Resilience to Climate Change along the Nile in Egypt

INTERNATIONAL UNION FOR CONSERVATION OF NATURE – REGIONAL OFFICE FOR WEST ASIA

ACKNOWLEDGMENTS

This case study comes as part of the Social, Ecological & Agricultural Resilience in the face of Climate Change (SEARCH) Egypt.

Egypt Team: Dr Amr Abdel Mageed, Galal Marzouk and Bassem al Sayed

SEARCH is a three year (2011 - 2013) regional project led by the International Union for the Conservation of Nature – Regional Office for West Asia and implemented in partnership with ten organizations (CEDARE, PHG, AWO, CEOSS,UAWC, BDRC, SPNL, MADA Association, Abdelmalik Essadi University, IUCN MED and ATED) from the five countries mentioned above and is supported by the IUCN Global Water Program in Switzerland and the Centre for Development and Innovation (CDI) - Wageningen in the Netherlands.
The objective of the project is to increase social and ecological resilience in watershed ecosystems of the Mediterranean Region in the face of climate and other drivers of change. Among the results that the project aims to accomplish is joint development and application of practical tools and guidelines (i.e. the toolkit) with policy makers to contribute to regional, (sub-)national and sector strategies and plans for climate change adaptation, water resources management, poverty reduction and economic development.

This case was produced with the support and commitment of the SEARCH partners and team. They are:

- Coptic Evangelic Organization for Social Services in Egypt
- Centre for Environment and Development for the Arab Region and Europe in Egypt

"This publication has been produced with the assistance of the European Union. The contents of this publication are the sole responsibility IUCN ROWA and can in no way be taken to reflect the views of the European Union."

INTRODUCTION

The Arab Republic of Egypt

Egypt is transcontinental country located in the northeastern corner of Africa and southwestern corner of Asia, bordered by Gaza Strip, Israel and the Red Sea to the east, Sudan to the south and Libya to the west. It has a total land area of 1.002.000 km2and a population of 87 million.

The general climate of Egypt is dry and hot, with mild winter season and rain over the coastal areas. Data collected by the Egyptian Meteorological Authority and local universities for the period 1961-2000 indicate that there is a general trend towards warming of the air temperature, with increases in the number of hazy days, misty days, turbidity of the atmosphere, frequency of sand storms and hot days. About 97% of Egypt's population lives on the Nile Valley and the Delta, an area representing about 4% of Egypt's total area. This yields an average population density of 1,435 persons per km^2. In this respect, a plan to found several new cities in desert areas by 2017 aims at increasing the populated area in Egypt to about 25%.The construction in these cities is expected to follow the green building code and this can therefore be considered as part of the adaptation activities to climate change,

Figure 1: Map of Egypt

(Egypt Second National Communication under the United Nations Framework Convention on Climate Change, 2010).

The total fresh water budget in Egypt is estimated at about 58 billion m^3 per year, with a total annual consumption of 78 billion m^3. The annual per capita share of fresh water is less than $700m^3$ per year. Considering the expected population growth, this value is estimated to become $350m^3$ in 2040. Projected future temperature rises are likely to increase crops' water requirements thereby decreasing water use efficiency and increasing the agriculture sector's irrigation demands. Although the overall efficiency of the irrigation system in Egypt is high due to the reuse of water, there is high vulnerability of on-farm irrigation systems which is attributed low local community awareness about on farm irrigation practices.

Climate Change Impacts in Egypt

The vulnerability of Egypt's water resources to climate change is relevant to factors affecting Nile flows (hypersensitivity to Ethiopian rain, sensitivity to temperature increase in equatorial lakes and Bahr El-Ghazal and uncertainty due to significant differences in the Global Circulation Models output of water flow into the Nile), rainfall (the possibility of a 50% reduction of rainfall on Egypt's Mediterranean coast) and groundwater (increased levels and salinity due to sea level rise and consequent sea water intrusion). Different ideas

are being considered for adaptation to the reduction of water resources or the increase of Nile flows. These primarily include: keeping the water level in Lake Nasser low, increasing water storage capacity, improving irrigation and draining systems, changing cropping patterns and farm irrigation systems, reducing surface water evaporation by a redesign of canal cross section and developing new water resources through Upper Nile projects, rain harvesting, desalination, wastewater recycling and increased use of deep groundwater reservoirs. Another idea wasusing a number of soft interventions such as increasing public awareness about the need for rational use of water, enhancing precipitation measurement networks in upstream countries of the Nile Basin, encouraging data exchange between Nile Basin countries, and developing Circulation Models for the prediction of the impact of climate change on the local and regional water resources.

