Egyptian Meteorological Authority

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Drought condition and management strategies in Egypt

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Background[1]

With the small exception of its strip of Mediterranean coastline and Narrow strip around the Nile River . The whole of Egypt has an arid desert climate. Throughout Egypt, days are commonly warm or hot, and nights are cool.

Egypt has only two seasons: a mild winter from November to April and a hot summer from May to October. The only differences between the seasons are variations in daytime temperatures and changes in prevailing winds. In the coastal regions, temperatures range between an average minimum of 14 C in winter and an average maximum of 30 C in summer.

Temperatures vary widely in the inland desert areas, especially in summer, when they may range from 7 C at night to 43 C during the day. During winter, temperatures in the desert fluctuate less dramatically, but they can be as low as 0 C at night and as high as 18 C during the day.

The average annual temperature increases moving southward from the Delta to the Sudanese border, where temperatures are similar to those of the open deserts to the east and west. In the north, the cooler temperatures of Alexandria during the summer have made the city a popular resort. Throughout the Delta and the northern Nile Valley, there are occasional winter cold spells accompanied by light frost and even snow. At Aswan, in the south, June temperatures can be as low as 10 C at night and as high as 41 C during the day when the sky is clear.

Egypt receives fewer than eighty millimeters of precipitation annually in most areas. Most rain falls along the coast, but even the wettest area, around Alexandria, receives only about 120 to 200 millimeters of precipitation per year. Alexandria has relatively high humidity, but sea breezes help keep the moisture down to a comfortable level. Moving southward, the amount of precipitation decreases suddenly. Cairo receives a little more than one centimeter of precipitation each year. The city, however, reports humidity as high as 77 percent during the summer. But during the rest of the year, humidity is low. The areas south of Cairo receive only traces of rainfall. Some areas will go years without rain and then experience sudden downpours that result in flash floods. Sinai receives somewhat more rainfall (about twelve centimeters annually in the north) than the other desert areas, and the region is dotted by numerous wells and oases, which support small population centers that formerly were focal points on trade routes. Water drainage toward the Mediterranean Sea from the main plateau supplies sufficient moisture to permit some agriculture in the coastal area, particularly near Al Arish.

A phenomenon of Egypt's climate is the hot spring wind that blows across the country. The winds, known to Europeans as the sirocco and to Egyptians as the khamsin, usually arrive in April but occasionally occur in March and May. The winds form in small but vigorous low-pressure areas in the Isthmus of Suez and sweep across the northern coast of Africa. Unobstructed by geographical features, the winds reach high velocities and carry great quantities of sand and dust from the deserts. These sandstorms, often accompanied by winds of up to 140 kilometers per hour, can cause temperatures to rise as much as 20 C in two hours. The winds blow intermittently and may continue for days, cause illness in people and animals, harm crops, and occasionally damage houses and infrastructure.

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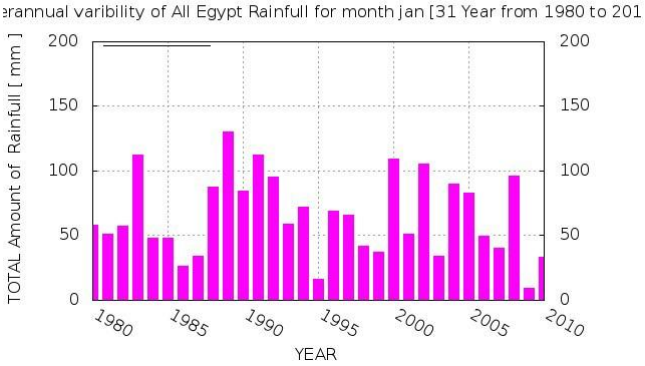
(a) Egypt annaual rainfall



(b) Interannaual variablity of Egypt January Rainfall

Drought[2] in Egypt is not the same concept that we see in the Horn of Africa countries; But affected by it.Egypt affected by the drought on the Horn of Africa countries with 1 month time lag to feel about droughts and to effect at Inventory water behind the Aswan High Dam .That happen because Egypt depend on river Nile Flood and Inventory water which saved behind High-Dam in Aswan[3].

