ECOSYSTEM APPROACH: AN ESSENTIAL TOOL FOR BIODIVERSITY CONSERVATION IN DRYLANDS

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INTRODUCTION

Ecosystem is an interconnected community of all life forms (plants, animals and microbes, including humans, and the physical environment such as soil, water and air within which they interact (World Resources 2000). The concept of ecosystem may be viewed as systems or generalization of the food chain and food web, allowing for more general relationships than consumption. For example, plants provide food for animals but also shelter, shade, etc. The idea of an ecosystem corresponds to viewing an organism as part of a larger scale system whose parts are interacting and interdependent. Ecosystem could be large or small. It refers to a function unit at any scale, for example, single tree with its associations, a pond, a forest, a biome or the entire biosphere.

Ethiopia has a vast territory with complex landscape and geomorphic type, and wider climatic range from desert to hot wet and cold alpine. The country possesses large river networks and numerous water bodies. The altitude of the country goes from 116 m below sea level to 4533 above sea level. Following these natural conditions there are diverse ecosystems in Ethiopia. The presence of huge ecosystem diversity and great variability in their extent complicated both the demarcation of ecosystem boundaries and setting a consistent definition/classification.

However, the Ecosystem Conservation and Research Department at IBC relied on major characteristic, dominant (and some times keystone) species in addition to the main environmental variables such as altitude, climate, soil type, and availability of soil moisture to describe/classify ecosystems of the country. A general classification of the ecosystem based on water as indicator gives us two broad categories, namely, Terrestrial ecosystem and Freshwater ecosystem. The terrestrial ecosystems are grouped in to eight major categories and include habitats of high forests, woodlands, bush lands, grasslands and deserts. The freshwater ecosystem encompasses aquatic ecosystem mainly standing for deep-water habitats and wetland ecosystem, which includes shallow water habitats. In summary, based on the aforementioned conditions, the major Ethiopian ecosystem fall into ten categories, namely, wetland, aquatic, afroalpine and subafroalpine, dry evergreen montane forest, grassland, moist montane foest, acacia-commiphora, combretum terminalia, lowland tropical forest and desert and semi desert ecosystems .

ECOSYSTEM APPROACH AND BIODIVERSITY CONSERVATION

Article 2 of convention on biological diversity CBD defines biodiversity to include ecosystem diversity, and biological diversity is a constituent of ecosystem. Ecosystem is the most comprehensive element of biodiversity and biodiversity is bound up with ecosystem processes and function. Ecosystem function and health is vital for survival of the human being and the environment. Thus, ecosystem and biodiversity are not seen in isolation from each other, and a proper understanding of the ecosystem functions facilitates biodiversity conservation.

The convention on biological diversity CBD considered the ecosystem approach as an appropriate management mechanism for conservation of biological diversity. A meeting in Malawi in January 1998 discussed on the basic principles of the ecosystem approach and accordingly, twelve principles were come out of the conference, which were adopted by the conference of the parties of the CBD in May 2000. It was understood that ecosystem approach would help to achieve the three objectives of the Convention. These are conservation, sustainable use, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

Biodiversity conservation is achieved through integrating gene, species and ecosystem conservation. However the species and gene approach focus on particular component of biodiversity, and alone couldn't address biodiversity conservation. The following are some of the limitations of the species and gene approaches of conservation leading us to pay attention for the application of the ecosystem approach to biodiversity conservation.

1. Inadequate recognition of vitality of ecosystem function for biodiversity;
2. too site-specific management without considering interlinkage with other sites;
3. Failure to integrate cultural, economical and social factors in biodiversity conservation;
4. Devaluation of public goods and services obtainable from ecosystem. For example, services like ecosystems are home for wild genes, maintain hydrological

cycles, generate and maintain soil, provide sources of beauty and inspiration regulate climate, store and recycle nutrients and many others which could not be valued in marketplace;

5. Inabilities to coordinate with relevant sectoral interests like agriculture, environment, forestry, fisheries, health, nature conservation etc.

Ecosystem approach is an integrated strategy for the management of land, water and life resources. The approach is based on application of appropriate scientific methodologies focused on levels of biological organization, which encompass the essential processes and interaction amongst organisms and their environment, and the linkage among ecosystems. It places human as an integral component of ecosystems.

Ecosystem approach has a comprehensive nature to protect, preserve, and utilize ecological resources, communities, and economies sustainably. It does not single out a species or pieces of land from its surroundings. All are interconnected, and disturbing or managing one affects the other in that ecosystem. It does not look an ecosystem for a dominant gene or species, rather takes unseen more valuable goods and services of ecosystems into consideration. It optimizes the mix of benefits across a given ecosystem.

An ecosystem approach maintains productive potential of ecosystems. It views production of goods and services as the natural product of healthy ecosystem, not as an end in itself. It is a method for sustaining or restoring natural systems and their functions and values. The approach provides the framework that draws together federal, state and

local governments and the public to achieve the ultimate goal of a healthy and sustainable environment. It integrates traditional and indigenous knowledge system with scientific thinking in providing conservation solutions. It has a holistic view of human health and environmental sustainability. It identifies interventions that will lead to improve human health and well being while simultaneously maintaining or improving the health of the ecosystem as a whole.

