Natural Resource Management and Climate Change: Policy and Institutional Arrangement.

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1.Natural resource management

- Natural resource management refers to the management of natural resources such as land,water,soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations.
- Natural resource management specifically focuses on a scientific and technical understanding of resources and ecology and the life-supporting capacity of those resources.

1.1 Natural resource management in Africa

- The world's greatest concentration of biological wealth is found in tropical developing areas including Africa.
- Forests & other fomrms of Biodiversity in Africa are under a great threat due to
- Increasing pressure from population growth,
- Unsustainable resource use
- Hotter and drier climate
- Poor management
- Clearace for cash crop production and urban expansion,.

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- Oil and mining exploitation
- The demand for fuel wood and charcoal
- Excessive timber production and
- Political instability

Excessive deforestation

- Led to permanent loss of soil fertility. The loss of fertile soil is also aggravated by slash-and-burn practices, over grazing,illegal cultivation, and natural climatic events.

slash-and-burn practices in Madagaskar

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- The annual rate of deforestation in Africa was 0.7 percent between 1990 and 1995, with the highest rates being recorded in the moist western parts of the continent. However, the rate of afforestation is far less than that of deforestation.

1.1.1 Traditional Knowledge and Natural Resources Management in Africa

- In Africa there are many ingenious and effective ways of natural resource management.
- Unfortunately, their innovations remain largely unknown.
- Weather for food, medicine, or income generation, thses groups are using their biological resource in a sustainable way to inprove livehoods.

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- Now it is important to mobilize the local communities and non governmental organizations to promote local initiatives for natural resource management.
- Sustainable natural resource management should focus on activities that conserve and protect the local environment and that contribute to alleviate poverty through increase natural resource base for food security for the welfare of the poor.
- The UN Conference on Environment and Development in 1992 ,World Conference on Science (Budapest, 1999) recommended that

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- scientific and traditional knowledge be integrated in interdisciplinary projects dealing with links between culture, environment and development in areas such as
- the conservation of biological diversity, management of natural resources,
- understanding of natural hazards and mitigation of their impact.
- Local communities and other relevant players should be involved in these projects.
- Development professionals consider indigenous knowledge as an invaluable and under-utilized knowledge reservoir.

1.2 The effects of climate change in Africa

- Climate change is one of the most serious threats the world faces. It will affect all of us, but will have a uneven impact on millions of poor rural people
- It puts more people at risk of hunger and makes it more difficult to reduce the proportion of people living in extreme poverty.
- For development work to be effective, we must help poor rural people cope with and mitigate the impact of climate change.

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- According to Conserve Africa, crop failures and livestock deaths are causing higher economic losses, contributing to higher food prices and undermining food security with ever-greater frequency, especially in parts of sub-Saharan Africa.
- Rain fed crop yields could drop by 50 percent by 2020 in some countries. At the same time, rapidly increasing populations mean that demand for food is rising and. Food production in developing countries will need to double by in 2050. to meet demand

Climate change impact is not known accurately but, there is agreement about the following

- Global mean surface temperature is projected to increase between 1.5 °C (2.7°F) and 6 °C (10.8°F) by 2100.
- Sea levels are projected to rise by 15 to 95 centimeters (6 to 37 inches) by 2100.
- Climate change scenarios for Africa indicate future warming across the continent ranging from 0.2°C (0.36°F) per decade (low scenario) to more than 0.5°C (0.9°F) per decade.

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- This warming will be greatest over the interior of semiarid margins of the Sahara and central southern Africa. This change of climate also has multiple effects on biodiversity loss, decrease agricultural productivity, deteriorating glaciers coverage and water supply, and escalating human animal migration.

1.2.1 Solutions for climate change impacts

- Better natural resource management practices such as:
- rehabilitating degraded crop and pasture land,
- better farming practices
- Forestation and reforestation
- Decreasing carbon dioxide and other gas emission
- Supporting the more vulnerable rural poor people at least to minimize its effects.
- Applying community based natural resource management system

1.2.3 International convention to combat climate change

- The Rio Declaration on Environment and Development
- United Nations Framework Convention on Climate Change
- Montreal Protocol
- The Convention on Biological Diversity
- The Bio-safety Protocol
- The International Treaty on Plant Genetic Resources for Food and Agriculture
- The Convention on International Trade of Endangered Species of Wild Fauna and Flora
- The Basel Convention on control of movements of Hazardous Wastes

2. Natural resource and climate change in Ethiopia

Natural resources in Ethiopia are:

- the foundation of the economy
- 45 percent of the GDP,
- 85 percent of exports and
- 80 percent of total employment

2.1 Natural resource management and climate change proclamations and strategies

1. The Constitution of the Federal Democratic Republic of Ethiopia
2. Regional Governments Establishment Proclamation
3. Environmental Organs Establishment Proclamation
4. The Environmental Policy of Ethiopia
5. Agricultural and Rural Development Policies and Strategies
6. The National Capacity Building Program
7. Sustainable Development and Poverty Reduction Strategy

All recognizes the importance of the environment protection and the need for its proper management

3. Natural resource management and institutional arrangements in Ethiopia

- Environmental Protection Authority
- Ministry of Agriculture and Rural Development
- Ministry of Capacity Building
- Ministry of Federal Affairs
- Ministry of Education,
- Disaster Prevention and Preparedness Commission
- Ethiopian Agricultural Research Organization
- Institute of Biodiversity Conservation
- Higher Learning Institutions
- National Meteorological Services Agency
- Regional Environmental Agencies
- Ethiopian Rural Energy Development and Promotion Centre
- NGOs/CBOs, Ministry of water Resource
- Ministry of mines & Energy

3.1 Undertaking activities through concerned stakeholders institutions

3.1.1 The Conservation of Natural Resources

The major activities are:

- Moisture conservation and utilization, which include water harvesting, small-scale irrigation etc,
- Physical and biological soil conservation measures and agro-forestry practices;
- forestation;
- Rehabilitation of degraded patches of remnant forest areas through enrichment planting and enclosure by local communities
- Upgrading control hunting areas to national parks and the establishment of one new national park;
- Based on the investment policy of the country, five eco-tourism based investments have been established by local and private investors;

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- Woody Bio-mass Inventory and Strategic Planning Project which was designed to develop national and regional planning and monitoring capabilities, including inventory of natural resources and to provide recommended land management options has been completed
- The introduction and dissemination of fuel saving stoves and utilization of renewable energy sources (solar, wind etc) and tree Nursery are under implementation,

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3.1.2 Improving Institutional Arrangements

3.1.3 Improving the Knowledge of the Public on Desertification, Climate change and Mitigation of the Effects of Drought

3.1.4. The Implementation of Early Warning System and the Strengthening of Drought

3.1.5. Improving the Role of Science and Technology

3.1.6. Improving Agricultural Research

3.1.7. Enhancing the Role of Indigenous Knowledge on Combating Desertification and Mitigating the Effects of Drought Ethiopia

3.1.8. Enhancing the involvement of women in natural resource management and combating desertification

3.1.9. Improving Environmental Information System

4. Major natural resource and climate change policies in Ethiopia

4.1 Soil Husbandry and Sustainable Agriculture Policies
4.2. Forest Resource Policies
4.3. Biodiversity resource Policies
4.4. Water Resources Policies
4.5. Energy Resource Policies
4.6 Atmospheric Pollution and Climate Change Policies
5.7. Population and the Environment Policies
4.8. Community Participation and the Environment Policies
4.9. Tenure and Access Rights to Land and Natural Resource Polices
4.10. Social and Gender Issues
4.11. Environmental Research Policies
4.12. Environmental Education and Awareness Policies

5. Policy implementation

5.1 Institutional Framework, Responsibilities and Mandates Policies

- To give political and popular support to the sustainable use of natural, human-made and cultural resources and environmental management for effectiveness at the federal, regional, zonal, wereda and community levels.
- To ensure that legally established coordination and management bodies from the federal down to the community level.
- To avoid conflicts of interest by assigning responsibilities to separate organizations for environmental and natural resource development and management activities on the one hand, and environmental protection, regulation and monitoring on the other;

6. Best Practices to natural resource management in Ethiopia

6.1.Konso's Indigenous Terrace building

- The Konso district is found in the Southern Nations.
- The District has an area of 2,354.3 km2 inhabited by 212,235 population. Out of the total area of the district, about 80% is terraced.
- The farmers of Konso are well known for their own home grown/special terrace building, which is one of the best locally available techniques for soil and water conservation.
- In addition, the Konso's are well known for their crop diversification to minimize risk, mixed cropping and multi-story crop and tree production in traditional intensification.