For the agriculture sector, climate change studies predict a reduction in the productivity of two major crops in Egypt; wheat and maize, by 15% and 19% respectively by 2050. Losses in crop productivity are mainly attributed to the projected temperature increase, crop-water stress, pests and diseases, as well as the inundation of 12% to 15% of the most fertile arable land in the Nile Delta as a result of sea level rise and salty water intrusion. Projected future temperature rises are likely to increase crop water requirements thereby directly decreasing crop water use efficiency and increase irrigation demands of the agriculture sector. Crop-water requirements of the important strategic crops in Egypt are expected to increase by a range of 6-16% by 2100.

For livestock production, temperature increases induce harmful stress impacts on animals' productivity. New animal diseases emerged in Egypt and have negative impacts on livestock production. These include the blue tongue disease and rift valley fever. Both are attributed to some observed changes in climate. The availability of fodder is decreasing due to climate change impacts on crops productivity and higher competition for land and water resources between fodder and cereal crops.

Beni Suef and Minia Governorates

Beni Suef and Minia Governorates are located in Middle/Upper Egypt, and populated (1\1\2013) by 2,687 million and 4,864 million respectively.

Figure 2: Ehnasia District (in pale blue) within BeniSuef Governorate

Ehnasia District in Beni Suef Governorate , a total area of 1007.55km^2 and is inhabited by About 336,000 of whom 80% work in agriculture. Cotton, wheat, onion and tomato are the most significant crops in this district. It depends mainly on two water sources: the Youssef and Ibrahimia sub canals. The biggest sub canal is El Sultani canal. The total area of the cultivated land is about 44.8 thousand feddan in addition to the reclaimed area. These areas are irrigated by canals originating directly from Youssef and Ibrahimia canals using the triple shifts system. Reuse of drainage water is practiced to supplement irrigation water in lands at the tail ends of the canals.

Ehnasia District faces significant challenges in terms of irrigation needs including limited water

resources, increasing water demand that exceeds the water supply in summer, rapidly growing population and negative practices of some upstream farmers that reduce the water availability at the tail ends.

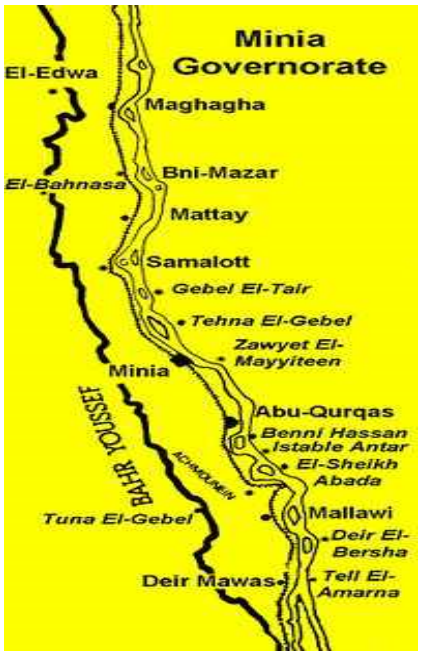


Figure 2: Samallout District

Samallout District in Minia Governorate, which is populated by About 460,000 persons, is characterized by its first class agricultural nature and is famous for the cultivation of the traditional crops of grain, grapes and cotton. Samallout's farmers are highly qualified due to their accumulated experience. Although Samallout has many grapes farms, the farmers are facing problems in marketing it, being a local production. Several development organizations have targeted this district and its people more than other districts in Minia.

RESILIENCE TO CLIMATE CHANGE

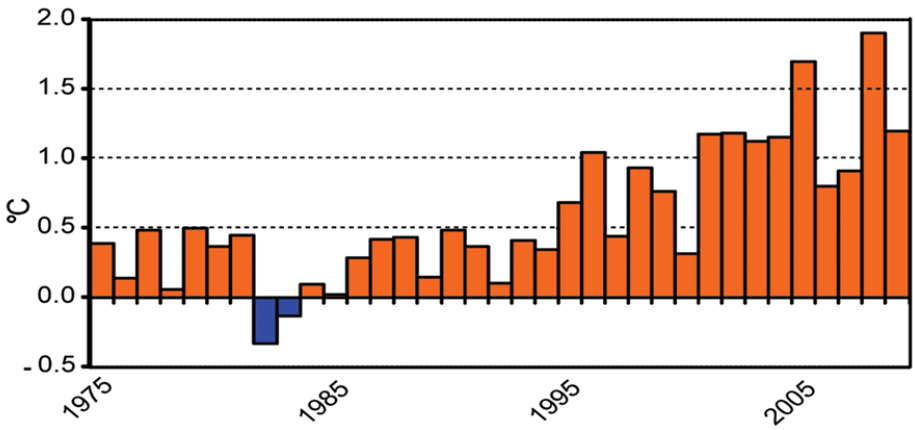
There are positive efforts for scientific research, however efforts have been made on climate change mitigation and adaptation in the agriculture sector in Egypt but never enough. Changing sowing dates and management practices are among the important adaptation measures oriented to mitigate the impacts of climate change. Changing crops to those tolerant to heat, salinity and pests and changing crop patterns are the most promising adaptation measures at the national level. Moreover, using different combinations of different levels of improved surface irrigation system efficiencies and applying deficit irrigation are considered as means of increasing the capacity of surface irrigation system in old land in order to overcome the negative impacts of climate change.

