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A review on kafa biosphere reserve: roles in meeting sustainable development of Ethiopia

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Abstract

This paper reviews Ethiopian forest biodiversity and roles in ensuring the country sustainable development. It mainly consists of Kafa Biosphere Reserve with its socio-economic and cultural values, management practices, challenges and major threats. Within the highlands of South West Ethiopia, two main ecological zones can be distinguished, i.e. the highland forest and coffee forest zone. These forests provide important ecological services that maintain good hydrological conditions in the headwaters of major Ethiopian rivers and conserve biodiversity. In both zones, local communities have been traditionally dependent on the forests their livelihoods, using a range of resource mainly non-forest timber product for household consumption and income generation. While there are non-forest timber products with promising value on international markets, the region has good prospects for a combining forest conservation and poverty alleviation. Although the current national and regional legal and policy framework is to a certain extent favorable to several elements of the project approach such as community involvement in forest management, small enterprise development and development of community-based organizations such as forest management associations and production cooperatives as well as export promotion of honey and coffee, several inconsistencies in policy articulation and weakness in policy implementation form a serious bottleneck to the large-scale application of the integrated approach of participatory forest management and non-forest timber product development.

Keywords: *Kafa* biosphere reserve, sustainable development, forest biodiversity, non-forest timber product, poverty alleviation, biodiversity hot spot, threats of biodiversity

1. Introduction

Ethiopia is a special topography, geology, landscapes ranging from highland and rugged mountains, deep gorges, river, and rolling plains. The altitude generally ranges from 120 m below sea level at the Afar depression to 4,620 m mount Ras-Dashen in North West Ethiopia. Ethiopia is one of the top 25 biodiversity-rich countries in the world and center of origin and diversity for several cultivated crops ^[20]. The biological diversity of Ethiopia is the basis for agriculture, fisheries, social, economic and cultural development of the country. The country ratified Conservation of Biological Diversity (CBD) in 1992, which was the direct result of world earth summit on sustainable development. Ethiopia is working hard to realize its mission by 2023; the Ethiopian Biodiversity Institute will be Center of Excellence in Biodiversity Conservation and Sustainable use in Africa. Furthermore, the National Biodiversity Conservation and Research formulated based on conservation biodiversity to promote environmental sustainability of the country (CBD, 1992). Besides Ethiopia is endowed with abundant biological diversity, in the last thirty years, Ethiopia lost 60% forest coverage ^[8]. It has dramatically reduced; the forest is now dispersed to include settlement areas, grazing, and agricultural land. The estimated annual deforestation rate in Kafa region was 22,500 ha ^[17]. This is mainly due to uncontrolled population growth, agricultural intensification; continuous deforestation, and construction wood coupled with poverty to forest country biodiversity ^[6]. Only 40 years ago, approximately 40% of Ethiopian land surface was occupied by forest mainly coniferous and broad-leaved type; today only 2.7% remains and out of this around 95% is found in the South West part of the country where Kafa, Yayu, and Sheka Biosphere Reserves are located ^[3, 9].

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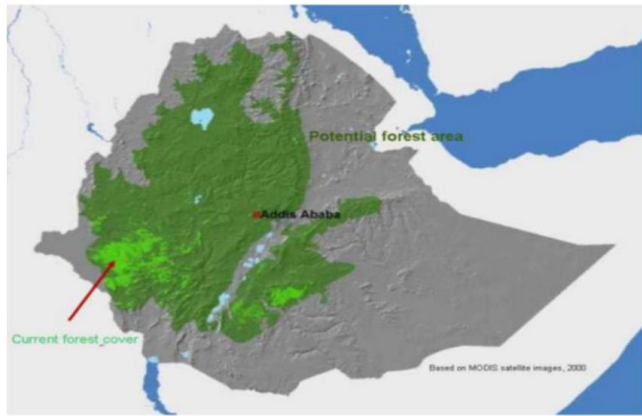


Fig 1: Forest Cover: past and present (Source: Gole, 2002).

