

## **Title: Drought conditions and management strategies in Eritrea**

Before I give presentation on the theme of the workshop I would very briefly introduce the participants Eritrea, where I came from.

### **Location:**

The State of Eritrea is located south of the Sahara Desert in the Horn of Africa and it is part of the Sudano-Sahelain Belt. It is bordered with the Red Sea in the east, Ethiopia in the south, the Republic of Djibouti in the southeast and the Republic of the Sudan in the north and northwest (refer Map of Eritrea). Eritrea got its independence from the Ethiopian rule in 1991 which was validated through referendum in May 1993. Eritrea became 182<sup>nd</sup> UN Member State in 28 May 1993.

The country exhibits a varied topography, with altitudes ranging from 120 meters below sea level to over 3,000 meters above sea level. Eritrea encompasses an area of 125,000 sq km and has about 1,200 km coastline with more than 350 small islands the biggest of which is the Dahlak Archipelago and two important ports, namely Assab and Massawa.



### **Map of Eritrea**

### **Climate:**

The country has a semi-arid climate with uneven and erratic rainfall distribution ranging annually from about 200 mm in the coastal areas to a wider range from 400 mm to 600 mm in

the highlands and in the western lowlands. In some spots, for example, in the Green Belt area annual rainfall may reach up to 1,000 mm. There are two major periods of precipitation; the main rains locally know as '*Kremti*', covering both the Western Lowlands and the Highlands are from mid June to mid September and the other rainy season locally known as '*Bahri*' or Coastal rains falls from October to February covers the Eastern Lowlands. The Highlands also receive small rains locally known as '*Asmera*' which lasts from February to March.

**Vegetation:** A century or so ago 30% of the Eritrean land mass was covered with forests and other types of vegetation. However, because of many interrelated biotic and abiotic factors such as deforestation (tree cutting for expansion of agricultural land, firewood, traditional house construction, urbanization, etc) about 1% of its land mass is currently covered with woodlands and scrublands.

Administratively the country is divided into six *zobas* (regions) and each in turn is divided into sub '*zobas*'. Agro-ecologically Eritrea is divided into six zones. The Western Lowlands bordering Ethiopia and the Sudan comprise of an area with extensive plains through which the major Eritrean rivers flow. This area is mainly inhabited by pastoralists. The Western Lowlands are divided into the Northwestern Lowlands which receive annual rainfall ranging from 200 to 500 mm and support smaller livestock population of small ruminants and camels and the Southwestern Lowlands which get an annual rainfall of about 500 mm. This region supports high number of livestock population and most of the cattle population is found in his area.

The Eastern Lowlands comprises of coastal plains which extend along the Red Sea Coast. Most of these areas are too arid for intensive crop production except for small stripes of land which are cultivated through rain fed-cum-spate irrigation and is inhabited by pastoralists, agro-pastoralists and sedentary farmers rearing livestock and practicing crop husbandry including vegetable production. Most of their livestock reared here are small ruminants and camels.

The Central Highlands comprise of the central plateau which is frequently interrupted by mountain ranges and deep gorges. The dominant agricultural activities in this area are small scale mixed farming i.e. crop cultivation and livestock rearing.

**Population and economy:** Though population census was not done the population is estimated to be 3.5 million composed of nine different ethnic groups, namely, Afar, Bilen, Hidareb, Kunama, Nara, Rashida, Saho, Tigre and Tigrigna. The population follows Christianity and Islam religions that live in harmony.

The country's economy largely depends on agriculture, with majority of the population engaged in subsistence farming and agro-pastoralist for livelihood, rendering them vulnerable to the negative effects of climate variability and its consequent results.

Exposure to climate variability and extremes, most particularly drought, poses substantial risks. In rural communities, Community-based sustainable livelihood (SL) and environmental management (EM) measures have been implemented to build resilience to the stresses of drought and other climate variations and extremes. These measures build resilience and adaptive capacity that lessen the vulnerability of rural communities of Eritrea to future climate change. Research

methods based upon a sustainable livelihood conceptual framework is being developed and applied in case studies in Eritrea to evaluate the performance of sustainable livelihood and environmental management measures for building resilience to today's climate-related shocks and for their potential for reducing community vulnerability to future climate changes.