[2]Note that droughts and floods are sometimes declared even when total rainfall or the number of days receiving rain is not very anomalous. This can occur when seasonal rainfall is grossly unevenly distributed over the season, with long dry or wet spells that may straddle the monthly boundaries.

[3]Aswan $24^\circ 05' 20'' N, 32^\circ 53' 59 E$

Topography

Approximately 96% of Egypt's geographic area, mostly arid [see figure 1] and 4% is Agricultural land. About 98.6% Water sources in Egypt comes from the flooding of the River Nile,Egyptian farmer has ever depended on rainfall as ' drought' indicates ' lack of rain' which is a few mm per year .Rainfall will be only in north coast and Sinai .Which are often in the winter on the northern coast of Egypt and the Sinai peninsula .its Always was result from depressions coming from the Mediterranean Sea .

Figure 2: Egypt Map

Sometimes violent rain on the south of Egypt happen South of Egypt and reached to Aswan result of abnormalities in the movement of the ITCZ but that is rare.But in all cases, the amount of rainfall is not enough nor quantified temporal and spatial variability for the adoption by the farmers.

River Nile Flood:

Egypt depend on amount of water which saved behind High-Dam in Aswan during River Nile annual Flood in a biggest artificial lake [4]

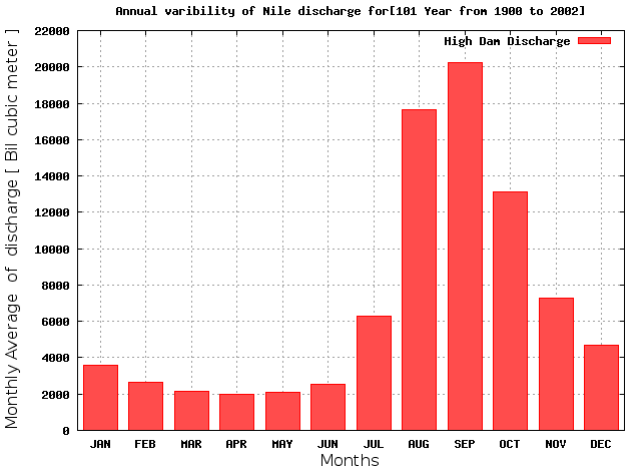
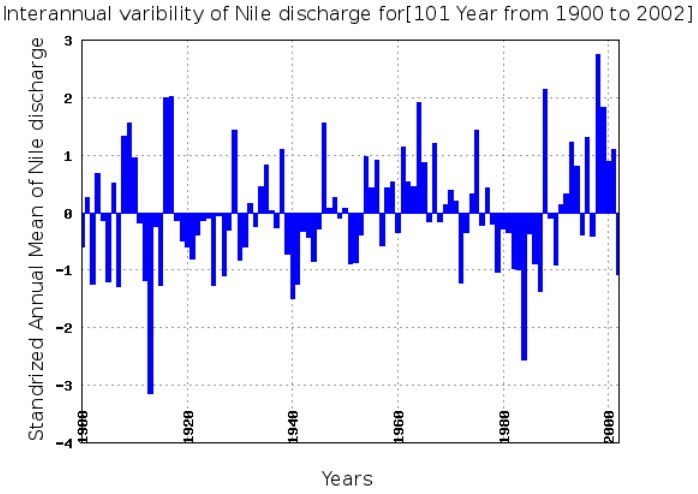


Figure 3: Flood march

Water deficit **in vegetation season caused 13 droughts in last 30 years, namely in Figure 4 illiterate Interannual variability of total discharge in general .**



(a) Interannual variability of Flood

Year 1972,1976,1983,1985,1987,1991,1997,1999,2002,2010 is below average.which is East Africa's drought .

In the last 20 years, Ethiopia has experienced recurring droughts followed by food shortages and famines. During times of drought, water-related diseases are rampant. Surface water sources such as springs and ponds dry up. Remaining water sources are heavily contaminated by environmental waste, such as human and animal excreta, which is washed in when it does rain. The stagnant water serves as a breeding place for mosquitoes.

