development, Conservation and Utilization Proclamation 542/2007, and
- the Oromiya Forest Proclamation No. 72/2005.

Further sections of the core areas have been designated as coffee gene reserve since 1998.

In order to strengthen its legal protection, the core area is currently gazetted by a new "Regulation for the Establishment of the Yayu Coffee Gene Reserve". In the near future, the regulation is expected to be approved by the Council of Oromiya National Regional Government.

Currently the Oromiya Forestry and Wildlife Enterprises, Illubabor Zone office, administer the core areas of the proposed biosphere reserve, while the Oromiya Bureau of Land and Environment is the main regulatory body for land and environment, including the core area.

The core area has five contingent compartments, covering 27,733 ha, which provides sufficient surface area to attain the conservation objective. The main objective of the core area is *in-situ* conservation of the genetic resources of coffee, i.e., the wild populations of *Coffea arabica*. Hence, the core area has been delineated based on such biophysical criteria, such as patterns in wild coffee occurrence, diversity of other plant species, disturbance levels, the location of roads and settlements as well as social criteria like traditional use rights of local community members. The biophysical criteria used to identify the core area were developed by Gole et al (2002) and employed by Gole

(2003) for zoning. This was supplemented by coffee genetic and functional diversity generated by different researchers (Meko, 2005; Hindorf et al., 2006; Kufa 2006; Tesfaye, 2006; Beining, 2008), as well as remotely sensed data and community participation (Getaneh 2009). The social criteria, especially regarding the conflicts created by previous zonations neglecting traditional use rights and the participation of local communities, have been investigated and documented by Zewdie Jotte, doctoral student of the abovementioned CoCE research project.

"(b) a buffer zone or zones clearly identified and surrounding or contiguous to the core area or areas, where only activities compatible with the conservation objectives can take place..."
(Describe briefly the buffer zones(s), their legal status, their size, and the activities which are ongoing and planned there).

The buffer zone in the proposed biosphere reserve is also part of the Yayu National Forest Priority Area, protected by both federal and regional government forest proclamations (Federal Forest Development, Conservation and Utilization Proclamation 542/2007; Oromiya Forest Proclamation No. 72/2005). Sustained management of the forest for non-timber forest products production is allowed. For instance, the local farmers use the buffer zone for coffee, spices and honey production. This part of the forest is known as the semi-forest coffee production system, and is the main source of coffee produced in the region. Cutting trees for timber is strictly forbidden by the federal and regional government forest proclamations, which also apply in the core area.

The buffer zone encompasses the core areas and covers 21,552 ha, mainly representing managed coffee forests by individual farmers. Currently ongoing activities include forest management by farmers to enhance coffee productivity, and planting coffee with the appropriate shade trees which would enable gradual expansion of the buffer zone into the more intensively managed transition area.

The CoCE project and the Geba-Dogi Forest Coffee Conservation Project are supporting the buffer zone expansion through coffee and shade tree planting. Marketing strategies for coffee produced in this zone are also being developed, along with coffee quality improvement through introduction of wet processing technologies.

"(c) an outer transition area where sustainable resource management practices are promoted and developed"
(The Seville Strategy gave increased emphasis to the transition area since this is the area where the key issues on environment and development of a given region are to be addressed. The transition area is by definition not delimited in space, but rather is changing in size according to the problems that arise over time. Describe briefly the transition area as envisaged at the time of nomination, the types of questions to be addressed there in the near and the longer terms. The size should be given only as an indication).

The transition area contains cropland, grazing land, grassland, wetlands as well as urban and rural settlement areas. It is the place of residence for all the human population in the biosphere reserve, the development organizations and local institutions. Most income for the livelihood of the population of the area comes from the transition area. Around 154,300 people live in the transition areas, including urban and rural settlements.

The agricultural landscape of the transition zone includes some of the semi-forest coffee production areas, garden coffee, small coffee plantations, cropland, and grazing land. Even though the area has abundant resources, which can support the local livelihood and the quality of important products like coffee, honey and spices, it has a large potential for improvement, mainly due to lack of improved production and processing technologies.

In the next five years, wet-processing plant and standard storage facilities for coffee, as well as modern beehives will be introduced by the government and NGOs to most communities within the transition area of the biosphere reserve.

In ten years, coffee production will be double the current annual production, according to government estimates. Doubling production can be achieved, by improving the management of existing coffee stands and extending the coffee growing area. Honey and spice production will also increase significantly, since their production goes hand–in-hand with coffee production. It is expected that over 50% of coffee and other non-timber forest products from the area can be certified and marketed on niche markets, through cooperative unions and private partners within five years. In ten years, all coffee from the area will be certified and sold with premium price at local and international market.

4.6 "Organizational arrangements should be provided for the involvement and participation of a suitable range of inter alia public authorities, local communities and private interests in the design and the carrying out of the functions of a biosphere reserve."

(Are such arrangements in place or foreseen)

The biosphere reserve conservation and development approach for the Yayu forest was developed based on the research findings and recommendations of the COCE project (www.coffee.uni-bonn.de) and previous works. Given the importance of these forests for both conservation and livelihoods, the research team of Ethiopian and German scientists recommends a biosphere reserve as the most suitable approach for sustainable development and biodiversity conservation in the human-impacted landscape of Illubabor zone. At that time all research partners lacked expertise and experiences in the biosphere reserve establishment process.

In 2006, the group requested assistance from the German Federal Agency for Nature Conservation (BfN) for technical and financial support to begin with the biosphere reserve establishment process. In October 2006, an international workshop on "Biodiversity conservation and poverty reduction in human transformed landscapes" was held in Addis Ababa, with focus on biosphere reserves as a response to the conservation and development needs expressed by local communities and governmental agencies. At the end of the three-day workshop, a taskforce for the Yayu Biosphere Reserve initiative was formed. The taskforce members conducted a series of meetings to develop a strategy for the establishment of a biosphere reserve.

In October 2007, BfN and ZEF supported another national training workshop for taskforce members and experts on landscape planning and biosphere reserve zoning, with practical exercises at the Yayu forest. Participants refined the taskforce membership and developed a road map for the biosphere reserve establishment process. A sub-group of the taskforce was formed at local level, which has later evolved into the Yayu Coffee Forest Biosphere Reserve Management Unit (MU).

The MU, at zone level, is composed of the Illubabor Zone Administration, Oromiya Forestry and Wildlife Enterprise - Illubabor Branch, Illubabor Zone Agriculture and Rural Development Office, Illubabor Zone Peace and Security Office and the Ethiopian Coffee Forest Forum (ECFF). Later in 2009, a new government organization called the Oromiya Land and Environmental Protection Bureau was created. Subsequently, the Illubabor Zone Land and Environmental Protection Office has been created, splitting from the Agriculture and Rural Development Bureau and merging with the Environmental Protection Agency. Hence, the number of members of the MU has also increased by one.

Further management units have been formed at six districts (Yayu, Chora, Hurumu, Dorani, Alge Sachi and Bilo-Nopha) in which the proposed biosphere reserve falls, and also 30 kebeles (kebele is the lowest formal administrative unit in Ethiopia) in which buffer zone areas fall, in order to guarantee

the equitable representation of local community representatives and their participation in decision making processes regarding the biosphere reserve. At community level, MU members include elders and community leaders. The Ethiopian Coffee Forest Forum is serving as scientific adviser to the MU at all levels.

The Zonal MU meets every month, and also plays a leadership role in organizing consultation meetings and discussions with community members. Since the composition of the MU includes local authorities and relevant government offices, the Zonal MU makes it easier to communicate to the community as well as to higher government officials.

4.7 Mechanisms for implementation

Does the proposed biosphere reserve have:

"(a) mechanisms to manage human use and activities in the buffer zone or zones" ?
(Briefly describe)

The buffer zones are part of the Yayu State Forest Priority Area. However, the forests are used for coffee production as a semi-forest production system. Some activities in the area are regulated by the 2007 Forest Proclamation of the Federal Democratic Republic of Ethiopia and the Oromiya Forest Proclamation of 2005.

Management guidelines will be applied in the buffer zone to manage human use activities, and monitor changes (See Appendix 5). These management guidelines have been discussed with the management units (MU) at all levels; they have found support and will be applied in accordance within the legal framework of the existing proclamations.

"(b) a management plan or policy for the area as a biosphere reserve" ?
(Briefly describe)

Management guidelines have been prepared and discussed with the MU members and the communities. The Ethiopian Coffee Forest Forum (ECFF) has devoted much of its work throughout the last year to introduce, discuss and explain the idea of a biosphere reserve to the communities of the proposed biosphere reserve. The management guidelines were endorsed in early 2009. The management guidelines are the first of its kind for coffee forests. After the establishment process of the proposed biosphere reserve has been completed, the guidelines will be revised and improved through practices and lessons learned from research and implementation. Moreover, the overall management plan is under preparation by the MU at Zonal level, and will be enriched further with community discussion.

"(c) **a designated authority or mechanism to implement this policy or plan" ?**
(Briefly describe)

Currently, the MU serves as a platform for coordination and operations of all biosphere reserve related activities, such as information dissemination, community consultation, research activities and planning. Its work is being supported by ECFF. Yayu town officials plan to establish a biosphere reserve office in Yayu town. This office will facilitate the coordination of stakeholders and all activities in the biosphere reserve and report them to the public, thereby ensuring that the three functions of a biosphere reserve are fulfilled.

On the other hand, the Oromiya Land and Environmental Protection Bureau has a regulatory role and will monitor and evaluate the activities of the different participants, in order to make sure that all are

in-line with management guidelines of the Yayu Coffee Forest Biosphere Reserve. The MU, at all levels, will also continue to play an advisory role throughout the implementation period.

√	☐	☐
Yes	No	Planned

(d) programmes for research, monitoring, education and training"?
(Describe briefly research/activities monitoring (ongoing or planned) as well education and training activities)

Research has been carried out for decades on coffee collected from the forest. During the past 6 to 7 years, however, a multi-disciplinary research project on forest biodiversity, coffee genetic diversity, coffee quality, disease and drought tolerance of coffee, economic values of the wild coffee gene pool and the forest ecosystem and institutions was conducted by the Center for Development Research (ZEF) and other institutes of the University of Bonn in Germany, and Ethiopian organizations such as the Institute of Biodiversity Conservation (IBC), the Ethiopian Institute of Agricultural Research (EIAR)- particularly Jimma Agricultural Research Center (JARC), Addis Ababa University, Haramaya University and the Ethiopian Coffee Forest Forum (ECFF). There are two ongoing projects and another one being developed. Over the past ten years, 15 PhD students and 31 MSc students have conducted research for their theses in the coffee forest areas, and all have shown the importance of the area for the conservation of biodiversity. The establishment of the Yayu Coffee Forest Biosphere Reserve is expected to attract more research from nearby universities like Jimma, Wollega and Metu. The VW foundation has provided a research grant of 325.000 Euros to study the role of institutions in these coffee forest landscapes, and has involved MSc students who will carry out their research in Yayu.

Monitoring has been conducted by various organizations over the past decades. Being a National Forest Priority Area (NFPA), the Forestry/ Natural Resources Department of the Ministry of Agriculture and Rural Development and Oromiya Bureau of Agriculture and Rural Development were in charge of monitoring the forest areas demarcated as core areas and buffer zone in the proposed biosphere reserve. Activities cover the detection of change over time, and forest condition assessment. The Geba-Dogi Forest Coffee Conservation Project has been active in monitoring most parts of the proposed core area. For the last two years, the Oromiya Forestry and Wildlife Enterprise - Illubabor Branch has been responsible for monitoring and development of the forest area. The Ethiopian Coffee Forest Forum (ECFF), through continuous research, is also playing an important role in monitoring. The ECFF is also building the capacities of community members in carrying out forest resource assessments, and monitoring by training para-ecologists. The establishment of the biosphere reserve is expected to reinforce this through proper implementation of the management guidelines.

Education and training have been the most important components of the completed and ongoing projects (CoCE and IFLEA) on the forest. These are tightly linked to research. Most researchers were graduate students at masters and doctoral levels. So, the forest has been used as a living laboratory to conduct research. In addition, the findings of the research have been used to train para-ecologists, farmers, practitioners, experts and local authorities regarding sustainable natural resource management. School children have been educated through school environmental education clubs. To make research, education and training more sustainable, ECFF is in the process of establishing a biodiversity conservation research and education center called the Darara Buna Conservation Research and Education Center (Darara Buna literally means “coffee flower”). When the biosphere

reserve is established, the center will contribute to the fulfilment of the three functions of biosphere reserve. Our first sponsors have expressed interest in supporting the center and architectural plans have been developed for the buildings. The Yayu city authorities have sponsored the project by a bestowal of a sufficiently large land area in Yayu town.

5. ENDORSEMENTS

5.1 Signed by the authority/authorities in charge of the management of the core area(s):

Institution: Oromiya Forestry and Wildlife Enterprises, Illubabor Branch

Full name: Gaddafaa Nagaraa

Title: Hojii Gaggeessaa

Date: 08/09/09

Institution: Illubabor Zone Land and Environmental Protection Office

Full name: Admaasuu Tashoomaa

Title:

Date: 08/09/09

Institution: Yayu District Administration

Full name: Balaa ChooBaqqalaa

Title: Administrator

Date: 08/09/09

Institution: Hurumu District Administration

Full name :

Title :

Date: 08/09/2001

Institution: Dorani District Administration

Full name : Tasfaayee Wadaajoo Ishoo

Title : Bulchaa Aanaa Doorannii

Date: 08/09/09

Institution: Bilo-Nopha District Administration

Full name : Wangeelaawii Maarqoos Foggii

Title: Bulchaa Aanaa Billoo Noophaa

Date: 09/09/09

Institution: Alge Sachi District Administration

Full name : Tasfaayee Raggaasaa Dayyaas

Title: Bulchaa Aanaa Algee Saachii

Date: 09/09/09

5.2 Signed by the authority/authorities in charge of the management of the buffer zone(s):

All institutions listed under 5.1 above and the following:

Institution: Illubabor Zone Agriculture and Rural Development Office

Full name: Ketema Addisu

Title : Itti Gaafatamaa waaj/Qonnaa fi Mis/Baadiyyaa G/I/A/ Booraa

Date:

Institution: Chora District Administration

Full name : Isaa Raggaasaa Jorgee

Title : Bulchaa Aanaa Cooraa

Date: 09/09/09

5.3 Signed as appropriate by the National (or State or Provincial) administration responsible for the management of the core area(s) and the buffer zone:

Institution: Oromiya National Regional Government

Full name:

Title:

Date: 12/09/09

Institution: Bilo-Nopha District Council

Full name: _____

Title: _____

Date: 09/09/09

Institution: Alge-Sachi District Council

Full name: Chali Dingata

Title: Speaker

Date: 09/09/09

Institution: Chora District Council

Full name: _____

Title: _____

Date: _____

5.5 Signed on behalf of the MAB National Committee or focal point:

Institution: UNESCO MAB National Committee of Ethiopia

Full name: _____

Title: _____

Date: _____

PART II: DESCRIPTION

6. LOCATION (LATITUDE AND LONGITUDE):

[Indicate in degrees - minutes, seconds the coordinates of the central point AND the external limits of the proposed biosphere reserve to be used for a Geographic Information System (GIS)]

Location of Central Point: 8 ^{O} 27’ 58” N, 35 ^{O} 49’ 96” E (Elemo Town),
External Limits: 8^{O} 0’ 42” to 8 ^{O} 44’ 23”N and 35^{O} 20’ 31” to 36 ^{O} 18’ 20”E

7. AREA (see map):

Total: **167, 021**(ha)

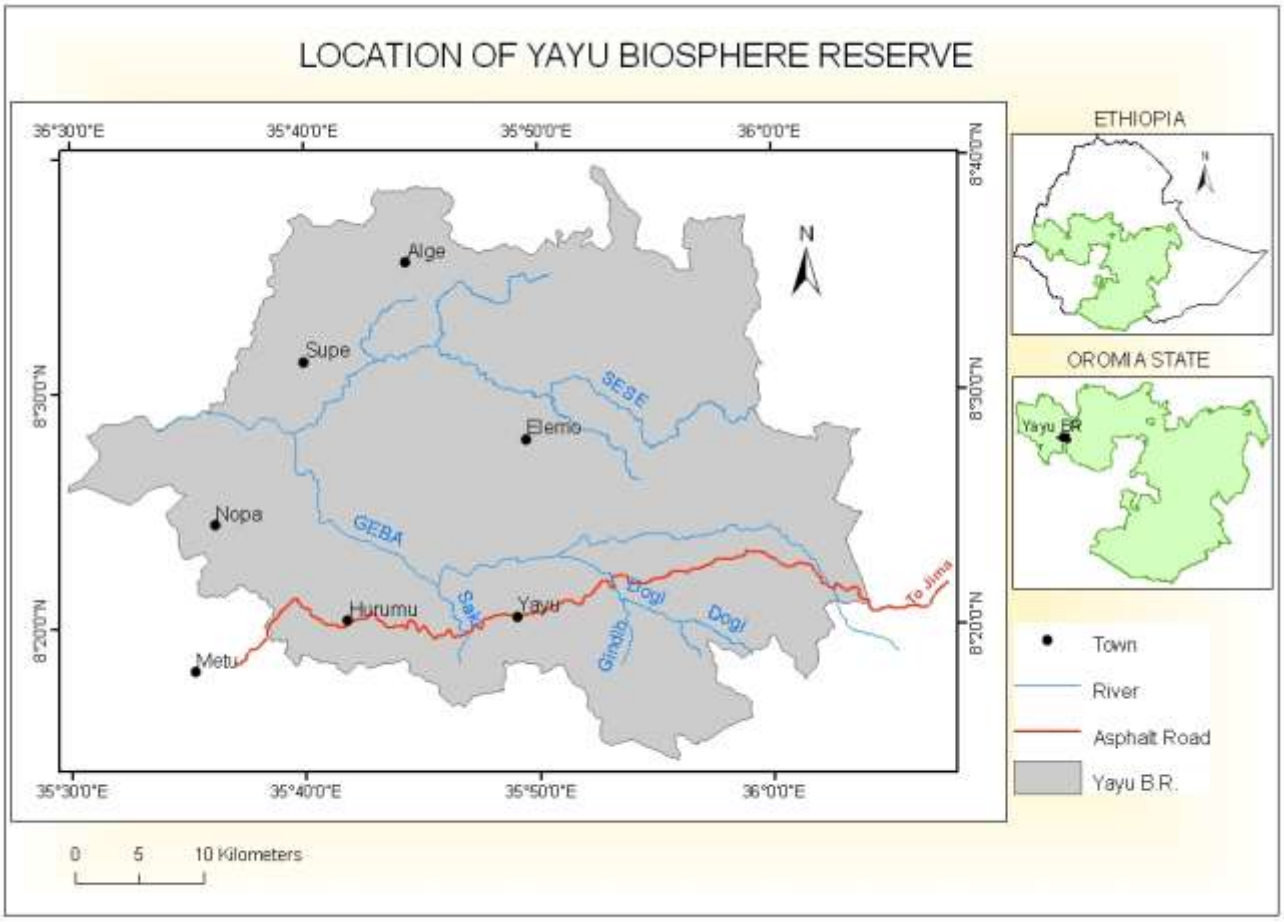

Figure 1.. Location of Yayu Coffee Forest Biosphere Reserve.

7.1. Size of terrestrial Core Area(s):

27,733 ha;

7.2. Size of terrestrial Buffer Zone(s):

21, 552 ha;

7.3. Approx. size of terrestrial Transition Area(s) (if applicable):
117,736 ha;

7.4. Brief rationale of this zonation
(in terms of the various roles of biosphere reserves) as it appears on the zonation map. In the cases where a different type of zonation is also in force at the national level, please indicate how it can coexists with the requirements of the biosphere reserve zonation system:

The zonation of the proposed Yayu Coffee Forest Biosphere Reserve has been determined based on research conducted on the forest over the last ten years, and the relevant Ethiopian land and forest laws. The forest is a National Forest Priority Area (EFAP 1994), mainly for conservation of biodiversity and coffee production. Part of the forest has also been designated for coffee genetic resources conservation. Past research works aimed at designing a management approach that incorporated both conservation and sustainable use. Hence, the biosphere reserve approach was chosen as a management option. To develop a rational biosphere reserve area zonation, ecological research began in 2000 and produced the first biophysical criteria for zonation (Gole et al. 2002b). With further research of coffee population genetics, functional diversity, economic and institutional analysis and forest spatial distribution studies, the biophysical and social criteria were further refined through community participation. Accordingly, abundance patterns of wild coffee Arabica populations, species diversity pattern, human disturbance risk and forest vegetation cover types determined from satellite images were mapped and used as inputs for multi-criteria evaluation using GIS (Getaneh 2009; Naujokat 2009). Social criteria, like use right claims by community members and infrastructures (e.g., roads and location of homesteads), were used as parameters for zonation. The zonation will be incorporated into the Oromiya Land Use Plan, which is under preparation by Oromiya Land and Environmental Protection Bureau and expected to cover the whole state within the coming two years.

Description of the zones

Core areas are areas with high abundance of wild Arabica coffee and high species diversity, and currently or historically not managed by the local communities. Hence, the core areas represent relatively intact forest of high conservation value for coffee and forest biodiversity. These areas are excluded from any use, except for research and monitoring purposes. In areas where roads pass through forests of the core area, a buffer zone of at least 400 m width was left on both sides due to potential human impact risk in the long-term.

In the design of the core areas, care was taken to avoid small forest fragments, since smaller areas increase edge effects and are vulnerable to human impact and increase the possibility of gene flow between surrounding cultivated coffee and wild coffee populations.

Buffer zones include managed forest areas. They are managed by the members of the local community for coffee, spices and honey production in the form of semi-forest coffee systems. In this system, the coffee plants are of wild origin (genetically wild), but the number of shade trees and understory vegetation is reduced by 30 to 50% in order to enhance coffee production (Gole 2003; Senbeta 2006).

The transition area represents an area of the biosphere reserve where sustainable development is promoted for the improvement of the livelihoods of the local community. The transition area in the proposed biosphere reserve includes agricultural land, grazing land, settlement areas, coffee homegardens, small plantations and some semi-forest coffee production areas. These areas are under intensive human use and therefore demand the promotion of sustainable resource use, which is the major objective to be attained in the transition zone. Moreover, the perception of the local community living next to the forest is taken into account during zonation. Apart from this, thorough discussions have been undertaken with local farmers, the chairmen of the kebeles (local government body), and district administration.

8. BIOGEOGRAPHICAL REGION:

[Indicate the generally accepted name of the biogeographical region in which the proposed Biosphere Reserve is located. You may wish to refer to the map of the World Network of Biosphere Reserves presenting 12 major ecosystem types.]

Classification by UNESCO/MAB: Tropical Forest Ecosystem
Classification by White (1983): Afromontane Region (Afromontane rainforest)

9. LAND USE HISTORY:

[If known, give a brief summary of past/historical land use(s) of the main parts of the proposed biosphere reserve]

Although there exist only a few documents that show land-use history of the area, there is plenty of oral information from the elders in the area. Accordingly, most of the area currently proposed for biosphere reserve has been covered by forest since the historical era, although the extent and coverage has been reduced in the last few decades. For example, before 1974 (during Emperor Haileselassie's regime), land and related resources were owned by landlords (Jotte 2005). The revolution which took place in Ethiopia in 1974 (which led to the empowerment of the Military Regime-Derg), changed the land ownership system from private to state. Following this change, all peasants were granted use rights of the land they were ploughing, through the proclamation "land to the tiller". In the 1980s, the Derg regime proclaimed Yayu Forest as one of the Natural Forest Priority Areas for forest conservation, an area which covers over 150,000 ha. Accordingly, most of the forest areas were set aside for conservation; and local communities were only allowed to extract non-timber forest products like honey, spices and coffee, without practicing any management interventions. In 1991, the Ethiopian People's Revolutionary Democratic Front (EPRDF) led government came to power, and the government policy changed from socialist economic policy to a mixed economy.

In 1998, parts of the Yayu National Forest Priority Area along the Geba and Dogi rivers was demarcated as Geba-Dogi Forest Coffee Conservation Area, and conservation activities commenced in 2003 with EU financial support through the 4th phase of the Coffee Improvement Program (CIP-IV). The current proposed biosphere reserve area covers most parts of the Yayu National Forest Priority Area, including the Geba-Dogi Coffee Forest Conservation Area. There is also information from local communities, which state that a portion of coffee forest has never been occupied by anybody. As some of the informants indicated, this type of coffee forest, forest without ownership, was accessible to everybody in the area.

In addition to the forest, people have been ploughing outside the forest for many years. Looking at the arable lands, agriculture has a long history in Ethiopia in general and Yayu area in particular, and is characterized by smallholder subsistence farming with animal traction (oxen plough). Because of low productivity, maximizing production to meet the demand from the ever growing population has been

at the expense of forest areas. In earlier times, people used to practice shifting cultivation to overcome the problem of low soil fertility. However, this has now become history, owing to shortage of land, resulting from population growth. In the proposed biosphere reserve, this land use type extends all over the plateaus, in between the river valleys, having a higher altitude and gentler slope, which is more convenient for cultivation.

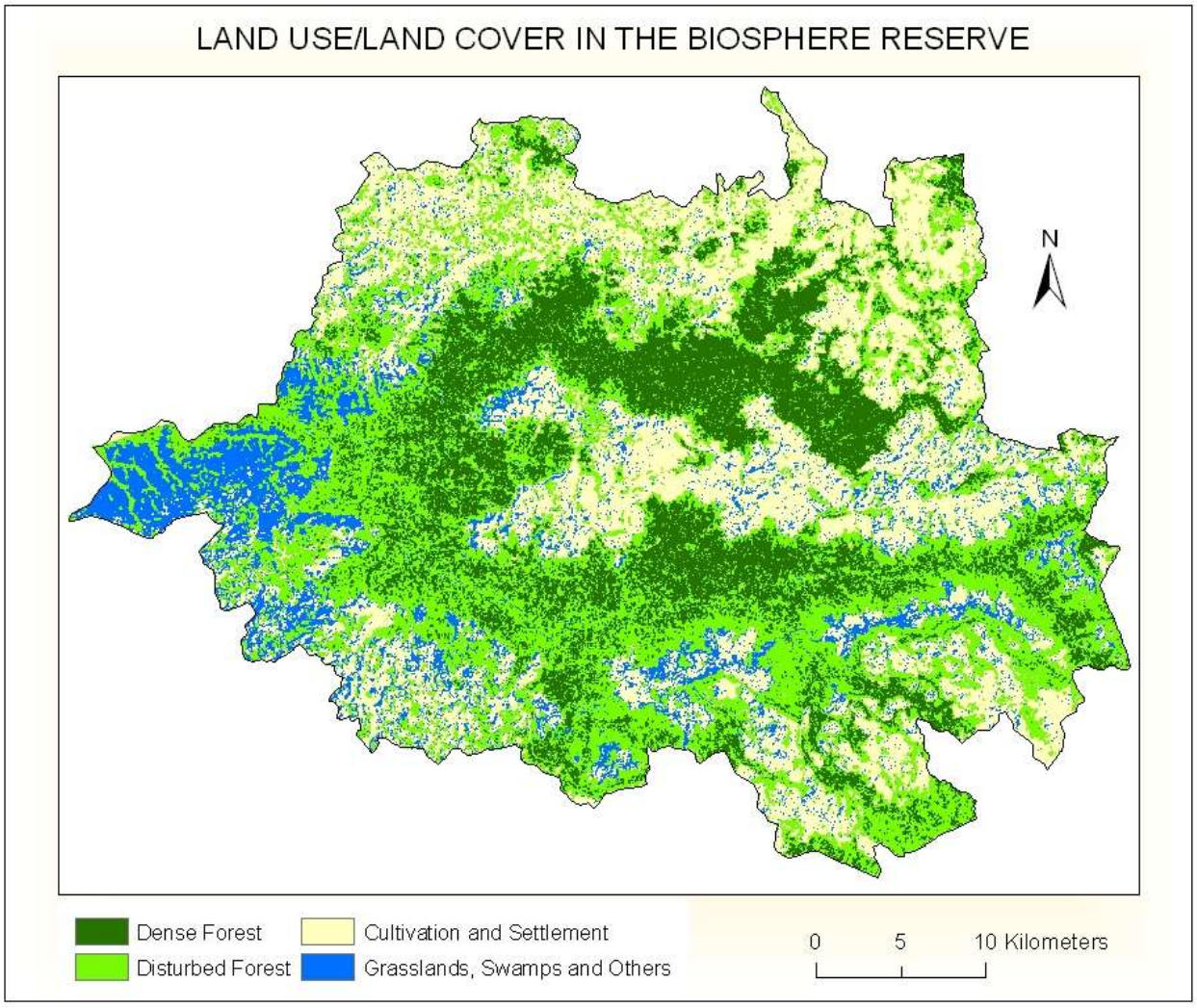

Figure 2.Land use/Land cover in the Yayu Coffee Forest Biosphere Reserve (Source: Getaneh, 2009)

10. HUMAN POPULATION OF PROPOSED BIOSPHERE RESERVE:

[Approximate number of people living within the proposed biosphere reserve]

permanently / seasonally

10.1 **Core Area(s):** No / No

10.2 **Buffer Zone(s):** No / No

10.3 **Transition Area(s):** 154,306 / No (Includes both urban and rural population)

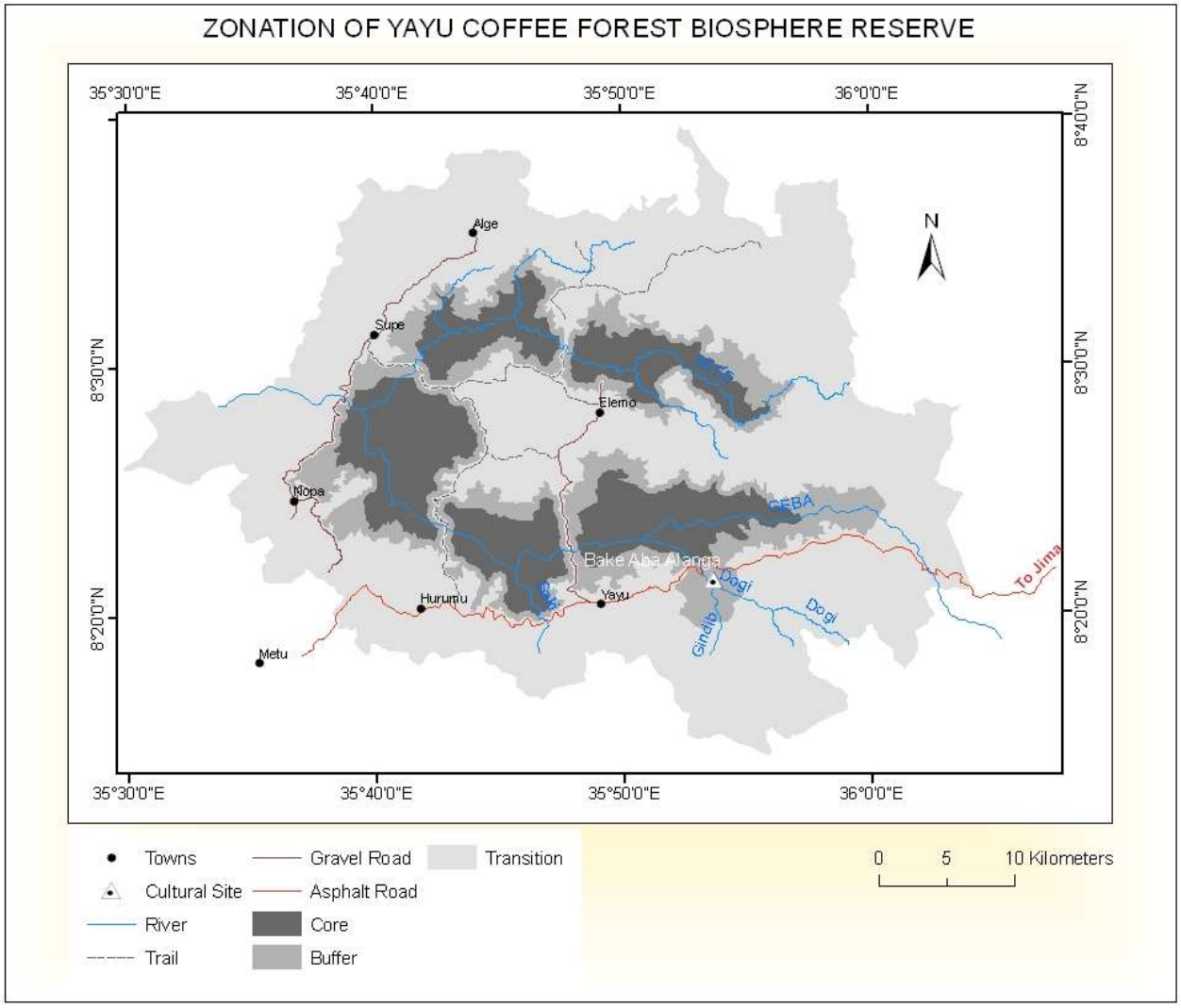

Figure 3. Zonation of Yayu Coffee Forest Biosphere Reserve

10.4 Brief description of local communities living within or near the proposed Biosphere Reserve:
[Indicate ethnic origin and composition, minorities etc., their main economic activities (e.g. pastoralism) and the location of their main areas of concentration, with reference to a map if necessary]

The inhabitants of the area are the Oromos. They trace consanguine kinship groups through patrilineal family that is common among the Oromo people (Bartels 1975). The Iluu Abba Bora Oromos originated from the two major clans named *Jahan Noonnoos* and the *Torban Hadheessos*, which literary means the six *Noonnos* and the seven *Hadhessos*, respectively. The *Noonnos* developed in to *Hurumuu, Aferson* (*Goree* area), *Matuu, Qrettii, Didduu* and *Algaa*, and the *Hadheessos*, on the other hand, developed into seven clans. One of these clans is known as *Hadheesso. Lagoo, Bachoo, Sarsaroo, Dongoro, Yakunoo, Bodee, Binooraal* and *Tuulama* are the other clans derived from *torban Hadheessoo*. The two grand clans (*Jahan Noonnoo* and *Torbban Hadheessoo)* developed further beyond their original number due to groups migrated to the area at different times, sometime around early 17th century. Other than the original inhabitant there are settlers who came from northern part of Ethiopia:Tigray, Wollo and Gonder (Jotte 2005).

Agriculture is the major means of subsistence for the communities in the proposed biosphere reserve. Ninety-four percent of the population make their livelihood from this sector, while trade and daily labour serve six percent of the population as a means of subsistence. The economic activities of the communities can be categorized into crop production, animal rearing and forest management and use. These can be depicted as coffee production, cereal production, use of minor forest products, and animal production which includes cattle and beekeeping. From the total population whose livelihood is based on agriculture, 98 percent are generating their income from coffee (Jotte 2005; Seyoum 2008).

10.5 Name(s) of nearest major town(s):

Metu- is the capital of Illubabor zone, where the biosphere reserve is located. It is located about 20 km from the proposed biosphere reserve, with a population of about 30,430 individuals.

Gore- is one of the oldest towns, formerly the capital of the region before Metu. It is located about 40 km from the biosphere reserve and has a population of 9,300 individuals.

Yayu- is the capital of Yayu District (Woreda) and is located in the transition area of the biosphere reserve. It has a population of around 7,760 individuals.

Bedele- is the second major town in Illubabor, and located about 50 km from the proposed biosphere reserve. It has a population of around 20,030 individuals.

10.6. Cultural significance:

[Briefly describe the proposed Biosphere Reserve's importance in terms of cultural values (religious, historical, political, social, ethnological)]

The Yayu forest has an important role in historical and cultural aspects for the local community, especially with respect to ecosystem management. The local inhabitants are Oromos. In the Oromo community, the Gadaa System used to play an important role in political, cultural and spiritual life of the people. The Gadaa System organizes the Oromo society in to groups or sets (about 7 to 11) that assume different responsibilities and society every eight years. It has guided religious, social, political and economic life of Oromo for many years, and also their philosophy, art, history and method of the timekeeping. It also serves as the base for democracy and egalitarian political system (Gedaa Melbaa 1988).

The Gadaa System is a key landmark in Oromo sophisticated political culture. The political role of the Gadaa institution ceased in the 1890s, since the area was conquered and annexed as part of Ethiopia by Emperor Menelik II. However, some of the organisation of the Gadaa institution continued to serve in the community. These include the Qoro, Abba-Lagaa, Tuulla, Xuxee and Shane. These are local-level administrative groups of the community and play important role in resource management, distribution and conflict resolution (Jotte 2005).

The historical site of the Gadaa assembly, known as Bakke-Abba-Alanga (literally means Lawmakers or Legislators Site) is located in the southern parts of the proposed biosphere reserve area. This site is located in part of the Yayu forest within the Wixatee kebele. Part of this area has been considered as spiritual and political sites for the local communities for nearly four centuries. All rules and amendments to the existing rules of the traditional institutions used to be made at Bakke-Abba-Alanga. In the Gadaa assembly, in which rules used to be made, revised or conflicts resolved, representatives of all the Oromo clans (qomo) in the area were represented. Hence, the Bakke-Abba-Alanga in Yayu forest served as site of local parliament, religious and ritual site, etc. Because of this, the forest has been protected and maintained; and as result a huge tree individuals of different species are very common on the site. In particular, because of an association between the Oromo people and *Ficus sycomorous* trees there are a lot of them on this site (it is a symbol of Oromo people). The site is still

maintained and continues to play an important role in the life of the Oromo people in the area, and the people of the whole of Illu Abba Bora zone of Oromiya state. The traditional institution is egalitarian and helps to make sure that there is equity in resource distribution. The Gada institution and cultural site found in the forest also represents a symbol of the Oromo ethnic identity and values. In fact, the traditional Gadaa system and associated cultural practices are what unifies all Oromos, whether they are Christians or Muslims by religion, or Kenyans or Ethiopians by citizenship. The Gadaa system is seen as Africa's most egalitarian governance system and can serve as the basis for the emergence of modern democracy. Ethiopia has applied to UNESCO to register the Oromo Gadaa system as a cultural heritage. The Oromiya State Bureau of Culture and Tourism has identified the Yayu forest area as a Cultural Heritage Site. Therefore, apart from its importance in biodiversity conservation, the establishment of the Yayu Coffee Forest Biosphere Reserve would play an essential role in the preservation and further exploration of the cultural and religious sites with its associated social values.