- I. **Background:** Describe briefly the general state of drought in the country focusing on recent years (the last 10 years) and covering statistics, duration, magnitude, impacts; vulnerable sectors and layers of the population, etc. **(Maximum 350 words)**

Climate change and drought are both an environment and a development issue. This is critical in Eritrea where the poor are the most at risk from the increased variability and volatility in weather patterns. One of the key climate-related vulnerabilities of Eritrea's economy is its heavy dependence on rain-fed agriculture which depends mostly on the monsoons. Monsoon rain analysis reveals that some part of the Eritrea's land mass is hit by drought periodically.

Drought threatens the existing cultivation of traditional rain-fed lands, mechanized and agro-pastoralist groups in the semi-arid areas of Eritrea.

Though detailed research has not been done on climate scenario it is expected that average temperatures will rise significantly relative to baseline expectations. Projections of rainfall under climate change conditions also show sharp deviations from baseline expectations. Results from some of the models show average rainfall decreases during the rainy season. While in certain respects, the country is quite exposed to the potential impacts of climate change, it is simultaneously poised to undertake proactive steps that can preempt certain negative impacts, mitigate others, and enable the country to adapt to a changing climate. In response to these challenges, Eritrea has been actively seeking to promote domestic sustainable development policies, by engaging in international environmental processes, facilitating strategic research, employing preventive measures and monitoring mechanisms, enabling ground-level sustainable livelihood development work, and strengthening its human and institutional capacity.

- II. **Drought monitoring and early warning systems:** Describe the available drought monitoring systems, including temperature, water, soil and socioeconomic indicators that are used to characterize drought magnitude; evaluate the capacity and adequacy of meteorological and hydrological institutions and networks and describe their role and their linkage to drought management. **(Maximum 350 words)**
  1. **Meteorological data collection and analysis:** There are several meteorological stations in Eritrea that record rainfall, temperature, wind direction and velocity. The data collected from these stations are analyzed and synthesized and are used for monitoring purposes.
  2. **General health statistics:** In drought prone areas temporary vaccination, sanitation and feeding programmes and mobile clinics are established. General health data which includes body weight, disease type, intensity and frequency are collected and analysed and compared with baseline data. These are good indicators for the drought impacts.

3. **Exchange of information:** There is monthly exchange of meteorological report with neighbouring countries which assists in monitoring and evaluating and forecasting weather conditions. The information obtained enables to take preventive measures.
4. **Early warning system:** In the Ministry of Agriculture there is an office that deals with different aspects of early warning systems. The office collects meteorological data, produces maps showing current weather conditions and predictions. The Office has linkages with regional early warning systems where it gets necessary information from the regional countries; and reciprocally the office provides information to these countries.
5. **Public awareness:** The information collected by the office of the Early Warning System is made public through arranging training sessions, the mass media (newspaper, TV and radio), using audio-visual means and distributing brochures, pamphlets, etc in order to create awareness to the public in general and the farming communities in particular where they take necessary precautions to prepare themselves against any problems that may happen. For example, farmers are advised to level and plough their farm land, to construct soil and stone bunds along their farm lands to conserve soil moisture and to collect their harvests on time and make proper stores for their harvests.

III. **Vulnerable assessment:** Indicate the most vulnerable sectors of the economy, if possible in the order of most to least vulnerable, focusing on water resources shortage and their impacts on various uses (drinking water supply, industry, agriculture and food production, fisheries, environment, etc.) as well as on the society at large. Describe the most vulnerable groups of the society, such as small farmers, the youth, women, or other special (**Maximum 400 words**)

Drought is one of the world's major natural hazards which occur in almost every climate region and periodically impacts nations and livelihoods around the world. It affects millions of people and causes significant economic and ecological damage. Droughts are considered to be the most far-reaching of all natural disasters. Because each location is unique, the number of people affected by drought and the types of effects experienced will vary by region. In developing countries, however, drought ranks as the single most common cause of severe food shortages and its consequent results and is regularly listed as a cause in the majority of food emergencies.

To reduce the societal vulnerability to droughts, a paradigm shift, from the currently predominant crisis management to a risk management based approach, is needed. Drought risk management seeks to increase societies coping capacities and resilience to droughts, by focusing on drought preparedness and mitigation measures that start working on the onset of droughts, prior to the culmination of drought effects in disasters. Over the past decades, much progress has been made in the scientific field of drought monitoring. Likewise, risk based responses and coping strategies have evolved, which can help reduce the impacts of droughts.