[4]Nasser Lake

The area of the River Nile

Basin is estimated to be nearly 3.3 million km^2. Ten countries share this area from south to north:

Tanzania - Rwanda Burundi Democratic Republic of Congo - Kenya Uganda Ethiopia - Eritrea Sudan -S.Sudan Egypt

The river Nile represents a unique geographic phenomenon in North Africa; it is the only river that managed to open its way through the Sub-Saharan Desert in North Africa carrying portion of Africa's tropical water to the Mediterranean Sea

Geography of the Nile The Nile river, the world's longest river, is 6670 kilometres long. In its journey from its remotest southern sources, the Ruvyironza River, in Burundi to its mouth north in the Mediterranean, the Nile passes through different types of religions, natures, languages, cultures and races. Unlike other world rivers, the Nile is marked by the following characteristics: It passes from south to north;

The Nile covers more than 34 latitudes stretching between its sources at the Equatorial Lakes and its mouth in the Mediterranean Sea;

The Nile water flows into a distance of 2700 kilometres between Al-Atbara River and the Mediterranean Sea without receiving any tributaries.

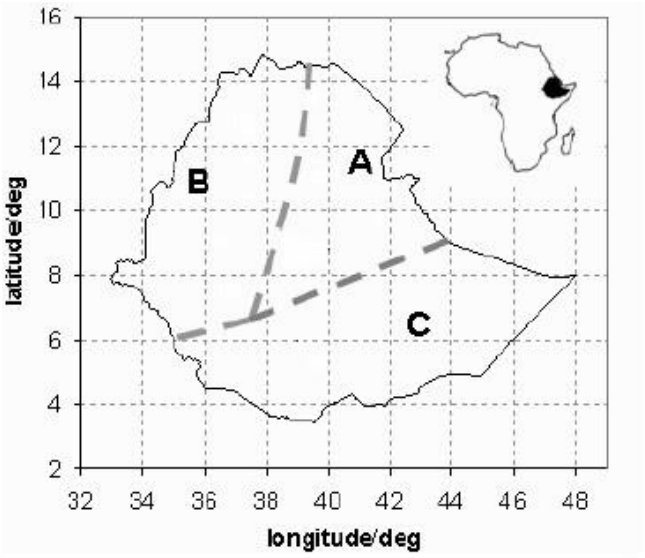
The River Nile yield fluctuates from one year to another; the lowest recorded yield reached 42 billion cubic meters, while the highest amounted to nearly 150 billion cubic meters. The Nile's average annual yield throughout the twentieth century is nearly 84 billion cubic meters at Aswan.

So, In Egypt we always depend on River Nile flood which 85% of it come from Ethiopian Platue and the rest of it Comes from the Equatorial Highland Lakes Basin : Lake Victoria Basin- Lake Kyoga Basin-Lake George Basin-Lake Edward Basin- Lake Albert basin,...,etc

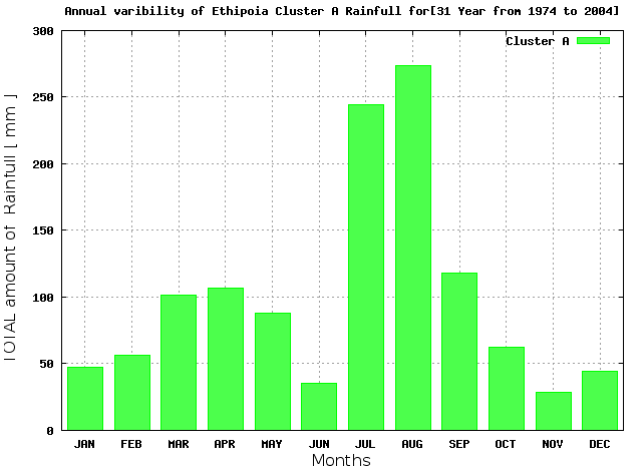
Ethiopian Platue

The Ethiopian Region has been divided into three homogeneous rainfall regimes (Zone A-C).Zone A and B share to fill Tana lake which provide blue Nile their water .