11. PHYSICAL CHARACTERISTICS

11.1. General description of site characteristics and topography of area:

[Briefly describe the major topographic features (wetlands, marshes, mountain ranges, dunes etc.) which most typically characterize the landscape of the area.]

The area is characterized by a rolling topography, and is highly dissected by small streams and one major river, the Geba, and its major tributaries Dogi, Sese and Saki. The land frequently changes from flat surface plateaus to very steep slopes and valley bottoms within a short distance. There is a continuous forest cover along the rivers (Gole, 2003; Getaneh 2009).

11.2.1 Highest elevation above sea level:
2,337 metres

11.2.2 Lowest elevation above sea level:
1,100 metres

11.3. Climate:

[Briefly describe the climate of the area using one of the common climate classifications]

According to the data obtained from Ethiopian Meteorological Agency, recorded at different stations within the proposed biosphere reserve, the area is hot and humid with mean minimum and maximum temperatures of 12.7°C and 26.1°C, respectively, and mean annual rainfall of 2,100 mm with the minimum and maximum being 1,400 and 3,000 mm, respectively. The hottest months are February, March and April while the coldest are August, September and October. The rainfall pattern is uni-modal, with low rainfall during January and February and the highest rainfall between June and August (Gole, 2003; Getaneh, 2009).

11.3.1 Average temperature of the warmest month:
26.1^0C

11.3.2 Average temperature of the coldest month:
12.7^0C

11.3.3 Mean annual precipitation:
2,100 mm

11.3.4 If a meteorological station is in or near the proposed Biosphere Reserve, indicate the year since when climatic data have been recorded:

a) Manually: **1979**

b) Automatically: ____-_____

c) Name and location of station: **Billo-Nopha District Meteorological Station**

11.4. Geology, geomorphology, soils:

[Briefly describe important formations and conditions, including bedrock geology, sediment deposits, and important soil types]

According to the 1996 Geological Map of Ethiopia, the area is characterised by Precambrian metamorphic rocks consisting of biotite and hornblende gneisses, granulate migmatite with minor meta-sedimentary gneisses along the river valleys and by flood basalts overlying the crystalline basements on the plateaus in between the river valleys.

According to FAO (1997) data, soils of the area are lithic or eutric leptosols along the river valleys and humic nitosols on the plateaus. At the western end, some parts of the area are covered with haplic nitosols and eutric cambisols. The geological formations and soil types of the proposed biosphere reserve are indicated in Figure 4.

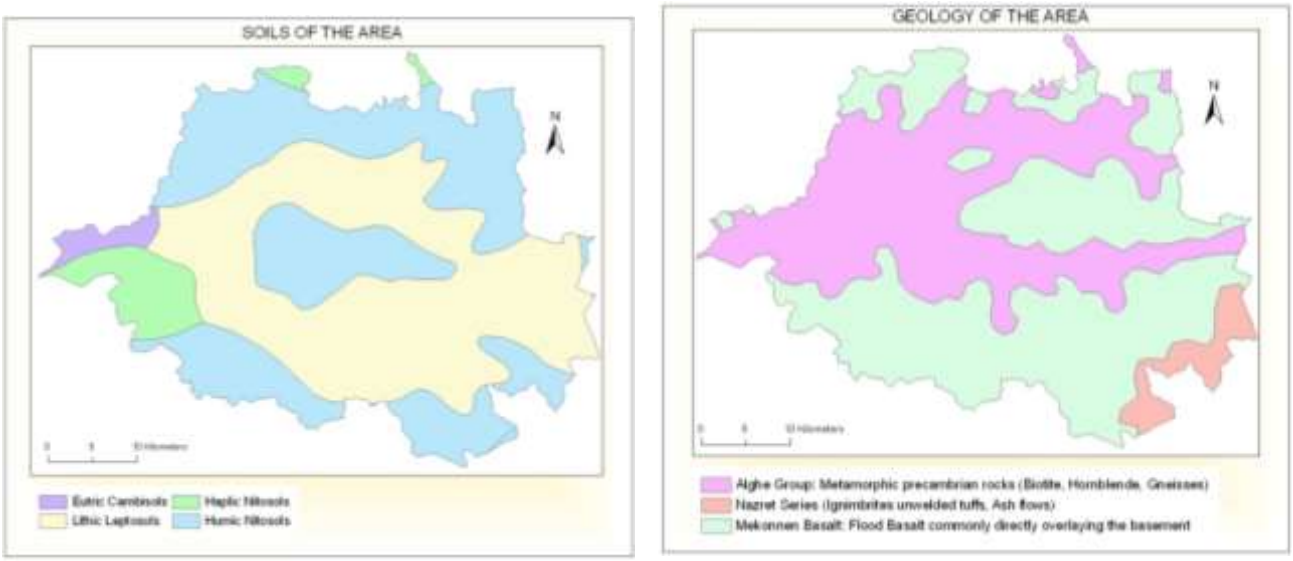

Figure 4. Soils types and geological formations in Yayu Coffee Forest Biosphere Reserve (Getaneh, 2009).

12. BIOLOGICAL CHARACTERISTICS

[List main **habitat types** (e.g. tropical evergreen forest, savanna woodland, alpine tundra, coral reef, kelp beds) and **land cover** types (e.g. residential areas, agricultural land, pastoral land). For each type circle REGIONAL if the habitat or land cover type is widely distributed within the biogeographical region within which the proposed Biosphere Reserve is located to assess the habitat's or land over type's representativeness. Circle LOCAL if the habitat is of limited distribution within the proposed Biosphere Reserve to assess the habitat's or land cover type's uniqueness. For each habitat or land cover type, list characteristic species and describe important **natural processes** (e.g. tides, sedimentation, glacial retreat, natural fire) or **human impacts** (e.g. grazing, selective cutting, agricultural practices) affecting the system. As appropriate, refer to the vegetation or land cover map provided as supporting documentation.]

The proposed Yayu Coffee Forest Biosphere Reserve contains a number of habitats and land cover types that range from intact forest ecosystems to land heavily modified by human activities. The most important habitat types in the proposed biosphere reserve area include:

- Forests
- Wetlands and running water
- Agricultural lands
- Grazing lands
- Built-up areas

Each of these habitat types is described as follows.

DISTRIBUTION

12.1. First type of habitat/land cover: Forest- (Afromontane and Transitional Rainforests)

Regional/Local.

The forest vegetation of the proposed biosphere reserve can be categorized into two types: (1) Afromontane rainforest and (2) transitional rainforest (Friis, 1992; Gole, 2003). The Afromontane rainforest occurs in the south-western highlands, in Wellega, Illubabor, and Kafa. It is found at elevations 1,500 and 2,500 m asl, with average annual temperatures of 18 to 20^0C, and an annual rainfall between 1,500 mm and 2,000 mm, sometimes even more than 2,000 mm (note: the average of the region is 2,100 mm), with rain all the year round, but at a maximum between April and October. In the proposed biosphere reserve area, the average rainfall is 2,100 m, with ranges between 1,400 and 3000 mm, and the Afromontane rainforest occurs at altitudes between 1,500 and 2,300 m (Gole 2003).

The transitional rainforest is also found on the escarpments of the south-western highlands in Wellega, Illubabor and Kafa, between the dry peripheral semi-deciduous Guineo-Congolian forest and the Afromontane rain forest. These forests occur at altitudes between 500 and 1,500 m, partly in river valleys, and partly in areas with a high water table. The annual temperature ranges from 20 to 25^0C. The mean annual rainfall is about 2,000 mm, with rain falling all year round, and the highest amounts falling in September. The transitional rainforests are similar in physiognomy and composition to the Afromontane rainforest. In the proposed biosphere reserve area, this forest type occurs at elevations between 1,100 and 1,500 m (Friis, 1992; Gole, 2003).

The Afromontane rainforest is part of the greater Afromontane eco-region in Africa. However, the part of the forest with wild Arabica coffee populations, the coffee forest, is unique and occurs only in Ethiopia. There are also endemic species associated with this forest. The transitional rainforest is unique to the escarpment of south-western Ethiopia. This forest type also has wild coffee populations,

and hence represents the unique coffee forest. In summary, the forest habitat in the proposed biosphere reserve area is representative for the Afromontane biogeographical region as well as coffee forest, which is unique.

12.1.1. Characteristic species:

The two forest types have many species in common. However, there are some species which are common and characteristics of each type. The characteristic species of the Afromontane rainforest are a mixture of broadleaved tree species and include: *Pouteria adolfi-friederici, Syzygium guineense, Polyscias fulva, Olea welwitschii, Diospyros abyssinica, Manilkara butugi, Cordia africana, Trilepisium madagascariense Croton macrostachyus,* and *Schefflera abyssinica.* A discontinuous canopy of smaller trees (less than 10 m) include *Allophylus abyssinicus, Chionanthus mildbraedii, Clausena anisata, Coffea arabica, Deinbollia kilimandischarica, Ehretia cymosa, Galiniera saxifraga, Lepidotrichilia volkensii, Nuxia congesta, Oxyanthus speciosus, Pittosporum viridiflorum, Ritchiea albersii, Rothmannia urcelliformis, Teclea nobilis,* and *Vepris dainellii.* Natural coffee is one of the characteristic species in the understory. The shrub layer includes *Acanthus eminens, Dracaena fragrans, Lobelia giberroa, Senecio gigs, Cyathea manniana, Maytenus* spp., *Whitfieldia elongata* and others. The lianas and scrambling shrubs are numerous: *Landolphia buchananii, Jasminium abyssinicum, Hippocratea goetzei, Combretum paniculatum, Embelia schimperi, Dalbergia lacteal, Paullinia pinnata, Oncinotis tenuiloba, Tiliacora troupinii,* and *Hippocratea africana.* Epiphytes are very common and include *Peperomia tetraphylla, Asplenium sandersonii, Loxogramme lanceolata, Aerangis luteoalba, Arthropteris monocarpa, Asplenium spp.,* different orchids, mosses, and others. The ground-cover is also very rich and includes: *Dorstenia sorensenii, Elatostema orientale, Impatiens ethiopica, Thalictrum rhynchocarpum,* and many others (Friis, 1992; Gole, 2003; Senbeta, 2006).

The characteristic species unique to the transitional rainforest include *Aningeria altissima, Anthocleista schweinfurthii, Campylospermum bukobense, Celtis philippensis, Celtis zenkeri, Croton sylvaticus, Dracaena fragrans, Elaeodendron buchananii, Eugenia bukobensis, Ficus exasperata, Garcinia huillensis, Manilkara butugi, Morus mesozygia, Phoenix reclinata, Strychnos mitis, Trichilia dregeana, Trilepisium madagascariense* and *Vepris dainellii* (Friis, 1992; Gole, 2003).

In the Afromontane rainforest and transitional rainforest, animal species are varied and include a diverse range of invertebrates inhabiting all niches, from the soil to high forest canopies; and vertebrates, including amphibians, reptiles, birds and small and large mammals. A list of common forest mammals and birds species in the area is published in EWNHS (1996) and completed by field observations. This list includes: *Hystrix cristata* (porcupine), *Cercopithecus aethiops* (Chlorocebus), *Cercopithecus mitis* (blue monkey), *Cercopithecus neglectus* (De Brazza's monkey), *Papio anubis daguera* (baboon), *Colobus guereza* (*colobus monkey), Syncerus caffer (*African buffalo), *Tragelaphus scriptus* (bushbuck), *Redunca redunca* (Bohor reedbuck), *Tragelaphus strepsiceros* (greater kudu), *Sylvicapra grimmia* (common duiker), *Phacochoerus aethiopicus* (warthog), *Leptailurus serval* (serval), *Lycaon pictus* (wild hunting dog), *Potamochoerus larvatus* (bushpig), *Panthera leo* (lion), *Panthera pardus* (leopard), *Civettictis civetta (*African civet), *Genetta abyssinica (*Abyssinian genet), *Lepus fagani (*Ethiopian hare), *Orycteropus afer (*aardvark), *Viverrdae sanguineus* (shelmitmat), and many bats.

According to EWNHS (1996), the common bird species having conservation importance, either as endemics or Afromontane highland biome species, found in or around the proposed biosphere reserve include: *Oriolus monacha (*Abyssinian black-headed oriole), *Bucorvus abyssinicus* (Abyssinian ground hornbill), *Turdus piaggiae* (Abyssinian ground thrush), *Dendropicos abyssinicus* (Abyssinian

woodpecker), *Alcippe abyssinica* (African hill babbler), *Lybius guifsobalito* (banded barbet), *Agapornis taranta* (black-winged lovebird), *Francolinus leucoscepus* (chestnut-naped francolin), *Nectarinia olivacea* (olive-bellied sunbird), *Rougetius rougetii* (Rouget's rail), *Apus myioptilus* (scarce swift), *Cinnyricinclus sharpei* (Sharpe's starling), *Cossypha niveicapilla* (snowy-headed robin chat), *Poeoptera stuhlmanni* (Stuhlmann's starling), *Tauraco ruspolii* (white-checked turaco), *Poicephalus flavifrons* (yellow-fronted parrot), *Bostrichia caruculata* (watttled ibis), *Cyanochen cyanoptera* (blue winged goose), *Parophasma galinieri* (Abyssinian cat bird), *Parus leuconutus* (white backed black tit), *Onchoganthus albirotris* (white-billed starling), and *Caruvus crassirostris* (thick-billed raven).

The characteristic species of reptile and amphibian found in this forest include: *Conraua beccarii, Mabuya maculilabris, Mabuya varia, Agama doriae, Chamaeleo agricanus,* and *Lycophidion capense* (ZNHM 1987).

The characteristic coffee insect pests in the forest include *Antesiopsis intricate* (Carayon), *Hypothenemus hampei* (Ferriere), *Prophantis smaragdina* (Butler), *Leucoplema doherthyi* (Werren), *Cryphiomystis alereuta* (Meyrick), *Leucoptera* spp., *Ceratitis fasciventris* (Bezzi), *Ceratitis anonae* (Graham), and *Trirhithrum coffeae* (Bezzi). The most abundant species of nematodes in the rhizosphere of coffee were *Helicotylenchus dihystera, H. californicus, H. multicinctus, H. willmottae, H. gerti, Rotylenchus unisexus, Scutellonema paralabiatum, Xiphinema insigne, X. basilgoodeyi, Tylenchorhynchus acti* and *T. agri* (Hindorf et al. 2008). The results provide basic information for further studies on the relationship between nematode population densities and coffee yield.

It is well-known that Yayu Forest belongs to the centre of origin and diversity of Arabica coffee, and hence there are coffee-specific endophytic bacteria that play an important role in pest and disease control. Accordingly, many endophytic bacteria were recorded in the Yayu Forest, amongst others : *Agrobacterium radiobacter, Bacillus pumilus, B. brevis, B. megaterium, B. mycoides, Cedecea davisae, Chryseobacterium balustinum, Cytophaga johnsonae, Lactobacillus paracasei, Micrococcus luteus, Pseudomonas syringae* and *Stenotrophomonas maltophilia* (Hindorf et al., 2008).

12.1.2. Important natural processes:

Yayu Forest is characterized by uneven canopies with gaps from old trees that have died and fallen. These internal forest dynamics allowed the forest to develop and regenerate naturally through natural succession with varying age and size of trees and decaying wood of varying dimensions and in various states of decomposition. Diverse understory vegetation also makes use of light from the canopy gaps to regenerate and fill the forest gaps. Standing and fallen dead wood provides a range of habitats and promotes a variety of ecological processes in the forest. Similarly, fallen trees and dead biomass enrich the habitat for many epiphytes, arthropods and micro-organisms. It also houses natural pollinators, decomposers and seed dispersers, which play an important role ecosystem services

12.1.3. Main human impacts:

Cultivation and livestock rearing over a number of years in the area have progressively converted large parts of the forest into open crop land and/or grazing land. Additionally, coffee management and conversion of the intact forest into managed, semi-forest coffee production system has affected the diversity of plant species. Additionally, logging for timber some decades ago and recent infrastructure development like roads and electric power line construction, are some of the human impacts on the natural ecosystems. Many people also extract timber, for local house constructions, and non-timber forest products like spices, honey, medicinal plants for household consumption and income generation. In degraded forest areas and settlement areas, the introduction of fast growing exotics like

Eucalyptus spp., *Gravillea robusta* and several fruit trees is changing the landscape to some extent. The establishment of the proposed biosphere reserve shall put appropriate management guidelines in place, in order to attain both conservation and sustainable development. Introductions and management of resources will also be based on outputs of scientific research for sustainability.

12.1.4. Relevant management practices:

Conversion of intact coffee forest into managed, semi-forest coffee or to monoculture agriculture is no longer permitted following the acceptance by the local government and local community, for the establishment of a biosphere reserve. Recognition of the impacts of past logging practices and agricultural expansion in the reserve area, means that these activities also will be limited to managed areas of the reserve. For high-yield coffee in the area, the Jimma Agricultural Research Center (National Coffee Research Center) began providing promising selections from the local wild populations. Degraded forest margins are also being revegetated by planting seedlings of wild coffee and shade trees, which serves as buffer zone expansion and a source of cash income for the surrounding communities, through sales of coffee. This activity increases the area covered by coffee plants in the region, improving the *in situ* genebank (merging the *in situ* and *ex situ* conservation concepts).

DISTRIBUTION

12.2. Second type of habitat/land cover: wetlands and running water

Regional/Local

The proposed biosphere reserve contains a number of wetlands and rivers. Geba is the major river in the area, with tributaries like Dogi, Saki and Sese Rivers. There are also a number of streams flowing into these rivers. Beside rivers, there are numerous small wetlands in valley bottoms, given the rugged topography of the region.

12.2.1. Characteristic species:

This habitat type consists of at least two physiognomically different vegetation types: riparian forest along the rivers and streams, and the treeless swamp vegetation with stagnant or slowly moving water. The characteristic of the riparian plant species include: *Ficus sur, F. mucuso, F. sycomorus, Syzygium guineense, Manilkara butugi, Bridelia micrantha, Mimusops kmmel, Phoenix reclinata* and *Sesbania dummeri.* The major vascular plant species that characterise the wetland habitat include: *Cyperus latifolus, Leersia hexandra, Cyperus papyrus, C. dereilema, Panicum hymeniochilum, Floscopa glomerata, Phyllanthus boehimi, Fuirena stricta, Aeschenomene Abyssinica* and *Anagalis serpens.*

The major characteristic species of birds observed in the wetlands and riverine system include Bostrichia watttled ibis, long-tailed cormorant , darter, cattle egret, great white egret, grey heron, black-headed heron, hamerkop, Abdim's stork, wooly-necked stork, white stork, Hadada ibis, wattled ibis, Egyptian goose, black-crowned crane, Rouget's rail, green sandpiper, and common sandpiper (EWNHS 1996; Gole 1999). The characteristic species of fish in the wetlands and rivers include barbus, catfish, brown trout and rainbow trout. According to ZNHM (1987), the characteristic species of reptiles and amphibians in wetlands and running water include: *Kassina senegalensis, Leptopelis bocagei, Conraua beccarii, Hylarana galamensis, Hemisus marmoratus, Mabuya guinguetaeniata, M. striata, Agama agama spinosa, Chamaeleo senegalensis,* and *Causus rhombeatus*. *Hippopotamus amphibius* is also the characteristic species in Geba-Dogi River.

12.2.2. Important natural processes:

Seasonal water level variations or/and fluctuations and drying of wetlands are important natural processes. Vegetation encroachment due to sedimentation and accumulation of soils and organic

matters from the surrounding agricultural fields has led to a decrease in water depth over time. These processes lead to encroachment of vegetation into open water and succession of wetlands towards more terrestrial vegetation types. Grazing of reeds and rushes by livestock and game animals as well as weather extremes (drought, flooding) affect the flow speed of running water.

12.2.3. Main human impacts:

Since the 1960s, demands for wetlands have increased in the area. The main human impact on wetlands is cultivation for food crop production. It is perceived that wetland cultivation lessens the demand for land on the uplands, saving it for use in coffee production. Wetlands are also the main source of fodder for livestock, and reeds are used for roof thatching. In previous times, only parts of wetlands were cultivated with crops once per year. In recent years, large parts of the wetlands are being completely cultivated, with two crops per year. This has led to a loss of soil fertility and decreasing ground water levels (Tegene, 1999; Dixon & Wood, 2001).

Human impacts on the rivers and running waters include loss of vegetation cover through deforestation, although this is not a major problem since most rivers are in deep gorges. There is also little use of the water resources in the rivers, due to rugged topography and hence inaccessibility. On several small streams, some water extraction is needed for use in coffee washing stations, which is seasonal and not significant.

12.2.4. Relevant management practices:

Sustainable wetland management promotes and sustains natural hydrological regimes and helps in tapping fertile sediments from the catchments. Afework et al. (2000) and Dixon & Wood (2001) suggested the following management practices for wetlands:

- Adapting drainage networks to spatial variability in hydrological regimes (avoiding over drainage)
- Adapting drainage practices to temporal changes in hydrological conditions,
- Avoiding cultivation of two consecutive crops in one year, and hence allowing a period of regeneration
- Facilitating natural flooding of wetlands during the wet season, for as long as possible
- Restricting the access of cattle to wetlands, to avoid compaction and erosion

Currently, Ethio Wetlands and Natural Resources Association (http://www.ewnra.org.et/), a local NGO, is promoting sustainable wetlands and catchments management in the area, based on research findings by Ethiopia Wetlands Research Programme (http://wetlands.hud.ac.uk/ewnra/).

Management practices relevant for the rivers and surrounding habitats is linked to sustainable management of the whole landscape. The establishment of a biosphere reserve in the area, and implementation of the developed management guideline would contribute to sustainable management of such habitat types.

DISTRIBUTION

12.3. Third type of habitat/land cover: Agricultural lands

Regional/**Local**

Ethiopia is one of the oldest agrarian countries in the world (McCann 1995). In the proposed biosphere reserve area, there is a long history of agricultural development, though not as old as the one in northern parts of the country. Agricultural lands and forest areas form the major landscape mosaic in the area. Most agricultural land has developed from the conversion due to forest. There is still a clear gradation of such conversion, with the presence of forest land, semi-forest coffee system, home gardens and farmlands with scattered trees.

12.3.1. Characteristic species:
In this habitat/land cover type, different plants are cultivated by smallholder farmers for both self consumption and market. Coffee is the major cash crop, which is produced in home gardens and small plantations. The major food crops produced in the area include maize, sorghum, tef, barley, wheat, finger millet, beans, potatoes, Oromo dinich (*Plectranthus edulis*), anchote (*Coccinia abyssinica*) and yam (*Dioscorea* sp.). Other minor crops produced in the area include soybean and sugarcane, and fruits like orange, banana and papaya. Vegetables grown in the area include tomato, onion, garlic, beetroot, carrot, Ethiopian cabbage, cabbage, pepper, and pumpkin. Spices cultivated in the area include turmeric ('erd'), Ethiopian cardamon ('kororima'), ginger, long pepper ('temez'). There are also many tree species scattered in the agricultural fields and serving as a coffee shade or other purposes. Depending on individual farmer's preference and the location of the farm, the major tree species in the agricultural lands include *Acacia abyssinica, Albizia gummifera, A. grandibracteata, Cordia africana, Ficus vasta ,F. sur, F. thonningii, Milletia ferrugnea, Polyscias fulva, Sapium ellipticum, Syzygium guineense, Trichilia dregeana, Vernonia amygdalina, Croton macrostachyus, Acacia abyssinica, Millettia ferrug*inea, *Ekebergia capensis,* and planted eucalyptus.

The characteristic bird species include: *Onchoganthus albirotris* (white-billed starling), *Caruvus crassirostris* (thick-billed raven), *Cinnyricinclus sharpei* (Sharpe's starling), *Bucorvus abyssinicus* (Abyssinian ground hornbill), and *Turdus piaggiae* (Abyssinian ground thrush). There is also a variety of domestic animals which include: donkeys, chickens, cows, sheep, and goats. Most of the bird species mentioned in section 12.1.1 and 12.2.1 also commonly occur in this cover types.

According to ZNHM (1987), the characteristics species of reptiles and amphibians found in this land-cover type include *Leptopelis vannutelli, Scaphiophis albopunctatus,* and *Crotaphopetlis hotamboeia.*

12.3.2. Important natural processes:
Despite the fundamental dependence of humans on land fertility, people throughout history have transformed and degraded the natural landscapes of their agricultural lands. Hence, most of the natural ecosystem processes have been greatly modified by human activities and harvests are primarily affected by factors such as loss of soil fertility. Accelerated soil erosion and formation are some of the natural processes, though induced by human activities, which are taking places in some areas of this habitat type.

12.3.3. Main human impacts:
Important changes have taken place in the system for so long and these in turn have greatly altered the landscape. Most agricultural lands are being converted from an agro-forestry system to clear farmlands, mainly due to the cultural influence of settlers from northern Ethiopia. This has led to nutrients depletion, soil erosion and gully formation in some areas. Coffee pulp from wet-coffee washing stations and dry mills are not recycled but instead are burned, causing low-level pollution. Other human impacts ongoing in the area include the introduction of numerous exotic plant species and improved varieties of coffee and cereals, and the development of housing and infrastructure.

12.3.4. Relevant management practices:
Environmentally-friendly farming, through strengthening of the agro-forestry system, is important for the reduction of farming impact on the environment and the improvement of land productivity. Management practices include terracing of sloping areas, use of biological conservation structures like rows of vetiver grass, composting coffee husk as manure and use of other organic materials as natural fertilized. These practices can play important roles in soil fertility management and erosion control. Indeed, diversification of income sources and crop mix, including fruit trees on farmlands, are management practices outlined in the management guideline of the proposed biosphere reserve**.**

DISTRIBUTION

12.4. Fourth type of habitat/land cover: Grazing lands

Regional/Local

Patches of grazing land or grasslands are found within the proposed biosphere reserve area. These are semi-natural or unimproved grasslands used for grazing. The areas that have been used for grazing may include dry grasslands as well as wet grasslands. These areas are most densely concentrated along forest margins, on degraded forest lands, abandoned farmlands and woodlands. Drained wetlands are also considered as grazing land.

12.4.1. Characteristic species:

The common vascular plant species that occurs in this habitat include *Digitaria abyssinica, Hyparrhenia cymbaria, Desmodium repandum, Trifolium spp., Oplismenus compositus, O. hirtellus, O. undulatifolius, Panicum calvum, P. Repens, P. ruspolii, P. Hochstetteri, P. maximum, Pennisetum clandestinum, P. ramosum, Poa leptoclad, Setaria atrata, Vernonia auriculifera, Mayentus spp., Acacia abyssinica,Abutilon longicuspe Ocimum urticifolium, Rubus* spp., *Rhus* spp., *Bersama abyssinica, Calpurna aurea* and others shrubs and small trees species mentioned in the other sections also.

The characteristic mammal species include *Cercopithecus mitis* (blue monkey), *Tragelaphus scriptus* (bushbuck), *Redunca redunca* (Bohor reedbuck), *Sylvicapra grimmia* (common duiker), *Phacochoerus aethiopicus* (warthog), *Lepus fagani* (Ethiopian hare), and *Viverrdae sanguineus* (shelmitmat).

According to EWNHS (1996), the characteristic bird species include: *Onchoganthus albirotris* (white-billed starling), *Caruvus crassirostris* (thick-billed raven), *Cinnyricinclus sharpei* (Sharpe's starling), *Bucorvus abyssinicus* (Abyssinian ground hornbill), and *Turdus piaggiae* (Abyssinian ground thrush), *Francolinus leucoscepus* (chestnut-naped francolin), *Onchoganthus albirotris* (white-billed starling), *Poeoptera stuhlmanni* (Stuhlmann's starling), and *Macronyx flavicollis* (Abyssinian longclaw).

The characteristic species of amphibians and reptiles in the grasslands (ZNHM 1987) include *Causus rhombeatus, Scaphiophis albopunctatus, Crotaphopetlis hotamboeia, Leptopelis vannutelli*

12.4.2. Important natural processes:

When management intensity is reduced or ceases altogether, invasive species of herb dramatically increase in abundance and shrubs and trees regenerate. The disturbance-dependent vegetation that characterizes dry, sandy areas has been preserved by the trampling by cattle. Retarded or disturbed regeneration of forest vegetation is usually indicated by lower biomass, lower number of trees, especially forest species, and higher depletion of soil nutrients. There is increased erosion due to lower infiltration and higher runoff rates because there is lesser biomass available to protect pastures under higher stock density. More-or-less extensive flooding has a seasonal impact on grazing along the larger watercourses and wetlands.

12.4.3. Main human impacts:

Grasslands, also grazing lands, are important habitats for certain species. With increase in cattle and human population, however, these areas are affected in two ways: (1) over grazing by animals and (2) conversion to agricultural lands. In the later case, total conversion leads to loss of many grass land species and associated ecosystem service. Cattle also suffer from lack enough fodder and do not produce needed products like milk. In some cases, over grazing has led to soil erosion, and weed invasion.

12.4.4. Relevant management practices:

Productivity of grasslands/grazing areas can be improved with proper management practice. These include:

- Reducing the cattle population and improving their productivity with additional feeds (concentrate)
- Fertilizing grazing areas to increase hay yield per unit area
- Where possible use the cut-and-carry method or zero-grazing

DISTRIBUTION

12.5. Fifth type of habitat/land cover: Built-area

Regional/Local

A number of villages and small towns with residential and commercial buildings are located in the proposed biosphere reserve. The character of these environments has generally been greatly modified by recent human activity and continued development. Hence, there are only a few areas where the original habitat and/or land cover remains intact. Yayu, Hurumu, Elemo, Supe, Nopa and Alge towns are the major built-up areas in the transition zone of the proposed biosphere reserve. Across the agricultural lands, there scattered farm houses and small villages. Public infrastructure, such as churches, mosques, framers training centers (FTCs), schools and clinics are found in all towns and several rural villages.

12.5.1. Characteristic species:

The flora in built-up areas is characterized by introduced species and much of the vegetation has been planted, with a lesser proportion of naturally occurring plants. Vascular plants include *Mangifera indica* (mango), *Persea americana* (avocado), *Catha edulis* (chat), *Carica papaya* (papaya), *Psidium guajava* (guava), *Musa acuminata* (banana), *Rhamnus prinoides* (gesho), *Ensete vetericosum* (false banana), *Spathodea campanulata* (African flame tree), different eucalyptus species, and some indigenous tree species. The characteristic animals are mainly domesticated, including cattle, sheep, goats, dogs and cats, with occasional visitors like black and white monkey, and several bird species.

12.5.2. Important natural processes:

The natural processes that occur in built-up areas are human induced land use/land cover dynamics, with varying degrees of disturbance.

12.5.3. Main human impacts:

The major impacts in these areas are solid wastes and other human induced pollution. In addition, land cut and fill, related to construction, changes the landscape. Built-up areas may also pose pressure on surrounding habitats through the increasing demand for construction and fuel wood, leading to deforestation, wetland degradation, and water abstraction.

12.5.4. Relevant management practices:

For built-up areas, like towns, proper planning and implementation of the management plan should solve most problems related urbanization. In rural areas, organic wastes composting for fertilizing land is a relevant management practice. In order to minimize these impacts on forests, establishment of woodland plots and small forest tree plantations for fuel and construction wood is a timely management measure.

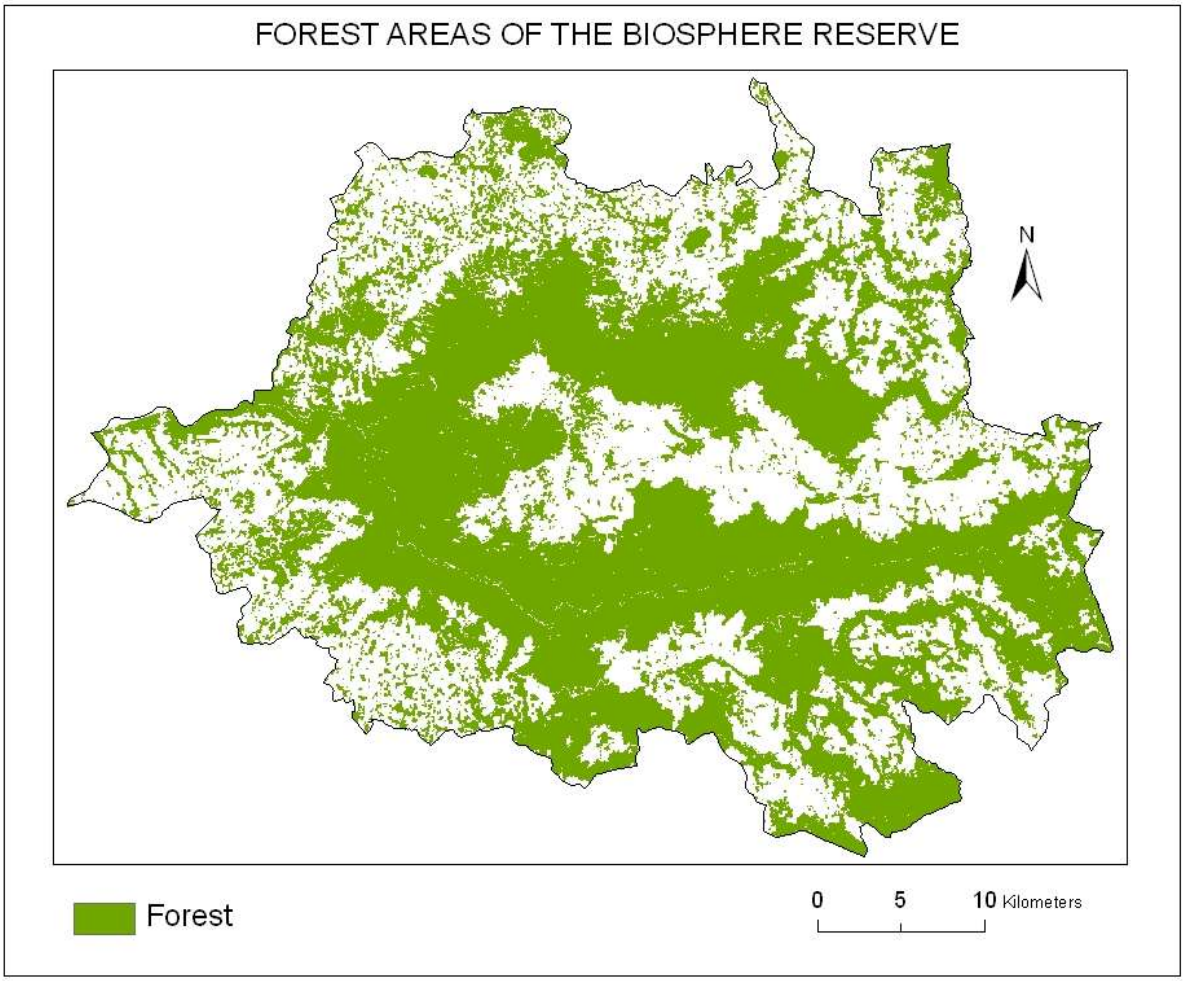

Figure 5. Forest areas of the Yayu Coffee Forest Biosphere Reserve (Source: Getaneh, 2009)

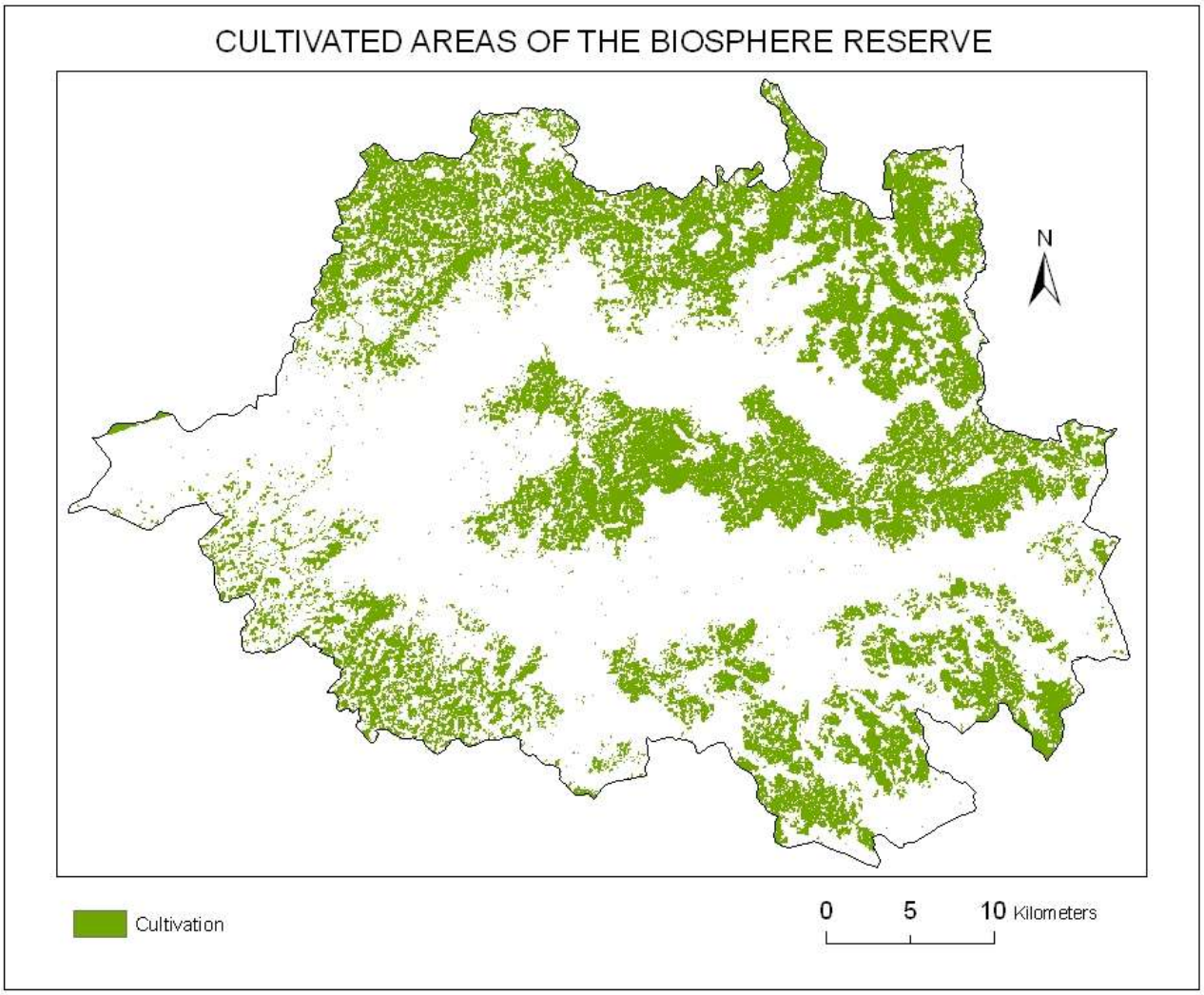

Figure 6. Cultivated areas of the Yayu Coffee Forest Biosphere Reserve (Source: Getaneh 2009)

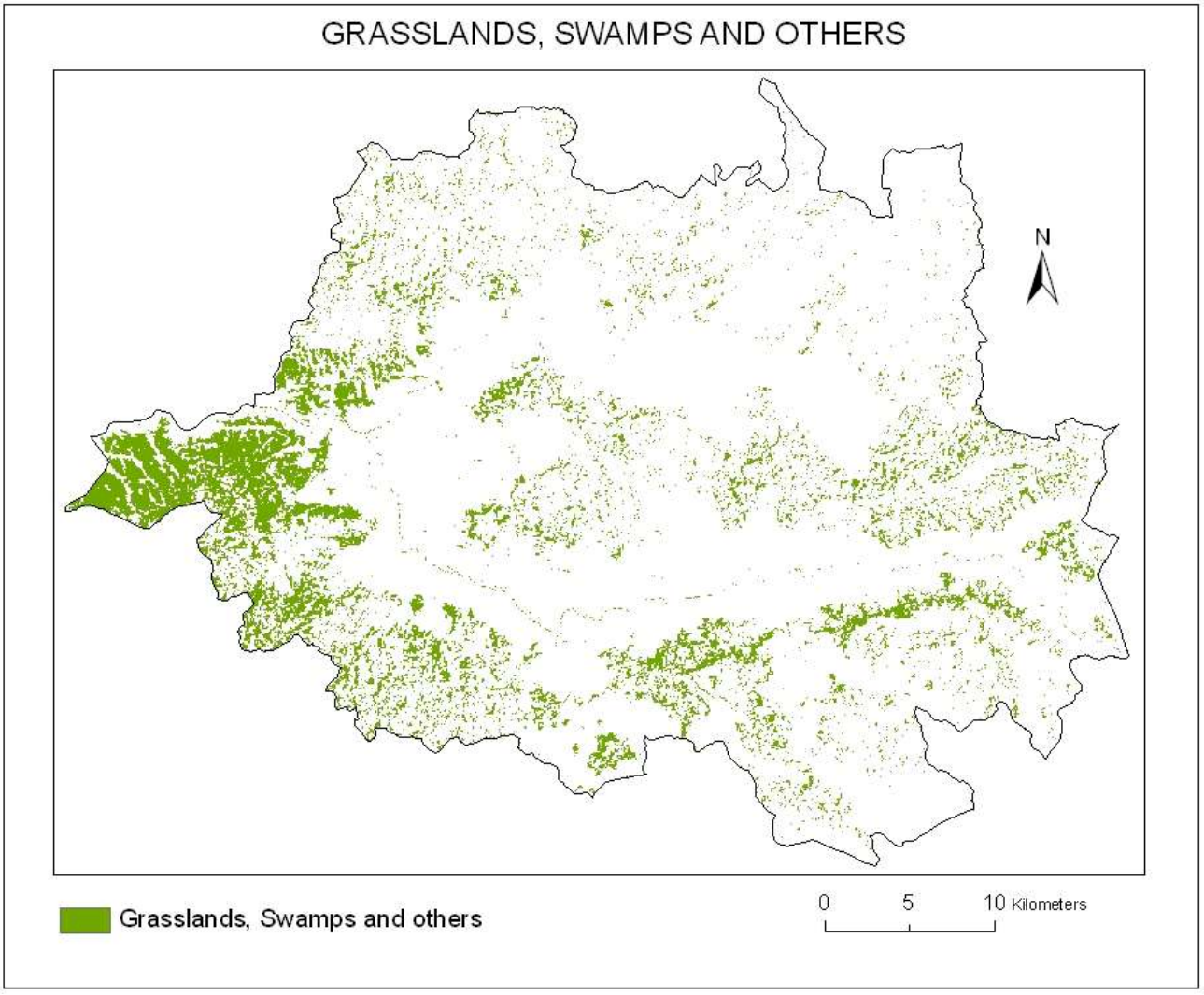

Figure 7. Grasslands, swamps and other (rock outcrop, bare soil) cover types in the Yayu Coffee Forest Biosphere Reserve (Source: Getaneh 2009)

13. CONSERVATION FUNCTION

13.1. Contribution to the conservation of landscape and ecosystem biodiversity

[Describe and give location of landscapes, ecosystems, habitats and/or land cover types of particular significance for the conservation of biological diversity.]