It is clear that climate change will, in many parts of the world, adversely affect socio-economic sectors, which include water resources, agriculture, forestry, fisheries and human settlements, ecological systems and human health. Developing countries are the most vulnerable.

The following are the most vulnerable sectors of the economy.

1. **Agriculture Sector**

Key drought vulnerabilities for crops include crop loss from lack of precipitation or insufficient irrigation, and possible damage to crops due to reduced quality of irrigation water. The livestock sub-sector focuses on impacts to grazing cattle, which can be vulnerable to drought due to limited forage availability

## **2. Energy Sector**

### **Subsectors Mining and Power Generation**

Thermoelectric power plants can be impacted by inadequate water supplies and increased cost of water during drought. Hydropower generation capacity decreases as reservoir levels drop.

Mining operations can be impacted by increased costs of water for operations or limited water availability. The energy sector is generally drought tolerant. Power providers and mining operations tend to have very senior water rights and some power.

## **3. Water Sector:**

Drought vulnerability depends on the reliability of a water supply system during a drought and the ability to actively respond. Vulnerability can vary greatly based on the following categories: Water supply, water distribution and water demand and adaptive capacity

### **3. Recreation and Tourism:**

.life Viewing and hunting/fishing/camping

Wild animals may move away from traditional viewing/hunting areas due to lack of water, loss of vegetative cover, and/or heat. Fishing areas can be impacted by lower reservoir and lake levels, decreased stream flow, and fish decline. Forced closure of camp sites and surrounding forest due to risk of wildfires and/or hazard trees watering restrictions or if water rights become out of priority due to low stream flows. Lower reservoir and lake levels can render boat ramps unusable; and lower water levels can deter potential boaters.

**IV. Emergency relief and drought response:** indicate the types and forms of emergency provided (food, feed, cash/food for work, compensation in cash), the beneficiary sectors and layers of the population as well as the criteria for selection, the response costs, institution(s) managing response; response effectiveness; impact evaluation after drought waves; other as relevant. **(Maximum 350 words).**

The management of drought risk and impacts is largely affected by the government decision making. Government addresses drought issues from multi-objective perspective. Each involved government agency has its own legislative mandates to oversee and implement some of which may affect mitigation, preparedness, response, or recovery related to drought. To implement the multi-faceted objective all concerned ministries, agencies and organizations synergise and harmonize their efforts to reduce drought impacts.

During periods of drought depending on the intensity and severity of the drought necessary drought responses are provided to the affected individuals which include, among other things,

the provision of medication, training and training materials, feeding programmes, clothes, shelter, small ruminants for example goats and improved agricultural inputs.

#### **V. Practices to alleviate drought impacts**

List the main measures and practices applied by the government and other supporting institutions including NGOs private sector, prior to or during drought in view of reducing drought impacts. (Maximum 200 words).

Several community-based and owned interventions to alleviate drought impacts are being carried out in Eritrea. The following is a list of the major practices:

1. **Five year (2014-2018) Strategic and Development Plan**: The MoA has developed a five-year Strategic and Development Plan which incorporates drought mitigation and adaptation measures to be undertaken by extension agents and land users. These interventions are meant develop and increase drought resilience. These interventions are based on risk management approaches as opposed to crisis management approaches.
2. **Awareness raising**: the government strengthens and develops awareness of the public in general and land users in particular on the effects of drought through arranging training sessions, workshops/seminars and the mass media. These practices are very indispensable in raising the public and land users' awareness.
3. **Strengthening early warning system**: As mention in this report the Ministry of the Agriculture is strengthening the office that deals with early warning system technically, financially and with human capacity.
4. **Strengthening of meteorological stations**: the capacity of the existing meteorological stations is being strengthened and new stations are being established which will enable to collect more meteorological data.
5. **Evading drought**: Transhumance, or the seasonal migration of livestock, has long been recognized as an effective means of evading unfavorable climatic effects, such as drought, whereby moving domestic livestock across a landscape allows maximum forage use across a variety of climatic regimes and events. This climate-driven lifestyle is effectively used by lowlanders and highlanders from time immemorial, although at present constrained by land ownership patterns and influenced by social norms and current agricultural practices. Transhumance is characterised by yearly movement cycles of livestock, following seasonal shifts in resource availability, coupled with variants in pattern associated with climatic events such as years of drought. A reduction in rainfall or even smaller scale shifts in the timing of rainfall can result in ecosystem responses such as switches from grass to shrub-cover dominance or the failure of annual plant production. Resource fluctuations are effectively evaded by following various well-established transhumance routes. The entrenched nature of the transhumance routes followed by pastoralists, attests to a familiarity with resource variability and evasion during times of scarcity.
6. **Improving crop production and productivity/unit area using integrated technologies**: To improve production and productivity per unit area contact/exemplary farmers are provided with improved crop, livestock, and forage varieties. The farmers will give back certain amount of the harvest which will be redistributed to other farmers. This cycle continues and production and productivity increases annually. The system increases drought resilience. They are also advised to construct physical soil and water