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- Unlike the tradition such as in the northern parts of Ethiopia, weaves, smiths, potters etc., are not outcastes but having equal status in the society. Merit is given to hard work, productivity and natural resource
- As a result, the Konso's people have controlled land degradation even in hilly and mountainous areas. Each terrace has been in place for more than 50 years.
- All Konso people participate in terrace building.
- Konso's terracing and agro forestry practices have significant contribution to combat desertification and mitigate the effects of drought and needs to be replicated in other parts of the country

6.1.2 Gedio's Agro-forestry system

- Gedio zone has a total area of 1347 km2 inhabited by 773,514
- Populations In Gedio, nearly all people live virtually in a home garden land use system.
- In this system slopes as steep as 80 degree are under production.
- Out of the total zonal population, about 86%, living in the rural area is involved in agro-forestry development activities, which is one of the best measures to combat desertification and mitigate the effects of drought in the zone.
- Plots are covered with multi-story vegetation and crops like , *Coffee*, Enset and several root crops.
- As a result, soil and water resources are well conserved, home garden agro-forestry and biodiversity have been enhanced; and most area of the zone is covered by evergreen vegetation

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- Gedio “agroforests” contain an organized mix of crops ,ensete and coffee to long living multi-purpose trees to get maximum benefits on a sustainable basis,
- High biomass production is ensured in an rising and falling rugged terrain.
- While Gedio agroforests are most ancient, they cannot be said to be primitive, i.e.,
- archaic or unfit for the present age, as their capacity of production is comparable to most high input conventional modern agricultural systems.
- There is a lesson to be learned from these “agro forests” that maximum yield can be obtained also from complex systems.

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- Therefore, ensete based Gedeo systems today as compared to contemporaries of modern day agriculture and forestry have retained the qualities of the original ecosystem by conserving their capacity for high biomass production.
- Unlike agro forestry systems proper that only cast a bridge between specialized agriculture and specialized forestry, Gedio “agro forests” fully integrate

6.1.3. “Lakech” and “Mirt” Stoves

- Ethiopia is highly dependent on biomass energy that includes fuel wood, charcoal, agricultural residues, animal dung that account more than 90% of the total domestic energy demand.
- The high biomass energy consumption, along with inefficient utilization, has created, among others, deforestation, biodiversity loss and land degradation.
- In general, the fuel wood demand of the country is far exceeding the sustainable supply, for instance, leading to a total of fuel wood deficit of 47 million m3 by the year 2000.
- The diminishing natural forest resources are much affected by the expansion of agricultural land in general and inefficient utilization of biomass fuels in particular.
- To address such problems:

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- the development and dissemination of the improved charcoal stove known as “ Lakech” and the biomass “Enjera” stove known as “Mirt. Lakech and Mirt provide a saving of 25% and 47 % over traditional stove and open fire stove respectively.
- This indicates that these stoves are useful to reduce the pressure on the biomass energy sources. Today, about 2,000,000 Lakech and 328,000 Mirt stoves have been distributed throughout the country.
- Therefore, large-scale distribution of improved stoves will help to reduce pressure on the biomass resources, including forests, increase land productivity by reducing crop residue and dung usage for fuel wood, and improve family health.

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- The intervention benefits women and children in particular, minimizing their high workloads to collect and supply fuel wood, and their exposure to flame hazard, high smoke emission and harmful pollutants
- It is assumed that if the whole rural and urban households (estimated to be about 14.44 million) in Ethiopia shift to the improved Lakech and Mirt stoves, a saving of about 7,778,800 tones of fuel wood which requires clear cutting of 137,192.24 of forest will be achieved in an annual basis.

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- This implies that sufficient distribution of these improved stoves will have significant contribution to save the biomass resources of the country in general and forest resource in particular and to combat land degradation and mitigate the effects of drought.
- Closed Enjera and“Lakech Charcoal Stoves have efficiency of saving 47% and 25-35% respectively.

Enjera **Closed Stove efficiency about 47%efficiency**

“*Laketch* Charcoal Saving Stove” in 25-35% efficiency

6.1.4 Tigray Experience

- Tigray is one of the National States located in the northern part of Ethiopia.
- In Tigray region, crop yields are very low due to the prevalent land degradation and the associated environmental problems for so many years.
- To increase soil fertility and crop yields, external agricultural inputs have been introduced for years now.
- As an alterative to external agricultural inputs, the Institute of Sustainable Development (Local NGO) in collaboration with Bureau of Agricultural and Natural Resources of the Tigray region (BoANR) has been implementing a pilot project on sustainable agriculture, particularly emphasizing on promoting the 'package' of making compost, trench building and planting multi-purpose trees.