The proposed Yayu Coffee Forest Biosphere Reserve area comprises an extraordinary natural and cultural landscape mosaic of forest, managed forest for coffee (semi-forest), agricultural land, historical sites, natural landmarks like waterfalls, grasslands, woodlands and wetlands, interspersed with settlements. These landscape elements or habitat types contribute to the conservation of biodiversity, unique to such mosaic landscapes and ecosystems. These landscape/ecosystem parts have their own uniqueness and internal characteristics in composition and structure, which adds value to biodiversity conservation. The establishment of the proposed biosphere reserve will set rules to maintain the balance of the proportion of these landscape elements, though management guidelines and implementation.

Natural and cultural landscape elements with high value for conservation in the area include the following:

- A natural, undisturbed coffee forest ecosystem
- Managed coffee forest (semi-forest coffee production) system
- Valleys, gorges and ravines along major rivers
- Woodlands, bush lands
- Wetlands and swamps
- Highland grasslands
- Agricultural land
- Settlement and urban areas

Each of these landscape elements and their conservation values are presented in the following section.

Undisturbed coffee forest ecosystem

The undisturbed coffee forest is characterized by a high abundance of wild Arabica coffee (*Coffea arabica*) populations and continuous, multi-storey vegetation structure. Arabica coffee is the most abundant species in the small tree/shrub layer stratum. It is considered to represent a **keystone ecosystem** for coffee conservations (a suite of keystone species, which support many other species as their habitat). Different sized plants occupy different niches, from the ground floor layer to the top of the canopy, making the forest structure continuous (since there is no or little human interference).

The undisturbed coffee forest represents intact Afromontane rainforest, and upper parts of the transitional rainforest, in Ethiopia. It is part of an important ecoregion, which has global importance for the conservation of biodiversity, i.e. the Eastern Afromontane Biodiversity Hotspot. The Afromontane forest ecosystems in general, and parts in Ethiopia in particular, are considered as the most threatened ecosystem in Africa. Due to its rugged topography, the forest landscape varies greatly. It provides several free ecosystem services of local and regional importance. In the proposed biosphere reserve this part of the landscape is the most important part for biodiversity conservation.

Managed coffee forest (semi-forest coffee production) system

This forest is part of the coffee forest, managed by people for coffee production. Its floristic composition is similar to the undisturbed coffee forests. However, the vegetation structure is reduced to two layers, i.e., the canopy layer of shade trees and the lower stratum of coffee. Shrubs, lianas, small trees, ground vegetation and some canopy trees are cleared to enhance coffee production.

Management includes weeding two to three times per year, and planting wild coffee seedlings in sparsely populated areas. Studies showed that this management increases coffee dominance while reducing general plant diversity (Gole, 2003) and within-species genetic diversity. This system coffee production system is the closest to natural coffee forests, and has a high value for conservation of biodiversity. If serves as a habitat for many plant species including epiphytes, birds and other animals. Underneath the coffee bushes spices such as correrima and black pepper are often produced.

Valleys, gorges and ravines along rivers

These parts of the forest are characterized by steep slopes, rocky outcrops, deep gorges and ravines, occasionally interspaced with flat areas. On steep slopes, this habitat type is mainly dominated by lianas, natural tree-fall gaps and secondary succession in the tree-fall gaps. On gentle to flat slopes, it is characterized by very tall trees with closed canopy. Because of its difficult terrain, this part of the forest is the least affected by humans. Floristically, it is very diverse and is dominated by transitional rainforest and lowland forest species. There are also many species present that link different biogeographical regions. Wild coffee is sparsely distributed, and often displaced by another species, *Argomuellera macrophylla* (Gole, 2003).

Tree-fall gaps are common due to the presence of many steep slopes. Trees naturally fall due to wind throw. Dead and decomposing wood creates special micro-habitat for many species of decomposers and other life forms adapted to such environments. Many secondary succession species invade these gaps. This is a dynamic ecosystem, with high biodiversity due to the presence of forest vegetation at different stages of natural succession (Gole, 2003). This type of forest ecosystem is found at altitudes between 1100 and 1300 m, along the courses of Geba, Sese, Dogi and Saki rivers.

Woodlands/ bushlands

This includes natural woodland/bushland, with small trees on shallow soils; or degraded forest margins, which are mainly used for grazing cattle. Such areas are covered with open stands of bushes, usually 3 to 7 m tall, with canopy cover of at least 40% cover, and an open stand of wood at least 8 m tall and with 40% canopy cover. The field layer is dominated by grasses of the savannah formation type. Natural woodlands on shallow soils are mostly found at lower altitudes, in the western part of the proposed biosphere reserve, while degraded forest areas are at higher altitudes.

Such cover types are rich in small trees of the open country type and grasses, and has important economic value as range-land for local communities. In some cases such areas are converted to either agricultural land by clear cutting, or to coffee plantation by planting coffee and shade trees.

Wetlands and swamps

These landscape elements are wetlands of herbaceous freshwater swamps and marshy aquatic vegetation, although some interaction with the surrounding terrestrial areas may occur. For the sake

of simplicity, it is possible to classify swamps as waterlogged sites dominated mainly by woody vegetation while marshes are waterlogged sites dominated by herbaceous vegetation; this cover type is known locally by Chefe and is mainly used by local people for dry season cultivation and grass for roof thatching.

Highland grasslands

In the Yayu area highland grasslands are found in patches at altitudes between 1600 and 2300 m. Most are secondary because of intensive human use. The major grassland type in the area is *Cynodon dactylon-Andropogon abyssinica* grassland (Kahurananga 1986). These grasslands are rich in Leguminosae. Scattered trees like *Acacia abyssinica*, *A. negerii*, and *Croton macrostachyus* are common these grasslands. In recent times much highlands grassland has been converted to agricultural lands for food crops production. It has a high value for conservation of plants and promotes small mammal diversity, which does not occur in other parts of the landscape. In addition, it is an important cultural landscape element useful for livestock production in the area. Parts of its diversity also can be attributed to human intervention, through livestock grazing and grass cutting for roof thatching in house construction.

Agricultural land

This part includes farmlands under crop production, coffee plantations, old-semi-forests or forest gardens and woodlots between farms. It is of value for the conservation of agro-biodiversity and cultural landscapes, particularly for crop plants, livestock and traditional coffee landraces. Different cultural coffee, honey, spice, and food crop production activities are practiced in the area by the local community and settlers from other parts of the country. This has contributed to the conservation of a wide natural and agro-biodiversity within this landscape. Agricultural land occurs on a wide altitudinal range within the landscape, i.e., from 1100 to 2337 m above sea level (Figure 6).

Generally, farming is traditional and carried out with simple technology by smallholder farmers. The domestication and use of coffee in Ethiopia dates back some 2000 years (Luxner 2001). During this long history of domestication, diverse traditional management practices for coffee production have evolved. Coffee domestication at different stages of development still exists in the area, from wild coffee production in the nearby undisturbed forest to the plantation type. This makes the area a 'living laboratory' of crop evolution, where the evolutionary process can be seen viewed with one area.

Scattered trees in these agricultural lands are important for many animal and plant species. They also add to the scenery of the agricultural landscape. In addition, the agricultural landscape also supports many land races, or farmers varieties, for different cultivated crops.

Settlement and urban areas

Within the proposed biosphere reserve the important elements of the rural settlement areas and towns are the diverse home gardens of annual and perennial plants, live fences, woodlots, church forests and other cultural and public sites. Like agricultural lands, this area is predominantly important for the conservation of agro-biodiversity. However, many exotic plants and newly introduced useful plants are found in these areas, too. The cultural backgrounds of urban dwellers and settlers add value to the diversity of the cultural landscape of the area.

Natural caves and Waterfalls

There are several natural caves and waterfalls in the proposed biosphere reserve. Around seven natural caves and five waterfalls have attracted the attention of the regional bureau of Culture and Tourism. These caves are important homes and habitats for many wild animals, especially bats, nightjars and

swifts. They were also used by people during periods of war. These caves may have historical importance and deserve further studies. The waterfalls contribute to the scenic beauty of the landscape. In addition, many life forms associated with cliffs and fast moving waters, especially birds occur in these areas. In general, both waterfalls and caves add to the complexity and diversity of the landscapes and ecosystems, and the scenic beauty. They have high potential for future tourism development.

Historical Gada Assembly site

This site is located in undisturbed coffee forest. However, because of its historical importance, it deserves a separate description. The major local inhabitant ethnic group, the Oromos, used to gather as the Gada Assembly. In the Oromo community, the **Gadaa** System used to play an important role in the political, cultural and spiritual life of the people. The historical Gada Assembly site, known as **Bakke-Abba-Alanga** (literally means Lawmakers or Legislators Site) is located in the southern part of the proposed biosphere reserve area. All customary rules and amendments to the existing rules of the indigenous institutions used to be made at **Bakke-Abba-Alanga** (See section 10.6 for detail). In the Gada Assembly, representatives of all the Oromo clans (*qomo*) in the area were represented. Hence, the Bakke-Abba-Gadaa in Yayu forest served as a site for local parliament, and represented a religious and ritual site. The site used to be under big *Ficus* sp. (called Oda) tree, which possesed a wide canopy. Because of this tradition, *Oda* trees have a very special cultural value for all Oromos. The Oromiya Government uses the Oda tree as national symbol today, as can be seen on all official stamps as the logo. This site is located in the Wixatee area within *Wixatee* kebele (the lowest formal administration unit).

Little is known about the Ilu Oromos, compared even to other Oromo clans in western Ethiopia (Triulzi, 1996). The preservation of this site, and oral literature related to the site and the Ilu Oromos, may shed light on the history of the local community.

The historical value of this site to the community has contributed to its preservation. People have a special respect for the site, and therefore keep it under forest cover. Regional government culture and tourism administrations have plans to designate the Gada Assembly as important cultural site.

13.2. Conservation of species biodiversity

[Identify main species (with scientific names) or groups of species of particular interest for the conservation of biological diversity, in particular if they are rare or threatened with extinction; use additional sheets if need be.]

The proposed biosphere reserve provides critical habitat of sufficient size to promote the conservation of species diversity. The area is characterized by high species diversity, and new species are being identified regularly through ongoing research and inventory initiatives. There are over 450 higher plant, 50 mammal, 30 bird, and 20 amphibian species in the proposed biosphere reserve. Preliminary studies of spiders have also recorded a number of genera and some of these genera assumed to be new to Ethiopia and even some to science (Aklilu, 2006), although this needs further verification. There are over 100 endemic species of plants, birds and mammals. The threatened species (INCN Red list) includes more than 40 species, including two birds, two mammals and 40 plant species. The forest is part of a National Forest Priority Area, coffee gene reserve, and an important bird area (IBA), for Ethiopia. It is also part of the Eastern Afromontane Biodiversity Hotspot, Center of Plant diversity as well as center of crop plants origin.

From the perspective of species diversity conservation, the area accomodates different categories of species with high conservation priority:

- Internationally threatened species
- Nationally threatened species (some taxa, especially plants, require further study)
- Ethiopian endemic species
- Afromontane endemic species (plants)
- Afromontane highland biome restricted species (birds)
- Crop plant species with their center of origin or diversity in Ethiopia

Vascular plant

International red-listed species

The proposed biosphere reserve area harbours at least 40 red-listed endemic flowering plants of Ethiopia (Vivero et al. 2005, 2006). These include *Aframomum corrorima, A. zambesianicum, Amorphophallus gallaensis, Ascolepis eriocauloides, Berkheya chiesiana, Bothriocline schimperi, Brillantaisia grottanelii, Ceropegia recurvata, Ceropegia sobolifera, Crotalaria agatiflora, Crotalaria gillettii, Eriosema scioanum, Cussonia ostinii, Cyperus bifolius, Cyphostemma pannosum, Dorstenia soerensenii, Eulopia albobrumea, Impatiens rothii, Justicia bizuneshiae, Justicia diclipteroides, Laggera tomentosa, Liparis abyssinica, Lobelia exilis, Pentas concinna, Phyllanthus limmuensis, Pilea bambuseti, Pimpinella heywoodii, Plumbago truncata, Polystachya caduca, Polystachya rivae, Pycnostachys abyssinica, Pycnostachys recurvata,Rinorea friisii, Satureja paradoxa, Scadoxus nutans,Tiliacora troupinii,Trachycalymma minutiflorum, Trifolium calocephalum, Trifolium mattirolianum, Vernonia gilbertii* and *Prunus africana* (non-endemic). A large number of red-listed endemic plant species are extremely important for the biodiversity of the area. This may be because other organisms depend directly on them; alternatively, they may play an indirect role in the ecosystem by having highly specialized habitat requirements; or, because of their sensitivity to change, they act as indicators of ecosystem function and health.

Nationally red-listed species

The proposed biosphere reserve area supports many vascular plant species that are nationally considered as threatened species. Because of the level of the threat, four tree species are legally protected; the use of these species is restricted to specific purposes (Proclamation 542/2007 and the amended-94/1994). The species are: *Cordia africana, Pouteria adolfi-friederici, Podocarpus falcatus,* and *Hagenia abyssinica*. The first three species occur in the proposed biosphere reserve area. In addtition to these four, many tree species occurring in the proposed bioospehre reserve are also nationally recognized as threatened species because of associated overuse or exploitation of the species by different users. Some of these species include: *Acacia abyssinica, Antiaris toxicaria, Milicia excelsa, Morus mesozygia, Manilkara butugi, Pouteria altissima* and *Trilepisium madagascariense.* The data sources for the above information are based on records from the National Herbarium, Addis Ababa, Ethiopia. These tree species warrant conservation within the proposed biosphere reserve since they are already at risk and becoming rare nationally. More importantly, most Afromontane rainforest species are rare and restricted in their distribution range, and often have a low frequency of occupancy (Senbeta, 2006).

Afromontane endemic/ near-endemic trees

Afromontane endemic trees are those trees restricted to the Afromontane eco-region, while near-endemics are trees primarily restricted to the region, with some extension into other eco-regions in Africa and its surrounding islands. Quite a large number of species fall under these categories. Some of these include: *Albizia grandibracteata, A. gummifera, Apodytes dimidiata, Bersama abyssinica, Breonadia salicina, Brucea antidysenterica, Canthium oligocarpum, Cassipourea malosana, Celtis*

africana, Coffea arabica, Cordia africana, Croton macrostachyus, Dracaena steudneri, Elaeodendron buchananii, Eugenia bukobensis, Euphorbia ampliphylla, Galiniera saxifraga, Macaranga capensis var. *kilimandscharica, Maytenus arbutifolia, Mimusops kummel, Olea capensis, Oxyanthus speciosus* subsp. *stenocarpus, Pittosporum viridiflorum, Podocarpus falcatus, Polyscias fulva, Prunus africana, Psychotria orophila, Psydrax parviflora, Rhus quartiniana, Ritchiea albersii, Schefflera abyssinica, Senna petersiana, Teclea noblis, Trichilia dregeana* and *Vepris dainelli*

Ethiopian endemic plants

There are 39 Ethiopian endemic plant species recorded in the area. Some of these include: *Cussonia ostinii, Rinorea friisii, Scadoxus nutans, Tiliacora troupinii,* and *Trifolium calocephalum*. For some of these endemics the forest habitat in Afromontane eco-region is critical for their conservation.

Crop plant species with their center of origin or diversity in Ethiopia

The Yayu area is the center of origin and diversity for Arabica coffee, and it houses the most significant populations of this species. Arabica coffee is restricted to SW Ethiopia, and most significantly the proposed biosphere reserve area. Outside Ethiopia, Arabica is only found in isolated localities in N Kenya (only Mt Marsabit) and SE Sudan (Davis et al. 2006). Loss or degradation of populations in SW Ethiopia would place Arabica coffee in real danger of extinction. In addition, many cereals have their center of diversity in Ethiopia, and many of these are cultivated in the proposed biosphere reserve area. These include: tef (*Eragrostis tef*), Ethiopian mustard (*Brassica carinata*), barley (*Hordeum vulgare*), sorghum (*Sorghum bicolor*), finger millet (*Eleusine coracana*), sesame (*Sesamum indicum*), faba bean (*Vicia faba*), and chickpea (*Cicer arietinum*). It is also the center of origin and diversity for other crops of local importance, including Ensete (*Ensete ventricosum*), Oromo dinich (*Plectranthus edulis*), Anchote (*Coccinia abyssinica*) and yam (*Dioscorea* spp.)

Mammals

Internationally red-listed species

The proposed biosphere reserve contains two globally red-listed mammal species: *Lycaon pictus* (wild dog) and *Panthera pardus* (leopard). Both species have been displaced in many areas, and are very much further threatened because of growing habitat fragmentation.

Nationally red-listed species

Additionally, there are also nationally and/or locally threatened mammal species, which are under threat due to habitat fragmentation and killings: *Hystrix cristata* (porcupine), *Orycteropus afer* (aardvark), *Genetta abyssinica* (Ethiopian genet), *Civettictis civetta (*African civet), *Genetta abyssinica* (Abyssinia genet), and *Lepus fagani* (Ethiopia hare). The establishment of this proposed Yayu biosphere reserve will safeguard the red-listed species and other associated species in the area.

Birds

Two globally red-listed bird species occur in the proposed biosphere reserve; these are: *Rougetius rougetii* (Rouget's rail), and *Macronyx flavicollis* (Abyssinian longclaw). The area is one of the most important sites for the conservation of these threatened bird species, and other associated species, in the region and in Ethiopia.

Endemic birds of Ethiopia recorded in the proposes biosphere reserve are: *Bostrychia carunculata* (wattled ibis), *Ruogetius rougetii* (Rouget's rail), *Columba albitorques* (white-collared pigeon), *Agapornis taranta* (black-winged lovebird), *Poicephalus flavifrons* (yellow-fronted parrot), *Lybius undatus* (banded barbet), *Dendropicos abyssinicus* (Abyssinian woodpecker), *Macronyx flavicollis* (Abyssinian longclaw), *Melaenornis chocolatinus* (Abyssinian slaty flycatcher), *Parphasma galinieri* (Abyssinian catbird), *Oriolus monacha* (Black-headed forest oriole) and *Corvus crassirostris* (thick-billed raven).

The area is also important for the conservation of the Afrotropical Highland Biome (HB) restricted bird species. There are around 30 species of a total 48 HB birds species in Ethiopia (62.5%). The list of HB species is marked in the checklist of birds for the area (see Appendix 7).

Other species

Although the data recording is not yet complete there are findings which show the presence of many endemic (and probably red-listed) species of fish, reptiles and amphibians in the proposed biosphere reserve area.

13.3. Conservation of genetic biodiversity:

[Indicate species or varieties of traditional or economic importance and their uses, e.g. for medicine, food production, etc.]

The area is important for the conservation of the genetic diversity of many useful plants, and most notably Many crop plants, including Arabica coffee (*Coffea arabica*), ensete (*Ensete ventricosum*), Oromo dinich (*Plectranthus edulis*), Anchote (*Coccinia abyssinica*) and yam (*Dioscorea* sp.). There are also many species here that are used as traditional medicines and wild food, available in both the wild and human dominated parts of the landscape in the area.

Of all genetic resources in the area, the case of coffee deserves elaboration in more detail. As it is well known, Ethiopia is one of the 12 centers of crop origin in the world, and per haps the third most important after China and India. Arabica coffee (*C. Arabica*) is Ethiopia's most precious gift to the world. Today, coffee is an important part of the culture of people all over the world, and is the worlds 'number one' beverage in terms of cups consumed per person. Coffee cultivation and processing alone supports the livelihoods of at least 25 million farming families world-wide. It is usually the world's most important commodity after oil (Vega, 2003).

There are 103 species of coffee species in the world (Davis et al., 2006). All are diploid (2n=22) except Arabica coffee, which is a tetrapoid (2n=44). Many have assumed from observation of morphological characteristics that it evolved from cross between two wild diploid species (Carvalho, 1952). Studies based on molecular markers have suggested possible putative parents, for example Raina et al (1998) concluded that *C. arabica* has originated from *C. congensis* and *C. eugenoides*, while Lashermes et al. (1999) and Maurin et al. (2007) concluded the parents to be *C. eugenoides* and *C. canephora*.

Our recent studies with the CoCE project (Tesfaye, 2006), however, have revealed a more accurate origin of the species. This study revealed that *C. arabica* and *C. eugenioides* have evolved from the same ancestor, and that the tetraploid nature of *C. arabica* has resulted through a single allopolyploidization event, involving *C. eugenioides* or its ancestor as a mother.

Of all coffee species, only two, *C. arabica* and *C. canephora* (robusta), are economically important, although Liberica coffee (*C. liberica*) is traded at a low-level. C*offea arabica* dominates 90% of the market and 70% of the production world-wide. All coffee production outside Ethiopia is based on a few coffee plants taken to Arabia (Yemen) in the thirteenth century, which means that it has a narrow-genetic based. Hence, Ethiopia is the only country where the genetic diversity of Arabica coffee can be conserved *in situ.* Over the last few decades, a high rate of deforestation has threatened *C. arabica* populations in the wild (Gole et al., 2002). The proposed biosphere reserve is the largest forest fragment containing wild (and genetically diverse) populations of Arabica coffee. It is, therefore, globally significant.

The coffee genetic diversity in Yayu is unique, in that it is more closely related to other diploid species of coffee with which it shares putative parents (Tesfaye, 2006). It is also more diverse, when compared with other wild populations, as can be seen from the width of the cluster on analytical, DNA dendrogram (Tesfaye 2006; Appendix 12).

The presence of high genetic variability is paralleled with high functional diversity, such as disease resistance, drought tolerance and quality (Adugna et al, 2005; Taye, 2006, Beining, 2008, Hindorf 2008). Some researchers have also discovered low caffeine coffee from accessions collected from Ethiopia, of which accessions from Illubabor had the lowest mean caffeine content (Silvarola et al., 2000; 2004).

The value of wild coffee genetic resources has been estimated on the basis of the use of wild coffee plants in three programmes, which include breeding for tolerance to coffee berry diseases and coffee leaf rust, low caffeine contents, and increased yields. The resulting economic value of the three respective coffee genetic resources amounts to around US$ 1.5 billion at a 5% discount rate and US$ 0.50 billion at a 10% discount rate (Hein & Gatzweiler, 2006). The gene pool is important in view of the limited genetic variation found in coffee plantations world-wide. The amount of genetic diversity within *C. arabica* populations found in the Yayu coffee forests is considerably higher than the genetic information stored in all *ex situ* coffee collections world-wide. Hence, the genetic reservoir acts as insurance for global coffee production, and a critically important resource for both national and international coffee breeding programmes that aim at increasing productivity, disease resistance and tolerance, low caffeine content and tolerance to drought. Moreover, the area may house the genetic diversity required to provide the flexibility needed to cope with local and global environmental change (‘global warming’).

Yayu forest offers the best opportunity for coffee genetic diversity conservation, given its big, intact forest with high frequency of wild Arabica abundance and unique genetic diversity. The Yayu wild coffee gene pool and cultivated land races can contribute considerably to these aims. In the likelihood of the spread and/or development of new pests or diseases attacking coffee plants, the Yayu coffee forests are much more likely to contain resistant varieties than the *ex-situ* collections. Whereas this value cannot be easily sold on a market, there is scope to capitalize on the possibilities for bio-prospecting in the forests, e.g. for low caffeine or disease resistant coffee.

The proposed biosphere reserve area also contains the genetic resources of many economically useful plants (Gole, 2003; Senbeta et al., 2005; Senbeta, 2006). These include plant species used as sources of wild food, medicines, spices and bee forage. Some of the common, useful plants in the area include: *Carissa spinarum, Cordia africana, Ocimum lamiifolium, Ficus mucuso, F. sur, Trilepisium madagascariense, Trichilia dregeana, Syzygium guineense, Clematis simensis, Passiflora edulis, Rhamnus prinoides, Piper capense, P. guineense, Rubus apetalus, R. rosifolius, R. steudneri,*

Capsicum frutescens, Solanum nigrum, Manilkara butugi, Mimusops kummel, Urtica simensis, Phoenix reclinata, Dioscorea praehensilis, D. sagittifolia, Ensete ventricosum, and *Aframomum corrorima.*

14. DEVELOPMENT FUNCTION

14.1. Potential for fostering economic and human development which is socio-culturally and ecologically sustainable:

[Describe how the area has potential to serve as a pilot site for promoting the sustainable development of its region or "eco-region".

Various factors contribute to the potential of the area to promote economic and social development that is socio-culturally and ecologically sustainable, and which therefore makes the area appropriate as a pilot site for the region. The proposed biosphere reserve is an area that possesses great natural and cultural values both from a national and an international perspective. At the same time, the area is endowed with diverse biological resources (Gole, 2003; Senbeta et al., 2005; Tesfaye, 2006). Tapping these resources by improving agricultural development and creating alternative incomes is an important precondition for conservation. The establishment of the biosphere reserve is an additional incentive to invest in the area. In general, the potential of the area to serve as a pilot site for promoting sustainable development in the region can be attributed to many natural and human intervention activities. These include: its agro-ecological location and natural resources, existing development interventions by different stakeholders, and market promotion by cooperative union. ,

1. It is an agro-ecology high rainfall area in the country, with high productivity
2. Major coffee growing area, with wild populations and diverse land races
3. Ongoing and planned development activities by government agencies and enterprises
4. Ongoing projects by international NGOs
5. Ongoing and planned activities by local NGOs and research organizations
6. Interventions of farms cooperative union

Location and natural resources

From the agro-ecology perspective, Yayu is a high rainfall area and is found at mid-altitude, which makes it suitable for major agricultural development. It has high potential for food crops, vegetables and fruit production. The area is one of the few food self-sufficient areas in the country, where food aid is not known to the local community. There is also plenty of water for irrigation during dry season.

The diverse ecosystems and mosaic landscape of the area, natural caves, waterfalls and historical sites make it attractive to visitors, and there is the potential to generate additional income for local inhabitants. For landscape eco-tourism development, there is a lack of infrastructure, like lodges, good roads, site profiles and trained tourist guides. Currently, a highway connecting Ethiopia with southern Sudan is under construction. Such developments have the potential to attract private investors in the hotel and hospitality businesses.

The area is one of the major coffee growing areas in the country. The presence of wild coffee as well as traditional coffee production systems like semi-forest and garden and forest garden coffee production systems has as added value for promoting coffee from the area as organic, bird friendly, or conservation coffee, which helps it to attain a premium price. Since coffee is the major export commodity of the country, special attention is given to its production, processing and marketing by the government of Ethiopia.

Development interventions by different stakeholders

The regional government, international NGOs, local NGOs and partner research institutions have several ongoing development activities, adding up to the potential of the area. The area has already been identified as a priority area for coffee production by the government, and the coffee production is set to double in ten years, from the current 20,000 tons/year to 40,000 tons/year.

This will be achieved through improved coffee stands management and planting of coffee and shade trees in the transition areas. This will also have conservation value due to its contribution to buffer zone expansion. Agricultural extension in the area promotes diverse vegetable and fruits production, which will contribute to nutrition and income diversification.

Oromiya Forestry and Wildlife Enterprise is primarily working on conservation and forest product marketing, and is establishing plantations in degraded forest areas. The income generated from plantations will be used to fund conservation activities in natural forest.

In order to make coffee production and marketing sustainable, an international NGO called, TechnoServe is working on quality improvement and marketing of coffee. TechnoServe received a grant of $47 million from the Bill and Melinda Gates Foundation for its Coffee Initiative in East Africa, of which close to 50% is allocated to Ethiopia. The Coffee Initiative is based on an approach that has proven successful in breaking the cycle of poverty for coffee farmers in Latin America and Africa, and builds on TechnoServe's four decades of experience working with coffee farmers.

TechnoServe provides technical and business expertise to help small-scale farmers produce higher-quality coffee and secure price premiums in the marketplace. Specifically, TechnoServe works with selected small-scale farmers, whose farms possess the agro-climatic conditions required to produce coffee sought out by the world's most discerning buyers. Areas of training include quality coffee production and processing, business management, and quality coffee assessment. It is well known that around 40% of coffee quality is attributed to post harvest processing and storage. With similar coffee processing intervention by TechnoServe in Tanzania, the income of smallholders coffee farmers has increased by 150%. Given the higher natural quality at the birth place of Arabica coffee and the contribution of the traditional production system to conservation, quality improvement through TechnoServe intervention is expected to earn an even greater premium for the farmers in the area. TechnoServe launched its four-year project in 2009 and the first washed coffee is expected to be produced in the 2009/2010 crop season. The organization plans to introduce 150 wet processing plants to Ethiopia, of which about 10 to 15 will be in the proposed biosphere reserve area.

An Austrian Foundation called Menschen fu Menschen (MfM) has been engaged in integrated development in the region over the last 25 years. MfM is primarily working on infrastructure, education, health, water-supply, agriculture, agroecology, women and social security programs. Outstanding infrastructure programs of MfM include the construction of bridges over major rivers like Geba, access and all-weather roads to increase linkages between urban and rural areas. To increase access to health services, MfM has built a referral hospital in Metu and staffed it with highly skilled doctors, including expatriates. MfM has also constructed and furnished many clinics and health centers in rural areas and major settlement areas. It has also developed thousands of potable water points, benefiting tens of thousands of households. In all rural settlement areas and towns, at least one primary school has been built. All district capital towns now have secondary schools. MfM has also built youth hostels, girls' hostels and children's homes for those who can not afford to rent houses in towns to attend high school education. Within the agro-ecology programme, MfM has been raising and distributing millions of forest and fruit tree seedlings, training farmers on improved agricultural practices, and constructed thousands of kilometres of physical and biological soil conservation

structures. Moreover, MfM has empowered women through skills training, provision of personal loans to begin small businesses and increased awareness creation for the abolition early marriage and genital mutilation. MfM continues to provide these services and other development activities in the area.

Local NGOs and research organizations play an important role in knowledge generation and dissemination of information and lesson from good practices. The Ethiopian Coffee Forest Forum (ECFF) is the major local NGO active in the area. ECFF's development interventions include training on sustainable forest management, decentralized forest tree and coffee seedling nurseries, and coffee quality. ECFF has also prepared forest management guidelines for coffee production, and indicators for certification of Ethiopian forest coffee. Farmers have also been trained and equipped with basic skills on forest conditions assessment, monitoring and corrective management. This helps farmers and/or their farming groups in internal auditing for certification of their semi-forest coffee plots. ECFF is working in close partnership with international organizations like the Centre for Development of the University of Bonn, the Federal Agency for Nature Conservation (BfN) and the Royal Botanic Gardens Kew, and with local organizations like the Institute of Biodiversity Conservation, the Ethiopian Institute of Agricultural Research and Addis Ababa University.

Currently, ECFF is developing a project with the Institute of Biodiversity, Ministry of Agriculture and Rural Development and the Environmental Protection Authority. The project is titled: **Mainstreaming agro-biodiversity conservation into the farming systems of Ethiopia**. It focuses on four sites, which includes Yayu forest for coffee and other native crops. The project has three components, namely: (1) enabling policy and institutional framework for *in situ* conservation of agro-biodiversity, (2) markets for agro-biodiversity friendly products to promote farmers uptake, and (3) crop wild relatives (CWR) conservation in *in-situ* gene banks (set side areas) that continue to provide "breeding ground for agro-biodiversity". It is envisaged that this project will be funded by GEF for a five-year period. The project preparation grant (PPG) has already been secured. The full project proposal willl be finalized in October 2009, and the project is expected to commence in January 2010.

The Oromia Coffee farmers Cooperative Union (OCFCU: http://www.oromiacoffeeunion.org) is the biggest and oldest union in Ethiopia, being established in 1999. Currently, it has 129 primary member cooperatives representing more than 200,000 small-scale farmers. OCFCU has member cooperatives in several districts within the proposed biosphere reserve. Within the next five years, the plan is to include most primary cooperatives in the membership of the OCFCU, for the production and export of high quality, premium price coffee. It exports both washed and dry processed coffee, as: certified organic, fair trade, fair trade-organic and bird-friendly. It awaits appropriate certification to export Ethiopian forest-coffee; a standard for this kind of certification is under development.

Education, research and information

Three universities and five technical-vocational education and training (TVET) colleges are located close to the proposed biosphere reserve area, with a student population of more than 30,000. The three Universities are Jimma, Wollega and Menu. The five TVET colleges are mainy in Metu, Bedele and Yayu towns. The nearest is Metu University, which is within 30 km of the proposed biosphere. The universities offer courses in biology, natural resource management, agriculture, technology, social sciences, landscape planning and watershed management, nature conservation, and health science. A number of these colleges and universities offer forestry, biology, natural resources, and related courses and are expected to visit the site for combined theoretical and practical experience in the courses they offer. Jimma University has a special curriculum, including programmes in: community based training, development of team training, and community based education, which require students to

conduct group practical exercises and studies whilst living within the community. Metu University could take over the scientific support role of the biosphere reserve in the future.