However, further studies on the impacts, vulnerability and adaptation to climate change are still needed in the agriculture sector in order to develop an adaptation strategy for the sector addressing the barriers to implementing adaptation measures. These barriers include lack of information sheering, poor adaptive capacity, gap between research and implementation, lack of implementation policies and lack of financial support.

Being highly dependent on agricultural production, some areas in both Minia and Beni Suef governorates are currently combating agricultural production losses from climatic changes and seasonal change. With a high population growth rate and increases in temperature, popular crops are no longer capable of coping with climatic changes and other drivers of change.

Other impacts that include the emergence of some livestock diseases have put burdens on livestock owners and therefore significantly impacted livestock productivity.

Figure 2: Changes to annual mean temperature in Egypt (Source: Egyptian Meteorological Authority)



For these reasons, SEARCH (Social, Ecological &Agricultural Resilience in the face of Climate Change) project has been implemented in Minia and Beni Suef governorates especially that both are considered as the poorest areas in Egypt and fall under the lowest development levels as per the UN Human Development Report. The Centre for Environment and Development for the Arab Region and Europe (CEDARE) and the Coptic Evangelical Organization for Social Services (CEOSS) have partnered to implement the SEARCH project in Egypt.

Three communities of Masharka, Mayana and Bahsmon in Ehnasia District (Beni Suef)were chosen for the project implementation based on diversity in the type of soil and communities' having active leaders with an ability for dialogue and understanding of the nature of the problems and openness to new ideas. Based on the same criteria another three communities in Samallout District (Minia) were selected: Shusha, El-Tybee and Koum El Raheb.

Approaches & Methodology

Participatory Approaches

The SEARCH team led the joint participatory action planning processes and played an important role in selecting, screening, testing and contextualizing feasible tools for climate change and vulnerability as well as other relevant planning tools (decision support tools, participatory planning cycles, water audits, etc.). The team made important inputs in the joint planning processes and the technical support to pilot actions. The team also led community mobilization, technical knowledge, facilitating communication between the relevant stakeholders and the involvement of the local community in the project. In addition, the team contributed to empowering and raising the Awareness of the locals on climate change impacts and adaptation procedures.

Stakeholders Dialogue and Concerted Action This approach had a central position in activities taking place on the different levels in the project area.

At the National Level, policymakers and high-level representatives of relevant stakeholders were brought together to discuss necessary actions. They agreed on the importance of community participation and capacity building to meet challenges imposed by climate change. They also agreed on the necessity to make data and information available for all concerned stakeholders, civil society and those interested in the issues of climate change in a transparent manner. Replication of the methodology in other regions was also considered significant. In aspects related to policy, they emphasized the need for introducing policies coherence in relation to water, agriculture and climate change as well as an improved governance structure and activating the role of the joint ministerial committees. National stakeholders acknowledged that national strategies and plans were designed, so attention should currently be directed to lower levels (of governorates, districts and villages) and establishing linkages horizontally and vertically.

At the Local Level, participating stakeholders in Masharqa village (as an example) agreed on:

1. Improving water management at the farm level and mesqa.
2. Maximizing the use of the irrigation improvement project in the village.
3. Enhancing farmers' awareness of the importance of maintaining the irrigation and drainage canals.
4. Reducing the rising subsurface water.
5. Providing irrigation water as needed.
6. Enhancing agricultural extension.
7. Improving tomato marketing.

8. Establishing a training center in the village to support women farmers, as many ladies work in agriculture.
9. Developing farming methods that are adaptive to climate change.
10. Increasing awareness on climate change impacts and resilience to these impacts.
11. Promoting agricultural automation in the village.