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- This approach is to help local communities develop a sustainable system of high agricultural and renewable natural resources production through the application of ecological principles so as to achieve self-reliance and depend largely on locally generated agricultural inputs.
- A given community therefore, devises its own by-laws that govern all its members in order to administer, enhance and utilize common resources. Currently, the pilot project has expanded from four (the original core sites established in 1996/97) to 15 sites.
- The results obtained from the pilot sites indicated that, in most cases, crop yields by using compost are comparable to the yield obtained using chemical fertilizer.

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- Based on the results of the pilot project, the region has been promoting the activities into over 90 communities within 25 districts of the region.
- The dissemination of such activities in marginalized and degraded areas is highly relevant for combating desertification
- through mitigating the effects of drought by preventing free-range grazing to increase forage productivity and encourage natural regeneration.
- In the pilot and other intervention areas of the Tigray region, cultivated land is protected through stabilizing terraces by planting multipurpose trees, grasses and legumes, and constructing trench bunds to capture both water and soil.

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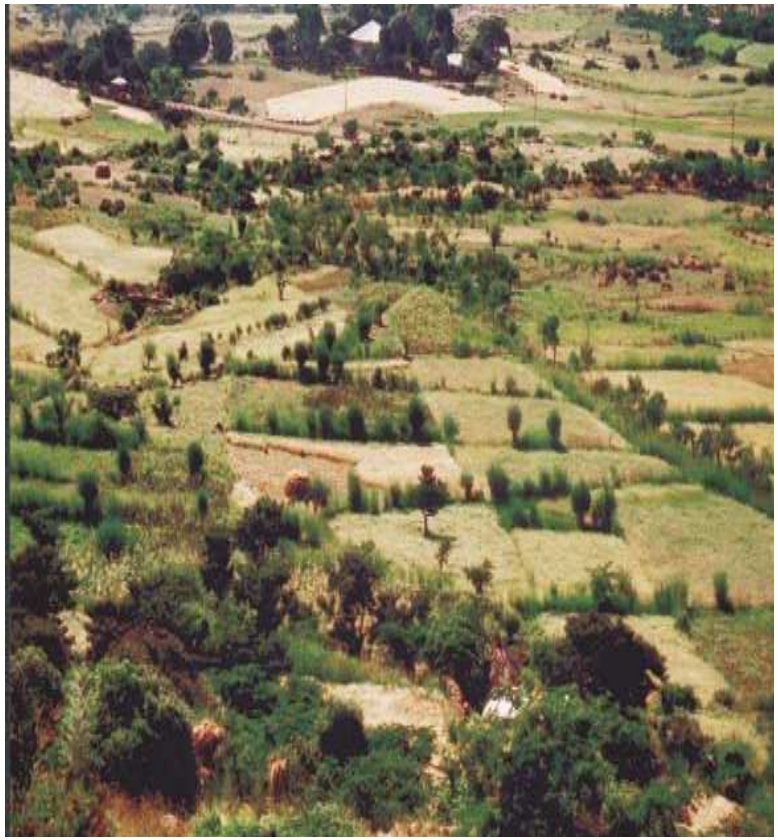
- These activities have resulted in quick overall land rehabilitation and marked increases in productivity per unit area.
- Farmers living adjacent to the project sites witnessed positive changes in the livelihoods of the communities resulting from the implementation of the project. This has prompted to these witnessing farmers and development workers to adapt the system in this respective domain and beyond agro-forestry System.



***Tigray –Adinefas*: land rehabilitated due to integrated intervention**

7. Challenges of natural resource management, climate change, institutional arrangements and policies in Ethiopia.

1. Lack of suitable coordination among institutions in mitigating the impacts of climate change and appropriate natural resources management.
2. Unable to decrease rapid population growth which creates immense pressure on natural resources.
3. Unable to attain the best result as the government and the society wishes in short period of time to minimize tremendous effects of climate changes and natural resource depletion.
4. The government owned land tenure system may create suspicions on the part on land owner to invest long life plants

8.Recommendations

1.In order to control the population growth of Ethiopia “The Central Statistical Agency Ethiopia” should established as a population ministry to inculcate and broaden its activity clearly to the community level.

2.For effective natural resource management, the government should try to secure land tenure policy

3. The higher officials of government of Ethiopia should be committed to control alarming population growth.

4.The miniseries of Ethiopia should create smooth and suitable coordination to combat the effect of climate change &natural resources depletion.

5.to get plausible results on impacts on climate change & natural resources depletion, the government & the society should broaden best practice of community based natural resource management.

Thank you