Since 2002, the Ethiopian Coffee Forest Forum in collaboration with the Centre for Development Research (ZEF, University of Bonn), Addis Ababa University, Jimma University, Jimma Agricultural Research Centre and others have been conducting research in the proposed biosphere reserve; and coordinating a number of studies in the region. These studies are part of the Project on conservation and use of wild *Coffea arabica* populations in the montane rainforests of Ethiopia supported by the Federal Ministry of Education and Research, and the Center for Development Research, University of Bonn, the German Federal Agency for Nature Conservation, the Volkswagen Foundation, the Horn of African Regional Environmental Network-Center, illy Café SPA and others. Access to the knowledge and the research networks that the proposed biosphere reserve stands to gain through these various initiatives represents a highly significant resource and a great potential.

An interesting information deliberation approach used by ECFF and its partners is the Coffee Information System (CoFIS). CoFIS presents the Ethiopian Coffee Forest Atlas on the Internet. CoFIS has been initiated within the framework of the transdisciplinary research project **Conservation and use of the wild populations of Coffea arabica in the montane rainforests in southwest Ethiopia** (CoCE) at the Center of Development Research in Bonn, Germany.

The CoFIS web portal provides a selection of research results of the CoCE project in spatially explicit format. As the web based extension of the Coffee Forest Atlas, CoFIS targets at endorsing both scientific research and practice oriented implementation of research results. It can be accessed online at www.cofis.info

Education is investment and hence important for sustainable development. In order to bring sustainable impacts on conservation and use of forest biodiversity in the biosphere reserve area and elsewhere in the country there is a need to establish a conservation education and research centre in Yayu. For this, the Ethiopian Coffee Forest Forum and its partners are working toward establishing the Darara Buna Biodiversity Research and Education Center. The centre can be used by researchers, educators, local community and conservation and development organization as a practical training center or field school. It will be involved in activities such as in research, education, awareness building, training, social community services, basic health services and home business activities. Many of these activities are already being performed, for example by researchers from universities, agricultural extension and governmental development agents, or development aid organizations such as "Menschen für Menschen". Ethiopian as well as international researchers will be hosted at the Center in Yayu. In particular, the local communities will be offered various training to develop new income generating skills. For instance, women will learn the sewing of the Darara Buna coffee bags which are filled with coffee to be sold in cities across Ethiopia (http://dararabuna.googlepages.com/home).

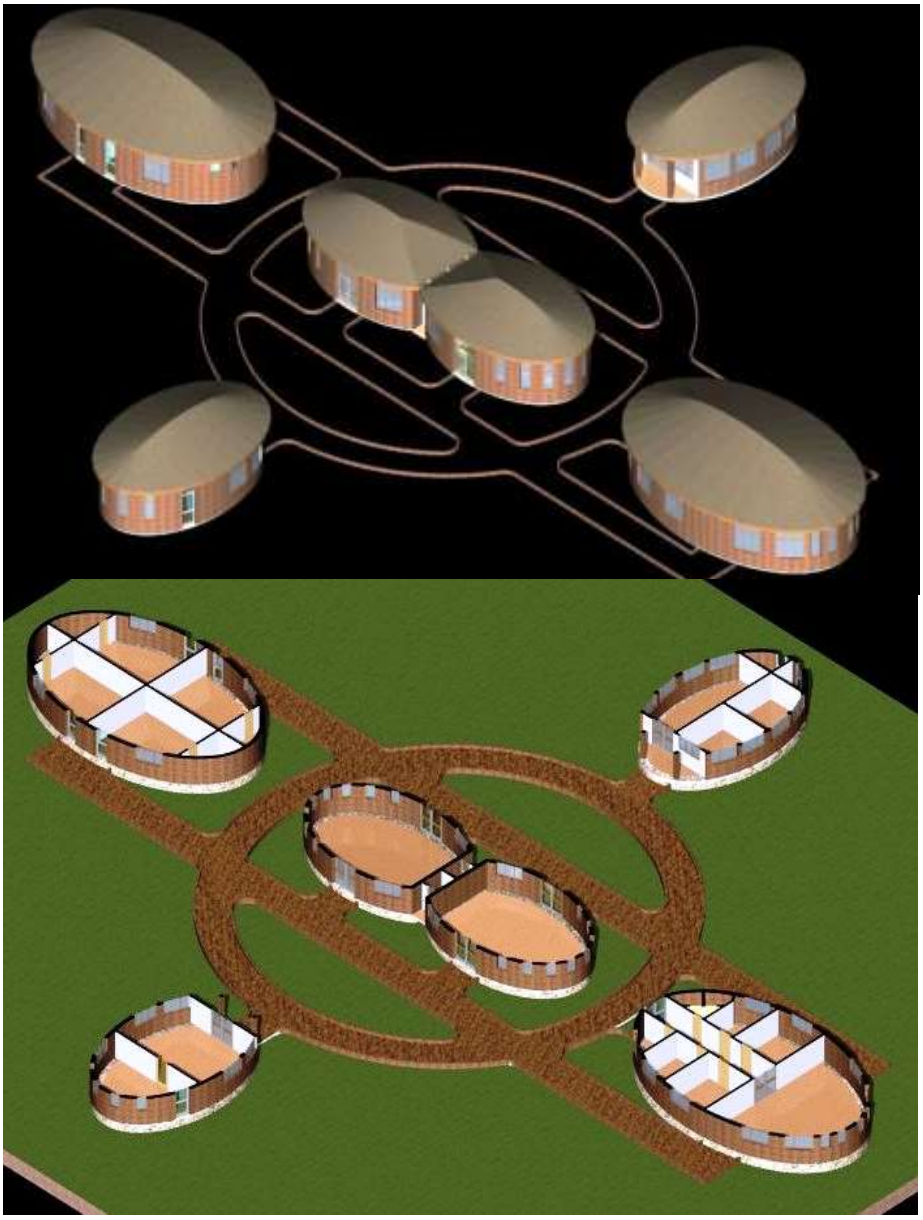

Figure 8. 3D Model of Darara Buna Center Buildings. Note the oval shape to simulate the shape of coffee beans

Potential activities in the core area and buffer zones of the reserve

The core areas and buffer zones are forest areas within the biosphere reserve. In these zones, an operational approach of conservation and careful utilization is demonstrated by concrete examples: marketing certified coffee, and honey and spice production. These projects serve as an example of our operational approach to future themes in the biosphere reserve, for instance in forest environments.

Coffee quality improvement and marketing: Globally there is a demand for high quality Arabica coffee and also for specialty coffee. Ethiopia, being a producer of diverse types of Arabica coffee, has a great opportunity to take hold of this growing demand. In the proposed biosphere reserve area, coffee is almost entirely produced by smallholder farmers. The improvement and development of the global market for Arabica coffee requires the production of good quality coffee. The traditional methods of processing coffee cherries often produce poor quality coffee, which lacks flavour and aroma (cup

quality). Traditionally, coffee cherries are dried on the ground and hence the natural inherent quality of coffee is negatively affected. Prices for coffee produced by these methods are inevitably low and limit the income of smallholder farmers. In order to improve coffee quality there is a need to improve the processing method. There is also a need to strengthen and capacitate smallholder coffee producers to enhance their income source. For this, the Ethiopian Coffee Forest Forum (ECFF) has initiated coffee marketing approaches for the quality of coffee produced from the proposed biosphere reserve area.

As part of coffee market improvement and a community development program, a project called Darara Buna coffee has been initiated by the Ethiopian Coffee Forest Forum and its partners. The project consists of two major elements: (1) the preparation of good quality coffee and (2) the production of coffee bags at Yayu village. The coffee bags are sown by the women, who receive training at the village. Through this project women and men living in the village are organized to undertake this business. The first sponsor of the project, Tana Rose, has shown interest and is already contributing to this project. The sale of bagged coffee, enables the women to be paid. The coffee being sold is not wild forest coffee alone but also high quality coffee produced from buffer and transitional zones in the biosphere reserve. For the continuity of the project and the business, women involved in the project will be trained to sew coffee bags at the Darara Buna Research and Education Center. Later on, they themselves will become trainers and will train women in other villages in the biosphere reserve.

With the assistance of this, and other projects active in the area, there is also a plan to introduce coffee washing machines to the area, which will drastically improve coffee quality. Currently, few coffee washing machines are present in the area. Given the high amount of coffee produced in the area there is a need for further wet processed (washed) coffee. The plan is to introduce about 10 eco-friendly coffee washing machines to the area, through the intervention of TechnoServe and OCFCU, and private investors. Companies like illy Café SPA have also expressed interest and have shown a considerable interest in supporting this initiative. Additionally, the project also addresses coffee production/management problems through training farmers on coffee diseases control measures, and coffee forest and shade trees management with the aim of increasing production. The project will also help to improve coffee quality by improving post harvest processing, through both dry and wet processing methods.

Ecotourism

Ecotourism can contribute toward biodiversity conservation and livelihood improvement, if it is designed and managed properly. The proposed biosphere reserve offers excellent natural and cultural attractions for developing ecotourism. Potential tourist attractions include waterfalls, Sor, Geba and Sese rivers, several caves in the core areas along river valleys, wild animals like colobus monkey, forest birds, traditional coffee management practices, Buna Qala-the traditional coffee culture, diverse plant species, and cultural heritage sites like the Gada Assembly site.

Examples of potential activities include guided nature tours and guided cultural tours. Awareness creation for ecotourism has to be made, and the need to provide support for those involved in this venture is crucial. The provision of logistic support, know-how and ideas are key elements in this endeavourer. The Ethiopian Coffee Forest Forum has already developed and compiled important information on the potential for ecotourism in the area and is working toward developing a local tourist's guidebook. Because the Yayu area is endowed with a great variety of natural, cultural and geological features as tourist attractions, there is a need to embark on improving the local infrastructure for visitors.

The Oromiya Forestry and Wildlife Enterprise- Illubabor Branch is very keen to develop some of the infrastructure required for tourism. They have already planned to establish a tourist lodge at Sor Waterfall. In addition to this, the Oromiya Culture and Tourism has already recognized the area as one of hotspot sites in the state for tourism development. The Bureau has already promised to develop infrastructure, such as road and communication systems. These initiatives have the potential to make the proposed biosphere reserve area a pilot site for the sustainable development of tourism in the area.

Potential activities in the transition area

The transition area consists largely of agricultural land, forest fragments and built-up areas. In this area, there is a great potential for promoting sustainable development through agriculture, forestry and beekeeping.

Agriculture

The proposed biosphere reserve includes the main agricultural activities of the region and the cultivation of coffee, fruits, tuber crops, and pulses, oil and cereal crops, often in combination with the rearing of livestock. However, some of the cultivated crops need improved varieties to increase productivity; introduction of improved varieties of some crops, such as beans, are highly important for domestic consumption and for marketing. More importantly, the large numbers of cattle kept for milk and beef production in the area is a good opportunity to enhance the income of the farmers. Fattening is very important and farmers can be advised to orient the livestock management system toward this. In addition to the above, the area is also well suited for fruit and vegetable production as well as beekeeping. There is huge potential for planting economically important fruit trees on degraded forestlands and in homegardens. A number of farmers are already involved in these activities. With the growing demand for high quality food, particularly in the urban centers, this is a good opportunity to enhance the livelihoods of local communities. In this regard, the Oromiya Forestry and Wildlife Enterprise - Illubabor Branch is planning to become a business partner for agricultural products produced by the local communities within the proposed biosphere reserve.

The area is a priority region for coffee production, based on the recent “development corridor” approach adopted by the government. Hence, the Agriculture and Rural Development Offices of the different districts in the proposed biosphere reserve have been and are still producing millions of coffee and shade trees seedlings every year, and giving them to farmers to increase coffee production from the area. For instance, in 2008, about five million coffee seedlings were raised and freely distributed to farmers in the area.

Apiculture/Beekeeping

The Agriculture and Rural Development Office (ARDO) is also assisting farmers by introducing modern beehives and beekeeping methods. ARDO provides modern beehives and trains farmers on how to manage and handle these modern hives. This initiative has considerable potential, since bees also play an important role in the pollination of coffee, which increases coffee yield significantly.

Spices production

The proposed biosphere reserve area is well-known for its diverse spice production. In this regard, there is a need to improve production, processing and marketing of spices by providing appropriate training for farmers. This can improve the income of rural households and reduce poverty through income diversification.

Forestry

The Oromiya Forestry and Wildlife Enterprise - Illubabor Branch was established by the Oromiya National Regional Government for the management, conservation and sustainable use of the forests and protected areas in the region. The enterprise gets its income through selling timber and non-timber forest products. Currently, about 90% of their income comes from forest plantations. In the future the enterprise plans to build its entire income from forest plantations, and then use this capital to finance the conservation of natural forests. The enterprise is also one of the initiators and promoters of the Yayu Coffee Forest Biosphere Reserve Initiative and is a member of the Yayu Coffee Forest Biosphere Reserve Management Unit. It is envisaged that the enterprise will become active in the biosphere reserve, allocating some of its revenue to support the biosphere activities. For this, the enterprise has already discussed and agreed with the local communities living in and around the proposed biosphere reserve area, for considering them as out-growers of forest plantations. As parts of this agreement the enterprise has already raised tree seedlings and distributed them to the farmers. Upon maturity the enterprise buys logs from the farmers. The enterprise also establishes own plantations on degraded forests areas not currently used by members of the local community.

Opportunities for future biosphere reserve projects

Yayu and the surrounding areas can be justifiably called the center of coffee production (particularly, forest coffee) for Ethiopia. In addition to coffee, the area is well known for its honey, spices and agricultural products. Many of the biological values in the central areas of the proposed biosphere reserve are related to the cultural landscape that has been characterized by centuries of cultivation and livestock farming. Preserving these values requires a strong agricultural sector with a market for it products.

Hence, the aims of improving coffee, spices, honey and agriculture production to preserve the region's biological values and to incorporate these in the various projects that can be undertaken within the proposed biosphere reserve in order to promote development is crucial. Some steps have already been taken; others remain to be made. Outlined below are some examples where ECFF and member institution of the management units (MU) intend to take concrete action to fulfil the objectives of biosphere reserve conservation and sustainable development. ECFF is already closely collaborating with the public, business and voluntary sectors in order to achieve the best possible outcome for the proposed biosphere reserve.

- ***Forest coffee.*** Improving awareness of the link between biodiversity and coffee production by labelling coffee. The continually increasing use of forest coffee from the forest (buffer zone and transition area) can create the right conditions for profitable coffee production and therefore the conservation of biodiversity in core areas.
- ***Agriculture.*** One challenge is to find new uses for farmland that enable ecological value and the values of the cultural landscape to coexist alongside social values in a way that it is as economically viable as possible (for example, organic farming and alternative crops). Another challenge is to work with farmers, with the support of research organizations, to develop new agricultural techniques that can be used to improve production and productivity of the land. Organic agriculture has great potential in the area. There is little chemical fertilizer input in the area, and even this can be replaced by compost prepared from coffee husk. Normally, coffee husk it burned at the processing stations. However, it can be converted to useful organic fertilized through composting.
- ***Development of rural communities***. The need to transform rural settlements is one of the challenges the management units need to consider in the area. The rural communities need schools, clinics, roads, electricity, and the like. MfM foundation is providing much of this infrastructure in villages with many inhabitants. However, electricity, tap water and access roads are not adequately available. In various discussions with the ECFF, community members continuously request these

services. The role of the biosphere reserve is, for example, to help devise activities related to ecotourism and to attract entrepreneurs and other stakeholders who are interested in providing such activities and infrastructure, in the form of local guides, forest walks.

- ***Enhance tourism*.** In recent years, coffee forests have become interesting areas for tourists and other visitors. In addition, the existence of many natural caves, waterfalls, rivers and other features in the area can be used to create attractions**.** One possible project of the ECFF, in collaboration with the Culture and Tourism Bureau, is to broaden the range of tourism so that those who travel to spend time in the area also discover what other things the region has to offer.
- ***Identify ecosystem services.*** The natural ecosystem provides us with a range of what is known as "ecosystem services". Examples include carbon sequestration, climate regulation, clean water, pollinating insects, wetlands that serve as natural water purification plants and water level regulators, and any number of other natural processes. The important challenge is to identify these ecosystem services in order to understand the need to conserve them and perhaps rehabilitate those that have disappeared or are on the verge of doing so.

14.2. If tourism is a major activity:

-how many visitors come to the proposed Biosphere Reserve each year?
-is there a trend towards increasing numbers of visitors? (Give some figures if possible)

Although there is a great potential for tourism in the proposed biosphere reserve area, so far this has hardly been exploited and little tourism infrastructure is in place.

14.2.1. Type(s) of tourism

[Study of flora and fauna, recreation, camping, hiking, sailing, horse riding, fishing, hunting, skiing, etc.]

A wide variety of tourism opportunities have potential to attract tourists to the area and surrounding region. Some of these include:

- Natural resources (flora, fauna, vegetation, waterfalls, caves)
- Cultural resources (religious sites, sacred sites, and Abba Gadaa site)
- Historical resources(historical sites)
- Archaeological resources
- Geological resources
- scenic foot paths, climbing
-fishing

14.2.2. Tourist facilities and description of where these are located and in which zone of the proposed biosphere reserve:

At the moment, there are no tourist facilities in the area as tourism is not well developed.

14.2.3. Indicate positive and/or negative impacts of tourism at present or foreseen:

Possible positive foreseen effects of tourism include the economic benefits that tourism brings to the area. Because of tourism, local communities can be involved and as a result can generate income sources through this activity. Moreover, nature tourism can promotes greater awareness and insight into conservation. This knowledge and the changes in attitudes that it inspires foster the right kind of conditions for increased local involvement. Tourism also improves the conditions for sustainable development through promoting fruitful collaboration between conservation, commercial and voluntary interests. Focusing on the unique natural features of an area provides a more solid platform from which to highlight the strengths of a rural community and increases the community's positive exposure to nearby built-up areas. Tourism also helps to inspire and consolidate new forms of

partnership between public, private and commercial interests, as well as generating increased participation from regional authorities and organizations.

Negative forseen effects of tourism include the risk of over-exploitation and degradation of the environments and, the disturbance of sensitive flora and fauna. Measures will be taken within the proposed biosphere reserve to direct visitors towards less sensitive areas by using posters and paths

14.3. Benefits of economic activities to local people:

[Indicate for the activities described above whether the local communities derive any income or benefits directly or indirectly from the site proposed as a Biosphere Reserve and through what mechanism]

Agriculture

Agriculture is the main means of livelihood in the area. Coffee alone fetches over 70% of the cash income for households. The community members are the prime beneficiaries from agriculture related developments by different stakeholders such as coffee quality improvement through processing, marketing through branding (Darara Buna coffee) and as certified coffee. And through cooperative union, diversification of income sources through modern beekeeping, fruits, spices and vegetable production, improved food crops production, forest plantations, and soil and water conservation. For instance, in Tanzania TechnoServe has discovered that quality improvement, couple with specialty marketing of coffee could help farmers to get premium prices of 150% higher than other coffee growers in Tanzania (TechnoServe, 2008).

Services sector

The area was once considered remote, with little access to education, health and transport facilities. The last two decades have seen tremendous improvements due to development interventions of the MfM foundation and the government. Schools and clinics are now found in all towns and major settlement areas. The area has the highest school density in Oromiya state, with reasonably high enrolment rates. Basic health care services are accessible to most villages, being located within walking distance. The road network has opened up markets for local products. Tens of thousands of community members have benefited from these services. The Darara Buna Biodiversity Conservation Research Education Center is also expected to train farmers, experts and students in sustainable development skills.

Ecotourism

Tourism is quite underdeveloped in the area. If its potential can be exploited through promotion and infrastructure development, it can benefit the local community and private sectors, through the creation of jobs as tour guides, in small businesses, as services providers and accommodation/ lodges. The Ethiopian Coffee Forest Forum has prepared tourism profile for the area, with detailed information about tourist attraction, existing infrastructures, sources of information and other regional destinations, including route packages to includes places such as Gambella and Southern Sudan.

15. LOGISTIC SUPPORT FUNCTION

15.1. Research and monitoring

In the last few decades there has been much research undertaken within the proposed Yayu Coffee Forest Biosphere Reserve. Since the 1960s and 1970s, coffee breeders were collecting wild coffee plants and conducting research to select disease resistant and high yielding genotypes. The disease

resistance research focused mainly on coffee berry disease, coffee leaf rust and coffee berry disease (Hindorf , 1975; Merdasa, 1986; Adugna et al., 2001)

In the 1970s, 1980s and 1990s, several independent studies on the biodiversity of the forest vegetation and wetlands were conducted by different individuals and institutions (Chaffey 1979; Friis 1979, 1983, 1992). A coordinated and multi-disciplinary research project (the CoCE project) started in 2002, through a collaboration between Ethiopian and German scientists and institutions. The project has documented the diversity and economic value of the coffee forests. Based on the project findings, the biosphere reserve approach was recommended as the most suitable conservation strategy.

Environmental monitoring began relatively recently. In the 1980s Yayu Forest was designated as one of the 58 National Forest Priority Areas within Ethiopia. Since the early 1980s, regular monitoring has been conducted, particularly for forest cover changes (Reusing 1998), forest conditions assessment and woody biomass (WBSPP, 2004). Since 1998, part of this forest has been designated for coffee gene reserve as Geba-Dogi Coffee Forest Conservation area by the government. Regular monitoring has been part of the management activities of this conservation area.

15.1.1. To what extent has the past and planned research and monitoring programme been designed to address specific management questions in the potential biosphere reserve?

(For example, to identify areas needing strict protection as core areas, or to determine causes of and means to halt soil erosion, etc.).

Most of the research activities since 2000 were directly linked to specific management questions in a potential biosphere reserve. They include:

- Vegetation of the Yayu forest in SW Ethiopia: impacts of human use and implications for *in situ* conservation of wild *Coffea arabica* populations. This research was part of the doctoral research of Gole (reference), which began in June 2000 and was completed in July 2003. The study developed initial biophysical criteria for zoning of the biosphere reserve, especially the core areas.
- The conservation and use of wild populations of *Coffea arabica* in the montane rainforests of Ethiopia (CoCE) Project was funded through the program "Biosphere research - Integrative and application oriented model projects (BioTEAM)“ of the German Federal Ministry for Education and Research (BMBF). CoCE is an integrated, multi-disciplinary research project with the aim of generating information for management approach based on the biosphere reserve concept. The research works of the CoCE project investigated biodiversity (at genetic, species and ecosystems level), socio-economic and institutional aspects of the communities in the vicinity of coffee forests, their interaction and at causes of deforestation. The CoCE project outputs contributed to identification of core areas and the development of management guidelines for the buffer zone and the biosphere reserve as a whole.
- The management guidelines for the Yayu Biosphere Reserve have been developed based on the knowledge generated by the CoCE research project and on numerous discussions the ECFF has held with local communities.
- With support from the German Federal Agency for Nature Conservation (BfN) the demarcation and zoning of the biosphere reserve has been re-worked in order to be compatible with the needs and expectations of local communities. As a result, previous conflicts on land use rights have been solved.
- Remote sensing and GIS assisted participatory biosphere reserve zoning for wild coffee conservation: the case of Yayu forest. This project produced different maps and biosphere reserve zones using biophysical as well as socio-economic criteria.

15.1.2. Brief description of <u>past</u> research and/or monitoring activities

[Indicate the dates of these activities and extent to which the research and monitoring programmes are of local/national importance and/or of international importance.]

Research of international importance includes those research works conducted by multi-national individuals and organizations as well as those published in scientific journal and recognized books and proceedings of international conferences. Those of national interest cover all research activities on the area.
Environmental monitoring of international importance are conducted by individuals or organizations representing more than one country and/or those used in international synthesis at international level.

•**Abiotic research and monitoring** [climatology, hydrology, geomorphology, etc.]

Research works accomplished in the past include:

- Description of Precambrian rocks, tertiary basalt and weathering (Mohr 1971)
- Soil surveys, description of soil types and maps by FAO and the national atlas of Ethiopia (EMA 1988)
- Basin development studies on surface and ground water, geomorphology (MoWR 1996)
- Studies on coal phosphate deposit and its potential for exploitation
- Assessment of natural caves, waterfalls and other natural heritage in the area, and their eco-tourism potentials (unpublished report 2007)

Monitoring on works includes:

- Measurement of water flows in main rivers
- Measurement of land degradation, specially soil erosion by water
- Recording of weather data at Yayu and other sites in the area by the National Meteorological Agency
- Soil samples in coffee forests under different management intensity
- Water quality and availability in small wetlands (e.g., Ethio-Wetlands Association 2000)

• **Biotic research and monitoring** [flora, fauna]:
Research: Since the second half of the twentieth century, several research activities were conducted. These include:

- Studies on the forest vegetation of the region, since the 1970s, by Addis Ababa and Copenhagen universities (Friis ,1979; 1983; 1992)
- Studies on diversity and distribution of mammals in the area by Joint Ethio-Russian Biological Expedition (JERBE) since 1990s.
- Past forest cover type reconstruction from studies on forest (e.g. Bonnefille et al., 1993)
- Floristic composition and environmental factors characterizing coffee forests (e.g. Gole et al., 2008)
- On the origin of *C. arabica* – and its diploid progenitors, as well as the genetic diversity of the wild populations compared to cultivars (e.g. Tefaye, 2006)
- Coffee quality, particularly the search for low-caffeine coffee in wild population
- Disease tolerance of wild population of *C. arabica*
- Inventory of the forests of south-west Ethiopia (e.g. Chaffey, 1979; Reusing, 1998)
- Avifaunal diversity and distribution of important bird areas of Ethiopia (EWNHS, 1996)
- Mammals diversity and distribution (e.g. JERBE publications)
- Distribution of epiphytes along disturbance gradient
- Human impacts on vegetation structure and diversity (Gole, 2003)
- Coffee cup quality and its relation with environmental factors (Yadessa et al., 2008).

Monitoring:

•**Socio-economic research** [demography, economics, traditional knowledge, etc.]:

Socio-economic research of international importance
List of socio-economic research of international importance are:

The CoCE project has produced several publication over the last seven years. Some sample publications are listed here. More can be found at: http://www.coffee.uni-bonn.de/project-outputs.html).

- Incentive mechanisms for sustainable use systems in the montane rain forest in Ethiopia (Rojahn, 2006; Seyoum, 2008;)
- The economic value of coffee (*Coffea arabica*) genetic resources (Hein & Gatzweiler, 2006)
- Certification of wild coffee in Ethiopia (Wiersum et al., 2008)

Socio-economic research of local/national importance
List of socio-economic research of local/national importance are:

- Socio-economic drivers of deforestation (Tadesse, 2007)
- People of the Plow: an agricultural history of Ethiopia (McCann, 1995)
- Local level institutions influencing coffee forest conservation (Toli, 2006)

More can be found at: http://www.coffee.uni-bonn.de/project-outputs.html).

15.1.3. Brief description of <u>on-going</u> research and/or monitoring activities:

•Abiotic research and monitoring [climatology, hydrology, geomorphology, etc.]:

- Predicting Climate Change Effects on Reproductive Phenology and Distribution of Coffea Arabica in the Afromontane rainforests of Ethiopia.. The objectives of the research project are to: (1) define the physical correlates of *Coffea arabica* in the rainforests in Ethiopia and develop a model based on climatic parameters to predict the potential present day distribution of the species; (2) investigate the variability in patterns of reproductive phenology of *Coffea arabica* populations under different climatic conditions in the rainforests; (3) investigate the potential shifts in the distribution of the species and phenological patterns with projected climate change in the future for 2050 under middle range climate scenario; (4) to evaluate the role that the rainforests in Ethiopia will play for the long-term conservation of coffee genetic resources; (5) stimulate the arising awareness of the impact of climate change and, furthermore, allow specific mitigation measures to be planned and implemented as well as proposing a general policy framework or strategy for attempting the conservation of the *Coffea arabica* gene pool in the rainforests in Ethiopia. The project is supported by the International START Secretariat through the Climate Change Adaptation in Africa program (CCAA).

• Biotic research and monitoring [flora, fauna]

Some of the ongoing research projects are:

- **The role of institutions for forest resource and livelihood management in East African forest landscapes- (IFLEA)** The objectives of this project are to strengthen research capacities, to better understand the role of institutions and institutional change for sustainable natural resource management and livelihoods in East African forest landscapes. The existing research network on forests and institutions (IFRI), which began in 1993 and includes partners from Uganda, Kenya and Tanzania, has produced pioneer knowledge on the importance of institutions for sustainable livelihoods in forest landscapes. This project is financed by the Volkswagen Foundation of Germany, and will run from 2009 to 2011.

- **Conservation and use of the wild populations of *Coffea arabica* in the montane rainforest of Ethiopia-(CoCE)** the aims of this project are to assess the diversity and the economic value of the montane rainforests and the wild coffee gene pool and to develop model concepts for their conservation and use, based on the *in-situ* conservation of genetic diversity linked to the conservation of species diversity of the forest. It has many components (1) Species diversity and ecology of coffee forest, (2) Genetic Diversity of Coffee Forest in Ethiopia (Molecular, Ecophysiology, coffee dieases) and (3) Economic analysis. This project is financed by German Federal Ministry for Education and Research (BMBF), and will run from 2002 to 2009.

•Socio-economic research [demography, economics, traditional knowledge, etc.]:

- CoCE and IFLEA projects described above.

15.1.4. Brief description of planned research and/or monitoring activities:

Most of the research works in the past focused biodiversity of plants. Through CoCE, woody biomass strategic planning, forest genetic resources the Flora of Ethiopia projects, and many other small individual studies, it was possible to generate enormous data on the diversity, distribution and conservation status of plants in Ethiopia, and in particular for proposed biosphere reserve area. Including, research works on:

•Abiotic research and monitoring [climatology, hydrology, geomorphology]:
Research areas identified for future stud include:

- Land-use dynamics and its effects on biodiversity conservation by ECFF
- Vulnerability of coffee production to climate change in Ethiopia by ECFF
- Application of coffee husk for soil fertility management- by ECFF

•Biotic research and monitoring [flora, fauna]:
Research areas identified, including draft proposal prepared by ECFF include:

- **Comparative biodiversity studies in four watersheds with different socio-cultural setting along Nile Basin, Ethiopia.** The aims of this study are to: (1) assess the contribution of different forest fragments for biodiversity conservation in degraded landscapes, (2) to assess the changes and the relationship between species richness, vegetation structure, and other indicators of anthropogenic disturbance in different forest fragments And, in particular, to: (1) assess the diversity of plant and animal species in the different forest fragments varying in size and shape, (2) to assess the impact of forest fragmentation on the physical and chemical properties of the soil, (3) to evaluate tree biodiversity parameters in traditional agroforestry systems as population increases and fallows become shorter, (4) to assess perception of the local communities on the existing forest fragments and (5) the importance of the forest fragments for the livelihoods of the local communities in the study areas

- **Conservation-Oriented Research and Implementation of Ethiopian Coffee Genetic Resources.** The overall goal of this project is to assess the diversity of the coffee gene pool in south-western Ethiopia and to develop a strategy for *ex situ* and *in situ* conservation. In addition, the project will aim to (1) assess the diversity of plant species in different coffee forests, (2) assess the genetic diversity of the wild coffee populations, with special emphasis on pest and disease resistance, caffeine content and other agronomic characters, and (3) assess the institutional set-up and forest resources and coffee use/ management arrangement (analysis of both local and government institutions).

- **Selection of wild coffee accessions** for good quality, productivity and disease tolerance by Jimma Agricultural Research Center (JARC), in collaboration with ECFF

- **Evaluation of shade trees** for soil fertility management and coffee quality in transition areas, by ECFF

- **Selection of effective biological enemies** for major coffee diseases and pests, by ECFF in collaboration with Addis Ababa University and JARC.

•Socio-economic research [demography, economics and traditional knowledge]:
Research topics identified, with implications for proposal development include:

- **Increasing incomes of smallholder coffee farmers through improved production, processing, marketing and income source diversification in southwest Ethiopia.** The objectives of the project are to strengthen and increase the income of smallholder farmers through improved coffee management, production, processing, and marketing, and to diversify income sources of smallholder farmers through integrated management of non-timber forest products like honey, beeswax and spices. The concept was developed by Jimma University in collaboration with Wageningen University and ECFF.

- **Sustainable Coffee Production by Smallholder Farmers in Ethiopia: an integrated approach for quality improvement, poverty reduction and biodiversity conservation**- To promote investment in improved coffee production management practices and processing through project intervention and creation of conditions for better access to credit and banking services to small holder farmers. This will improve the farmers' capacity to benefit from the supply chain through improved marketing and establishment of a producer-exporter linkage, with appropriate support from the public sector, i.e., the establishment of strong public private partnership. The programme will also carry out studies that support product quality improvement, income diversification, better extension services and marketing. The concept was developed by ECFF, in collaboration with Illy Caffe´ SPA.

15.1.5. Estimated number of <u>national</u> scientists participating in research within the proposed biosphere reserve on:

- a permanent basis: 5
- an occasional basis: 30

15.1.6. Estimated number of <u>foreign</u> scientists participating in research within the proposed Biosphere Reserve on:

- a permanent basis: 2
- an occasional basis: 10

15.1.7. Estimated number of masters and/or doctoral theses carried out on the proposed biosphere reserve each year:

- Doctoral thesis: 15
- Masters theses: 31

15.1.8. Research station(s) <u>within</u> the proposed Biosphere Reserve:

[.1..] = permanent [3.] = temporary

DararaBuna Biodiversity Conservation Research and Education Center. It is planned that this facility will be established in Yayu town, withn the next two to three years.

15.1.9. Permanent research station(s) <u>outside</u> the proposed Biosphere Reserve:
[If no permanent research station exists within the proposed Biosphere Reserve, indicate the location, distance to the core area, name and address of the most relevant research station]

- Metu Agricultural Research Center (c. 20 km away)
- Jimma Agricultural Research Center (c. 200 km away)
- Jimma University (200 km)
- Metu University (25 km)
- Wollega University (150 km)
- Addis Ababa University (550 km)

15.1.10. Permanent monitoring plots
[Indicate the year established, the objective of monitoring, the type and frequency of observations and measurements, and whether an internationally recognized protocol is being used, for example the Smithsonian-MAB MAPMON protocol for monitoring forest biodiversity]:

The ECFF is the the Collaborating Research Center (CRC) of the International Forestry Resources and Institutions (IFRI, Bloomington, USA) . IFRI CRCs are networks of research centers, looking at forest condition and institutions, and monitoring changes in around 17 countries in the world. In order to learn the protocol from other established centers in Eastern Africa, a new research project has been developed, "*The role of institutions for forest resource and livelihood management in East African forest landscapes, IFLEA www.iflea.uni-bonn.de)* in collaboration with the Center for Development Research of the University of Bonn in Germany, Makarere University in Uganda, Kenya Forestry Research and Sokoine Agricultural University in Tanzania.

15.1.11. Research facilities of research station(s)
[Meteorological and/or hydrological station, experimental plots, laboratory, computerized databases, Geographical Information System, library, vehicles, etc.]:

For the time being, there are limited research facilities in the proposed biosphere reserve. The Ethiopian Coffee Forest Form is in the process of establishing Darara Buna Biodiversity Conservation Research and Education Center in Yayu town, with some laboratory facilities for coffee quality, computer equipment, library, internet access, training facilities, demonstration sites and experimental fields. Besides these, there are three meteorological stations, which were established by CoCE project and the National Meteorological Services of Ethiopia. ECFF has other facilities like the permanent plots of CoCE and IFLEA projects, forest and tree measurement equipment and two 4WD vehicles.

15.1.12. Other facilities
[e.g. facilities for lodging or for overnight accommodation for scientists etc.]:

Currently, there are private hotels in and around the proposed biosphere reserve. In addition, the Ethiopian Coffee Forest Forum is planning to establish a guest house in the long-term that would include several accommodation possibilities at different price levels in the middle of the proposed biosphere reserve.

15.1.13. Does the proposed biosphere reserve have an Internet connection?

Yes, there is telephone connection in the area, with dial-up internet connection facilities. The whole area is within the mobile telephone network, and cellular phones work well in the area.

15.2. Environmental education and public awareness

[Environmental education -- sometimes now referred to as education for sustainable development -- can be aimed at schoolchildren, the adult population of the local communities, and visitors from home and abroad].

15.2.1. Describe environmental education and public awareness activities, indicating the target group(s):

The Ethiopian Coffee Forest Forum's (ECFF) mission is to contribute to conservation research, education, communication and awareness raising in the coffee forest areas of Ethiopia.

A number of environmental education and public awareness initiatives have been conducted in and around the proposed biosphere reserve. These also include activities that have been undertaken by local government institutions and non-governmental organizations.

Examples include:

Experts training

- In October 2006, a workshop on "Biodiversity Conservation and Poverty Reduction in Human Transformed Landscapes in Ethiopia" was organized for high-level policy makers and researchers, with presentations of local and international good practice, with special focus on biosphere reserves. This was organized by ECFF, in collaboration with German Federal Agency for Nature Conservation (BfN), the Center for Development Research (ZEF) and the Institute of Biodiversity Conservation (IBC).
- In October 2007, a training workshop on "Landscape planning for the establishment of a biosphere reserve in coffee forest areas of Ethiopia" was organized by the ECFF in collaboration with BfN, ZEF, and IBC. The aims of the training workshop were to create awareness about conservation and sustainable use of biodiversity at various levels, particularly to train scientists and administrators in landscape planning in human-transformed landscapes with the emphasis of biosphere reserves. Over 50 individuals from federal and regional government institutions, non-governmental organizations and international experts participated. At the end of this training workshop, a road map for the Yayu Coffee Forest Biosphere Reserve Initiative was prepared with details of the activities to be carried out over the years to come.
- In November 2008, a training workshop on "Biosphere Reserve and Its establishment Processes" was organized in Yayu town by ECFF and ZEF. On the training scheme were experts and local administrators from the six districts (woredas) within the proposed biosphere reserve.
- April, 2009, a National Workshop on Biosphere Reserve and Landscape Planning was organized. On this workshop, basic training on landscape planning as a tool for biosphere reserve zoning was given. It was organized by the ECFF in collaboration with BfN, ZEF, IBC and UNESCO Addis Office.