conservation structures and practice conservation agriculture techniques. Currently this approach is found promising.

1. **Construction of soil and water conservation structures/drylands agriculture:** Farming communities and other land users led by the Villages Development Committee of each Administrative *Kebabi* construct physical soil and water conservation structures such as terraces, gully plugging and check dams along denude and eroded hills, soil and stone bunds along farmlands, and in school compounds to protect erosion and to conserve soil moisture. These activities are coupled with planting of different multipurpose tree species.
2. **Summer campaign:** In Eritrea schools are closed during the rainy season (June-September) during which high school students (Grades 10-11) go to the countryside and carryout construction of physical soil and water conservation structures coupled with planting of multipurpose tree species in eroded hillsides and along farm lands; they also assist farmers in land preparation that would play a positive role in drought resilience. The summer campaign activities have been carried out every year since 1994 and commendable achievements have been undertaken with positive impacts on environment and livelihoods.
3. **Green Clubs:** All schools in Eritrea have established Green Clubs where students construct physical soil and water conservation structures coupled with tree planting in their school compounds and surrounding areas. Each student plants trees and manages them properly. This practice plays a positive role in increasing drought resilience. Currently churches and mosques are initiating the formation of green clubs.
4. **Strengthening of Sustainable Land and Water Management Forum:** SL&WMF is established. This Form has three levels. The first level comprises concerned ministers that deal with land, water, environment, marine resources, mines, energy, forestry, wildlife, agriculture, human welfare and social affairs, etc. The second level comprises director generals of the above mentioned ministries/organizations/agencies while the third level is made up of senior experts. This structure is replicated in all zobas (regions) and sub zobas and administration kebabis (two to three villages are clustered to form an administrative kebabi). The Forum discusses issues related to the management of natural resources and drought mitigation and adaptation measures.
5. **Construction of water reservoirs:** In Eritrea there is a motto which says ‘Let’s conserve any drop of water for immediate and future uses’. To this effect, ponds, dams, roof water harvesting structures are constructed annually. To reduced soil erosion and increase the life span of these water reservoirs the surrounding areas (watershed areas) are treated through the construction of physical soil and water conservation structures coupled with planting of multipurpose tree species.
6. **Development of ground water:** wells are developed.
7. **Development of irrigation systems:** To supplement rain fed agriculture different types of irrigation systems such as spate, mixed pressurized irrigation system, furrow and surface irrigation systems and irrigation from wells, dams, micro-dams, etc are being practiced.
8. **Introduction of a package system:** the Ministry of Agriculture is introducing a package system where farmers get one cow, 25 one-month old vaccinated chicks along with one month feed, a variety of improved vegetable seeds, forage seeds and 20 tree seedlings to

be planted around their homesteads for firewood. The package system has many positive impacts as compared to the piecemeal system practiced earlier.