A Biosphere Reserve is defined as “a unique kind of protected area that differs from national park, wilderness area, national forest or wildlife refuge in having different tree, but equal aims: conservation of genetic resources, species and ecosystems; scientific research and monitoring; and promoting sustainable development in the communities of the surrounding region” [18]. Species diversity is the variety of different species found in a biome, taxonomic grouping or a geographically defined area [15], whereas ecosystem diversity refers to the diversity between and within ecosystems [15]. Frankham *et al.*, (2002) defined genetic diversity as “The variety of alleles and genotypes present in the group under study”. Sustainable development can be defined as “development that meets the present without future generations to meet their own needs” [14]. In 1970, UNESCO Man and Biosphere (MAB) which focuses mainly on: minimizing loss of biological diversity, making people aware of how each other and promoting environmental sustainability through the World Network of Biosphere Reserves.

2. Kafa Biosphere Reserve

Kafa Biosphere Reserve is located in Kafa Zone around Bonga, the predominantly highland region covered by evergreen montane forest, in the Southern Nation Nationalities and Peoples Regional State (SNNPRS) 460 km South West of Ethiopia and 80 km from Jima town. The Kafa Zone is administered by the regional government in association with 10 administration sectors called woredas and 250 rural Kebele administrations in 25 urban towns. The economy of the region is mainly agriculture accounting 41% Gross Domestic Product, 80% export and 80% labor force. Other sectors include services, tourism, manufacturing, and trade [2, 10].

The biosphere reserve has been designated in June 2010 by UNESCO MAB and became part of the World Network of Biosphere Reserve and provides to combine conservation and sustainable development in the region. This biosphere reserve is Ethiopia’s first biosphere reserve and the first coffee biosphere reserve of the world, which can be recognized as a worldwide attraction for coffee consumers and ecotourists. The altitude of the area ranges 900-4000 m above sea level [3]. The total area biosphere reserve is 760144 ha from which currently 422,260 ha (56.6%) is covered with belongs to Eastern Afromontane Biodiversity. Nowadays there are about 657,780 people living and working within the biosphere reserve boundaries. Of this, 91.68% live in rural areas and 8.42% in urban areas of the transition zone [5]. The biosphere reserve has 3 main management focal zones called Core, Buffer, and Transition. These different zones have their own different functions [9].

The core zone is used only for the in-situ conservation of wild coffee. It covers 41391.1 ha and consists of 11 protected forests managed by the SNNPRS and provides appropriate surface area to conservation objectives of the reserve. Any human prohibited except project visits for public/education. Collection of wild coffee, medicine plants, vegetables and mushrooms, hunting, production of honey and use of wood can be allowed under specific conditions [16]. The buffer zone I am an extension of the core zone. It covers 161427 ha and includes a number of National Forest Priority Areas and composed of managed semi-coffee forest systems by individual farmers. There are only non-disturbance interventions like picking fruits or collecting honey is allowed [16]. In the Buffer zone, II traditional semi-forest production is allowed. In the understory, which disturbs the coffee grow will be eliminated. Besides coffee, there is also a spice which has a high value. This spice is endemic for Ethiopia and depends on the wild coffee area. In fact, to ensure the success of the core, the rules of the buffer zone must be realized [9]. Transition zone covers 337885 ha and has a variety of land uses which are mainly owned by the used in subsistence commercial agriculture. In this zone, all cultural and productive activities including animal husbandry are allowed. In addition to introducing new plants and new techniques if people have benefited from it. If the production in the transition zone is working and brings enough benefit to the people, the danger of affecting the core zone will be minimal [9].

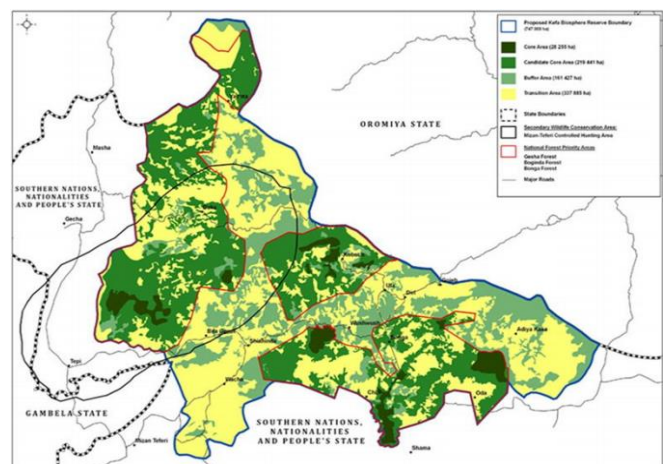


Fig 2: Different management zones of Kafa Biosphere Reserve (Source: <http://www.unesco.org/>).