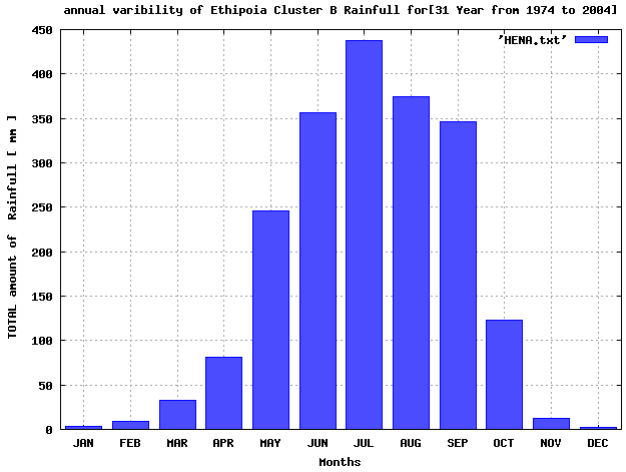
(a) Ethiopia homogeneous Climatic regimes.



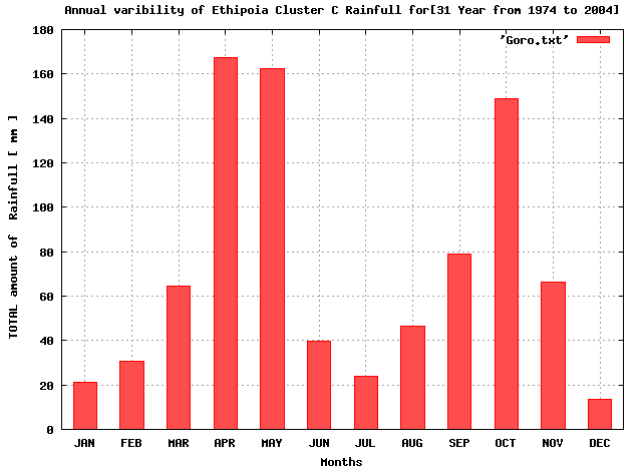
(b) cluster A



(c) cluster B

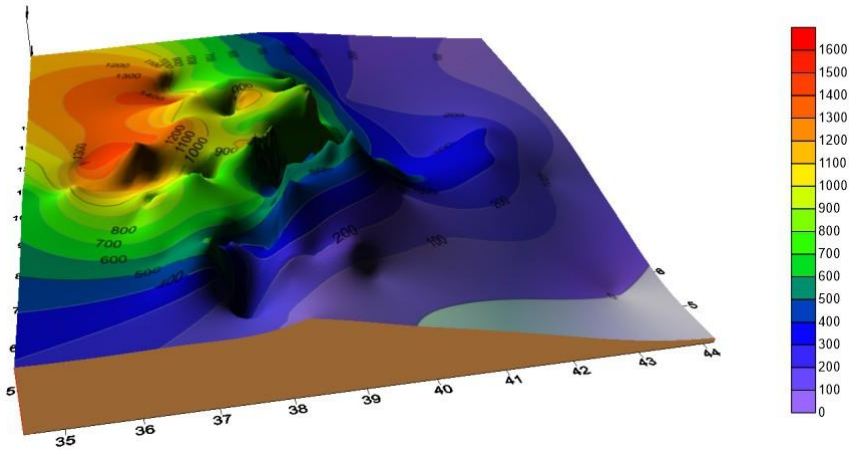


(d) cluster C



The seasonal classification of the region, especially over Ethiopia, is from February to May, June to September and October to January, called **Belg**, **Kiremt** and **Bega**, respectively. Here, more emphasis is given to the **Kiremt** season. and Drought begotten from this season deficit.

Figure 6: **Kiremt** JJAS Average Rainfall over Ethiopian platue.



the **Kiremt** season represent 55-85 % of total annual Rainfall over Ethiopian area.So, We Always Concern About Drought in Horn of Africa countries which Egypt are linked their water policy with them.

Drought monitoring and early warning systems

Because the Main water sources for Egypt does not come from within borders. Many Egyptian Authorities share many sectors in the management of the water issue and control the Nile River file.