School children environmental education

- As part of a public awareness raising program (in July/August 2008), a School Children Talent Competition Award was organized together with BfN to promote school children's awareness on environmental issues, and encourage them to use their natural talents to express their perception about their environment, using songs, painting/visual art and poems. Over 70 school

students aged 12 years or under, from 40 schools in two coffee forest areas, namely Yayu and Sheko forests, participated on the competition. At the end, awards were given to the best students at two levels: regional and national. The winners were given certificates and material awards. The award ceremony was attended by many guests including the donors and regional and federal officials.

Community training

- Community training in October 2008. The involvement of relevant stakeholders, especially the local communities, is the key issue for the success of any development initiative including a biosphere reserve. In order to facilitate this involvement, 26 farmers living in and around the Yayu forest were identified and trained as para-ecologists, in October 2008. The training focused on methods of forest sampling, plant identification, coffee disease and forest management. The idea is that these trained personnel can be actively involved in research and conservation activities, and assist in the realization of the initiative and other development initiatives in the area.
- In 2009, over 100 farmers and community representative were trained in the biosphere reserve concept and its potentials for development.

Public awareness (together with MUs????)

- Over 10 public meetings were held at various places in and around the proposed biosphere reserve area in the years 2007 to 2009. These meetings were set up to introduce the concept of the biosphere reserve in detail, for key stakeholders and local communities, and to clarify the remaining tasks for the biosphere reserve application. During one of these meetings, the Declaration for Yayu Biosphere Reserve initiative was developed, agreed upon and signed by key stakeholders. In virtue of the Declaration, the signatories committed themselves to carry out key actions: (1) awareness raising, information and education for conservation and sustainable development, (2) clarifying land demarcation, use rights, use rules and sanction for the biosphere reserve, (3) developing activities and capacity building in the biosphere reserve, and (4) strengthening institutional structure for collaboration between government and non-governmental agencies, and local communities. Additionally, four awareness creation workshops and meetings were organized by ECFF, for experts and policymakers/politicians at all levels-from local to federal.

Public awareness and training

- In April 2009, in order to show the efforts undertaken in order to broader stakeholder participation, the ECFF in collaboration with IBC, BfN, ZEF, and UNESCO-cluster Office in Addis Ababa organized a National Workshop on Biosphere Reserves and Landscape Planning. Over 60 people participated, representing the Federal and Regional states, mainly senior experts, policy makers, representatives of conservation and development initiatives in the country, international experts and UNESCO representatives. The workshop highlighted the potential and scope of the biosphere reserve approach. The new MAB-Africa initiative with specific reference to the implementation of the Madrid Action Plan was discussed and the suitability of the biosphere reserve approach for sustainable development in Ethiopia was demonstrated. Two coffee forest biosphere initiatives, the Yayu and Kafa Coffee Forest Biosphere Reserve Initiatives were also discussed, and the way forward for nomination elaborated.
- **Awareness creation for the general public.** For general public awareness raising, mass-media programs like radio and TV were used. We worked with the Ethiopian Radio Program on ‘Population and Environment’. The program presented a 30 minute broadcast twice in October

2008, based on activities of the project and public opinion. It focused on values of coffee forests for the farmers, the country and even for the world coffee industry, and how implementation of the BR concept helps to achieve the twin goals of conservation and use. The project also collaborated with DW TV journalist in the production a short reportage on coffee forests, with field visits and documentation in March 2008. The reportage was broadcasted by DW-TV in May 2008 on the program 'Made in Germany?' in German and English. It was also shown on the CBD COP 9 in Bonn, and could reach coffee consumers around the world. Additionally, a documentary video was made in April-May, 2008, mainly focusing on the conservation education activities, including public meetings with community members and development agents, lectures for students and presentation on international conferences like the CBD COP 9 in Bonn. This video is being edited in English, Amharic and Oromiffa languages, and will be used for further conservation education activities. In addition, the Yayu Coffee Forest Biosphere Reserve initiative was published three times under the Economy column of the national Ethiopian Herald and the Reporter Newspapers in April and May 2009.

15.2.2. Indicate facilities for environmental education and public awareness activities

[visitors' centre; interpretative programmes for visitors and tourists; nature trails; ecomuseum demonstration projects on sustainable use of natural resources]:

Facilities for environmental education include:

- Schools and public training centers in each village of the biosphere reserve area
- The Darara Buna Biodiversity Conservation Research and Education Center
- The Ethiopian Coffee Forest Forum office in Yayu and Addis Ababa
- Documentary films
- Projectors, photo and video cameras, and laptop computers.

15.3 Specialist training

[Acquisition of professional skills by managers, university students, decision-makers etc.]

[Describe specialist training activities: for example research projects for students; professional training and workshops for scientists; professional training and workshops for resource managers and planners; extension services to local people; training for staff in protected area management]

Over the past seven years, 15 researchers received high-level specialist trainings in different fields at PhD level. In addition, 31 researchers and experts were trained at Masters degree level in different disciplines. The training covered the following areas of specialization:

- Molecular systematics (Genetic diversity of coffee)
- Biodiversity of Plants (Ecology, botany)
- Coffee pathology and entomology
- Eco-physiology- drought tolerance of coffee
- Coffee quality- (sensory as well as biochemical)
- GIS and Remote Sensing
- Forestry
- Economics- (ecological/ resource economics, market chain analysis)
- Sociology/ Social anthropology
- Institutional analysis

Further to the above, three post-doctoral researchers have conducted research on coffee and forest biodiversity over the last three years.

ECFF staff members also visited Rhön Biosphere Reserve in Germany to gain experience on biosphere reserve management and associated research and development activities. Training workshops were organized by ECFF for numerous stakeholders in order to familiarize them with biosphere reserve and its management. These include:

- Landscape planning and BR zoning training workshop in 2007,
- Para-ecologists Training in 2007/2008,
- Training of Local Stakeholders on the concept of biosphere reserves in 2008,
- Workshop on Biosphere Reserves and Landscape Planning in 2009

15.4 Potential to contribute to the World Network of Biosphere Reserves

[Collaboration among biosphere reserves at a national, regional and global level in terms of exchange of scientific information, experience in conservation and sustainable use, study tours of personnel, joint seminars and workshops, Internet connections and discussion groups, etc.]

15.4.1. Collaboration with existing biosphere reserves at the national level

(indicate on-going or planned activities):

In Ethiopia, there are no biosphere reserves up to now. However, there are two biosphere reserve initiatives being nominated at the same time this year. These are:

1. Yayu Coffee Forest Biosphere Reserve Initiative
2. Kafa Coffee Biosphere Reserve Initiative

The two initiatives have been in collaboration since late 2008, trying to lobby policy makers to put the biosphere reserve issue on the national agenda and to establish UNESCO MAB National Committee. These two initiatives contributed key stakeholders for the identification of the committee, and developed the terms of reference of the national committee.

In April 2009, the Yayu Coffee Forest Biosphere Reserve initiative, led by ECFF organized a National Workshop on Biosphere Reserve and Landscape Planning, in collaboration with BfN, IBC and UNESCO Addis Office. The workshop was at the forefront of all lobby activities for biosphere reserves, since it engaged the President of the Federal Democratic Republic of Ethiopia, the Minister of the Ministry of Science and Technology, the State Minister of the Ministry of Agriculture and Rural Development, the Ambassador of Germany, the President of BfN, and many senior federal government and regional states officials.

Participants also included the Director of the Natural Sciences at the Division of Ecology and Earth Sciences of UNESCO-Paris, representatives of Afri-MAB, Ethiopian and German scientists. Beside the keynote address and different presentations on biosphere reserves, landscape planning and relevant scientific research works, the two initiatives presented their respective cases. This has created an opportunity for warm and mutually beneficial discussions. Based on two presentations and the research work of the CoCE project on coffee genetics, it was apparent that:

1. the Yayu forest represents a very unique area, with truly wild and very diverse coffee populations, and houses considerable biodiversity of local, national and global importance.
2. the Kafa (Bonga) Forest represents cultivated coffee types, and as such the coffee populations are genetically similar to cultivated (or subsets of cultivated coffee) found on farms in Eastern part of the country, rather than wild populations of Arabica coffee.

On discussion of the way forward with nomination process, it was agreed that the two nominations have their own peculiarities and are complementary to conserve both wild and cultivated coffee types, and serve as model sites for sustainable development in the country and continental level.

In the future, such collaboration will be strengthened via the establishment of biosphere reserves, and the two can serve as bench-marks and role models for others to follow.

15.4.2. Collaboration with existing biosphere reserves at the regional or subregional levels, including promoting transfrontier sites and twinning arrangements (indicate on-going or planned activities)

[Here, 'regional' refers to the regions as Africa, Arab region, Asia and Pacific Latin America and the Caribbean, Europe. Transfrontier biosphere reserves can be created by two or more contiguous countries to promote cooperation to conserve and sustainably use ecosystems which straddle the international boundaries. Twinning arrangements usually consist of agreements between sites located at some distance in different countries to promote activities such as cooperative research projects, cultural exchanges for schoolchildren and adults, etc.]

The Yayu Coffee Forest Biosphere Reserve Initiative, through its coordination office-ECFF, has started to establish a network with existing regional biosphere reserve networks. ECFF invited two members of the AfriMAB, from Benin and South Africa, to the National Workshop on Biosphere Reserves and Landscape Planning held in April 2009 in Addis Ababa. One of them, Dr. Bonaventure Guedegbe, UNESCO MAB focal person of Benin, attended the workshop and presented information about AfriMAB. Even though the AfriMAB member from the Cape West Biosphere Reserve of South Africa (Mrs Janette du Toit) could not attend the workshop, contact has been established. Two members ECFF plan to visit the Cape West Biosphere Reserve in October 2009. Additionally, one member of the biosphere reserve initiative plans to visit Dinder Biosphere Reserve in the Sudan in mid-November 2009. The biosphere coordination office will strengthen its network with the regional and sub regional (East Africa) biosphere reserves.

15.4.3 Collaboration with existing biosphere reserves in thematic networks at the regional or international levels (indicate ongoing and planned activities)

[Networks of sites which have a common geographic theme such as islands and archipelagoes, mountains, or grassland systems, or a common topic of interest such as ecotourism, ethnobiology etc.]

The proposed Yayu Coffee Forest Biosphere Reserve is unique in that its key conservation element is the genetic resources of Arabica coffee, an important global cash crop, and its forest habitat. No similar biosphere reserve is known to the initiative. Parenthetically, the East Usambara Biosphere Reserve in Tanzania is also found within the Eastern Afromontane Biodiversity Hotspot area. It is similar to Yayu forest as it also houses wild coffee. Even though coffee species at Usambara are non-commercial species they are wild crop relatives of coffee. Hence, there is a potential biosphere reserve for collaboration, beside the proposed Kafa Coffee Biosphere Reserve in Ethiopia.

15.4.4 Collaboration with existing biosphere reserves at the international level

(indicate ongoing and planned activities: [Notably through Internet connections, twinning arrangements, bilateral collaborative research activities, etc.]

From this initiative side, ECFF members have visited the Rhön Biosphere Reserve in 2007. Members of the initiative also visited UNESCO MAB program office in Paris, which has helped considerably in establishing contacts with AfriMAB members. Up to now, contacts have been made with these few biosphere reserves in Eastern Africa, South Africa and Benin. These contacts will be strengthened by further integration and collaboration in the future. The current East African Research project coordinated by ECFF will be used as an opportunity to establish stronger ties with the biosphere reserves in the region.

16. USES AND ACTIVITIES

16.1 Core Area(s):

16.1.1 Describe the uses and activities occurring within the core area(s):

[While the core area is intended to be strictly protected, certain activities and uses may be occurring or allowed, consistent with the conservation objectives of the core area]

The core areas consist of largely undisturbed montane rainforests along the Geba, Dogi, Saki and Sese rivers. The forest is also one of the few (but most important) refugia for wild Arabica coffee populations in the world.

The core areas are strictly protected from any kind of human use. Activities allowed in the core are limited to:

- Research and environmental monitoring
- Eco-tourism – with limited access from selected view points
- Education and training

16.1.2. Possible adverse effects on the core area(s) of uses or activities occurring within or outside the core area(s):

(Indicate trends and give statistics if available)

Adverse effects on the core area come from land use activities being carried out close to or outside the core area, and in many cases even outside the proposed biosphere reserve, such as agricultural land expansion, wetland degradation, overgrazing and sometimes forest fires.

The following accounts have concentrated on the adverse effects that occur as a result of activities close to the proposed biosphere reserve.

Examples of adverse effects on the core area:

- Loss of forest cover due to conversion to agriculture, and associated loss of wild populations of coffee (genetic resources loss)
- Decline in biodiversity in managed forests like semi-forest coffee system
- Habitat loss, and loss of wild animals
- Loss of ecosystem / landscape level biodiversity

Trends of forest cover change over the last 30 years show relatively little change in the area. During the same period, the highland plateau of southwest Ethiopia has lost over 60% of forest cover (Reusing, 1998; Gole et al., 2002). In Yayu, however, there was only 7% cover change during that same period (Getaneh, 2009). Hence, Yayu forest is an eminent safe haven for wild coffee conservation.

16.2. Buffer zone(s)

16.2.1 Describe the main land uses and economic activities in the buffer zone(s):

[Buffer zones may support a variety of uses which promote the multiple functions of a Biosphere Reserve while helping to ensure the protection and natural evolution of the core area(s).]

Most parts of the buffer zone consist of managed coffee forests, as semi-forest coffee production system.

Land use activities carried on within the buffer zones include:

- Coffee production, using local coffee of wild origin
- Beekeeping, and extraction of different non-timber forest products

- Fuel wood collection
- Afforestation and reforestation
- Agroforestry
- Hunting and fishing
- Transport(roads) and power lines

16.2.2 . Possible adverse effects on the buffer zone(s) of uses or activities occurring within or outside the buffer zone(s)in the near and longer terms:

Examples of possible adverse effects on the buffer zone:

- Reduced biodiversity through intensive use of the land, e.g. for agriculture and forestry,
- Reduction in structure and diversity of the vegetation in semi-managed forest coffee system
- Loss of wild coffee populations and possible replacement by improved varieties (genetic erosion)
- Total clearance of forest/plantation or conversion to agriculture
- Degradation of wetlands and the associated plants and animal species
- Degradation of grazing lands and associated environment

16.3. Transition area

[The Seville Strategy gave increased emphasis to the transition area, since this is the area where the key issues on environment and development of a given region are to be addressed. The transition area is by definition not delimited in space, but rather is changing in size according to the problems that arise over time. Describe briefly the transition area as envisaged at the time of nomination, the types of questions to be addressed there in the near and the longer terms. The size should be given only as an indication]

16.3.1 Describe the main land uses and major economic activities in the transition area(s):

The transition area within the proposed biosphere reserve consists largely of agricultural land, forest fragments, villages and dispersed settlements.

Examples of land use activities that are being carried out in the transition area include:

- Agriculture
- Surface and ground water uses for domestic consumption, industry and irrigation
- Forestry
- Agroforestry (semi-forests and homegardens)
- Livestock rearing
- Honey production
- Tourism and recreation
- Transport and communication: roads and telephone lines
- Settlement
- Trade and small industrial activity

16.3.2 Possible adverse effects of uses or activities on the transition area(s):

Examples of the adverse effects on the transition area of land use or other activities are:

- Reduced biodiversity through intensive agriculture, e.g. loss of traditional land races of crop plants and replacement by improved varieties
- Soil erosion, and loss of fertility
- Shortage of fuelwood
- Pollution from coffee processing plants/ washing stations

- Degradation of wetlands through draining the water for irrigation and also through over grazing or farming
- Degradation of grazing land through over grazing

17. INSTITUTIONAL ASPECTS

17.1. State, province, region or other administrative units:

[List in hierarchical order administrative division(s) in which the proposed Biosphere Reserve is located (e.g. state(s), counties, districts)]

Country: Federal Democratic Republic of Ethiopia
Regional State: Oromiya National Regional State
Administrative Zone: Illubabor zone (locally also referred to as- Ilu Abbaa Boraa)
District (Woreda): Yayu, Dorani, Hurumu, Bilo-Nopha, Alge-Sachi, Chorra

17.2 Units of the proposed biosphere reserve:

[Indicate the name of the different land management units (as appropriate, e.g. protected area, territories of municipalities, private lands) making up the core area(s), the buffer zone(s) and the transition area).

The core areas are the interior parts of the biosphere reserve, representing the Yayu Coffee Gene Reserve (Oromiya, new proclamation awaiting enactment) within the Yayu National Forest Priority Area (NFPA), which falls under state forest according to Forest Proclamation 542/2007 (Article 3). The buffer zone is also part of the NFPA. However, use rights for coffee production by smallholders have been given to the local community. It is currently used for coffee production as semi-forest coffee system by farmers.

The current core areas include areas that were demarcated Geba-Dogi Forest Coffee Conservation Area by the Government in 1998. However, it was not legally gazetted. During a landscape planning and biosphere reserve training workshop held in Metu in October 2007, local experts suggested that the core are include undisturbed forests along Sese river, which were not included in the 1998 demarcation. The core area is divided into five districts (woredas), namely- Yayu, Hurumu, Bilo-Nopha and Alge-Sachi. Though it is contiguous, it has five compartments due to presence of roads and foot paths crossing through the forest.

17.2.1. Are these units contiguous or are they separate?

[A biosphere reserve made up of several geographically separate units is called a "cluster biosphere reserve". Please state if this is the case of the proposal.]

All the management units (core, buffer, transition) in the proposed biosphere reserve are contiguous, but five compartments of the core areas are separated by roads and foot paths (see Figure 3). The core areas are always surrounded by the buffer zones, which in turn are surrounded by the transition area.

17.3. Protection Regime of the core area(s) and, if appropriate of the buffer zone(s)

The zonation that applies to the proposed Yayu Coffee Forest Biosphere Reserve is based on existing national and regional governments' laws on environment, land administration and a new regulation of Oromiya National Regional Government for the Establishment of Yayu Coffee Gene Reserve (awaiting enactment).

17.3.1Core area(s):

[Indicate the type (e.g. under national legislation) and date since when the legal protection came into being and provide justifying documents (with English or French summary of the main features)

The core areas in the proposed biosphere reserve consists of 27,733 ha (16.6% of the total biosphere reserve). All parts of the core areas are protected by the Regulation for the Establishment of 'Yayu Coffee Gene Reserve' of the Oromiya state, soon to be enacted. The core areas are found within the Yayu National Forest Priority Area, legally protected as "State Forest" by the federal government (Proclamation No. 542/2007). Such natural forests are also afforded protection by the Constitution of the Federal Democratic Republic of Ethiopia (FDRE).

The new law, Regulation for the Establishment of 'Yayu Coffee Gene Reserve', is based on existing relevant federal and regional governments' laws and the constitution. The relevant laws include:

- The Constitution of the Federal Democratic Republic of Ethiopia (1995). Article 52 deals with powers and functions of the Regional Governments and Article 92 outlines the environmental objectives.
- Environmental Protection Organs Establishment Proclamation No. 295/2002, which stipulates the power of regional governments to establish an independent regional environmental agency or designate an existing agency that shall, based on the Ethiopian Environmental Policy and Conservation Strategy and ensuring public participation in the decision making process, be responsible for (a) coordinating the formulation, implementation, review and revision of regional conservation strategies, and, (b) environmental monitoring, protection and regulation
- The Federal Rural Land Administration and Land Use Proclamation No. 456/2005 Article 17 states the Responsibility of Regions to enact rural land administration and Land use law, which consists of detailed provisions necessary to implement this Proclamation
- The Federal Forest Development, Conservation and Utilization Proclamation No.542/2007, which gives power to regional states to designated, demarcate (Article 8), administers and protects forest areas by enacting laws (Article 18), various purposes, including genetic resources (Article 11, 2b).
- Oromia Rural Land Use and Administration Proclamation 56/2002, and Forest Proclamation No. 72/2005.

The regulation for the establishment of Yayu Coffee Gene Reserve is aimed at the conservation of *Coffea arabica* genetic resources and its forest habitat in the center of origin.

17.3.2 Buffer zone(s):

[Indicate the type (e.g. under national legislation) and date since when the legal protection came into being and provide justifying documents (with English or French summary of the main features. If the buffer zone does not have legal protection, indicate the regulations that apply for its management.)

The Buffer zone is also legally part of the National Forest Priority area, given legal protection as state forest (Proclamation 542/2007). However, this is the forest area primarily managed for coffee, spices and honey production (also allowed by this law- Article 11 (6)). In the management guidelines, the buffer zone is proposed for the same purposes, but with a standardized practice and indicators for monitoring (see Appendix. 5).

Other relevant laws are:

- Federal Rural Land Administration and Land Use Proclamation No. 456/2005
- Oromia Rural Land Use and Administration Proclamation 56/2002 and
- Oromia Rural Land Use and Administration Regulation No. 39/2003

17.4. Land use regulations or agreements applicable to the transition area (if appropriate)

The land use regulations applicable to the transition zone are set out in relevant federal and regional governments' laws, notably:

- Federal Rural Land Administration and Land Use Proclamation No. 456/2005
- Oromia Rural Land Use and Administration Proclamation 56/2002 and
- Oromia Rural Land Use and Administration Regulation No. 39/2003

Regulation No. 39/2003 of Oromiya stresses proper use of land. In cases of no use for three years, the use rights of land can be revoked (Article 22.1). Article 17 imposes a number of obligations on land use practices. Based on these laws, and local practices, the management guideline for Yayu Coffee Forest Biosphere Reserve has also outlined recommended management practices. Hence, the transition area contains a variety of agricultural activities, human settlements and other land uses; and has great economic and social significance for regional development.

Land use activities allowed in the transition areas include

- Agricultural activities such cereal farming, coffee, mixed farming, spice farming.
- Livestock development and grazing.
- Coffee management.
- Collection of firewood or fuel wood.
- Settlements and schools.
- Establishing coffee washing machines, preferably eco-friendly washing machines introduced by TechnoServe in order to minimize pollution.
- Establishment of all necessary infrastructures.
- Traditional extractive uses of spices, wild edible fruits and medicinal plants.
- Domestication of spices and traditional medicinal plants.
- Establishing forest plantation using native species.
- Planting native and exotic multipurpose plant species.
- Establishing tourism and education centres.
- Wild honey harvesting and modern apiculture management.
- Hunting of wild animals, if necessary.
- Maintenance of at least 10 to 20 trees on farms.

Activities not allowed

- Farming and/or clearing forests along river banks and wetlands.
- Polluting rivers/streams by using waste disposal from coffee depulping or wet washing machine is strictly forbidden.
- Harvesting and use of endangered tree species either for household or market consumption is strictly forbidden, e.g., *Prunus africana*.
- Misuse of or change of historical landscapes or places, e.g., the Abba Gada site.
- Removal of vegetation that may cause damage to historical places.
- Establishing factories that change the existing landscape and also encourage immigration of people. But with the consultation of BR Management Unit some activities may be allowed.

17.5. Land tenure of each zone:

[Describe and give the relative percentage of ownership in terms of national, state/provincial, local government, private ownership, etc. for each zone.]

As per *Article 40* of the 1995 Constitution of the Federal Democratic Republic of Ethiopia, the rights to ownership of rural and urban land, as well as of all natural resources, is vested in the state and the people of Ethiopia. Land is common property of the Nations, Nationalities and Peoples of Ethiopia and shall not be subject to sell or other means of exchange. The Rural Land Administration and Land Use Proclamation No. 456/2005 states that the "right to land is exclusively vested in the state and in the people" and grants only "holding rights" to users. Holding rights include leasing rights and inheritance rights. So, practically, all areas of the proposed biosphere reserve are state property, and farmers only have use rights on some.

17.5.1. Core area(s):

The core areas are 100% owned by the Ethiopian government, and designated as state forest as well as coffee gene reserve. Currently the Oromiya Forestry and Wildlife Enterprise - Illubabor Branch is, authorised by Oromiya National Regional State to administers the forest.

17.5.2. Buffer zone(s):

The buffer zone is also part of the state forest, and 100% under government ownership. The Oromiya Forestry and Wildlife Enterprise - Illubabor Branch is authorised to administer the forest. Farmers have use rights on plots of the forest allocated to them, to produce coffee, spices and honey, with technical support from the Agriculture and Rural Development Office.

17.5.3.Transition area(s):

Like other lands, all areas in the transition areas are also 100% state property. In general, 80% are utilized by farming communities for agricultural production, 10% as communal grazing land, 5% are not convenient for any agricultural activity and 5% comprise settlement area. Formers are granted "lifelong usufruct rights" (Article 6.1) by the Oromia Rural Land Use and Administration Proclamation 56/2002. The proclamation grants "lifelong usufruct rights" (Article 6.1) to agricultural land "free of payment" in the area.

17.5.4. Foreseen changes in land tenure:

[Is there a land acquisition programme, e.g. to purchase private lands, or plans for privatization of state-owned lands?]
There is no foreseen change in land tenures, as Oromiya Proclamation 56/2002 clearly rules out redistribution of land plots.

17.6. Management plan or policy and mechanisms for implementation

[The Seville Strategy recommends promoting the management of each biosphere reserves essentially as a "pact" between the local community and society as a whole. Management should be open, evolving and adaptive. While the aim is to establish a process leading to elaborating a comprehensive management plan for the whole site reflecting these ideas and involving all stakeholders, this may not yet exist at the time of nomination. In this case however, it is necessary to indicate the main features of the management policy which is being applied to guide land use at present for the area as a whole, and the 'vision' for the future.]

In 1998, parts of the current core areas were demarcated as Geba-Dogi Forest Coffee Conservation Area. Following this, the government launched Geba-Dogi Forest Coffee Conservation Project in 2003, which ends in December 2009. The project used the biosphere reserve concept and categorized the forest and its surrounding landscape as core areas, buffer zones and transition areas. The overall policy is strict protection of core areas and limited use rights in the buffer zones. However, there was no proper management plant ready for implementation from the start. In 2006, the Ethiopian Coffee

Forest Forum (ECFF), as part of the activities of CoCE project, began different activities together with the Geba-Dogi Forest Coffee Conservation project and other government partner organizations. Preparation of the management guidelines for the different zone began also during the same year, based on the CoCE finding and existing local management practices. In 2007, the core areas, buffer zones and the transition areas expanded to include areas further to the north and to the west, based on the recommendations of stakeholders and local experts, on the occasion of landscape planning and biosphere reserve zoning training workshop held in Metu. During this training, local biosphere reserve taskforce (TF) was also formed, of which ECFF is a member and coordinator. Continuous consultations with TF members, and community representatives were conducted to develop the management guidelines, which acceptable by all stakeholders.

In November 2008, the process entered a new phase, when experts and local authorities met and passed a declaration to adopt the UNESCO Biosphere Reserve concept for the management of the proposed biosphere reserve (See Appendix 11). In December 2008, "Yayu Coffee Forest Biosphere Reserve Management Unit" was formed at Zone level (Appendix 10). The management unit comprised the Zone Administration, the then Illubabor Forest Enterprise (now Oromiya Forestry and Wildlife Enterprise- Illubabor Branch), the Illubabor Zone Agriculture and Rural Development Office and Illubabor Zone Peace and Security Office. The Illubabor Zone Land and Environmental Protection office also joined the MU later after the regional Bureau was formed by Proclamation No. 147/2009. Similar MUs were also formed consecutively, at lower administrative structures, namely district (Woreda) and village (Kebele) levels. The MU conducted intensive regular meetings (every month) as of January 2009. It also held various consultative meetings with stakeholders, local authorities, and community members. The management guideline was among the discussion agendas. After continuous discussions, it was approved by the MU in March 2009. Implementation of the management guideline commences in 2010.

17.6.1. ***Indicate how and to what extent the local communities living within and next to the proposed biosphere reserve have been associated with the nomination process***

[This can range from being an entirely locally driven initiative, to a more 'top down' approach led by government authorities or scientific institutions. Describe the steps taken and the stakeholders involved]

The idea of conserving coffee genetic resourcess emanated from the scientific research and concerns of habitat loss due to deforestation (Gole et al., 2002). Similarly, the idea of creating a biosphere reserve in the area originated from previous research work (Gole et. al., 2002; Gole, 2003) and the CoCE project (http://www.coffee.uni-bonn.de/project-outputs.html).

Research on coffee forests was undertaken by Ethiopian and German scientists. The CoCE research project began in 2002. In 2004, it was realized that a forum that brings researchers, policy makers and parishioners together for the implementation of the research outputs is required. A discussion forum was started during the same year. After a couple of discussions, it was realized that an independent organization which bridges the gap between science, policy and practices was required. In 2005, the Ethiopian Coffee Forest Forum (ECFF) was established as a non-profit, non-government organization as per the Ethiopian law, to bridge this gap and ensure the continuation of action research and development activities after the project ends. ECFF started implementation oriented activities, mainly the Biosphere reserve establishment process, by taking up results of the 1st phase (2000-2006) and coordinating all activities of the second phase (CoCE-II; 2006-2009).

ECFF conducted different workshops and public meetings between 2006 and now (2009), to create awareness about biosphere reserve and disseminate findings of the project. As a new organization,

ECFF received technical and financial support from the German Federal Agency for Nature Conservation (BfN) and the Center for Development Research (ZEF). Different means of communications were used to create awareness. These include:

- Workshops and public meetings, with more tha ten workshops organized, and public meetings
- Presentations on national and international workshops to get feed-back and disseminate information (e.g. PFM conference in Addis Ababa- March 2007; Coffee Conference in Addis Ababa- August 2007; COP9 of CBD in Bonn- May 2008; BIOTA Africa- October 2008).
- Public media, organized media trips for journalist, which enabled them to provide information for radio and TV programs, and newspapers.
    - The biosphere reserve concept was presented on 6 different occasions on the national radio programs called "Population and Environment.
    - National TV programs broadcasted three workshops during news hours.
    - Dutche Welle TV broadcasted a program in Global 3000 program, also posted on YouTube (http://www.youtube.com/watch?v=5T_8wIpU5xg).
    - Documentary Film on the initiative prepared for education purpose in 2008.

Two years after its establishment and engagements in information dissemination, ECFF had strong local support in 2007, leading to establishment of local task force (TF) at Illubabor zone level. The TF evolved to Management Unit (MU) at zone in 2008. In 2009, the initiative has become more institutionalized at local levels, and reached a stage at which it can be considered as a local initiative. The MUs were formed at all Kebeles (ca. 30) falling in buffer and core areas and all six Woredas (districts). This has given a great moment to speed up the nomination process. The local communities have also participated in zoning of the biosphere reserve, especially in demarcations between core areas and buffer zones, to avoid use rights conflicts.

On three different occasions, the President of the Federal Democratic Republic of Ethiopia participated on workshops as guest of honour, including the ministers and state ministers of Science and Technology and Agriculture and Rural Development.

17.6.2 Main features of management plan or land use policy

(Describe the 'vision' of what the proposed biosphere reserve is expected to achieve in the short and longer term, and the benefits foreseen for the local communities and other stakeholders)

The overall vision of the biosphere reserve is to achieve sustainable development through improving the livelihood of the people in the area while conserving the genetic resources of coffee and other components of biodiversity in the region.

The biosphere reserve shall achieve the following in short terms (three to five years), in terms of three functions of a biosphere reserve:

Conservation

- Conservation of core areas ensured through community participation. In the past, protected forest areas were guarded with establishment of the biosphere reserve the community and government participants agreed to stop further expansion into core areas for any development activities. Trained para-ecologists conducted assessments and monitoring of the forest condition every two years. The management units, in collaboration with designated authorities regulate activities to ensure proper implementation
- All forest plot users in the buffer zones trained and strictly following the management guidelines
- The proposed biosphere reserve become an active member of AfriMAB, and the world network of biosphere reserves

- Host one meeting and exchange visits of the AfriMAB network
- Major of the seedlings of coffee planted in the surrounding transition areas based on local coffee varieties to avoid genetic erosion on farms

Development

- Primary cooperatives of coffee producers established in 50% of the biosphere reserve
- Improved coffee processing technologies, including wet-processing plants introduced at five to ten sites, in collaboration Technoserve and Oromiya Coffee Farmers' Cooperative Union
- Significant increase in coffee plantations in marginal lands and transition areas
- About 25 to 30% of coffee produced in the buffer zone and some from transition areas certified and marketed with a premium price as specialty coffee. A similar regime initiated for other NTFPs, such as species and honey
- Coffee husk, which is produced at all processing plants, shall be used either for briquette (fuel) or compost (fertilizer)
- Development projects for income diversification, including fruits, vegetables and modern beekeeping, initiated with development agencies and private partners (e.g., Oxfam America, Illy Caffe', Oromiya Coffee Farmers Cooperative Union)
- "Darara Buna" coffee brand known in major local markets and some international markets
- Potential buyers identified and market linkage created for local products, and primarily for coffee

Logistic support

- Darara Buna Biodiversity Conservation Research and Education Center established and operational
- Demand driven/tailor made training for local experts, development agents and farmers offered at least two to three times per year
- Research partnership established with at least five local universities and two new international partner organizations (e.g., The Royal Botanic Gardens, Kew and the Botanical Museum of Berlin).
- Research and monitoring protocols in the biosphere reserve prepared.
- The area becoming one of the destinations for educational tours for school, universities and special training programs.

In the long term (five to ten years), the proposed biosphere reserve is expected to fully serve the three functions of a biosphere reserve.

Conservation

- The biosphere reserve shall be a model site for sustainable development and biodiversity in Ethiopia, and will share its successes with many others that follow its example
- The conservation status of the core areas to become more secure and be in better condition, or at least the same as when it was established,
- Expand the biosphere reserve areas into suitable surrounding areas,

Development

- Coffee production, processing and storage significantly improved: over 50% of the coffee shall be wet processed, with good storage facilities in each district
- Farmers begin to produces other commodities as source of income in the transition areas
- Over 50 to 75% of the coffee sold on the specialty market, either as certified forest coffee or Darara Buna coffee

- Most producers become members of primary cooperatives, and the Oromiya Coffee Farmers Cooperative Union

Logistic support

- Collaborative research projects on coffee, climate change, organic agriculture, fauna, and micro organisms, from the perspective of conservation and development
- Monitoring of forest conditions with para-ecologists and scientist on IFRI monitoring forest plots
- Darara Buna center becomes a recognized research center for biodiversity conservation, coffee quality and integrated development

17.6.3 The designated authority or coordination mechanisms to implement this plan or policy

(Name, structure and composition, its functioning to date)

There is a **Yayu Coffee Forest Biosphere Reserve Management Unit** established at all levels to facilitate and lead the biosphere reserve initiative. These include the Zonal Management Unit (at zonal level), District Management Unit (at district / woreda level), and Village Management Unit (at village level). The MUs at all levels have a chairman and four to seven key institutional members. The MUs coordinate all the steps towards the nomination process for the biosphere reserve establishment. The MUs were established and began operation by the end of 2008. As they will be part of and fully integrated into the existing administrative structure at village, at district and zonal level, there is little additional cost for performing their coordination and management functions.

The MUs are also responsible for implementation of the management guideline and management of the reserve. For instance, the MU at zonal level includes the Illubabor Zone Administration Office (Chairman), Oromiya Forestry and Wildlife Enterprise - Illubabor Branch (Secretariat), Illubabor Zone Agriculture and Rural Development Office, Illubabor Zone Peace and Security Office, Illubabor Zone Land and Environmental Protection Office and the Ethiopian Coffee Forest Forum (ECFF). The ECFF performs coordination and scientific advisory functions.

At village level the members of an MU include the Kebele Chairman, Village/Community Representatives, Kebele Manager, Youth Representative, Elders, Development Agent and Traditional leaders. The Zonal MU plays the leading role, and has its own founding charter, in which the goals, duties and responsibilities are clearly defined.

There are plans to establish a Biosphere Reserve Office at Yayu town. This office will be engaged in activities relevant to fulfil three functions of a biosphere reserve. The office shall also initiate and coordinate activities within the different management zones of the biosphere reserve, particularly core areas and buffer zone. The office initiates, supports and coordinates collaboration and operational activities by the other parties, i.e. the community/farmers, Agriculture and Rural Development offices, Forestry and Wildlife Enterprise, Cooperative offices, Farmers cooperative union and NGOs operating in the area.

17.6.4 The means of application of the management plan or policy

(For example through contractual agreements with landowners or resources users, traditional users' rights, financial incentives, etc.)

The management guideline is based on existing practices in different parts of the landscape, supported by scientific research findings, which will ensure sustainability. The overall implementation will be done by the MU at different administrative levels, i.e., Zone, district and village levels.

- The zonal MU inspects/overlook the implementation of the guidelines through

- Adoption of the zoning scheme and management guidelines and prescriptions for forest management and utilisation activities;
- Enhancing the capacity of local communities through training and establishing necessary infrastructures;
- Ensuring that plans to use within the management zones conform with the aims of that zone or area;
- Ensuring that modifications to the zoning scheme or other management strategies conform to the aims and targets established in the guidelines;
- Coordinate and supervise overall planned activities of the biosphere reserve.

- The district (woreda) and village MU is responsible for:
  - Ensuring that the local communities are aware of the plan;
  - Ensuring that the uses are in accordance with the management guidelines;
  - Implementation of specific actions in collaboration with zonal MU;
  - Supervision for the appropriate implementation of the guidelines and;
  - Inform local communities about the penalty in case of any rule breaking
  - Coordinate and supervise overall planned activities of the biosphere reserve.

In order to ensure proper implementation, member MU institutions shall take the leading role for activities in different management zone of the biosphere reserve. The core areas are managed by the Oromiya Forestry and Wildlife Enterprise (OFAWE) while managed forests are by individual farmers, with close follow up of the OFAWE regarding the forest and by the Agricultural and Rural Development Office (ARDO) on coffee management.

Plans in the transition areas are implemented by individual farmers and the community with the technical and extension services by ARDO and NGOs. These activities shall be part of the routine development activities of government agencies, since the sustainable development model approach has become the main approach of any development intervention in the area. The management units as well the future biosphere reserve office initiate, motivate and support the activities in all parts of the biosphere Reserve.