In the Biosphere Reserve, there are more than 106 woody plant species, 48 mammalian species and 260 bird species (15 bird species compromise Highland Biome Species accounting 31% of the Restricted highland Biome Assemblages) in the country. Of this variety of flora and fauna, most of them are endemic to the region. The Biosphere Reserve also registered as Important Bird Area [3]. Among the flora found in the biosphere reserve, six species namely *Coffea arabica*, *Pouteria adolfi-friendercii*, *Beracama abyssinica*, *Schefflera abyssinica*, *Trilepsium madagascariense*, and *polycias fulva* are most common and dominant. It is also the origin and primary center of most popular diversity of *Coffea arabica* in the world where coffee is still grown in the wild and contains high diverse gene pool over 5000 varieties. In addition, the Biosphere Reserve researchers currently list seven different amphibians, six fish species, and ten reptiles. Both amphibians and reptiles play an important role forest ecosystem by controlling pests, insects, and rodents [1].

3. Socio-Economic and Cultural Values

In spite of rich cultural and ecological heritage, Kafa's growing population life mainly at the subsistence level and relies heavily on natural resources. The creation of the Biosphere Reserve to combat the threats to the forests, raise awareness of the region on a local and international level and standards by implementing sustainable and long-term development. By setting up tourism and promoting sustainable use of resources, the forests will remain intact and the people will get a new source of income. The Biosphere Reserve aims to protect this region's natural and cultural promoting sustainable livelihood development. It has also incredible support for the livelihood of the local community and contributes for country's development at large [17]. The forest ecosystem makes an important contribution to the livelihoods of people in the area. It provides coffee, a variety of commercially valuable spices and honey from wild bees. Agriculture forms the backbone of the economy with most of the other sectors. Wild coffee from the zone is the of cash the local communities. Coffee the area is mainly forest-based and environmentally friendly. The Biosphere Reserve also provides honey from traditional bee-keeping and variety of commercially valuable spices [11].

On the other hand, a local community directly use resources form the forest like construction materials from climbers/Liana, tree ferns, climbers for beehives construction, wood for utensils, bee forage and traditional hanging beehives, spice production, timber products such as firewood, charcoal, bamboo, and medicinal plants collection. The locally constructed wood products valued highly by the regional community including timber doors, windows, dining tables, chairs, benches, beehives, coffins and raw timber for sale. The Biosphere Reserve is impressive natural scenery and serves as scientific, economic, aesthetic and cultural treasure house incorporating numerous fertile valleys and lowlands, mountains and ridges, moist cloud forests, rainforests, and grasslands and different majestic waterfalls in the region. Ecotourism is in its infancy through the area would have a good potential with its diverse cultural landscape, tropical forest, cultural festivals [2, 10].

Many developing countries in tropics and East African countries in particular focused on tourism to generate additional income sources and to diversify their economy [13]. Tourism is a featured component of Ethiopia's Poverty Reduction Strategy Paper, which aims to combat poverty and encourage economic development. Tourism is responsible for developing and promoting tourism in Ethiopia. Apart from benefits, tourism may be associated with negative impacts in several ways. Mass tourism may lead to the destruction of natural habitats in the biosphere reserve [4].

Currently, Ethiopia has recognized the importance of diversifying its economic sectors by putting main attention on sustainable tourism to transform the economy, ensure sustainable development and alleviate local poverty. A recent study on Economic Growth and Tourism Sector in Ethiopia underscores that the country has underexploited its rich tourism potential. The report identified a skilled human resource, poor infrastructure, lackluster marketing, a weak financial the underperformance. To arrest this, the country of 85% million in September 2010 development policy that also encourages the active participation of the private sectors.