Ecosystem Approach Principles

Princilpe1. The objectives of management of land, water and living resources are a matter of societal choice.

Principle 2. Management should be decentralized to the lowest appropriate level.

Principle 3. Ecosystem mangers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

Principle 4. Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should: (a) reduce those market distortions that adversely affect biological diversity; (b) align incentives to promote biodiversity conservation and sustainable use; (c) internalize costs and benefits in the given ecosystem to the extent feasible.

Principle 5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Principle 6. Ecosystem must be managed within the limits of their functioning.

Principle 7. The ecosystem approach should be undertaken taken at the appropriate spatial and temporal scales.

Principle 8. Recognizing the various temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.

Principle 9. Management must recognize that change is inevitable.

Principle 10. The ecosystem approach should seek the appropriate balance between, and the integration of, conservation and use of biological diversity.

Principle 11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

Principle 12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

DOMESTICATION OF THE ECOSYSTEM APPROACH

Generally, it is a global tendency to focus on ecosystems and implement the ecosystem approach for biodiversity conservation. Several states have implemented ecosystem approach following the CBD. The U.S. Fish and Wildlife Services, countries like Canada are such examples applying the approach.

Ethiopia is a signatory to CBD and, following that she is expected to implement ecosystem approach to biodiversity conservation. The Institute of Biodiversity Conservation is responsible for the adoption and domestication of the ecosystem approach not only for the fulfillment of the international obligations but also for the sake

of effective conservation and safeguarding of the biodiversity resources of the country. With the intention for implementation of the ecosystem approach, IBC has established Ecosystem Conservation and Research Department (in 2000) as one of eight Departments under the Institute. The Department is, therefore, responsible to take a leading role for the implementation of the ecosystem approach. Its main objective is to protect, maintain and sustainably use Ethiopia's biodiversity through implementation of the ecosystem approach. So far, major ecosystems of the country has been identified and classified in to ten major ecosystems. Their distribution, extent, major biological components (species composition, diversity and distribution) including the dominant, flagship and endemic species of the different ecosystems has been identified. The Department has also identified major ecological problems of the different ecosystems of the country and has forwarded its recommendations to minimize the on going degradation and destruction of biodiversity resources in the respective ecosystems. Ecological impacts of invasive alien species on native flora and fauna (such as *Prosopis juliflora*, in Afar and Somali Regional States; *Lantana camara* in Oromia and Somali Regional States) has been assessed and the possible measures to control the invasions has been forwarded to the respective regional states. The Department has also prepared national Guideline for implementation of Ecosystem Approach in Amharic language. In addition the Department has been monitoring the impact of wild fire on forest regeneration (the case of forest fire 2000 in Ethiopia and forwarded its findings/recommendations on the importance of protection of natural forests from wild fire incidence) and the options to forest management.

Despite several achievements in introducing and implementing the ecosystem approach during the past few years by the Department, the recognition and support in capacity building, training, human resource and financial allocation remained very low. The following are among the main gaps identified by the Department and to be filled out by professionals, decision making bodies and the public at large to ensure the conservation and sustainable use of biodiversity through implementation of the ecosystem approach:

1. Enhancing ecosystem understanding about the structure and functions of ecosystems, ecosystem status and productive capacity which are important for effective management and foundation to formulate policies governing biodiversity;
2. publicizing needs of nations from ecosystems and how the benefits should be distributed;
3. Valuation of ecosystem services so that GOs, NGOs, Private organizations and communities will take the value into consideration before a short-sighted management practice is exercised;
4. Involving local communities in ecosystem management and equitably sharing the benefits and costs of ecosystem use;
5. Evaluation of the potential of denuded or invaded ecosystems for ecological restoration;
6. Launching new approaches to parks and protected areas as creating a physical link of parks and protected areas through landscape corridors so that the original spatial character of the ecosystem can continue to function;

7. involving all relevant stakeholders and sectors of society as well as scientific discipline;
8. analysis of natural character of ecosystems as a means to evaluate vulnerability of ecosystem to invasive species;
9. set up a standardized assessment of ecosystem health;
10. establishing a national ecosystem database and a long term ecosystem monitoring protocol;
11. capacity building such as of manpower development especially ecosystem expertise together with logistic and laboratory facilities.

REFERENCES

1. World Resources 2000. Http://www.epa.gov/region08/community_resources/steward/ecoapp.html
2. National Biodiversity Strategy and Action Plan 2002. Institute of Biodiversity Conservation and Research. Addis Ababa
3. The Convention of Biological Diversity 2004. A Hand Book of CBD.
4. Ecosystem Approaches to Human Health Programme Initiative. International Development Centre. Ottawa, Canada. Http://www.idrc.ca
5. Getachew Tesfaye and Abiyot Berhanu 2004. Ecology and Management of *Prosopis juliflora* in Afar and Somali Regional States. IBCR, Addis Ababa.
6. Getachew Tesfaye and Berihun G/Medhin, 2004. Ecosystem approach and management and biodiversity conservation in Ethiopia. IBCR, Addis Ababa.