There is scope for re-negotiating the management guidelines. It is expected that the guidelines are self-enforcing as soon as the community members realize that they are for their own benefit. The ECFF will continuously work in the area with the people in order to mediate between interest groups and incorporate improvements to the management guidelines.

17.6.5 Indicate how and to what extent the local communities participate in the formulation and the implementation of the management plan or policy
(informed/consulted: decision making role etc.)

The management guideline suits existing management practices (Senbeta et al. 2007). It is based on research work that has involved the community and evaluation of the impacts of the existing practices. The scientific knowledge compiled through research led to the formulation of the management guidelines for the biosphere reserve. Studies showed that the management of coffee forests and other resources differs in intensity and impacts from one farmer to another. Besides, there was no monitoring to make the practice sustainable. The main policy differences of the new management guideline from existing practices are basically three:

1. The core areas are strictly for conservation and that the boundary should be respected.

2. The management practices in the buffer zone are standardized, setting minimum requirements for the forest conditions and coffee stands. In addition, appropriate management practices for sustainability in transition areas are also recommended.
3. Activities in the core areas and buffer zones are regularly monitored and corrective measures are taken as necessary.

These concepts were discussed with community members during research activities initiated in 2002. Since 2006, these concepts have developed through consecutive consultations with the communities, development agents, experts and local authorities within the six districts (woredas) found within the proposed biosphere reserve. Awareness creation and consultative meetings have been conducted by the ECFF and the Task force members since 2007. The guidelines were discussed at all levels since the establishment of management units at village (kebele), district (woreda) and zone levels, in 2009. It is now approved as a guideline or policy for the management of the biosphere reserve. However, it subject to improvements, with further research and lessons from practice.

17.6.6 The year of start of implementation of the management plan or policy

Some of the activities in the management guidelines have already been going on, at least in parts of the current core areas and the buffer zone, by the Oromiya Forestry and Wildlife Enterprise - Illubabor Branch, the CoCE (ECFF) and the Geba-Dogi Coffee Forest Conservation Projects. Actual implementation of the newly adopted management guideline will begin in January 2010.

17.7. Financial source(s) and yearly budget:

[Biosphere reserves require technical and financial support for their management and for addressing interrelated environmental, land use, and socio-economic development problems. Indicate the source and the relative percentage of the funding (e.g. from national, regional, local administrations, private funding, international sources etc.) and the estimated yearly budget in the national currency]

The financial sources for the proposed biosphere reserve are contributions of the MU member institutions, which can be in cash, staff time and/ or both. ECFF covers the costs of technical support and coordination, while others cover the salaries of the staff members engaged in the biosphere reserve activities as MU member.

Table 2 Annual budget breakdown of Yayu Coffee Forest Biosphere Reserve by source and category

No.	**Item**		**Amount (Birr)**	**Source**
1	Salaries			
	a	Zone MU members	240,000	Illubabor Zone
	b	District MU Members	1,008,000	Illubabor Zone
	c	ECFF staffs	360,000	ECFF
2	Coordination and facilities			
	a	Coordination of activities	550,000	ECFF
	b	Office facilities	100,000	OFAWE
		Grand total	***2.258,000***	

The total annual budget is estimated at about 2,258,000.00 Ethiopian Birr, which is equivalent to US $180,270.00.

17.8. Authority(ies) in charge

17.8.1. The proposed biosphere reserve as a whole:

For the whole biosphere reserve, the MU member government organizations are responsible.
The Names of the authorized agencies are:

- Illubabor Zone Administration, which will oversee all activities as organization responsible for political leadership
- Illubabor Zone Land and Environmental Protection Office (LEPO), for monitoring and regulation
- Oromiya Forestry and Wildlife Enterprise (OFAWE)-Illubabor Branch, for forest administration and management
- Illubabor zone Agriculture and Rural Development Office (ARDO), for agricultural extension services

If appropriate, name the National (or State or Provincial) administration to which this authority reports:

These organizations report to their respective authorities at Oromiya National Regional Government level, and to the Ministry of Science and Technology and the Institute of Biodiversity Conservation at the federal government level.

17.8.2. The core area(s):

[Indicate the name of the authority or authorities in charge of administering its legal powers (in original language with English or French translation]

Name(s):

- Illubabor Zone Land and Environmental Protection Office (LEPO)
- Oromiya Forestry and Wildlife Enterprise (OFAWE)-Illubabor Branch

17.8.3.The buffer zone(s)

Name (s)

- Illubabor Zone Land and Environmental Protection Office (LEPO)
- Oromiya Forestry and Wildlife Enterprise (OFAWE)-Illubabor Branch
- Illubabor zone Agriculture and Rural Development Office (ARDO)

18. SPECIAL DESIGNATIONS:

[Special designations recognize the importance of particular sites in carrying out the functions important in a biosphere reserve, such as conservation, monitoring, experimental research, and environmental education. These designations can help strengthen these functions where they exist or provide opportunities for developing them. Special designations may apply to an entire proposed biosphere reserve or to a site included within. They are therefore complementary and reinforcing of the designation as a biosphere reserve. They are therefore complementary and reinforcing to designation as a biosphere reserve. Check each designation that applies to the proposed biosphere reserve and indicate its name]

Name:

( ) UNESCO World Heritage Site

( ) RAMSAR Wetland Convention Site

(Yes) Other international/regional conservation conventions/directives [Please specify]

( ) Long term monitoring site [Please specify]

- International Forestry Resources and Institutions (IFRI), Collaborating Research Centers network, Ethiopian CRC research site (Site number 33).

(Yes) Other Conservation Priority Areas of global importance, as identified by different organizations]

- Eastern Afromontane Biodiversity Hotspot (Conservation International)
- Center of Crop Plants Origin (Bioversity International)
- Important Bird Areas of Ethiopia (BirdLife International)

19. SUPPORTING DOCUMENTS

(to be submitted with nomination form) [Clear, well-labelled maps are indispensable for evaluating Biosphere Reserve proposals. The maps to be provided should be referenced to standard coordinates wherever possible. Electronic versions are encouraged]

(Yes) General location map

A GENERAL LOCATION MAP of small or medium scale must be provided showing the location of the proposed Biosphere Reserve, and all included administrative areas, within the country, and its position with respect to major rivers, mountain ranges, principal towns, etc.
See Appendix 1

(Yes) Biosphere Reserve zonation map [large scale, preferably in black & white for photocopy reproduction]

[A BIOSPHERE RESERVE ZONATION MAP of a larger scale showing the delimitations of all core area(s) and buffer zone(s) must be provided. The approximate extent of the transition area(s) should be shown, if possible. While large scale and large format maps in colour are advisable for reference purposes, it is recommended to also enclose a Biosphere Reserve zonation map in a A-4 writing paper format in black & white for easy photocopy reproduction. It is recommended that an electonic version of the zonation map be provided]

See Appendix 2

(Yes) Vegetation map or land cover map

[A VEGETATION MAP or LAND COVER MAP showing the principal habitats and land cover types of the proposed Biosphere Reserve should be provided, if available].

See Appendix 3

(Yes) List of legal documents (if possible with English or French translation)

[List the principal LEGAL DOCUMENTS authorizing the establishment and governing use and management of the proposed Biosphere Reserve and any administrative area(s) they contain. Please provide a copy of these documents, if possible with English or French translation].

See Appendix 4

(Yes) List of land use and management plans

[List existing LAND USE and MANAGEMENT PLANS (with dates and reference numbers) for the administrative area(s) included within the proposed Biosphere Reserve. Provide a copy of these documents]

See Appendix 5.

(Yes) Species list (to be annexed)

[Provide a LIST OF IMPORTANT SPECIES (threatened species as well as economically important species) occurring within the proposed Biosphere Reserve, including common names, wherever possible.]

See appendices 6 and 7.

(Yes) List of main bibliographic references (to be annexed)

[Provide a list of the main publications and articles of relevance to the proposed biosphere reserve over the past 5-10 years].

See Appendix 8

20. ADDRESSES

20.1 Contact address of the proposed biosphere reserve:

[Government agency, organization, or other entity (entities) to serve as the main contact on the MABnet to whom all correspondence within the World Network of Biosphere Reserves should be addressed.]

Name: Ethiopian Coffee Forest Forum
Street or P.O. Box: 28513
City with postal code: Addis Ababa
Country: Ethiopia
Telephone: +251115151694
Telefax (or telex): +251115151684
E-mail: twgole@ethionet.et; info@ecff.org.et
Web site: www.ecff.org.et

20.2. Administering entity of the core area:

Name: Oromiya Forestry and Wildlife Enterprise, Illubabor Branch
Street or P.O. Box: 320
City with postal code: Metu
Country: Ethiopia
Telephone: +251474414490
Telefax (or telex): 251474411863
E-mail: _____
Web site

20.3. Administering entity of the buffer zone:

Name: Oromiya Forestry and Wildlife Enterprise, Illubabor Branch
Name: Oromiya Forestry and Wildlife Enterprise, Illubabor Branch
Street or P.O. Box: 320
City with postal code: Metu
Country: Ethiopia
Telephone: +251474414490
Telefax (or telex): 251474411863
E-mail: _____
Web site

Annex to Biosphere Reserve Nomination Form, February 2004

MABnet Directory of Biosphere Reserves

Biosphere Reserve Description[1]

Administrative details

Country: Federal Democratic Republic of Ethiopia
Name of BR: Yayu Coffee Forest Biosphere Reserve
Year designated: (*to be completed by MAB Secretariat)*
Administrative authorities: Oromiya National Regional State, Oromiya Forestry and Wildlife Enterprise, Illubabor Branch, Illubabor Zone Land and Environmental Protection, Six Districts Administration, Oromiya Bureau of Land and Environmental Protection, Oromiya Forestry and Wildlife Enterprise, Oromiya Bureau of Agriculture and Rural Development and Ministry of Science and Technology.

Name Contact: Dr. Tadesse Woldemariam Gole
Contact address: P. O. Box 28513, Addis Ababa, Ethiopia
Related links *(web sites)*: www.ecff.org.et.
www.coffee.uni-bonn.de
www.cofis.info

Description

General description: *(Site characteristics in 11.1; human population in 10; land management units in 17.2)*

The Yayu Coffee Forest Biosphere Reserve is situated in southwestern Ethiopia. The area plays a key role in the conservation of natural and cultural landscapes. The biosphere reserve includes Eastern Afromontane Biodiversity Hotspot and Important Bird Areas of international significance and one of the last remaining montane rainforest fragments with wild *Coffea arabica* populations in the world. The area is also of cultural and historical significance since it possesses many archaeological sites, ritual sites, caves and waterfalls. The proposed biosphere reserve is zoned into core areas, butter zone and transitional areas. The core areas are found at the centre and surrounded by buffer zone and transition area, respectively. Both the core areas and buffer zone are considered as one of the Regional Forest Priority Areas (or Forest Conservation Area) and Forest Coffee conservation Site. The transition area is found adjacent to the buffer zone and it is composed of agricultural land, wetland, grassland, settlement area and fragments of forest land. All the management units (core, buffer, transition) in the proposed biosphere reserve are contiguous; but there are five core areas. About 154, 300 permanent residents live in the biosphere reserve and mainly rely on agriculture. The designation as a biosphere reserve is expected to enhance ecologically sound and traditional agriculture, to foster ecotourism and to create new jobs in small businesses such as coffee, bee-keeping, spices and horticulture activities. Within the biosphere reserve framework, local communities are familiarized with the wise use of natural resources and sustainable development techniques, and the implementation of conservation projects. Currently, two projects funded by the German Federal Agency for Conservation and German Federal Ministry of Education and Research are being implemented in the proposed biosphere reserve: Conservation and use of the wild populations of *Coffea arabica* in the montane rainforests of Ethiopia and Public awareness and environmental education project.

Major ecosystem type: (**Montane rainforest ecosystem)**

[1] To be posted on the MABnet once the nomination has been approved. The numbers refer to the relevant sections of the nomination form.

Major habitats & land cover types: (Forests, wetlands and running water, agricultural lands, grazing lands, and built-up areas).
Location (latitude & longitude): (8^{O} 0' 42" to 8^{O} 44' 23"N and 35^{O} 20' 31" to 36^{O} 18' 20"E)
Area (ha): (**167, 021**)
Total*:* (167,021)
Core area*(s):* (27,733 ha)
Buffer zone*(s):* (21, 552 ha)
Transition area*(s) (when given):* (117,736 ha)
Different existing zonation: (Core areas, buffer zone and transitional areas)
Altitudinal range *(*metres above sea level): (1,100 - 2,337)

Research and monitoring

Brief description: 15.1.3)

Monitoring- is conducted by various organizations over the past decades. Being a state forest, the Forestry/ Natural Resources Department of the Ministry of Agriculture and Rural Development and Oromiya Bureau of Agriculture and Rural Development were in charge of monitoring the area. Activities cover the change detection over time, and forest conditions assessment. The Geba-Dogi Forest Coffee Conservation Project has been active in monitoring most parts of the proposed core area. For the last two years, the Oromiya Forestry and Wildlife Enterprise - Illubabor Branch is responsible for monitoring as well as the development of the forest area. The Ethiopian Coffee Forest Forum, through continuous research, is also playing an important role in monitoring.

Specific variables (please fill in the table below and tick the relevant parameters)

Abiotic		Biodiversity	
Abiotic factors		Afforestation/Reforestation	X
Acidic deposition/Atmospheric factors		Algae	
Air quality		Alien and/or invasive species	
Air temperature		Amphibians	
Climate, climatology	X	Arid and semi-arid systems	
Contaminants		Autoecology	
Drought		Beach/soft bottom systems	
Erosion	X	Benthos	
Geology		Biodiversity aspects	X
Geomorphology		Biogeography	
Geophysics		Biology	
Glaciology		Biotechnology	
Global change	X	Birds	X
Groundwater		Boreal forest systems	
Habitat issues	X	Breeding	X
Heavy metals		Coastal/marine systems	
Hydrology	X	Community studies	X
Indicators		Conservation	X
Meteorology		Coral reefs	
Modeling		Degraded areas	X
Monitoring/methodologies	X	Desertification	
Nutrients		Dune systems	
Physical oceanography		Ecology	X
Pollution, pollutants		Ecosystem assessment	X
Siltation/sedimentation		Ecosystem functioning/structure	X
Soil		Ecotones	
Speleology		Endemic species	X
Topography		Ethology	
Toxicology		Evapotranspiration	
UV radiation		Evolutionary studies/Palaeoecology	
		Fauna	
		Fires/fire ecology	
		Fishes	
		Flora	X
		Forest systems	X
		Freshwater systems	
		Fungi	
		Genetic resources	X
		Genetically modified organisms	
		Home gardens	X
		Indicators	X
		Invertebrates	
		Island systems/studies	
		Lagoon systems	
		Lichens	
		Mammals	X
		Mangrove systems	
		Mediterranean type systems	

		Microorganisms	
		Migrating populations	
		Modeling	
		Monitoring/methodologies	X
		Mountain and highland systems	X
		Natural and other resources	X
		Natural medicinal products	X
		Perturbations and resilience	
		Pests/Diseases	
		Phenology	
		Phytosociology/Succession	
		Plankton	
		Plants	X
		Polar systems	
		Pollination	X
		Population genetics/dynamics	X
		Productivity	
		Rare/Endangered species	X
		Reptiles	
		Restoration/Rehabilitation	X
		Species (re) introduction	
		Species inventorying	
		Sub-tropical and temperate rainforest	
		Taxonomy	
		Temperate forest systems	
		Temperate grassland systems	
		Tropical dry forest systems	
		Tropical grassland and savannah systems	X
		Tropical humid forest systems	X
		Tundra systems	
		Vegetation studies	X
		Volcanic/Geothermal systems	
		Wetland systems	X
		Wildlife	

Socio-economic		Integrated monitoring	
Agriculture/Other production systems	X	Biogeochemical studies	
Agroforestry	X	Carrying capacity	
Anthropological studies	X	Conflict analysis/resolution	X
Aquaculture		Ecosystem approach	X
Archaeology		Education and public awareness	X
Bioprospecting		Environmental changes	X
Capacity building	X	Geographic Information System (GIS)	X
Cottage (home-based) industry		Impact and risk studies	X
Cultural aspects		Indicators	X
Demography		Indicators of environmental quality	
Economic studies	X	Infrastructure development	
Economically important species	X	Institutional and legal aspects	X
Energy production systems		Integrated studies	X
Ethnology/traditional practices/knowledge		Interdisciplinary studies	X
Firewood cutting		Land tenure	X
Fishery		Land use/Land cover	X
Forestry	X	Landscape inventorying/monitoring	X
Human health		Management issues	X
Human migration		Mapping	X
Hunting		Modeling	X
Indicators	X	Monitoring/methodologies	X
Indicators of sustainability	X	Planning and zoning measures	X
Indigenous people's issues		Policy issues	
Industry		Remote sensing	X
Livelihood measures	X	Rural systems	X
Livestock and related impacts		Sustainable development/use	X
Local participation	X	Transboundary issues/measures	
Micro-credits		Urban systems	
Mining		Watershed studies/monitoring	
Modeling			
Monitoring/methodologies	X		
Natural hazards			
Non-timber forest products	X		
Pastoralism			
People-Nature relations	X		
Poverty			
Quality economies/marketing			
Recreation	X		
Resource use	X		
Role of women			
Sacred sites	X		
Small business initiatives	X		
Social/Socio-economic aspects	X		
Stakeholders' interests	X		
Tourism	X		
Transports			

Appendices

Appendix 1. General Location Map

Appendix 2. Biosphere Reserve Zonation Map

Appendix 3. Land Cover Map

Appendix 4. List of Legal Documents

- Oromiya Yayu Coffee Gene Reserve Establishment Regulation (soon to be enacted)
- The Constitution of the Federal Democratic Republic of Ethiopia (1995).
- Environmental Protection Organs Establishment Proclamation No. 295/2002
- The Federal Rural Land Administration and Land Use Proclamation No. 456/2005
- The Federal Forest Development, Conservation and Utilization Proclamation No.542/2007
- Oromia Rural Land Use and Administration Proclamation 56/2002
- Oromia Rural Land Use and Administration Regulation No. 39/2003

Appendix 5. Management Guidelines for Yayu Coffee Forest Biosphere Reserve

1. INTRODUCTION

This guideline helps government and forest users make informed management decisions about the coffee forest of Yayu area which is to be designated as Yayu Coffee Forest Biosphere Reserve. The guideline is developed to reflect the statutory requirements to conserve biodiversity and enhance sustainable development in the area. This process focuses on social, ecological, and economic criteria. The use of these keys will help create appropriate management prescriptions for coffee forest management for Yayu Coffee Forest Biosphere Reserve (IBR) management. The focus of the guideline is to confine management impacts to buffer zone and transition area of the forests so that a healthy functioning forest ecosystem is maintained in core areas.

2. THE PURPOSE OF GUIDELINES

The purpose of coffee forest management guidelines is to provide consistent and coordinated guidance in conserving and sustaining the functions and values of coffee forests through establishing Yayu Coffee Forest Biosphere Reserve. These guidelines set out specific management activities within the different forest management zones (biosphere reserve zones) to help balance ecological, social and economic values of coffee forests at the landscape and stand levels.

3. GUIDING PRINCIPLES

This document helps set the process for Biosphere Reserve Management Unit to practices management guidelines that sustain coffee forest values and function over time. The guideline is developed under a set of biodiversity conservation and sustainable development management objectives. The framework includes ecological, social and economic values associated with biosphere reserve. This document and subsequent coffee forest management activities will be guided by the following principles:

- to conserve coffee forest biodiversity
- to sustain or improve ecological function of coffee forest ecosystems
- to balance ecological, cultural, social and economic values of the forests
- to provide a framework for operating plan requirements for proposed biosphere management activities
- to provide a decision support mechanism to assist with informed decision making

4. COFFEE FOREST MANAGEMENT ZONES

4.1 ZONING SCHEME

To achieve the aims of this guideline and to enhance the establishment of biosphere reserve in the Yayu area, the forest has been divided into three management zones (Figure 1, Table 1). These management zones include core area, buffer zone and transition area.

Core area (CA) is exclusively established for biodiversity conservation or to ensure that all plant and animal species and communities survive and flourish throughout the area;

Buffer zone (BZ) is set to buffer the core area from human interference, while allowing conservation and sustainable of forest resources; and

Transitional area (TA) will be used for a range of uses that can enhance sustainable development in the area.

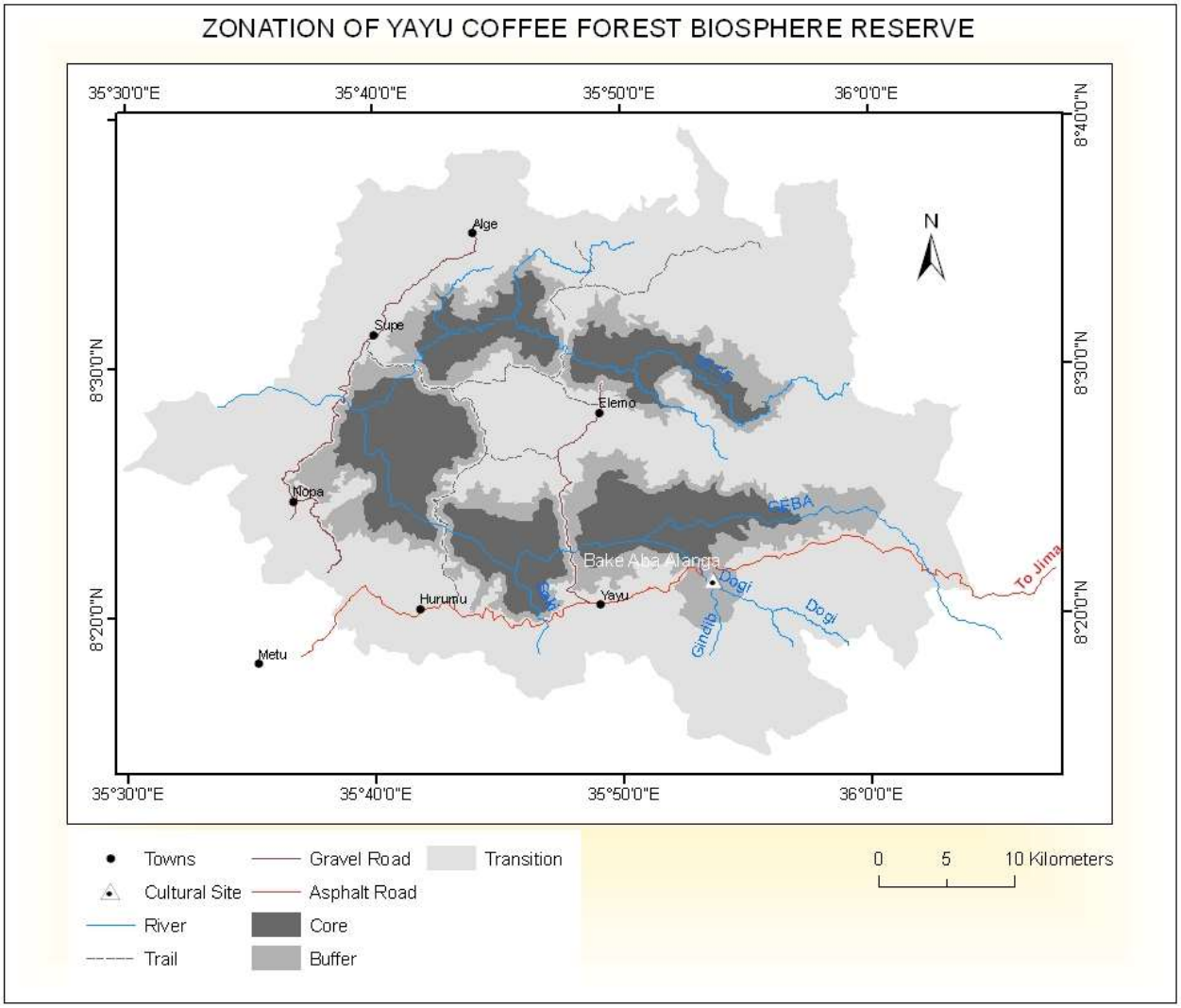

Figure 1. Yayu Coffee Forest Biosphere reserve zonation map.

Table 3. Size distribution of the different management zones

ZONE	***AREA***	***PERCENTAGE***
Core Area	27,733	16.6
Buffer Zone	21,552	12.9
Transition Area	117,736	70.5
Total	167,021	

These management zones are set to assist land users in deciding on and implementing management practices in key areas of biosphere reserve. In the following sections, detailed management guidelines are outlined for each management zone. The guidelines contain information that provides guidance and advice on what needs to be done and where it should be done in each respective management zone.

4.2 CORE AREA (CA)

The core areas are securely protected sites for conserving biological diversity with minimal human activities - aimed at protecting the landscape, ecosystems, species and genetic resources it contains. The core areas are about 16.6% of the total Yayu Coffee Forest Biosphere Reserve. These core areas must be safeguarded in perpetuity as strict protection areas. The restrictions on human use must be controlled and accompanied by suitable measures. Box 1 shows management guidelines in the core area

Box 1

Management guidelines in CA

Activities not recommended

Agricultural activities: - Expansion of agriculture into the core areas can easily accelerate deforestation; and evidently enhances loss of plant and animal diversity or biodiversity. In order to maintain a mosaic of forest landscapes with its immense biological diversity this activity need to be avoided from the core area.

Coffee stand management: - In order to improve coffee productivity in the forest, coffee stand management is very important. Coffee management means, however, removal of competing shrubs and small trees around the coffee plants. This type of coffee management is often threat the diversity of associated plant species in the forest. Hence in the core areas coffee management is not allowed.

Introduction of improved coffee varieties:- introducing improved coffee variety into core areas may enhance gene flow from new varieties to wild gene pool (e.g., cross pollination between wild and improved varieties). Ultimately this will threat the wild coffee genetic pools in the forest. In order to minimize this damage, introduction of improved coffee variety into the core areas should be restricted.

Settlement in the area: Expansion of settlement into core areas will have a significant impact on forest and its biodiversity through forest clearance. It can also encourage new settlers once such practices started somewhere. Hence settlement is strictly forbidden in the core areas.

Livestock grazing: - Livestock grazing in the core areas can affect young plants and seedlings through browsing and trampling and apparently damage the diversity and structure of the forest. Because of these reasons, livestock grazing should be restricted.

Reforestation using exotic trees: - The use of exotic tree species to develop/enrich forest gaps or degraded forest areas will have an ecological impacts. It can affect soil and soil microorganism, plant and animal diversity. Because of these foreseen effects, planting exotic tree species in and around the core areas is completely forbidden.

Any silvicultural management: - Silvicultural systems usually focus on improving some economically important tree species and ignore/neglect some less required species. Ultimately, it can affect plant species composition and structure and promote monoculture forest types. Thus silvicultural management is not permitted in core areas.

Timber harvesting and collection of dead trees:- timber harvesting affect the compositional, structural, and functional patterns of the forest and its biodiversity. Additionally, standing dead and fallen woody material provides habitat for many species and is necessary to sustain elements of biological diversity. Hence these uses are prohibited.

Wild honey harvesting: - Wild honey harvesting is mostly a source of wild fire in the forest. In order to avoid the incidence of wild fire in the core areas wild honey harvesting is prohibited.

Hunting of wild animals: - Hunting wild animals for food and other purposes, can affect the diversity of the animals. It is also not compatible with the objectives of biodiversity conservation in the core areas and hence need restriction.
Uses of agrochemicals and other chemicals: - use of any chemicals in and around the core areas is strictly forbidden because of the impacts they have on the environment, e.g., on plants, soil etc.
Movement of heavy machinery and cars:- the movement of heavy machineries (e.g., bull dozer) and cars can have damaging effect on the soil and associated biodiversity. Movement of these machineries in the core areas will be not allowed.
Quarry extraction, road construction and any other investment: These activities affect biodiversity by changing habitat, fragmenting contiguous forest, and increasing access to a site and change the existing land use system. Hence restricted.

Management activities recommended
Collection of non-timber forest products such as spices, wild edible fruits and ripped coffee cherries: - However, any activities that gears towards improving the productivity of these forest products through management are not allowed. Collection of these forest products are only allowed without any management practices such as slashing, burning, making path and the like.
Enrichment planting using indigenous species: - under certain circumstances and when believed necessary enrichment planting can be possible using only native plant species from the area.
Establishing research plots and demonstration sites: - This is to understand and monitor vegetation dynamics and ecological evolution of different forest species.
Can be used as an educational and awareness creation centers:- The area can serve as a training centers for biodiversity, ecology, botany etc. students/ researchers but with care- so that it will not affect the ecosystem.

4.3 BUFFER ZONE (BZ)

The BZ surrounds or is contiguous to the core area. This area acts as a buffer for the core areas and accommodates more human activities such as research, environmental education and training as well as tourism and recreation. Within the buffer zone, special content of the respective natural or cultural landscape that warrants particular protection must also be safeguarded. A management plan must be drawn up in close cooperation with the people who use the areas and a system of subsidies developed that reimburses the efforts necessary for the maintenance of the area. Box 2 shows management guidelines in the buffer zone.

Box 2

Management guidelines in BZ

Management activities recommended

Agricultural activities: - If there are already existing farmlands in the buffer zone these can be allowed for further use or cultivation but without any expansion. However, site preparation using fire is not allowed in order to avoid fire risks in the buffer zone or core areas.

Coffee management:- As coffee is the major livelihoods in the area, coffee management in the buffer zone is allowed. However, the management practices should maintain enough density and diversity of shade trees in the system.

Traditional honey production: - As honey is the second most important income sources for the local communities in the area, traditional or modern honey production is allowed. However, in order to reduce risk of fire and related impacts during beehive hanging or honey harvesting the practices should be highly controlled.

Extraction of non-timber forest products:- Extraction of spices, wild edible fruits and climbers are allowed in the buffer zone. Domestication of spices mainly *Aframomum corrorima* and *Piper capense* is also possible.

Fuel wood collection:- dead wood collection for fuel wood is possible but it should be with care - as it can affect biodiversity.

Reforestation:-Restoration, rehabilitation or enrichment of degraded forest land can be possible in the buffer zone using native plants only.

Establishing research plots and demonstration sites:- to understand vegetation dynamics and land use changes or related issues establishing research plots or demonstration sites is possible in the buffer zone.

Tourism and education centers:- tourists and students are allowed to visit or making a research. Education trips or trainings can also be possible within buffer zone with limited number participants at a time in order to reduce human impacts in the zone.

Activities not recommended

Settlement:- Expansion of settlements into buffer zone is not allowed as it has impact on the biodiversity. It can also encourage new settlers once such practices started somewhere. Hence settlement expansion is strictly forbidden in the buffer zone.

Farming wetlands and deforesting riverine forests or river banks are not allowed.

Burning of crop residues and forests during land preparation- affect soil and microorganisms

Polluting rivers using wet coffee processing or through other means

Timber harvesting:-Timber harvesting is not allowed in the buffer zone as it has damaging effect on the ecosystem during harvesting. But harvesting man-made plantation around home garden is possible.

Over exploitation of endangered tree species is not allowed, e.g., *Prunus africana*

Hunting of wild animals: - Hunting of wild animals is not allowed except only when it is believed necessary to reduce the population of vermin animals.

Introduction of improved coffee varieties:- introducing improved coffee variety into buffer zone will enhance the chance of cross pollination between the wild and new varieties of coffee. This will damage the wild coffee genetic pools in the forest. To minimize this damage introduction of improved coffee variety into the buffer zone should not be allowed.

Number of shade trees should not be lower than 200 trees/ha for dbh $\geq$ 10 cm which is equivalent to 1 tree per 50 m^2.

Number of seedlings/saplings should not be lower than 200 individuals per ha which equivalent to 1 seedlings 50 m^2.
Number of shade tree species should not be lower than 20 species per ha which is equivalent to 1 species per 500 m^2.
Planting exotic trees: - The use of exotic tree species to develop/enrich forest gaps or degraded forest areas will have an ecological impacts in the long run. Planting exotic tree species in and around the buffer zone is forbidden.
Uses of pesticides and other chemicals: - use of any agrochemicals in and around the buffer zone is strictly forbidden because of the impacts they have on the environment, e.g., on plants, soil etc.
Movement of heavy machinery and cars:- the movement of heavy machineries (e.g., bull dozer) and cars can have damaging effect on the soil and associated resources including plants. Hence, movement of these machineries in the buffer zone should be minimized.
Quarry extraction and any other investment that changes the land use system need restriction.

4.4 TRANSITION AREA (TA)

This area will contain a variety of agricultural activities, human settlements and other land uses; and has great economic and social significance for regional development. Local communities and other stakeholders must work together to manage and sustainably develop the area's resources for the benefit of the people who live there. By employing innovative sustainable economic and human use practices, the transitional area should set paradigmatic standards for the entire region with regard to agriculture and forestry, crafts, trade and industry, as well as culture and education. Box 3 shows management guidelines in the transitional area ..

Box 3
Management guidelines in TA

Management activities recommended
Intensive agricultural activities
Livestock development and grazing
Coffee management
Collection of firewood or fuel wood
Settlements and schools
Establishing coffee washing machine preferably dry wash in order to minimize pollution.
Establishing all necessary infrastructure
Traditional extractive uses of spices, wild edible fruits and medicinal plants
Domestication of spices and traditional medicinal plants
Establishing forest plantation using native species
Planting native and exotic multipurpose plant species
Establishing tourism and education centers
Wild honey harvesting and modern apiculture management
Hunting of wild animals if necessary
Maintenance of at least 10 to 20 trees on farms

Activities not recommended
Farming and/or deforesting riverine forests or river banks and wetlands
Burning of crop residues and forest fragments during land preparation
Expansion of large-scale forest plantation using exotic species

Expansion of large scale tea or coffee plantation
Introduction of improved coffee varieties into exiting farming system
Over exploitation of endangered tree species, e.g., *Prunus africana*
Polluting rivers through wet coffee processing or other means
Misuse of or change of historical landscapes or places, e.g., Abba Gada place
Removal of vegetation that may cause damage to the historic place
Establishing factories that damage the existing landscape and also encourage immigration of people
Quarry extraction and any other investment that changes the existing land use system
Restricting mining, and other investment in the area
Uncontrolled waste disposal

5. PROCEDURES FOR IMPLEMENTATION

- The guidelines will be implemented by the zonal level Management Unit and (IBRMU) and village level Management Steering Committee. In order to implement the developed guidelines the following steps are required;
- Zonal Yayu Coffee Forest Biosphere Reserve Management Unit (IBRMU) should be established,
- Yayu Coffee Forest Biosphere Reserve Management Steering Committee (IBRMSC) should be established at village level.
- There should be a clearly identified management zones in order to implement the guidelines.
- Yayu Coffee Forest Biosphere Reserve Management Unit (IBRMU) should agree on the guidelines first.
- Once the IBRMU accept the guidelines, the idea should be communicated to IBRMSC and to the local communities for any feedback.
- A memorandum of understanding (MOU) should be signed between the IBRMSC and the villager representative to ensure smooth working relationship and implementation. The MOU should define/state the procedures required.
- IBRMU must supervise for the appropriate implementation of the guidelines.
- A memorandum of understanding (MOU) should also be signed between the IBRMU and IBRMSC as to how to follow-up the implementation process on the ground.
- There should also be a written statement that supports the guidelines from the variety of public and private organizations.
- There should be a bimonthly meeting between the local IBRMU and IBRMSC to exchange ideas on the implementation process.
- Annual plans should be jointly developed between the two IBRMU and IBRMSC.
- Local communities should be informed about the penalty in case of any rule break.

6. MODIFICATION OF THE GUIDELINES

This use rules is not intended to be a comprehensive treatment of every management guideline practice that pertains to every situation - specific sets of circumstances may necessitate further research or consultation to determine the most appropriate management practice to achieve the BR management outcome desired. Based on the consultation of the implementing parties, this guideline can be changed or modified when deemed necessary.

7. SANCTIONS

In case of any diminution of the guidelines indicated for each zone or areas, sanction will be imposed. The sanction will be according to the Ethiopian Proclamation No. 542/2007; a proclamation that provide for the development, conservation and utilization of forests. According to *PART FOUR no 20* of this proclamation, a person can be punishable with greater penalty in case of any misuse in any state forests. Accordingly, the following the criminal law is applicable:

- Except pursuant to this proclamation and directives issued herein under, cuts trees or removes, processes or uses in any way forest products from a state forest shall be punishable with not less than 1 year and not exceeding 5 years imprisonment and with fine Birr 10,000;
- Destroy, damages and falsify forest boundary marks shall be punishable with not less than 1 year and not exceeding 5 years rigorous imprisonment;
- Causes damage to a forest by setting fire or in any other manner shall be punishable with not less than 10 years and not exceeding 15 years rigorous imprisonment;
- Settles or expands farmland in a forest area without permit or undertakes the construction of any infrastructure in a forestland without having the necessary permit shall be punishable with not less than 2 years imprisonment and with fine Birr 20,000;
- Provides assistance in any form to those who illegally cut forest trees or transport forest products to hide or take away the forest products shall be punishable with 5 years imprisonment.

8. MANAGEMENT AND MONITORING

The ultimate success of these guidelines is contingent upon successful management and monitoring of its impact. Adequate capacity to manage, monitor and enforce measures rests in part on IBRMU and the BR management steering committee at village level. The impact of these processes can be assessed annual by joint mission between IBRMU and the BR management steering committee at village level and the local communities. An understanding of the impact of threatening processes on the IBR can be evaluated through observing distribution, structure and species composition of ecosystems.

Appendix 6. Lists of major plant species in the proposed biosphere reserve area.
Abbreviation: Uses (**En**-for fuel wood and charcoal; **Fo**- for food; **Hu**- for house construction and utensils; **Me**- for medicine; **Ti**-for timber); Common name (**Am**-Amharic; **O**- Affan Oromo); **St** –status (**E**- endemic).
.