For marketing the Kafa Biosphere Reserve in the long term the following 4 main objectives are proposed. These are raising awareness about Kafa's its need in balancing conservation and development, attracting tourists to visit the

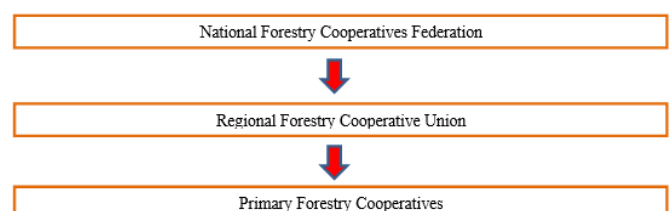
Biosphere Reserve in a responsible way, helping in convince donors to support the Biosphere Reserve, helping in fostering local stewardship for the Biosphere Reserve. The target groups for marketing the Biosphere tourist operations, international donors, conservation networks, local population, consumer product companies and interest groups [3]. In the Kafa zone, there is "Kafa Forest Coffee Farmers Cooperative Union" which produce coffee, spices, honey and other for the local consumption. The union is working to begin exporting cardamom, long "Non-timber forest product" such as honey, false wild pepper which particularly for the indigenous Kafa population. Furthermore, the forests are source of fuel wood, charcoal, and timber. Coffee collected and managed in the home gardens are the most important cash crop. The Ethiopian coffee offers 90% of Ethiopian export and 80% of total employment. That means coffee production gives employment in the rural areas and livelihood for more than 15 million people [19].

The Biosphere Reserve has its own unique culture and linguistic identity distinct from the rest of Africa. The SNNP regional state has more than 80 different ethnic groups (tribes), each claiming its own unique identity and history. The major ethnic groups constituting the Biosphere Reserve are the Kafecho (81.4%), Amhara (5.5%) and Oromo (2.35%) with the remaining 5.38% comprising of other ethnic groups like the indigenous Manja. The Kafa Forest has an important role in historical and cultural aspects of the local community.

4. Management Practices

Environmental policy of Ethiopia is prepared at the federal level and approved by the council of ministers in 1997 for sustainable environmental management. Although Ethiopian environmental institution framework structure is established at federal, regional and sub administrative sectors; the management capacity is highly undermined mainly by chronic capacity issues, serious turn over problems and financial constraints (Environmental Protection Agency, 2010).

In the past, forests were managed by the government, excluding the communities from participation and denying their use rights. This has led to the illegal utilization of the forest without a sense of ownership. Since we signed the agreement, changes are being seen in our forests. To mention some of the changes: i. Vegetation cover has significantly increased ii. Eco-tourism activities have been promoted, iii. Pasture condition has improved, iv. Community income forest products and through non-forest-based services has been enhanced, v. Working relations/partnerships between the community and the forest professionals have been improved. Nowadays, the forest management associations are growing to cooperatives and union levels. Considering the administrative division of the country, the on-going cooperative experiments, and the provisions in Cooperative Society Proclamation No. 147/1998 and the successful model of India, the following structure is proposed for the cooperative management of forest resources [17].



Regarding efforts, according to Stellmacher, T., (2010), the forest Proclamation 9/1994 of Ethiopia assigned five forest administration categories. These are State forests, state protected forests, regional forests, regional protected forests, and private forests. Kafa Coffee Forest Biosphere Reserve Management Units established at all levels for management implementation by performing coordination all stakeholders. These include the Zonal Management Unit, District Management Unit and Village Management Unit. At the village level, the members of Management Units include the Kebele Chairman, Village representatives, youth representatives, elders, and traditional leaders local community participation. The leading role is played by the Zonal Management Unit. Moreover, there is various environmental education and special information dissemination activities in the Biosphere Reserve. These include education activities by the Ethiopian Coffee Forest Forum, the Geba-Gogi Forest Coffee Conservation Project, as well as schools, and environmental education club activities.

The on-going research by NABU headquarters in Berlin conserve Kafa Biosphere various activities such as biodiversity conservation, sustainable regional development, logistic support to the protected areas itself, community-based management environmental education. In addition, Bonn University adopted a project on conservation and use of the wild coffee plant in Ethiopian rainforests and established Ethiopian NGO called Ethiopian Coffee Forest Forum. This project is funded by the German Federal conducted jointly by natural and social scientists from Germany and Ethiopia [12].

Kafa Biosphere Reserve is administered by 2 managers

contracted by Kafa Zone department of the facilitation of NABU. Forest conservation mainly Participatory Forest Management, reforestation, enrichment planting and planting fast community plantations for multipurpose uses has been started and local communities to ensure livelihood and firewood supplies. Tourism and ecotourism development within the biosphere multiple opportunities for local communities. Promotion of the Biosphere Reserve through websites, print media, conferences, and workshops has been done at local, national and international level. The Biosphere Reserve promotion, communication, and management are co-financing mainly by NABU and local government. NABU and its many partners have been involved since 2003 to save these forests, the area of which has been dramatically reduced. At the same time, they are helping in the sustainable use of wild coffee, the development of the region generally and above all to set up the first Coffee Biosphere Reserve in the world [12].