9. **Provision of credit and subsidized agricultural inputs:** The Small Scale Marketing and Credit Enterprise, an autonomous enterprise lends cash to poor women headed families at a very low (nominal) interest rate as compared to the cash borrowed from other lending agencies such as the Commercial Banks of Eritrea. The beneficiaries use the cash borrowed to improve their livelihoods. The repayment turnover is very high. IN addition to lending cash money these enterprises provide improved agricultural input at very low cost. These intervention increases agricultural production and productivity which has a positive function in increasing drought resilience.
10. **Establishment of community-based shops:** There are community run and owned shops. These shops sell improved agricultural inputs such as farm tools (pick axes, sickles, inorganic fertilizers, vegetable seeds, etc to farmers at a very low price as compared to other private shops. These shops play a very positive role in boosting agricultural yields which increases drought resilience.
11. **Establishment of enclosures:** enclosures are areas delineated for grazing. To reduce erosion and to increase biodiversity physical soil and water conservation structures are constructed coupled with tree planting and broadcast sowing of grass and forbs species. Grass for livestock feed and house construction is removed from such enclosures through the cut-and-carry systems is removed from these enclosures. Except for lactating cows, sick animals and plough oxen, enclosures are closed for grazing for a certain period of the year which allows them to increase grass availability. This system of management improves drought resiliencies.
12. **Storage and proper utilization of crop residues:** In rural Eritrea livestock are fed with crop residues like sorghum and maize stocks, hay and straws during most of the year especially during the drought periods. The extension agents of the Ministry of Agriculture advice the farming communities to prepare and store these crop products properly so that they are not damaged by rain or lose their nutrition values.
13. **Exchange of information:** information on climatic data are collected, analyzed and shared with other countries.
14. **Participating in international forum/workshops/seminars:** experts of different disciplines participate in international workshops/seminars and short to medium courses on drought and drought related topics. This enables experts to increase their know-how and skill on drought management

**VI. The need for knowledge and skills on drought management:** Specific capacity gaps on the drought management by individuals or institutions dealing with drought management; level of knowledge and skills urgently needed (prioritize the needs). (Maximum 200 words)

At the Ministry level (headquarters and *zoba* levels)

1. **Technical support:** there is a need to upgrade the skill and know-how of staff working in meteorological data collection and analysis. Hence support in this area is needed.
2. **Material support:** The early warning system at headquarters level is ill-equipped. There is need to equip it with the necessary materials. The system should be replicated in the six zobas which need technical and material support.
3. **Develop regional and global linkages:** Drought has negative effects on livelihoods of individuals, communities, regionally and globally and should be tackled in an integrated

manner. We need support to create linkages with the existing early warning systems/regional and global meteorological organizations and systems so that it will be possible to get and to give timely meteorological information.

4. **Study tours:** One way of developing skill and know-how are through visiting demonstration sites. There is a need to arrange such visits to different meteorological sites. This could be done for land users as well as extension agents of meteorological stations as well as early warning systems.

**At community level:**

1. Land users should be made aware on the causes and effects of drought and drought prevention measures. Training of trainers should be arranged for land users of different categories. To put this objective into effect technical, financial and material support are essential. Such arrangements will enable land users to develop drought resilience.
2. **Strengthening community-owned shops:** These shops play a positive role in improving the livelihoods of the farming communities through the provision of improved agricultural inputs at low cost which is affordable and easily accessible by poor women headed households. These improved inputs increase agricultural production and productivity thus increasing drought resilience of the poor sectors of the farming communities especially women headed households. It is therefore recommended that these shops should be strengthened through the provision of agricultural inputs which is affordable by the beneficiary communities.

In conclusion in order to reinforce and to scale up the above mentioned practices and to have them replicated through the country technical, financial and material support are needed so that a positive and sustainable development could be achieved.

Table 1: Translation:

S. No	Vernacular languages	Clarifications
	Azmera rains	Rain that fall from Feb to March
	Bahri rains	Rain that fall from Oct to Jan
	Kebabi	A cluster of 2-3 villages
	Kremti rains	Rains that fall from Juen to mid Sept
	Sub zoba	Sub region
	Zoba	Region/province

Country Report prepared and submitted by Mr. Hadgu Ghebrendrias in collaboration with Mr. Heruy Asghedom.

Heruy Asghedom, Director General, Agricultural Extension Department, Ministry of Agriculture and UNCCD/NFP, Asmara Eritrea E-mail address: asgedomheruy@gmail.com

Hadgu Ghebrendrias, Head, Planning and Statistics Unit, Agriculture Extension Department, Ministry of Agriculture, Asmara Eritrea UNCCD Reporting Officer and CST for Eritrea. E-mail address: hadgufor@gmail.com