Scientific name	Family name	Life form	Uses	St	Common name
Abutilon cecilii N.E.Br.	Malvaceae	Shrub	En		Danissa (O)
Acacia abyssinica Hochst. ex Benth	Fabaceae	Tree	En		Lafto (O)
Acacia montigena Brenan & Exell.	Fabaceae	Climber	En		Haragama (O)
Acacia polyacantha Willd.	Fabaceae	Tree	En		Gumura (Am)
Acacia seyal Del.	Fabaceae	Tree	En		Wachu (O)
Acacia sieberiana DC.	Fabaceae	Tree	En		Lafto (O)
Acalypha acrogyna Pax	Euphorbiaceae	Shrub	M		
Acalypha psilostachya Hochst.	Euphorbiaceae	Shrub	Me		
Acalypha racemosa Baill.	Euphorbiaceae	Shrub	Me		
Acanthus eminens C.B.Cl	Acanthaceae	Shrub	Fo		Sokoru (O)
Achyranthes aspera L.	Amaranthaceae	Shrub	Me		Dergu (O)
Achyrospermum schimperi (Hochst. ex Briq) Perkins	Labiatae	Shrub	Me		Balandalecha (O)
Adiantum philippense L.	Adiantaceae	Epiphyte	Me		Sara-bazu (Am)
Aframomum corrorima (Braun) Jansen	Zingiberaceae	Herb	Fo	E	Oghio (O)
Ageratum conyzoides L.	Asteraceae	Herb	Me		Arema (O)
Albizia grandibracteata Taub.	Fabaceae	Tree	Ti		Shawo (O)
Albizia gummifera (J. F. Gmel.) C.A.Sm.	Fabaceae	Tree	Ti		Muka-arba (O)
Albizia malacophylla (A. Rich) Walp	Fabaceae	Tree	Ti		
Albizia schimperiana Oliv.	Lauraceae	Tree	Ti		Sasa (O)
Alchornea laxiflora (Benth.) Pax & Hoffm.	Euphorbiaceae	Shrub			
Allophylus macrobotrys Gilg	Sapindaceae	Tree	Me		Seho (O)
Allophylus rubifolius (Hochst. Ex A. Rich) Engl	Sapindaceae	Tree	Me		Seho (O)
Amorphophallus abyssinicus (A. Rich.) N.E. Br.	Araceae	Herb	Me		Ch'ich'en (Am)
Amorphophallus gallaensis (Engl.) N.E. Br	Araceae	Herb	Me	E	
Aneilema aequinoctiale (P.Beauv.) G.Don	Commelinaceae	Herb			
Aneilema beniniense (P. Beauv.) Kunth	Commelinaceae	Herb			
Aneilema leiocaule K. Schum.	Commelinaceae	Herb			
Aneilema recurvatum Faden	Commelinaceae	Herb			
Antiaris toxicaria Lesch	Moraceae	Tree	Ti		
Apodytes dimidiata E. Mey. ex Arn.	Icacinaceae	Tree	Ti		Chelelka (O)
Argomuellera macrophylla Pax	Euphorbiaceae	Shrub	En		
Arisaema flavum (Forssk.) Schott	Araceae	Herb			Abutaye (O)
Arisaema schimperannum Schott	Araceae	Herb			
Arundo donax L.	Gramineae	Shrub	Hu		Shomboko (O)
Ascolepis eriocauloides (Steud.)Steud	Cyperaceae	Herb		E	
Asparagus africanus Lam.	Asparagaceae	Climber	Fo		Seriti (O)
Asparagus flagellaris (Kunth)Baker	Asparagaceae	Shrub	Fo		Seriti (O)
Asparagus officinalis L.	Asparagaceae	Epiphyte	Fo		Seriti (O)
Asparagus setaceus (Kunth) Jessop	Asparagaceae	Climber	Fo		Seriti (O)
Asplenium aethiopicum (Burm. F.) Becherer	Aspleniaceae	Epiphyte	Me		
Asplenium hypomelas Kuhn.	Aspleniaceae	Epiphyte	Ti		
Asplenium sandersonii Hook	Aspleniaceae	Epiphyte	Ti		
Berkheya chiesiana Chiov.	Asteraceae			E	
Bersama abyssinica Fresen	Melianthaceae	Tree	Ti		Lolchissa (O)
Blighia unijugata Bak.	Sapindaceae	Tree	Ti		
Bothriocline fusca Oliv. & Hiern	Asteraceae	Shrub			
Bothriocline schimperi Oliv. & Hiern ex Benth	Asteraceae	Shrub	Me	E	
Bridelia micrantha (Hochst.)Baill.	Euphorbiaceae	Tree	En		Galalo (O)
Brillantaisia grotanellii Pichi-Sermoli	Acanthaceae	Herb	Me	E	
Brillantaisia madagascariensis Lindau.	Acanthaceae	Herb	Me		
Brucea antidysenterica J.F.Mill.	Simaroubaceae	Tree	Me		Komogno (O)
Buddlea polystachya Fresen.	Loganiceae	Shrub	Me		Anfare (O)
Bulbophyllum intertextum Lindl.	Orchidaceae	Epiphyte			
Bulbophyllum josephii (Kuntze) Summerh.	Musaceae	Epiphyte			
Bulbophyllum sandersonii (Hook.f.)Rchb.f.	Orchidaceae	Epiphyte			
Bulbostylis abortiva (Steud.) C.B. Clarke	Cyperaceae	Herb			
Bulbostylis densa (Wall.) Hand-Mazz.	Cyperaceae	Herb			
Caesalpinia decapetala (Roth)Alston	Fabaceae	Climber	En		Kitkita (Am)
Calpurnia aurea (Ait.) Benth	Fabaceae	Tree	Ti		Cheka (O)
Canna indica L.	Cannaceae	Herb	Fo		
Canthium oligocarpum Hiern	Rubiaceae	Tree	En		Galo (O)
Capparis micrantha A. Rich.	Capparidaceae	Shrub	En		Arangama (O)
Capparis tomentosa Lam.	Capparidaceae	Climber	Me		Arangama (O)

Capsicum frutescens L.	Solanaceae	Herb	Fo		Berbere (O)
Cardamine africana L.	Brassicaceae	Herb	Fo		
Cardamine trichocarpa A. Rich.	Brassicaceae	Herb			
Carissa spinarum L.	Apocynaceae	Climber	Fo		Agamssa (O)
Cassipourea malosana (Baker) Alston	Rhizophoraceae	Tree	Ti		Tilo (O)
Cassytha filiformis L.	Lauraceae	Herb			
Celosia trigyna L.	Amaranthaceae	Herb			
Celtis gomphophylla Bak.	Ulmaceae	Tree	Ti		Gerbi-adi (O)
Celtis philippensis Blanco	Ulmaceae	Tree	Ti		
Celtis toka (Forssk.) Hepper & Wood	Ulmaceae	Tree	Ti		
Celtis zenkeri Engl	Ulmaceae	Tree	Ti		
Celtis africana Burm.f.	Ulmaceae	Tree	Ti		Matakoma (O)
Centella asiatica (L.) Urban in Mart	Apiaceae	Herb			
Ceropegia recurvata M.G. Gilbert	Asclepidaceae	Climber		E	
Ceropegia sobolifera N.E.Br	Asclepidaceae	Climber		E	
Chenopodium procerum Moq.	Chenopodiaceae	Herb	Me		Met'ene (O)
Chionanthus mildbraedii (Gilg & Schellenb.) Stearn	Oleaceae	Shrub	En		
Chlorophytum macrophyllum (A. Rich.) Aschers	Anthericaeae	Herb			
Chlorophytum nubicum (Baker) Kativu	Anthericaeae	Herb			
Chlorophytum tuberosum (Roxb.) Baker	Anthericaeae	Herb			
Cissus ellenbeckii Gilg & Brandt	Vitaceae	Shrub			
Cissus quadrangulanis L.	Vitaceae	Climber			
Clausena anisata (Willd.) Benth.	Rutaceae	Tree	Me		Ulmayi (O)
Clematis longicauda Steud. ex A. Rich.	Ranunculaceae	Climber	Me		Hid-feti (O)
Clematis simensis Fresen.	Ranunculaceae	Climber	Me		Hid-feti (O)
Clerodendrum alatum L.	Verbenaceae	Shrub	Me		
Clerodendrum myricoides (Hochst.) Vatke	Verbenaceae	Shrub	Me		Mara-sisa (O)
Coccinia schliebenii Harms.	Cucurbitaceae	Climber			
Coffea arabica L.	Rubiaceae	Tree	Fo		Buna (O)
Coleochloa abyssinica (Hochst. ex A.Rich.)Gilly	Cyperaceae	Epiphyte	Me		
Combretum aculeatum Vent.	Combretaceae	Climber			Kaleda (O)
Combretum paniculatum Vent.	Combretaceae	Climber			Bagi (O)
Commelina eckloniana Kunth	Commelinaceae	Herb			
Commelina foliacea Chiov.	Commelinaceae	Herb			
Commelina latifolia Hochst. ex A. Rich.	Commelinaceae	Herb			
Cordia africana Lam.	Boraginaceae	Tree	Ti		Wadessa (O)
Corymborkis corymbis Thouars	Orchidaceae	Herb			
Costus afer Ker-Gawl	Costaceae	Herb			Kichu (O)
Crassocephalum montuosum (S. Moore) Milne-Redh.	Asteraceae	Herb	Me		
Crinum ornatum (Ait.) Bury	Amaryllidaceae	Herb			Shinkurt (Am)
Crossopteryx febrifuga (Hochst.) Bridson	Rubiaceae	Shrub	En		
Crotalaria agatiflora, Schweinf.	Fabaceae	Shrub		E	
Crotalaria gillettii, Polhill	Fabaceae	Herb		E	
Croton macrostachyus Del.	Euphorbiaceae	Tree	Ti		Bakanissa (O)
Culcasia falcifolia Engl.	Araceae	Climber			
Cussonia ostinii Chiov.	Araliaceae	Tree		E	
Cyathea manniana Hook.	Cyatheaceae	Shrub	Hu		
Cynanchum abyssinicum Decne	Asclepidaceae	Climber			
Cynoglossum coeruleum A.DC. subsp. coeruleum	Boraginaceae	Herb			
Cyperus bifolius Lye	Cyperaceae	Sedges		E	
Cyperus brevifolius (Rottb.) Hasskn	Cyperaceae	Sedges			
Cyperus castaneus Willd.	Cyperaceae	Sedges			
Cyperus cyperoides (L.) Kuntze	Cyperaceae	Sedges			
Cyperus dereilema Steud.	Cyperaceae	Sedges			
Cyperus dichroostachyus A. Rich.	Cyperaceae	Sedges			
Cyperus difformis L.	Cyperaceae	Sedges			
Cyperus digitatus Roxb.	Cyperaceae	Sedges			
Cyperus distans L. f.	Cyperaceae	Sedges			
Cyperus divulsus Ridley	Cyperaceae	Sedges			
Cyperus erectus (Schum.) Mattf. & Kuk.	Cyperaceae	Sedges			
Cyperus esculentus L.	Cyperaceae	Sedges			
Cyperus fiscjerianus A. Rich.	Cyperaceae	Sedges			
Cyperus flavesens L.	Cyperaceae	Sedges	Me		
Cyperus imbricatus Retz.	Cyperaceae	Sedges			
Cyperus macrostachyos Lam.	Cyperaceae	Sedges			
Cyperus maculatus Bock.	Cyperaceae	Sedges			
Cyperus papyrus L.	Cyperaceae	Sedges	Hu		Aladu (O)
Cyperus pauper Hochest. Ex A. Rich	Cyperaceae	Sedges			
Cyperus pectinatus Vahl.	Cyperaceae	Sedges			
Cyperus pinguis (C. B. Clarke) Mattf. & Kuk.	Cyperaceae	Sedges			
Cyperus pumilus L.	Cyperaceae	Sedges			
Cyperus reduncus Bock	Cyperaceae	Sedges			

Cyperus submacropus Kuk	Cyperaceae	Sedges			
Cyperus subumbellatus Kuk	Cyperaceae	Sedges			
Cyperus unioloides R. Br.	Cyperaceae	Sedges			
Cyphostemma adenocaule (Steud. Ex A. Rich.) Descoings	Vitaceae	Climber			
Cyphostemma dembianense (Chiov.) Vollesen	Vitaceae	Climber			
Cyphostemma pannosum Vollesen	Vitaceae	Climber		E	
Dalbergia lactea Vatke	Fabaceae	Climber	En		
Daucus hochstetteri Braun ex Drude	Apiaceae	Herb			
Desmodium hirtum Guill. & Perr	Fabaceae	Herb			
Desmodium repandum (Vahl) DC	Fabaceae	Herb			
Diaphananthe adoxa F. Rasm	Orchidaceae	Epiphyte			
Dioscorea alata L.	Dioscoreaceae	Climber	Fo		Kotehare (O)
Dioscorea bulbifera L.	Dioscoreaceae	Climber	Fo		Kotehare (O)
Dioscorea praehensilis Benth.	Dioscoreaceae	Climber	Fo		Kotehare (O)
Dioscorea schimperiana Kunth	Dioscoreaceae	Climber	Fo		
Diospyros abyssinica (Hiern) F. White	Ebenaceae	Tree	Ti		Loko (O)
Diospyros mespiliformis Hochst. Ex A.DC	Ebenaceae	Tree	Ti		Loko (O)
Dissotis decumbens (P. Beauv.) Triana	Melastomataceae	Herb			
Dodonea angustifolia L.f.	Sapindaceae	Shrub	En		Itecha (O)
Dombeya torrida (J.F.Gmel.) P. Bamps	Sterculiaceae	Tree	Ti		
Dorstenia barnimiana Schweinf.	Moraceae	Herb			
Dorstenia soerensenii Friis	Moraceae	Herb		E	
Doryopteris concolor (Langsd. & Fisch.) Kuhn	Adiantaceae	Herb			
Dracaena afromontana Mildbr.	Dracaenaceae	R-Tree			Wondo (O)
Dracaena fragrans (L.) Ker-Gawl	Dracaenaceae	R-Tree			
Dracaena steudneri Engler	Dracaenaceae	R-Tree			Aferfertu (O)
Dregea abyssinica (Hochst.) K.Schum	Asclepidaceae	Climber			
Droguetia iners (Forssk.) Schweinf.	Urticaceae	Herb			
Drymaria cordata (L.) Schultes in Roem. & Schultes	Caryophyllaceae	Climber			
Drynaria volkensii J. Sm	Polypodiaceae	Epiphyte			
Ehretia cymosa Thonn.	Boraginaceae	Tree	Ti		Wuruga (O)
Ekebergia capensis Sparrm.	Meliaceae	Tree	Ti		Somboo (O)
Elaeodendron buchananii (Loes) Loes.	Celastraceae	Tree	Ti		Loko (O)
Elaphglossum deckenii (Kuhn) C. Chr.	Lomariopsidaceae	Epiphyte			
Elatostema monticolum Hook.f.	Urticaceae	Herb			
Embelia schimperi Vatke	Myrsinaceae	Climber	Me		Haniku (O)
Ensete ventricosum (Welw.) Cheesman	Musaceae	R-Tree	Fo		Kocho (O)
Entada abyssinica Steud. ex A.Rich.	Fabaceae	Tree	En		
Eriosema scioanum Avetta	Fabaceae	Herb		E	
Erythrina brucei Schweinf.	Fabaceae	Tree	En		Walensu (O)
Erythrina abyssinica Lam. ex DC	Fabaceae	Tree	En		Walensu (O)
Erythrococca abyssinica Pax	Euphorbiaceae	Shrub	En		Galo dala (O)
Erythrococca trichogyne (Muell. Arg.) Prain.	Euphorbiaceae	Shrub	En		Galo dala (O)
Eugenia bukobensis Engl.	Myrtaceae	Tree	Fo		Kirunfudi (O)
Eulopia albobrumea Kraenzl	Orchidaceae	Herb		E	
Eulophia cucullata (Sw.) Steud.	Orchidaceae	Herb			
Eulophia guineensis Lindl.	Orchidaceae	Herb			
Euphorbia ampliphylla Pax	Euphorbiaceae	R-Tree			Adami (O)
Euphorbia schimperiana Sheele	Euphorbiaceae	R-Tree			Adami (O)
Fagaropsis angolensis (Engl.) Milne	Rutaceae	Tree	Ti		Ajee (O)
Ficus capreaefolia Del	Moraceae	Tree	Fo		
Ficus exasperata Vahl.	Moraceae	Tree	En		
Ficus lutea Vahl	Moraceae	Tree	Me		
Ficus mucuso Ficalho	Moraceae	Tree	Fo		
Ficus sur Forssk.	Moraceae	Tree	Fo		Harbu (O)
Ficus sycomorus L.	Moraceae	Tree	Fo		Odda (O)
Ficus thonningii Blume	Moraceae	Tree	En		Dambi (O)
Ficus umbellata Vahl	Moraceae	Tree	En		
Ficus vallis-choudae Del.	Moraceae	Tree	En		
Ficus vasta Forssk.	Moraceae	Tree	En		Warka (Am)
Filicium decipiens (Wight & Am.) Thw.	Sapindaceae	Tree	Ti		Chana (O)
Flacourtia indica (Burm.f.) Merr.	Flacourtiaceae	Tree	Fo		Huda (O)
Galiniera saxifraga (Hochst.) Bridson	Rubiaceae	Tree	En		Adamo (O)
Galinsoga parviflora Cav.	Asteraceae	Herb			Abadaba (Am)
Galium simense Fresen.	Rubiaceae	Herb			Matane (O)
Galium spurium L.	Rubiaceae	Herb			
Gardenia ternifolia Schumach. & Thonn.	Rubiaceae	Tree	Hu		Gambilo (O)
Geophila repens (L.)J. M. Johnston	Rubiaceae	Herb			
Geranium aculeolatum Oliv.	Geraniaceae	Herb			
Girardinia diversifolia (Link) Friis	Urticaceae	Herb	Hu		Gobdu (O)
*Gloriosa superb*a L.	Colchicaceae	Herb	Me		

Gompherena celosioides Mart.	Amaranthaceae	Herb	Me		
Gomphocarpus fruticosus (L.) Ait.f.	Asclepidaceae	Herb	Me		
Gomphocarpus semilunatus A. Rich.	Asclepidaceae	Herb	Me		
Gouania longispicata Engl.	Rhamnaceae	Climber	Me		
Grewia ferruginea Hochst. Ex A. Rich.	Tiliaceae	Tree			Hada (O)
Habenaria cirrhata (Lindl.) Rchb.f.	Orchidaceae	Herb			
Habenaria cornuta Lindl.	Orchidaceae	Herb			
Habenaria holubii Rolfe	Orchidaceae	Herb			
Habenaria humilior Rchb.f.	Orchidaceae	Herb			
Habenaria malacophylla A.Rich.	Orchidaceae	Epiphyte			
Habenaria peristyloides A. Rich.	Orchidaceae	Epiphyte			
Habenaria schimperiana A. Rich.	Orchidaceae	Epiphyte			
Hallea rubrostipulata (K. Schum.) J. F. Leroy	Rubiaceae	Tree			
Helinus mystacinus (Ait.) E. Mey.ex Steud.	Rhamnaceae	Climber			
Hibiscus calyphyllus Cavan.	Malvaceae	Shrub			
Hibiscus diversifolius A. Rich.	Malvaceae	Shrub			
Hibiscus ludwigii Eckl. & Zeyh	Malvaceae	Shrub			
Hibiscus micranthus L. F.	Malvaceae	Shrub			Kunch'e (O)
Hilleria latifolia (Lam.) H. Walter	Phytolaccaceae	Herb			
Hippocratea africana (Willd.) Loes.	Celastraceae	Climber	Hu		
Hippocratea goetzei Loes	Celastraceae	Climber	Hu		
Hippocratea pallens Planchon. ex Oliver	Celastraceae	Climber	Hu		
Hydrocotyle mannii Hook.f	Apiaceae	Herb			
Hydrocotyle ranunculoides L.f.	Apiaceae	Herb			
Hymenodictyon floribundum (Hochst. & Steud.) Robinson	Rubiaceae	Shrub			
Hypoestes forskaoli (Vahl) Röm. & Schultes	Acanthaceae	Herb			
Hypoestes triflora (Forssk.) Röm & Schult	Acanthaceae	Herb			
Ilex mitis (L.) Radlk.	Aquifoliaceae	Tree	Ti		Amshika (O)
Impatiens ethiopica Grey-Wilson	Balsaminaceae	Herb	Me		Hansosila (O)
Impatiens hochstetteri Warb.	Balsaminaceae	Herb			
Impatiens rothii Hook.f.	Balsaminaceae	Herb		E	
Ipomoea cairica (L.) Sweet	Convolvulaceae	Climber			
Ipomoea hochstetteri House	Convolvulaceae	Climber			
Ipomoea tenuirostris Steud. ex Choisy	Convolvulaceae	Climber			
Jasminum abyssinicum Hochst. ex Dc	Oleaceae	Climber			
Justicia betonica L.	Acanthaceae	Shrub			
Justicia bizuneshiae Ensermu	Acanthaceae	Herb		E	
Justicia diclipteroides Lindau subsp. *aethiopica* Hedren	Acanthaceae	Herb		E	
Justicia heterrocarpa T. Anderson	Acanthaceae	Herb			
Justicia schimperiana (Hochst. ex A.Rich.) T. Anders	Acanthaceae	Shrub			Dhumuga (O)
Kalancoe densiflora Rolfe	Crassulaceae	Herb			Bosoqe (O)
Keetia gueinzii (Sond.) Bridson	Rubiaceae	Climber			
Keetia zanzibarica (Klozsch) Bridson	Rubiaceae	Climber			
Kniphofia pumila (Ait.) Kunth	Asphodelaceae	Herb			
Lagenaria abyssinica (Hook. f.) Jeffrey	Cucurbitaceae	Climber			Buke (O)
Laggera alata(D. Don) Oliv	Asteraceae	Herb			
Laggera crispata (D. Don) Oliv	Asteraceae	Herb			
Laggera tomentosa (Sch.Bip. ex A.Rich.)Oliv. & Hiern	Asteraceae	Herb		E	
Landolphia buchananii (Hall.f.) Stapf	Apocynaceae	Climber	Fo		Gebo (O)
Lankesteria elegans (P. Beauv.) T. Anders.	Acanthaceae	Herb			
Lannea welwitschii (Hiern) Engl.	Anacardiaceae	Tree			
Lecaniodiscus. fraxinifolius Bak.	Sapindaceae	Tree	Ti		
Lepidotrichilia volkensii (Gurke) Leroy	Meliaceae	Shrub	Ti		
Lepisanthes senegalensis (Juss. ex Poir.) Leenh.	Sapindaceae	Tree	Ti		
Leptaspis zeylanica Nees ex Steud.	Gramineae	Sedges			
Leucas urticifolia (Vahl)Sm.	Labiatae	Shrub			
Liparis abyssinica A. Rich.	Orchidaceae	Herb		E	
Liparis deistelii Schltr.	Orchidaceae	Herb			
Lipocarpha nana (A. Rich.) Cherm.	Cyperaceae	Sedges			
Lobelia exilis	Lobeliaceae	Herb		E	
Lobelia giberroa Hemsl.	Lobeliaceae	R-Tree			Daju (O)
Lonchocarpus laxiflors Guill. & Perr.	Fabaceae	Tree			
Lotus discolor E. Mey	Fabaceae	Shrub			
Loxogramme lanceolata (Sw.) Presl.	Loxogrammaceae	Epiphyte			
Lycopodium clavatum L.	Lycopodiaceae	Epiphyte			
Macaranga capensis (Baill.) Sim	Euphorbiaceae	Tree	Ti		Hongo (O)
Maesa lanceolata Forssk.	Myrsinaceae	Tree	Fo		Abayi (O)
Malaxis weberbaueriana (Kraenzl.) Summerh	Orchidaceae	Herb			
Manilkara butugi Chiov.	Sapotaceae	Tree	Ti		Butugi (O)
Marantochloa leucantha (K. schum.) Milne-Redh.	Gramineae	Herb			
Marantochloa mannii (Bentham) Milne-Redh.	Marantaceae	Herb			
Marattia fraxinea Gmel	Marattiaceae	Herb			
Maytenus arbutifolia (A. Rich.) Wilczek	Celastraceae	Shrub			

Maytenus gracilipes (Welw. Ex Oliv.) Exell	Celastraceae	Shrub			
Maytenus obscura (A. Rich.) Cuf.	Celastraceae	Shrub			Komblocha (O)
Metarungia pubinervia (T. Anders) Baden	Acanthaceae	Shrub			
Microcoelia globulosa (Hochst.) L. Johsson.	Orchidaceae	Epiphyte			
Microglossa pyrifolia (Lam.) Kuntze	Asteraceae	Climber			
Milicia excelsa (Welw.) C. C. Berg	Moraceae	Tree	Ti		
Millettia ferruginea (Hochst.) Bak.	Fabaceae	Tree	Me		Birbiraa (O)
Mimosa pigra L.	Fabaceae	Herb			
Mimusops Kummel A. DC.	Sapotaceae	Tree	Fo		Kolati (O)
Momordica foetida Schumach	Cucurbitaceae	Climber			
Morus mesozygia Stapf	Moraceae	Tree	Ti		Sacho (O)
Myrsine africana L.	Myrsinaceae	Shrub	En		Kechemo (O)
Nervilia bicarinata (Bl.)Schltr.	Orchidaceae	Herb			
Nuxia congesta R. Br. ex Fresen	Loganiceae	Tree	En		Nafuro (O)
Ocimum lamiifolium Hochst. ex Benth.	Labiatae	Shrub	Me		Urgo (O)
Ocimum urticifolium Roth	Labiatae	Shrub	Me		
Oldenlandia capensis l.f.	Rubiaceae	Herb			
Oldenlandia corymbosa L.	Rubiaceae	Herb			
Oldenlandia goreensis (DC.) Summerh	Rubiaceae	Herb			
Olea capensis L. ssp. macrocarpa (C. H. Wright) Verdc.	Oleaceae	Tree	Ti		Gagama (O)
Olea europaea L. ssp. cuspidata (Wall. ex G. Don) Cif. L'Olivicoltore	Oleaceae	Tree	Ti		Ejersa (O)
Olea welwitschii (Knobl.) Gilg & Schellenb.	Oleaceae	Tree	Ti		Gagama (O)
Oleandra distenta Kunze	Oleandraceae	Epiphyte			
Olinia rochetiana A. Juss.	Oliniaceae	Tree	En		Nole (O)
Olyra latifolia L.	Gramineae	Sedges			
Oncinotis tenuiloba Stapf	Apocynaceae	Climber			
Oplismenus hirtellus (L.) P. Beauv.	Gramineae	Sedges			
Oplismenus undulatifolius (Ard.) Roem. & Schult.	Gramineae	Sedges			
Oxalis corniculata L.	Oxalidaceae	Herb			
Oxalis procumbens Steud. ex A. Rich.	Oxalidaceae	Herb			
Oxalis radicosa A. Rich.	Oxalidaceae	Herb			
Oxyanthus speciosus ssp. globosus Bridson.	Rubiaceae	Tree			Birango (O)
Pancratium tenuifolium A. Rich.	Amaryllidaceae	Herb			
Panicum polystachya (Kunth) Stapf.	Gramineae	Sedges			
Panicum hochstetteri Steud.	Gramineae	Sedges			
Pappea capensis Eckl. & Zeyh.	Sapindaceae	Tree			
Paullinia pinnata L.	Sapindaceae	Climber			
Pavetta abyyssinica Fresen.	Rubiaceae	Shrub			
Pavetta oliveriana Hiern	Rubiaceae	Shrub			
Pavonia urens Cav.	Malvaceae	Herb			Inch'ini (O)
Pentas caffensis Chiov.	Rubiaceae	Herb			
Pentas concinna K. Schum.	Rubiaceae	Herb		E	
Pentas schimperiana (A. Rich.) vatke	Rubiaceae	Herb			
Pentodon pentandrus (Schumach & Thonn.) Vatke	Rubiaceae	Herb			
Peperomia abyssinica Miq.	Piperaceae	Epiphyte			
Peperomia fernandopoiana C. DC.	Piperaceae	Epiphyte			
Peperomia molleri C. DC.	Piperaceae	Epiphyte			
Peperomia retusa (L.f.) A.Dietr.	Piperaceae	Epiphyte			
Peperomia rotundifolia (L.) Kunth	Piperaceae	Epiphyte			
Peperomia tetraphylla (Forster) Hook & Arn.	Piperaceae	Epiphyte			
Peponium vogelii (Hook.f.)Engl.	Cucurbitaceae	Climber	Fo		Sompa (O)
Periploca linearifolia Quart-Dill. & A. Rich.	Asclepidaceae	Climber	Me		Hid-Anano (O)
Persicaria decipiens (R. Br.) K.L. Wilson	Polygonaceae	Herb			
Persicaria nepalensis (Meisn.)Miyabe	Polygonaceae	Herb			
Persicaria senegalensis (Meisn.) Sojak	Polygonaceae	Herb			
Phoenix reclinata Jacq.	Arecaceae	R-Tree	Fo		Meti (O)
Phyllanthus lameness Cuf.	Euphorbiaceae	Herb	En	E	
Phyllanthus ovalifolius Forssk.	Euphorbiaceae	Climber	En		
Physalis peruviana L.	Solanaceae	Herb	Fo		Simiko (O)
Phytolacca dodecandra L´Herit.	Phytolaccaceae	Climber	Me		Andode (O)
Pilea bambuseti Engl.	Urticaceae	Herb		E	
Pimpinella heywoodii Abebe	Apiaceae	Herb		E	
Piper capense L.f.	Piperaceae	Herb	Fo		Kundeberbere (O)
Piper guineense Schum. & Thonn.	Piperaceae	Climber	Fo		
Piper umbellatum L.	Piperaceae	Herb	Fo		
Pittosporum viridiflorum Sims	Pittosporaceae	Tree	Me		Sole (O)
Platycerium elephantotis Schweinf.	Polypodiaceae	Epiphyte			
Plectranthus laxiflorus Benth.	Labiatae	Epiphyte			
Plectranthus punctatus (L.F.) L´H´er	Labiatae	Herb			
Plectranthus sylvestris Gurke	Labiatae	Herb			

Plumbago truncata	Plumbaginaceae	Herb		E	
Pollia condensata C. B. Clarke	Commelinaceae	Herb			
Pollia mannii C. B. Clarke	Commelinaceae	Herb			
Polyscia fulva (Hiern) Harms	Araliaceae	Tree	Ti		Karasho (O)
Polystachya. caduca Rchb.f	Orchidaceae	Epiphyte		E	
Polystachya cultriformis (Thouars)Spreng.	Orchidaceae	Epiphyte			
Polystachya lindblomii Schltr.	Orchidaceae	Epiphyte			
Polystachya paniculata (Sw.) Rolfe	Orchidaceae	Epiphyte			
Polystachya rivae Schweinf.	Orchidaceae	Epiphyte		E	
Polystachya steudneri Rchb.f.	Orchidaceae	Epiphyte			
Pouteria adolfi-friederici (Engl.) Baehni	Sapotaceae	Tree	Ti		K'erero (O)
Pouteria alnifolia (Bak.) Roberty	Sapotaceae	Tree	Ti		
Pouteria altissima (A.Chev.) Baehni	Sapotaceae	Tree	Ti		Kuro (O)
Premna schimperi Engl.	Verbenaceae	Shrub	Me		
Prunus africana (Hook.f.) Kalkm.	Rosaceae	Tree	Ti		Hoomi (O)
Psychotria capensis (Eckl.) vatke	Rubiaceae	Shrub			
Psychotria kirkii Hiern	Rubiaceae	Shrub			
Psychotria orophila Petit	Rubiaceae	Shrub			
Psychotria peduncularis (Salisb.) Steyerm	Rubiaceae	Shrub			
Psydrax parviflora (Afz.) Bridson	Rubiaceae	Tree	En		
Pteris catoptera Kunze	Pteridaceae	Herb			
Pteris cretica L.	Pteridaceae	Herb			
Pteris dentata Forssk.	Pteridaceae	Herb			
Pterolobium stellatum (Forssk.)Brenan	Fabaceae	Climber	En		Harangama (O)
Pycnostachys abyssinica,	Labiatae	Herb		E	
Pycnostachys recurvata,	Labiatae	Herb		E	
Ranunculus multifidus Forssk.	Ranunculaceae	Herb			
Raphiostylis beninensis (Planch.) Benth	Icacinaceae	Climber			
Rhamnus prinoides L´Herit.	Rhamnaceae	Climber	Fo		Gesho (O)
Rhipsalis baccifera (J. Miller) W.T. Stearn	Cactaceae	Epiphyte			
Rhoicissus revoilii Planch	Vitaceae	Climber			
Rhoicissus tridentate (L.f.)Wild & Drummond	Vitaceae	Climber			
Rhus quartiniana A. Rich.	Anacardiaceae	Shrub			Tatessa (O)
Rhus ruspolii Engl	Anacardiaceae	Shrub			
Ricinus communis L.	Euphorbiaceae	Tree	Me		Kobo (O)
Rinorea friisii M.Gilbert	Violaceae	Tree		E	
Ritchiea albersii Gilg	Capparidaceae	Tree	Fo		
Rosa abyssinica Lindley	Rosaceae	Shrub	Fo		Qaqawi (O)
Rothmannia urceliformis (Hiern) Robyns	Rubiaceae	Tree			
Rubia cordifolia L.	Rubiaceae	Herb			
Rubus *apetalus* Poir.	Rosaceae	Climber	Fo		Gora (O)
Rubus steudneri Schweinf.	Rosaceae	Climber	Fo		Gora (O)
Rumex abyssinicus Jacq.	Polygonaceae	Herb			
Rungia grandis T. Anders	Acanthaceae	Shrub			
Rytigynia neglecta (Hiern) Robyns	Rubiaceae	Tree			
Saba comorensis (Boj.) Pichon	Apocynaceae	Climber			
Salacia congolensis De Wild & Th. Dur.	Celastraceae	Climber			
Sanicula elata Buch.-Ham. ex D. Don	Apiaceae	Herb			
Sapium ellipticum (Krauss) Pax	Euphorbiaceae	Tree			Bosoke (O)
Sarcocephalus latifolius (Smith) Bruce	Rubiaceae	Shrub			
Satureja paradoxa (Vatke) Engl. ex Seybold	Labiatae	Herb		E	
Scadoxus multiflorus (Martyn) Raf.	Amaryllidaceae	Herb			
Scadoxus nutans (Friis & I. Bjørnstad) Friis & Nordal	Amaryllidaceae	Epiphyte		E	
Scadoxus puniceus (L.) Friis & Nordal	Amaryllidaceae	Epiphyte			
Schefflera abyssinica (Hochst. ex A. Rich.)Harms	Araliaceae	Tree	Ti		Getema (O)
Schefflera volkensii (Engl.) Harms	Araliaceae	Tree			
Schoenoplectus corymbosus (Roem & Schult.) Rayn.	Cyperaceae	Herb			
Schrebera alata (Hochst.) Welw.	Oleaceae	Tree			
Scleria racemosa Poiret	Cyperaceae	Sedges			
Scutia myrtina (Burm.f.) Kurz	Rhamnaceae	Climber			
Secamone punctulata Decne	Asclepidaceae	Climber			
Selaginella hraussiana (Kze.) A. Br.	Selaginellaceae	Epiphyte			
Senna occidentalis (L.)Link	Fabaceae	Shrub			
Senna petersiana (Bolle)Lock	Fabaceae	Tree			
Sericostachys scandens Gilg & Lopr.	Amaranthaceae	Climber			
Sesbania dummeri Phil. & Hutch.	Fabaceae	Shrub			
Setaria megaphylla (Steud.)Th. Dur.	Gramineae	Sedges			
Sicyos polycanthus Cogn	Cucurbitaceae	Climber			
Sida collina Schlechtend.	Malvaceae	Shrub			
Sida rhombifolia L.	Malvaceae	Shrub			
Sida ternata L.	Malvaceae	Shrub			
Siphonochilus aethiopicus (Schweinf.) B.L.Burtt	Zingiberaceae	Herb			

Solanecio gigas (Vatke) C.Jeffrey	Asteraceae	Shrub			
Solanum benderianum L	Solanaceae	Climber			
Solanum giganteum L.	Solanaceae	Shrub			
Solanum incanum L	Solanaceae	Shrub			Hidi (O)
Solanum indicum L.	Solanaceae	Shrub			Hidi (O)
Solanum nigrum L.	Solanaceae	Herb	Fo		
Spermacoce mauritiana Gideon	Rubiaceae	Herb			
Spermacoce princeae (K. Schum.) Verdc	Rubiaceae	Herb			
Spermacoce pusilla Wall.	Rubiaceae	Herb			
Spermacoce sphaerostigma (A. Rich.) Vatke	Rubiaceae	Herb			
Stereospermum kanthianum Cham.	Bignoniaceae	Tree			
Stiotocardia beraviensis (Vatke) Hall. F.	Convolvulaceae	Climber			
Strychnos mitis S. Moore	Loganiceae	Tree	Ti		
Syzygium guineense ssp. afromontanum F. White	Myrtaceae	Tree	Ti		Badessa (O)
Syzygium *guineense* ssp. *guineense* (Willd.)DC	Myrtaceae	Tree	Ti		Badessa (O)
Syzygium guineense ssp. macrocarpum F. White	Myrtaceae	Tree	Ti		Gosu (O)
Tacazzea apiculata Oliv.	Asclepidaceae	Climber			
Tacca leontopetaloides (L.) O. Ktze.	Taccaceae	Herb			
Teclea nobilis Del.	Rutaceae	Tree	En		Hadhessa (O)
Tectaria gemmifera (Fee) Alston	Aspidiaceae	Herb			
Terminalia brownie Fresen.	Combretaceae	Tree	En		
Thalictrum rhynchocarpum Dill. & A. Rich.	Ranunculaceae	Herb			
Thonningia sanguinea Vahl	Balanophoraceae	Herb			
Tiliacora funifera Oliv.	Menispermaceae	Climber	Me		
Tiliacora troupinii Cufod.	Menispermaceae	Climber		E	
Toddalia asiatica (L.) Lam.	Rutaceae	Climber			
Trachycalymma minutiflorum Goyder	Asclepiadaceae	Herb		E	
Tragia brevipes Pax	Euphorbiaceae	Climber	Me		
Trema orientalis (L.) Bl.	Ulmaceae	Tree			
Trichilia dregeana Sond.	Meliaceae	Tree	Fo		Luyya (O)
Trichilia emetica Vahl.	Meliaceae	Tree	Ti		
Trichilia prieuriana A. Juss.	Meliaceae	Tree	Ti		
Trifolium calocephalum Fresen	Fabaceae	Herb		E	
Trifolium mattirolianum Chiov	Fabaceae	Herb		E	
Trifumfetta rhomboidea Jacq.	Tiliaceae	Shrub			
Trilepisium madagascariense DC.	Moraceae	Tree	Fo		
Tristemma mauritianum J.F.Gmel.	Melastomataceae	Herb			
Turraea holstii Gurke	Meliaceae	Tree			
Tylophora sylvatica Decne.	Asclepidaceae	Climber			
Uncaria africana G. Don	Rubiaceae	Climber			
Urera hypselodendron (A. Rich.) Wedd.	Urticaceae	Climber			
Urera trinervis (Hochst.) Friis & Immelman	Urticaceae	Climber			
Vepris dainellii (Pichi-Serm.) Kokwaro	Rutaceae	Tree	Me		Hadhessa (O)
Veronica abyssinica Fresen	Scrophulariaceae	Herb			
Vernonia amygdalina Del.	Asteraceae	Tree	Me		
Vernonia auriculifera Hiern.	Asteraceae	Shrub	Me		
Vernonia hochstetter Sch. Bip. ex walp	Asteraceae	Shrub			
Vernonia gilbertii Mesfin	Asteraceae	Shrub		E	
Wissadula rostrata (Schumach & Thonn.) Hook.f.	Malvaceae	Herb			
Zanha golungensis Hiern	Sapindaceae	Tree	Ti		
Zanthoxylum leprieurii Guill. & Perr.	Rutaceae	Tree			
Zehneria scabra (L.f.) Sond.	Cucurbitaceae	Climber			
Ziziphus abyssinica Hochest. Ex A. Rich.	Rhamnaceae	Shrub	Hu		
Ziziphus mucronata Willd.	Rhamnaceae	Shrub	Hu		Kukura (O)