In addition, communities in the Biosphere Reserve area has been trained by 30 Biosphere Reserve rangers (biosphere ambassadors landscape and nature guides) through NABU which are working within the communities at the local level to enhance the community skill and development awareness regarding biodiversity of the region. NABU through Kafa Zone Department of Water, Mines, and Energy introduced alternative energy saving stoves to local household communities living in the Biosphere reduce excessive forest harvesting for consumption of firewood and charcoal, to minimize CO₂ emissions, indoor environment pollution of users and to ease the workload on women [12].

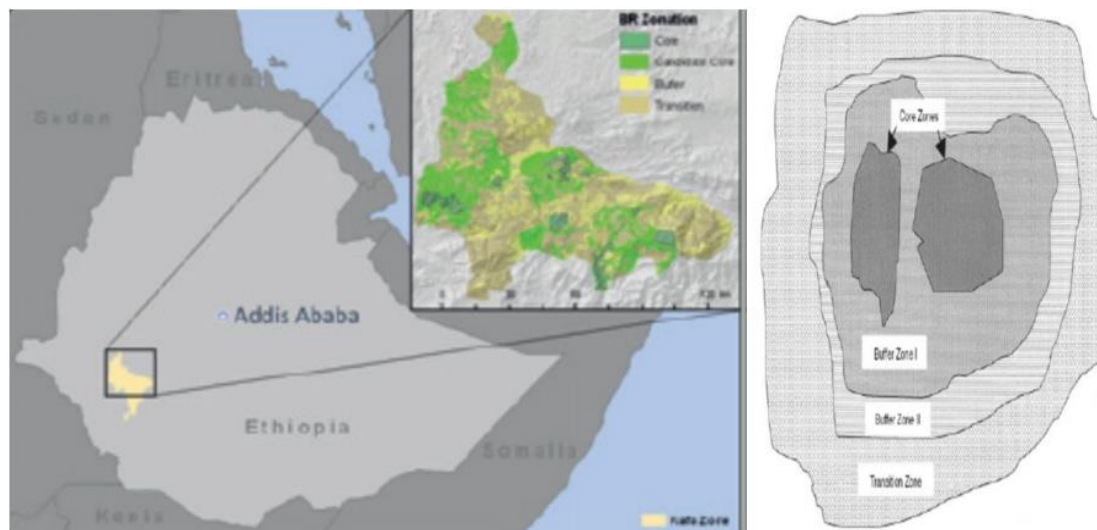


Fig 3: Conceptual reserve design for *Coffea arabica* (Source: Gole, 2002).

5. Challenges and Major Threats

Like several other tropical ecosystems in Africa, Kafa Biosphere Reserve is facing unprecedented their ecological integrity. Unsustainable activities leading to habitat destruction and fragmentation of wildlife corridors are major challenges confronting this fragile ecosystem. The Kafa Forest is heavily exploited mainly due to logging, agricultural use, and honey production. Honey production affects the existence of trees because of fire they need during honey production [6].

Poor communication infrastructure among all stakeholders is a major challenge for effective management practice. Cultivation and livestock rearing in the area have progressively converted a few parts of the forest into open cropland and/or grazing land. Many people are also extracting

timber, for the local house constructions and non-timber forest products like spices, honey, medicinal plants, for house hold consumption and income generation. Additionally logging for some infrastructure development and electric power line construction are some of the human impacts on the natural ecosystems. More recently, wildfire became a major threat, especially in dry and hot season [6].

6. Conclusions and Recommendations

Kafa Biosphere Reserve has magnificent roles to foster sustainable socio-cultural and economic development of the country. It has also some logistic functions such as research, monitoring, education and information exchange. The biosphere reserve is one of the significant biodiversity hotspots to conserve the endangered wild *Coffea arabica* in

the country and globally at large. The local communities have been practicing the socio-culturally sustainable way of management in the biosphere reserve. Nevertheless, protection through the Kafa biosphere reserve is urgently needed to conserve the unique forests. The German-based on-going research projects are working actively in the region to realize the sustainability of the forests. This region is one of the 34 "Biodiversity Hotspots" worldwide and has global significance for conservation of biological diversity. However, the impact of converting South West Ethiopian forests into semi-forest coffee and further intensification into plantation coffee systems has been recently studied. As a result, little is known about the impact of such land use changes on the various ecosystem services. Finally as an overall suggestions I forward the following recommendations based on the above all information.