In order to mitigate the effects of drought, it is important that farmers are aware of risks that they are exposed to. They can contribute to reduction of losses by choosing less sensitive crops in case the drought is developing already in early spring in time of sowing. They can mitigate drought impacts if they prepare irrigation plans in early stages of drought development and they can decide for early harvest in case outlooks are not good. For all these decisions they need information on drought development and forecasts of possible scenarios of development in next days and weeks.

Monitoring Water Resources

Egyptian Meteorological Authority share with Ministry of Irrigation and Water Resources . Egyptian Meteorological Authority Doing seasonal forecast [5] prediction[6] using many Climatic Models 3 months before main Rainy Season Jun-Sep [7] Over Ethiopian Platue.Also Monitoring Rainfall with Satellite Image
While Ministry of Irrigation and Water Resources doing many thing Like

1. Put The necessary water policies to ensure coverage of all of agriculture, industry, drinking and navigation and other consumer energy and water needs requirements.
2. Maintain all the available water resources and rational use and maximize the return them and raise their efficiency through the use of modern technologies in water management and River Nile and rainwater floods and potable water drainage for use in accordance with the specific standards and controls.
3. Adjust and control irrigation water, construction, operation and maintenance of reservoirs and barrages of major industrial and business on the Nile and its branches and Canals, canals and irrigation systems and drainage distribution.
4. Improvement and development of irrigation methods in order to optimize the use of available water resources.
5. Maintain water quality and protection from pollution.
6. Increase Egypt's share of Nile water through cooperation and coordination with the Nile Basin countries to establish joint ventures to attract wasted water and exploitation
7. Make simulation for runoff with Hydrology Model which feed by Precipitation Indies and topography data with information about dams and lakes behind dams,capacity and depth of the tributaries and canals.
8. Have wide station network Along the riverbed and the Nile Basin countries

[5]Using Statistical Methods
[6]Using Numerical Methods
[7]**Kiremt** season.

Early warnning systems

The Ministry of Public Works and Water and Irrigation warning Egyptian Ministry of Agriculture for the processing of agricultural and implementation plan, which is to begin years of drought
Also Warning the Ministry of Industry and the Ministry of Electricity and Energy ministries to priming itself to amount of energy generated from Hydro-power less than usual .

Vulnerability assessment

the Most vulnerable sector is agriculture sector.Although the High Dam protects them from drought year such as the Nile Basin countries, but shows the effects of drought in choosing a quality crop, which according to their share, which is given to them in the years of drought. farmers is suffer from water resource shortage in Crop Selection which have less time and less water need.And this corps not valued in markets .So many farmers have a deep impact with Debt to banks

Emergency relief and drought response

Drought response in Egypt is typically reactive. In case of high drought impacts, a political action is triggered which results in intervention bill (allocating funds from national budget which compensate not more than 50% of assessed damages). In case that intervention bill is passed, detailed analysis of drought is required. According to preliminary assessment of damage,commissions are set up within municipalities in order to give final assessment and priorities for compensations. The whole process can take more than one year. Apart from direct compensations, there are also possibilities of tax reductions and exemptions of social costs

The Ministry of Agriculture specify categories of farmers affected by share scarce water discharges and compensated financially and working on the postponement of their debts for Banks.

Practices to alleviate drought impacts

The State [8] import quantities of crops, which happened by the lack of markets and provided to citizens at the convergence of the natural prices in normal years

The need for Knowledge and skills on drought management

The gaps for drought management is to Continuous preparation of Meteorologist and engineers crews due to lack of Government wages and salaries in meteorology sector and irrigation, causing the brain drain of work crews from analysts , Meteorologist and engineers through the ministry of irrigation and Egyptian meteorology Authority need fellowship abroad on the ability to predict the incidence of drought, good with the latest scientific methods.

[8] Ministry of Trade

Main challenge remains planning of optimal infrastructure in terms of combination of large and small water reservoirs and irrigation systems. Main need in knowledge is in optimization of organization of stakeholders and distribution of responsibilities.

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