Appendix 7. List of birds recorded in Yayu Coffee Forest Biosphere Reserve area

No.			
1	***Podicipedidae***	*Tachybaptus ruficollis*	Little Grebe
2	***Phalacrocoracidae***	*Phalacrocorax africanus*	Long tailed Cormorant
3	***Anhingidae***	*Anhinga rufa*	Darter
4	***Ardeidae***	*Ardea cinerea*	Grey Heron
5		*Ardea melanocephala*	Black headed Heron
6		*Bubulcus ibis*	Cattle Egret
7		*Butorides striata*	Green backed (Straited)Heron
8		*Egretta alba*	Great White Egret
9		*Egretta garzetta*	Little Egret
10	***Scopidae***	*Scopus umbretta*	Hamerkop
11	***Ciconiidae***	*Anastomus lamelligerus*	Open billed Stork
12		*Ciconia abdimii*	Abdim's Stork
13		*Ciconia ciconia*	White Stork
14		*Ciconia episcopus*	Wooly necked stork
15	***Threskiornithidae***	*Bostrychia carunculata*	Wattled Ibis
16		*Bostrychia hagedash*	Hadada Ibis
17	***Anatidae***	*Alopochen aegyptiacus*	Egyptian Goose
18		*Anas sparsa*	African Black Duck
19		*Anas undulata*	Yellow billed Duck
20	***Accipitridae***	*Accipiter melanoleucus*	Black Goshawk
21		*Accipiter minullus*	Little Sparrowhawk
22		*Accipiter rufiventris*	Red breasted Sparrow Hawk
23		*Accipiter tachiro*	African Goshawk
24		*Aegypicus occipitalis*	White headed Vulture
25		*Aegypicus trachelious*	Lappet faced Vulture
26		*Aquila clanga*	Greater Spotted Eagle
27		*Aquila rapax*	Tawny Eagle
28		*Buteo augur*	Augur Buzzard
29		*Buteo buteo*	Common Buzzard
30		*Circaetus cinerascens*	Western Banded Snake Eagle
31		*Gyps africanus*	White backed Vulture
32		*Gyps ruppellii*	Ruppell's Vulture
33		*Haliaeetus vocifer*	African Fish Eagle
34		*Lophoaetus occipitalis*	Long crested Eagle
35		*Machaerhamphus alcinus*	Bat Hawk
36		*Milvus aegypticus*	Yellow billed Kite
37		*Necrosyrtes monachus*	Hooded Vulture
38		*Pernis apivorus*	European Honey Buzzard
39		*Polyboroides typus*	African Harrier Hawk
40		*Stephanoaetus coronatus*	Crowned Eagle
41		*Terathopius ecaudatus*	Bateleur
42	***Falconidae***	*Falco ardosiaceus*	Grey Kestrel
43		*Falco biarmicus*	Lanner Falcon
44		*Falco concolor*	Sooty Falcon
45		*Falco tinnunculus*	Common Kestrel
46	***Phasianidae***	*Francolinus castaneicollis*	Chestnut napped Francolin

47		*Francolinus squamatus*	Scaly Francolin
48	***Gruidae***	*Balearica pavonina*	Black Crowned Crane
49	***Rallidae***	*Ruogetius rougetii*	Rouget's Rail
50	*Heliornithidae*	*Podica senegalensis*	African Finfoot
51	***Scolopacidae***	*Tringa hypolucos*	Common Sandpiper
52		*Tringa ochropus*	Green Sandpiper
53	***Columbidae***	*Columba albitorques*	White collared Pigeon
54		*Streptopelia decipiens*	African Mourning Dove
55		*Streptopelia vinacea*	Vinaceous Dove
56		*Turtur abyssinicus*	Black billed Wood Dove
57		*Aplopelia larvata*	*Lemon Dove*
58		*Columba arquatrix*	*African Olive Pigeon*
59		*Columba guinea*	*Speckled Pigeon*
60		*Streptopelia lugens*	Dusky (Pink breasted) Turtle Dove
61		*Streptopelia semitorquata*	Red eyed Dove
62		*Treron waalia*	Bruce's Green Pigeon
63		*Treron calvus*	African Green Pigeon
64		*Turtur afer*	Blue spotted Wood Dove
65		*Turtur chalcospilos*	Emerald spotted Wood Dove
66		*Turtur tympanistria*	Tambourine Dove
67	***Psittacidae***	*Agapornis taranta*	Black winged Love Bird
68		*Poicephalus flavifrons*	Yellow fronted Parrot
69	***Musophagidae***	*Tauraco leucotis*	White cheeked Turaco
70	***Cuculidae***	*Centropus monachus*	Blue headed Coucal
71		*Centropus senegalensis*	Senegal Coucal
72		*Ceuthmochares aereus*	Yellowbill/ Green Coucal
73		*Chrysococcyx caprius*	Diederik Cuckoo
74		*Chrysococcyx cupreus*	African Emerald Cuckoo
75		*Chrysococcyx klaas*	Klaas's Cuckoo
76		*Clamator jacobinus*	Black and White Cuckoo
77		*Clamator levaillantii*	Levaillant's Cuckoo
78		*Cuculus clamosus*	Black Cuckoo
79		*Cuculus solitarius*	Red chested Cuckoo
80	***Strigidae***	*Bubo lacteus*	Verreaux's Eagle Owl
81		*Strix woodfordi*	African Wood Owl
82	***Apodidae***	*Apus caffer*	African White rumped Swift
83	***Coliidae***	*Colius striatus*	Speckled Mousebird
84	***Alcedinidae***	*Megaceryle maxima*	Giant Kingfisher
85		*Alcedo cristata*	Malachite Kingfisher
86		*Alcedo semitorquata*	Half collard Kingfisher
87		*Ceryle rudis*	Pied Kingfisher
88		*Ceyx pictus*	Pygmy Kingfisher
89		*Halcyon chelicuti*	Striped Kingfisher
90		*Halcyon senegalensis*	Woodland Kingfisher
91	***Trogonidae***	*Apaloderma narina*	Narina Trogon
92	***Meropidae***	*Merops oreobates*	Cinnamon breasted Bee eater
93		*Merops albicollis*	White throated Bee eater
94		*Merops apaister*	European Bee eater

95		*Merops pusillus*	Little Bee eater
96		*Merops variegatus*	Blue breasted Bee eater
97	***Coraciidae***	*Eurystomus glaucurus*	Broad billed Roller
98	***Bucerotidae***	*Bucorvus abyssinicus*	Abyssinian Ground Hornbill
99		*Bycanistes brevis*	Silvery cheeked Hornbill
100		*Tockus alboterminatus*	Crowned Hornbill
101		*Tockus deckeni*	Von der Decken's Hornbill
102	***Capitonidae***	*Lybius bidentatus*	Double toothed Barbet
103		*Lybius guifsobalito*	Black billed Barbet
104		*Lybius undatus*	Banded Barbet
105		*Pogoniulus chrysoconus*	Yellow fronted Tinkerbird
106		*Tricholaema diademata*	Red –fronted Barbet
107	***Indicatoridae***	*Indicator indicator*	Greater Honeyguide
108		*Indicator variegatus*	Scaly throated Honeyguide
109		*Prodotiscus insignis*	Cassin's Honeyguide
110	***Picidae***	*Campethera nubica*	Nubian Woodpecker
111		*Dendropicos abyssinicus*	Abyssinian Woodpecker
112		*Dendropicos fuscescens*	Cardinal Woodpecker
113		*Dendropicos goertae*	Grey Woodpecker
114		*Dendropicos spodocephalus*	Grey headed Woodpecker
115		*Jynx ruficollis*	Red throated Wryneck
116		*Thripias namaquus*	Bearded Woodpecker
117	***Hirundinidae***	*Delichon urbicus*	House Martin
118		*Hirundo abyssinica*	Lesser Striped Swallow
119		*Hirundo daurica*	Red rumped Swallow
120		*Hirundo fuligula*	African Rock Martin
121		*Hirundo rustica*	Barn Swallow
122		*Hirundo senegalensis*	Mosque Swallow
123		*Hirundo smithii*	Wire tailed Swallow
124		*Psalidoprocne prestoptera*	Black Saw wing
125		*Pseudhirundo griseopyga*	Grey rumped Swallow
126		*Riparia paludicola*	African Sand Martin
127	***Motacillidae***	*Anthus cinnamomeus*	African Grassland/ Richard's Pipit
128		*Anthus novaeseelandiae*	Richard's Pipit
129		*Macronyx flavicollis*	Abyssinian Longclaw
130		*Motacilla aguimp*	African Pied Wagtail
131		*Motacilla alba*	White Wagtail
132		*Motacilla cinerea*	Grey Wagtail
133		*Motacilla clara*	Mountain Wagtail
134		*Motacilla flava*	Yellow Wagtail
135	***Campephagidae***	*Campephaga flava*	Black Cuckoo shrike
136		*Campephaga phoenicea*	Red shouldered Cuckoo shrike
137		*Coracina caesia*	Grey Cuckoo shrike
138		*Coracina pectoralis*	White breasted Cuckoo shrike
139	***Pycnonotidae***	*Nicator vireo*	Yellow throated Leaflove
140		*Phyllastrephus strepitans*	Norhtern Brownbul
141		*Pycnonotus barbatus*	Common Bulbul
142	***Turdidae***	*Cercomela sordida*	Hill Chat

143		*Cossypha heuglini*	White browed Robin Chat
144		*Cossypha niveicapilla*	Snowy crowned Robin Chat
145		*Cossypha semirufa*	Ruppell's Robin Chat
146		*Monticola rufocinerea*	Little Rock Thrush
147		*Oenanthe isabellina*	Isabelline Wheatear
148		*Oenanthe oenanthe*	Northern Wheatear
149		*Oenanthe pleschanka*	Pied Wheatear
150		*Phoenicurus phoenicurus*	Common Redstart
151		*Psophocichla litsipsirupa*	Ground scraper Thrush
152		*Saxicola rubetra*	Whinchat
153		*Saxicola torquata*	Stonechat (Ethiopian Race)
154		*Turdus olivaceus*	Olive Thrush
155		*Turdus pelios*	African Thrush
156		*Zoothera piaggiae*	Abyssinian Ground Thrush
157	***Sylviidae***	*Acrocephalus schoenobaenus*	Sedge Warbler
158		*Bradipterus cinnamomeus*	Cinnamon bracken Warbler
159		*Cameroptera brachyura*	Grey backed Cameroptera
160		*Chloropeta natalensis*	Dark capped Yellow Warbler
161		*Cisticola cantans*	Singing Cisticola
162		*Cisticola erythrops*	Red faced Cisticola
163		*Cisticola galactotes*	Winding Cisticola
164		*Cisticola natalensis*	Croaking Cisticola
165		*Cisticola robustus*	Stout Cisticola
166		*Cisticola troglodytes*	Foxy Cisticola
167		*Ermomela icteropygialis*	Yellow billed Ermomela
168		*Hippolais languida*	Upcher's Warbler
169		*Phyllolais pulchella*	Buff bellied Warbler
170		*Phylloscopus collybita*	Chiffchaff
171		*Phylloscopus sibilatrix*	Wood Warbler
172		*Phylloscopus trochilus*	Willow Warbler
173		*Phylloscopus umbrovirens*	Brown Woodland Warbler
174		*Prinia subflava*	Tawny flanked Prinia
175		*Sylvia atricapilla*	Blackcap
176	***Muscicapidae***	*Muscicapa infuscata*	Sooty Flycathcer
177		*Myioparus plumbeus*	Lead coloured Flycatcher
178		*Bradornis microrhychus*	Grey Flycatcher
179		*Melaenornis chocolatinus*	Abyssinian Slaty Flycatcher
180		*Melaenornis edolioides*	Northern Black Flycatcher
181		*Muscicapa adusta*	Dusky Flycatcher
182	***Platysteiridae***	*Platysteira cyanea*	Banded Wattle eye
183		*Batis minor*	Black headed Batis
184		*Batis orientalis*	Grey headed Batis
185	***Monarchidae***	*Terpsiphone viridis*	Paradise Flycatcher
186	***Timaliidae***	*Parphasma galinieri*	Abyssinian Catbird
187		*Pseudoalcippe abyssinica*	African Hill Babbler
188		*Turdoides leucopygius*	White rumped Babbler
189	***Paridae***	*Parus leucomelas*	White winged Black Tit
190	***Certhiidae***	*Salpornis spilonotus*	Spotted Creeper

191	***Nectariniidae***	*Hedydipna collaris*	Collared Sunbird
192		*Nectarinia cuprea*	Coppery Sunbird
193		*Nectarinia erythrocerca*	Red chested Sunbird
194		*Nectarinia habessinica*	Shining Sunbird
195		*Nectarinia olivacea*	Olive Sunbird
196		*Nectarinia pulchella*	Beautiful Sunbird
197		*Nectarinia senegalensis*	Scarlet chested Sunbird
198		*Nectarinia tacazze*	Tacazze Sunbird
199		*Nectarinia venusta*	Variable Sunbird
200	***Zosteropidae***	*Zosterops senegalensis*	Yellow White eye
201		*Zosterops abyssinicus*	Abyssinian White eye
202		*Zosterops poligastrus*	Montane White eye
203	***Oriolidae***	*Oriolus monacha*	Abyssinian Black headed Oriole
204	***Laniidae***	*Dryoscopus gambensis*	Northern Puffback
205		*Laniarius aethiopicus*	Tropical Boubou
206		*Lanius collaris*	Fiscal Shrike
207		*Tchagra minuta*	Marsh Tchagra
208		*Tchagra senegala*	Black crowned Tchagra
209	***Corvidae***	*Corvus rhipidurus*	Fan tailed Raven
210		*Corvus capensis*	Black Crow
211		*Corvus crassirostris*	Thick billed Raven
212	***Dicruridae***	*Dicrurus adsimilis*	Fork tailed Drongo
213	***Sturnidae***	*Buphagus erythrohynchus*	Red billed Oxpecker
214		*Cinnuricinclus leucogaster*	Violet backed Starling
215		*Cinnuricinclus sharpii*	Sharp’s Starling
216		*Lamprotornis chaylbaeus*	Greater Blue eared Starling
217		*Lamprotornis splendidus*	Splendid Glossy Starling
218		*Onychognathus morio*	Red winged Starling
219		*Onychognathus tenuirostris*	Slender billed Starling
220		*Poeoptera stuhlmanni*	Stuhlmann’s Starling
221	***Passeridae***	*Passer swainsonii*	Swainson’s Sparrow
222	***Ploceidae***	*Amblyyospiza albifrons*	Thick billed Weaver
223		*Anaplectes rubriceps*	Red headed Weaver
224		*Euplectes afer*	Yellow Bishop
225		*Euplectes ardens*	Red collared Whydah
226		*Euplectes axillaris*	Fantailed Widowbird
227		*Euplectes franciscanus*	Northern Red Bishop
228		*Euplectes progne*	Red shouldered Whydah
229		*Ploceus baglafecht*	Baglafecht Weaver
230		*Ploceus cucullatus*	Village Weaver
231		*Ploceus intermedius*	Lesser Masked Weaver
232		*Ploceus nigricollis*	Black necked Weaver
233		*Ploceus ocularis*	Spectacled Weaver
234		*Ploceus spekei*	Speke's Weaver
235		*Ploceus taeniopterus*	Northern Masked Weaver
236		*Quelea erythrops*	Red headed Quelea
237		*Quelea quelea*	Red billed Quelea
238	***Estrildidae***	*Coccopygia quartinia*	Yellow bellied Waxbill

239		*Cryptospiza salvadorii*	Abyssinian Crimsonwing
240		*Estrilda astrild*	Common Waxbill
241		*Estrilda paludicola*	Fawn breasted Waxbill
242		*Lagonosticta senegala*	Red billed Firefinch
243		*Logonsticta rubricata*	African Firefinch
244		*Lonchura bicolor*	Black and White Manikin
245		*Lonchura cucullata*	Bronze Manikin
246		*Mandingoa nitidula*	Green Twinspot
247		*Uraeginthus bengalus*	Red cheeked cordon bleu
248	***Viduidae***	*Vidua hypocherina*	Steel Blue Whydah
249		*Vidua chalybeata*	Village Indigobird
250		*Vidua macroura*	Pintailed Widow
251	***Fringillidae***	*Serinus citrinelloides*	African Citril
252		*Serinus richardi*	Stripe breasted Seed eater
253		*Serinus striolatus*	Streaky Seed eater
254		*Serinus tristriatus*	Brown rumped Seed eater

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Appendix 9. Letters of Support

Waajjira Pirezidaantii
Bulchiinsa Mootummaa Naannoo Oromiyaa
The Oromiya National Regional Government
Office of the President
Finfinnee (Addis Ababa)

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Guyyaa/Date ቀን 11/01/2002

Lakk/Ref.No. ቁጥር 03/Dh-135/917/2

UNESCO MAB National Committee
Ministry of Science and Technology
Addis Ababa

Subject: **Legal Status of the Core Areas of Yayu Coffee Forest Biosphere Reserve**

I would like to express the strongest support of the Oromiya National Regional Government for the Nomination of the Yayu Coffee Forest Biosphere Reserve, found in Illubabor Administrative Zone of our Regional State.

The Legal protection of the core areas of the proposed biosphere reserve as "**Yayu Coffee Gene Reserve**" will be enacted into law on our government's next Cabinet Meeting as Regulation. The draft **Regulation for the Establishment of Yayu Coffee Gene Reserve** has already been prepared and reviewed by experts' panel. However, our government's next Cabinet Meeting will only be held in October.

We would like to submit the Nomination Form of the Yayu Coffee Forest Biosphere Reserve before the deadline for this year's application. This is, therefore, to kindly request your good office to accept our nomination. Once again, I would like to confirm that a copy of the enacted Regulation shall be sent to you before the end of October 2009.

Sincerely,

Abdulaziz Mohammed
Vice-President & Capacity Building Bureau Head

C.C

- **To Vice President & Capacity Building Bureau Head Finfinnee**

Barkumee Haarawaatti, Jijjiirama Bu'uuraa Adeemsa Hojii Haarawaaf Hundi Keenya Haatumsinu

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101769

e-mail:oromiaweb@ethionet.et
www: oromiagov.org

(251-1) 551 36 42
551 96 33

Zentrum für Entwicklungsforschung
Center for Development Research
Universität Bonn

ZEF Bonn

ZEF Bonn, Walter-Flex-Str. 3, D-53113 Bonn, Germany

Direktor: Prof. Dr. Paul L. G. Vlek
Abteilung: Ökologie und Ressourcennutzung

United Nations Educational, Scientific
and Cultural Organisation (UNESCO)
Man and Biosphere Programme (MAB)
1, rue Miollis
75732 Paris Cedex 15

September 18, 2009

Nomination of the Yayu Coffee Forest Biosphere Reserve

Dear Sir, Madam,

Throughout the last decade, the Center for Development Research (ZEF, University of Bonn) has educated young scientists from Ethiopia who are now engaged in research, nature conservation and development of their country in the scientific and educational sector. In this context, Ethiopian-German research has been carried out in an inter- and transdisciplinary project from 2002 until today to develop strategies for the conservation and sustainable use of the threatened wild coffee populations in the montane rainforests of southwestern Ethiopia. The research activities include vegetation, phytopathological, ecophysiological, economic and institutional studies.

The concept of the proposed Yayu Coffee Forest Biosphere Reserve is fully in line with the results of our research which concludes that the conservation of wild coffee populations is enabled by offering development opportunities, by income generation, solving conflicts over land use, science-based natural resource management, providing alternative energy sources and improving environmental education. The NGO "Ethiopian Coffee Forest Forum (ECFF)", a spin-off of the above-mentioned research project, is a major driver of the Yayu Coffee Forest Biosphere Reserve initiative and – throughout the last 4 years – of the preparatory work for its nomination. ECFF has already contributed to solving disputes of access to land by engaging local stakeholders in the negotiation procedures among all administrative levels.

An important reason for being able to gain the backing for this nomination from Ethiopian stakeholders at national, state, district and village levels was that ECFF managed to synthesize together with all stakeholders the different interests and goals of conservation and development. Despite Ethiopia's "development first" policy, ECFF contributes to building public awareness that the conservation of ecosystems and biodiversity is a requirement for development and that development is needed for conservation.

ECFF has achieved that the people of the prospective Yayu Coffee Forest Biosphere Reserve are organising themselves under the umbrella of a new common identity. In a country like Ethiopia which is struggling to achieve development, despite enormous

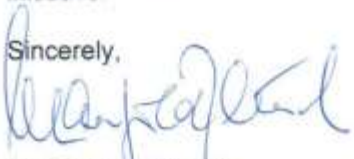
support from the international donor community, identity, conflict resolution, justness and ownership are crucial preconditions for development to bear fruit.

The Center for Development Research (ZEF) is an international and interdisciplinary academic research institute of the "Rheinische-Friedrich-Wilhelms" University in Bonn. ZEF's mandate includes research, capacity building, policy advice and public awareness raising. Due to the ZEF alumni network and collaboration agreements with research institutes, Ethiopia is one of ZEF's most important scientific foci in Africa and, hence, it will carry out research projects on biodiversity, land use, water, health and energy issues in the future as well.

ZEF will continue its research collaboration with ECFF and within southwestern Ethiopia by sending young scientists into the area and thereby contributing to the monitoring and scientific back-up of the establishment of a biosphere reserve. Until 2011, ZEF will be investing 325,000 Euro in order to investigate the relationships between people, forests and institutions in the area and support the exchange of knowledge between Ethiopia and its neighbours in Uganda, Tanzania and Kenya.

ZEF fully supports the application of the Yayu Coffee Forest Biosphere Reserve initiative.

Sincerely,



Dr. Manfred Denich

Kew

PLANTS PEOPLE
POSSIBILITIES

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UNESCO
Division of Ecological and Earth Sciences
1, rue Miollis
F-75352 Paris
Cedex 15
France

10 September 2009

To whom it may concern

Re: Nomination of Yayu Coffee Forest Biosphere Reserve in Ethiopia

On behalf of the Royal Botanic Gardens, Kew, I am writing to express my strong support for the nomination of the Yayu Coffee Forest Biosphere Reserve in south western Ethiopia.

On the basis of our long-term involvement with the Ethiopian flora, and the conservation of wild coffee genetic resources, we are intensely aware of the global importance of the proposed Biosphere Reserve at Yayu. As part of the Eastern Afromontane Biodiversity Hotspot, Yayu is one of the world's most important regions for biodiversity and is also the home for significant agricultural species and crop land-races. As a storehouse for the genetic diversity of Arabica coffee (*Coffea arabica*) it is, without doubt, the world's premier site for safeguarding the medium- to long-term sustainability of Arabica coffee, by providing genetic flexibility for crop development and survival against regional and global climatic change.

Please do not hesitate to contact me if you require further information regarding the nomination of Yayu Coffee Forest Biosphere Reserve.

Yours faithfully

Steve Hopper

Professor Stephen D Hopper, FLS
Director

T:\Director\Letters\s-z\UNESCO 10Sep09.doc

THE NATIONAL HERBARIUM
Department of Biology
Faculty of Science
Addis Ababa University

EFP/42/2009
21 Sept. 2009

UNESCO
Division of Ecological and Earth Sciences
1, rue Miollis, F-75352 Paris Cedex 15, France

Subject: **Letter of Support for Yayu Coffee Forest Biosphere Reserve**

On behalf of the National Herbarium, Addis Ababa University, I am writing this letter to confirm our strong support for the nomination of Yayu Coffee Forest Biosphere Reserve. Through our decades of research on the Flora of Ethiopia, we managed to document the distribution and conservation status of plants in the country and its surrounding regions. This has contributed for the recognition of most parts of Ethiopia with two of the 34 globally important regions for biodiversity conservation, in collaboration with Conservation International (CI). These sites are the Eastern Afromontane and the Horn of Africa Biodiversity Hotspots. The proposed Yayu Coffee Forest Biosphere Reserve is part of the Eastern Afromontane Biodiversity Hotspot.

As the most important *Coffea arabica* gene pool in Ethiopia and the world, its unique and diverse genetic diversity would serve as insurance for the coffee industry, safeguarding coffee production from events new and existing diseases and pest outbreak, and possible impacts of climate change.

The forest landscape has been one of the major field research sites for our senior and graduate student researchers. It shall continuously be used as a research and training site for our university. I would also like to confirm that we will continue to collaborate with the management of the proposed Biosphere Reserve in providing trainings and capacity building of the local experts and community members.

If you inquire any information for further clarification please do not hesitate to contact me any time.

ADDIS ABEBA UNIVERSITY
FACULTY OF SCIENCE
NATIONAL HERBARIUM
P.O. Box 3434
ADDIS ABEBA, ETHIOPIA
TELEX 21205

Yours faithfully,

Ensermu Kelbessa

Ensermu Kelbessa (Prof.)
Curator, the National Herbarium (ETH)

CC: UNESCO MAB National Committee of Ethiopia,
Ministry of Science and Technology, Addis Ababa, Ethiopia

P.O. Box 3434, Addis Ababa, Ethiopia. Email: info@bio.aau.edu.et; Tel: +251-(0)111-236760; Fax: +251-(0)111-236769.

YUUNIYEENII WALDAA GAMTAA OMISHTOOTA BUNAA OROMIYAA
Finfinnee, Itiyoophiyaa
የኦሮሚያ ቡና ገበሬዎች ሕብረት ሥራ ማህበራት ዩኒየን
አዲስ አበባ - ኢትዮጵያ
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Addis Ababa, Ethiopia

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Lakk ቁጥር Ref.No. 11/1-8/01

Guyyaa ቀን Date 18-09-2009

UNESCO
Division of Ecological and Earth Sciences
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Email: mab@unesco.org

Subject: **Letter of support to Yayu Coffee Forest Biosphere Reserve**

I am writing this letter of support on behalf of the Oromiya Coffee Farmers' Cooperative Union (OCFCU), to support the nomination of Yayu Coffee Forest Biosphere Reserve. OCFCU is the biggest union in the country, representing 65% of the coffee producing region in Ethiopia. Our union is also among the biggest exporters, in speciality coffees like fair trade and organic.

We are convinced that the establishment of Yayu Coffee Forest Biosphere Reserve is important for coffee genetic resources and forest biodiversity. Above all, such recognition by UNESCO gives it visibility at global level, which gives us a strong leverage for our union and member primary cooperatives in this forest region to market biosphere reserve coffee at a better price. This, in turn, contributes to the improvements of the livelihood of our member farmers.

OCFCU is committed to the success of the proposed biosphere reserve through development activities and marketing of coffee and other products from the region.

Sincerely,

Tadesse Meskela
General Manager

CC: UNESCO MAB National Committee of Ethiopia
Minstry of Science and Technology
Addis Ababa, Ethiopia

Yuuniyeenii Waldaa Gamtaa Omishtoota Bunaa Oromiyaa • Oromia Coffee Farmers Cooperative Societies Union •

UNIVERSITY OF BOTSWANA
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18 September 2009

UNESCO
Division of Ecological and Earth Sciences
1, rue Miollis, F-75352 Paris Cedex 15
<u>France</u>

Subject: Letter of support to Yayu Coffee Forest Biosphere Reserve

I am writing this latter in support to the Nomination of Yayu Coffee Forest Biosphere Reserve to UNESCO MAB Program to join the world network of Biosphere Reserves. I began my career as coffee extension worker in 1970s. From my earlier works I have learned about importance of coffee genetic resources in Ethiopia in 1980sand 1990s, have conducted research on both wild and cultivated coffee. I led the team of experts in 1998 who have identified and demarcated three important coffee forests, which are designated during the same year as coffee gene reserve by the government of Ethiopia. Yayu forest is the biggest of the three forest reserves. In my position as a Director General of the Ethiopian Agricultural Research Organization I have initiated and led an interdisciplinary research project with our German Partners (COCE <u>www.coffee.uni-bonn.de</u>). The CoCE project laid the scientific basis for this nomination.

It gives me a great pleasure that the research works of CoCE and public consultation developed a sustainable management approach, by adopting the UNESCO Biosphere Reserve concept. The Yayu coffee Forest and its surrounding represent extra-ordinary natural and cultural landscape important for genetic conservation of coffee and livelihood of the community. Coffee being part of human culture in the world, recognition of Yayu coffee forest by UNESCO adds an important agricultural heritage landscape to the list of biosphere reserves in the world.

With this brief background, I strongly support the Yayu coffee Forest Biosphere Reserve Nomination, and congratulate colleagues who managed to make the nomination possible.

With best regards,

Demel Teketay, PhD
Research Scholar in plant Ecology

C.C.: **UNESCO MAB National Committee of Ethiopia**
Ministry of Science and Technology
Addis Ababa, Ethiopia

Appendix 10. Yayu Coffee Forest Biosphere Reserve Management Unit Founding Charter

FOUNDING CHARTER

The YAYU Biosphere Reserve Management Unit at Illubabor Zone

RECOGNIZANT of the outmost importance to protect the largest remaining wild coffee forest fragment worldwide for its unique genetic diversity;

UNDERSTANDING that the coffee forest landscapes are home to the Iluu Oromo People and their principal source of livelihood;

EMPHASIZING the need to jointly undertake biodiversity conservation with efforts to enhance and secure sustainable livelihoods;

CONVINCED that forest dwellers should be fully involved in the management of their natural environment;

We, the signatories to this Founding Charter,

1. ADOPT the UNESCO Biosphere Reserve concept as the framework within which we will plan and execute our activities in the area of the future YAYU BR; in accordance with our legal mandates;

2. AGREE to develop a joint work plan for the YAYU BR, to mobilize necessary resources, to orient our respective regular activities in the area according to this plan and to commit the necessary staff, resources and political backing for its prompt execution.

3. Further AGREE to closely collaborate with the relevant Woreda administrations and Kebele representatives on the planning, decision making, implementing, monitoring and evaluation of the work plan and performance the activities;

4. ESTABLISH herewith the *YAYU BR Management Unit*, as the principal coordinating body for all activities related to the implementation of the UNESCO BR concept in the future YAYU BR;

5. ADOPT the following rules for the *YAYU BR Management Unit*:

    a. **Membership**: The Illubabor Zone Administration Office (IZAO), the Illubabor Forest Enterprise (IFE), The Illubabor Zone Agriculture and Rural Development Office (IARDO) and Illubabor Zone Peace and Security Office (IZPSO).

    b. **Functions**: The Management Unit assumes 4 key functions:

        i. develop and implement a 3-year joint work plan for fully implementing the BR concept;

        ii. ensure coordination among relevant government bodies concerning all activities affecting the BR;

Founding Charta: YAYU BR-MU 1/2

iii. develop and maintain a regular mechanism of consultation and feedback with Woreda administrations and Kebeles;

iv. develop and maintain a regular mechanism of consultation and feedback with Oromia Sate respective organs;

v. report bi-annually to Oromia State, Institute of Biodiversity Conservation, the national UNESCO MAB Committee and other relevant actors at national level.

c. **Responsibilities**: The legal mandates define respective responsibilities of the Members in the BR area. The Members jointly assume responsibility for the proper functioning of the Management Unit. IZAO chairs work meetings and IFE assumes adequate documentation of progress.

d. **Decision making**: Decisions are made by consensus.

e. **Work mode**: Work meetings take place at least once a month at which the (vice-) directors of each member organisation convene, together with 1-2 expert staff from their organisations. Expert staff meets as required to implement and follow up on decisions taken in monthly meetings.

f. **Scientific Advisor**: The Ethiopian Coffee Forest Forum (ECFF) acts as scientific advisor to the management unit. It has the right and the responsibility to take part in monthly meetings of the Management Unit, having an observer status.

Mettu, Illubabor Zone, 12 January 2009

The YAYU BR Management Unit:

IZAO | IFE

IARDO | IZPSO

The Scientific Advisor:

ECFF

Appendix 11. Yayu Coffee Forest Biosphere Reserve Initiative Declaration

Declaration from the YAYU Biosphere Reserve Initiative

We, the signatories ,participants of the YAYU Biosphere initiative, who meet Nov.8,2008 in yayu town ,Illubabor Zone: We collaborate towards the establishment of the YAYU Biosphere Reserve for the propose of sustainable development and conservation of our forest landscapes.We have met today,discussed in-depth the UNESCO concept and agreed that the following activities should receive priority for the establishment of the Biosphere Reserve(BR)

Priority activities

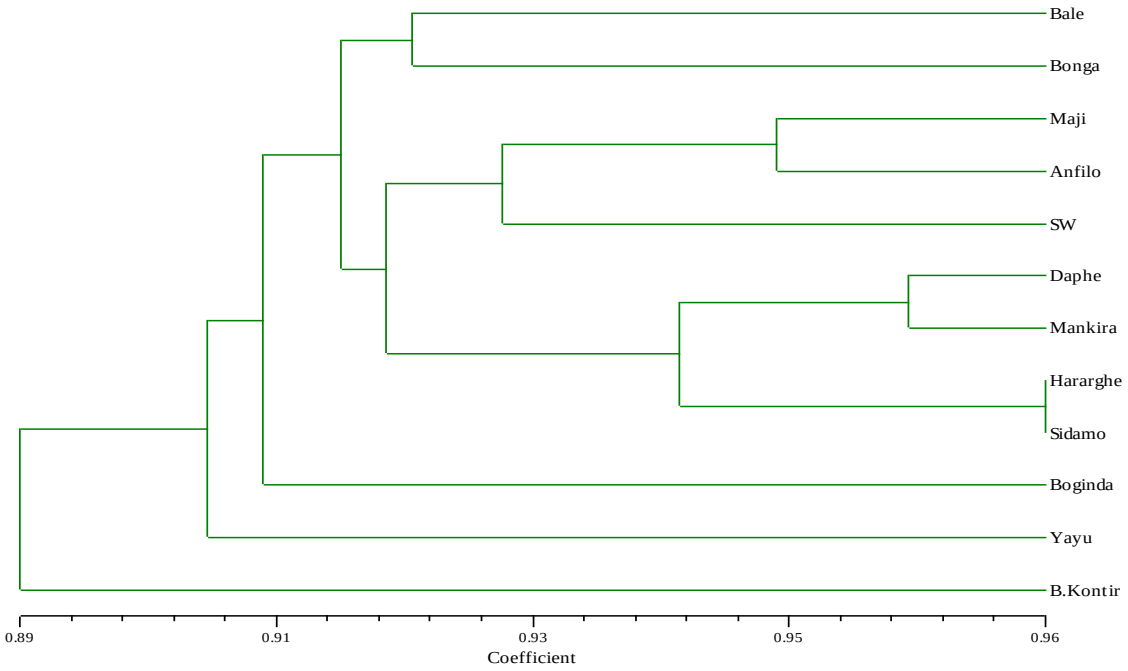
1. Awareness raising, information and education for conservation and sustainable development
2. Clarifying land demarcation, use ~~writes~~ rights, use rules and Sanctions for the BR
3. Development activities and capacity building in the BR
4. Strengthen institutional structures for collaboration b/n government and non governmental agencies and with the resident population

We herewith seek the support for our efforts from concerned authorities, as well as national and international organizations

Yayu, November 8, 2008

Name	Institution	Signature
Tadesse Woldemariam	ECFF	
Getahun Kassahun	Wereda Adimastration office	
Asfaw Kelebe	MOA wereda office	
FEKADU SORRI	Hurumu Agr. office	
Dereje Kitila	I/A/B forest enterprise	
Abdo Gelato	Haramaya university student	
Shiferaw Belachew	Addis Ababa university	
Getachew Gedana	Oromia Culture & Tourism Bureau	
Essa Raggassa	Doparta Wereda Adm office	
Bizuayehu Legesse	Chora wereda Agr. office	
Dawit Gifar	Wereda Agri offi	
Belachew Bekele	" Admin.	
Aschenaki Admassu	Agricultural office	
Abera Deressa	wereda Administrator	
Melese Kuse	Agriculturas office	
Wangelaw Martos	Wereda Adm.	

Appendix 12. Dendrogram and Photos



Some of the authors and management unit members

Darara Buna brand sample

Yay Forest

Coffee nursery in the forests

Public meeting at Yayu town

Coffee processing plant in Addis Ababa- women cleaning