- i. For the positive effects of biosphere reserves, more collaboration amongst all stakeholders in protected area management is vital.
- ii. In decision-making through strengthening the links and partnerships among local communities, NGOs and local and national governments.
- iii. Follow up of the recommendations for implementation involving potential actors such as local peoples, society, managers, decision makers, institutions through communication, education, indigenous knowledge for collective action, knowledge, and networks.
- iv. Reward and emphasis should be given for the local community for the conservation of the biosphere and natural resources who are directly dependent on the resources.

7. References

1. Aerts R, Berecha G, Gijbels P, Hundera K, Van Glabeke S, Vandepitte K *et al.*, Genetic variation and risk of introgression in the wild Coffee arabica gene pool in SW Ethiopian montane rainforests. *Evolutionary Applications*. 2013; 6:243-252.
2. Bekele M, Tadesse D. management arrangement study. Consultancy report. Non-timber Forest Products Reseach and Development Project in SW Ethiopia, Mizan-Teferi, Ethiopia, 2004.
3. Berghofer A. Financing Equilibrium in the Cloud Forests of Kafa. Fundraising Strategy for the Kafa Biosphere Reserve, Ethiopia, 2013.
4. Bramwell B. Actors, power, and discourses of growth limits. *Annals of Tourism Research*. 2006; 4:957-978.
5. Center of Statistical Authority Southern Nations Nationalities and Peoples' Regional State, 2013.
6. Foley JA, Defries R, Asner GP, Barford C, Bonan G, Carpenter SR, *et al.*, Global consequences of land use. *Science*. 2005; 309:570-574.
7. Frankham R, Ballou JD, Briscoe D A. Introduction to Conservation Genetics. Cambridge, Cambridge University Press, 2002.
8. Gole TW. Human impacts on the Coffee arabica Genepool in Ethiopia and the need for it's in situ conservation. Bonn, Addis Ababa, 2002.
9. Gole TW. Conservation and use of coffee genetic resources in Ethiopia: challenges and opportunities in the context of current global situations. Bonn, 2003.
10. Gole TW. Forest biodiversity, forest functioning, and NFTP production. Consultancy report. Non-timber Forest Products Reseach and Development Project in SW Ethiopia, Mizan-Teferi, Ethiopia, 2004.

11. Gole TW, Center PO. Conservation and Use of Coffee Genetic Resources in Ethiopia: Challenges and Opportunities in the Context of Current Global Situations. Powerpoint presentation, 2002.
12. Gole TW, Teketay D, Dnich M, Bosch T. Human impact on the Coffee for in-situ conservation. Managing plant diversity. Proceedings of an international conference. Malaysia, 2000, 237-247.
13. Gossling S. water use on a tropical island: Zanzibar, Tanzania. *Journal of Environmental Management*, 2001; **61**:179-191.
14. IISD, Sustainable development?, 2013. Available at <http://www.iisd.org/sd/> (Accessed on 15 May 2014).
15. Sauer J, Abdallah JM. Forest diversity, tobacco production, and resource management in Tanzania. *Forest Policy and Economics*, 2007; 9:421-439.
16. Schmitt C. Montane rainforest with Coffee arabica in the Bonga region (SW Ethiopia). Plant diversity, wild coffee management for conservation. *Ecology and Development Series 48*. Cuvillier Verlag, Göttingen, Germany, 2006.
17. Stellmacher T, Grote U, Volkman J. Biodiversity through coffee certification? The case of forest coffee in Bench Maji and Kaffa Zone, Ethiopia, 2010.
18. UNESCO, UNESCO MAB Biosphere Reserves Directory, 2014 Available at <http://www.unesco.org/> (Accessed on 25 April 2014).
19. Van der Beek J *et al.*, Options for payment of Biodiversity Services from Ethiopian Coffee Forests. Student Research series No. 4. Wageningen, 2006.
20. Young J. Ethiopian Protected Areas a Snapshot. A Reference Guide For Future Strategic Planning and Project Funding, 2012.