At the District Level, a vision was developed based on problem analysis and stakeholders' analysis: “Seeking a clean environment and an increased agricultural productivity in order to improve the livelihoods of farmers in Ehnasia”. With the participation of district-level stakeholders, the different factors of vulnerability were assessed. Drought was identified to cause low agricultural productivity, increase in costs of production elements and higher rates of soil salinity in some area due to irrigation from agricultural drainages. Frost, on the other hand, caused damages to crops in cultivated lands located in desert areas and led to the extra costs for protecting from frost. It also affected animal productivity causing high rates of poultry mortality. Wind blowing from the desert during spring time, carrying dust and sand and characterized by high temperature, affects some crops especially while blossoming as it causes the fall of flowers. In addition to negative effects on human health, wind has been undermining the productivity of animals and poultry. Increased temperature has a multifaceted negative impact in Ehnasia leading to vulnerability and requiring resilience actions. In addition to the manifestations related to water and agriculture, the heat effects extend to animal productivity (in mating and grazing). Seeking to mitigate the effects of heat, owners are forced to increase their expenditure on energy which in turn reduces profitability.

Resilience Strategizing

A resilience assessment showed ‘increased temperature’ and ‘drought’ as the most climatic stress factors. Meetings at different levels were held in order to develop resilience strategies in the two areas of the project. The strategies developed revolved around four components:

Learning: Focusing on the media, building capacities, raising awareness and Facilitate access to climate change information. Also highlighted was promoting and enhancing research in climate change and dissemination of best adaptation practices.

Diversity: This included diversification of resources through -for example- reusing drainage water , introducing new varieties of crops tolerant to severe climate events such as heat, frost and wind and diversification of income sources through adopting more than one economic activity by the locals like agriculture, poultry and livestock production. Diversity strategy also included activities like promoting integrated farms in the reclamation areas (fish breeding in ponds after having used the water rich in bio substance in cultivating alfalfa and raising livestock feeding on alfalfa).

Self-Organization and Governance: This was based on building capacity at the governorate, district and village levels, empowering CSOs and water users associations to assume more responsibility in environmental issues and promoting coordination between stakeholders and the communities and between the different sectors to achieve policies coherence.

Sustainable Infrastructure and Technology: Emphasis here is on low cost technological applications for water saving, renewable energy, sustainable agriculture and food security. There is a particular need for technological solutions for soil improvement and protection against desertification, maintaining the irrigation and drainage network and water pollution abatement. In addition, the government needs to be

encouraged to include green infrastructure in its plans while the private sector should be urged to invest more in sustainable infrastructure and technology.

INSTITUTIONALIZATION & DISSEMINATION

Two pilot projects were implemented as part of advocating in collaboration with agricultural extension in Director of Agriculture in Beni Suef, the institutionalization and dissemination of SEARCH's approach to building resilience to climate change.

Establishing Farmer Field Schools

It was a pilot project designed for Masharka and Mayana villages in order to raise awareness about adaptation to climate change with respect to agricultural production (irrigation, plants, animal production, combating diseases, recycling of wastes and rural women). Specialists from the Agricultural Extension in Directorate of Agriculture in Beni Suef helped in establishing linkage between the recommendations of field specialists and farmers' concerns with regard to maximizing agricultural production, plants and animals productivity, in order to overcome the expected shortages due to climate change. Over a period of four months, a total number of 160 locals (males and females) in each village have received a climate resilience education.

Optimizing Water Usage

Stakeholders of SEARCH project acknowledged that a significant component of resilience efforts in Ehnasia was reducing water consumption through adoption of flexible practices. Upon that, a pilot project sought to promote the cultivation of moringa tree which is considered useful in mitigating climate change impacts due to its limited need for irrigation. Moringa canbe cultivated on the sides of water canals, gardens, houses and roads. All parts of the moringa can be useful including seed, green leaves, dry leaves, roots, seed oils and oil wastes. The pilot project bought 500 moringa seedlings and one kilo seeds. Some were planted; others were sold to farmers at a low price to have them planted in their lands.

In general, throughout the project cycle there was special emphasis on documentation of methodologies and learning processes, as well as, exchange of valuable information and lessons learnt at all levels. Capacity building and introducing coherence to policies related to water, agriculture and climate change were also recommended as means to sustain, upscale and institutionalize the outputs of SEARCH.

References

Egyptian Environmental Affairs Agency, Egypt (May 2010). Egypt Second National Communication under the United Nations Framework Convention on Climate Change. Cairo, Egypt.

Cover Photo:

Document Figures (as they appear in order):