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THE ROLE OF SCIENCE AND TECHNOLOGY IN BIODIVERSITY IN EGYPT

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Abstract

Biodiversity serves as important source of food. It provides people with basic ecosystem goods and services. Biodiversity is a key component of the "environmental health" pillar of sustainable development. In Egypt, the Bibliotheca Alexandrina Planetarium Science Center (PSC) has given special attention to global issues through ongoing and annual activities and events. Egyptian biodiversity signals the characters of three bio-geographical zones, Western Palearctic, Eastern Palearctic and Afrotropical. Egypt's first national assessment of biodiversity at the ecosystem level was carried out during 1996 - 1998 as part of weighing the completeness of coverage and status of existing protected areas (PAs) network as the main vehicle for biodiversity conservation. During the past three decades, Egypt has paid increasing attention to environmental issues at both official and popular levels aiming to improve the ethical management of our ecosystems and which are affected by many factors. A national biodiversity strategy was established aiming to conserve and to sustainably manage our natural heritage. Conservation of critical ecosystems and biodiversity has been mandated by regional and international conventions that necessitate the establishment of a network of protectorates to protect and conserve ecosystems, representative habitats, threatened species, cultural heritage sites and traditional knowledge. About GM technology in plants; we fear from the possibility of gene flow to close relatives of transgenic plants, the possible undesirable effects of the exotic genes or traits.

Promoting awareness and improved ethical management of our ecosystems for development is essential and this includes various issues such as atmosphere, land resources, agriculture, biodiversity, sea and fresh water resources, toxic chemicals, hazardous wastes, solid wastes and sewage. A national natural history museum, a national gene bank, regulations of the import and export trade in wildlife products and careful programs for conservation of medicinal plants; are all needed in Egypt.

Keywords: Science and Technology, Biodiversity, Activities, Egypt.

1. INTRODUCTION

We know that poor persons ; particularly in rural areas, depend on biological resources for as much as 90% of their needs, including food, fuel, medicine, shelter and transportation. About 70% of the world's poor live in rural areas and depend directly on biological diversity for their livelihoods. Biodiversity serves as an important source of food and income to rural households and is an important source of alternative foods during periods of scarcity.

The impact of environmental degradation is most severe among the rural population living in poverty, since they have few livelihood options. Therefore, access to and sustainable use of biodiversity by the poor are of direct relevance to efforts aimed at poverty reduction. Addressing the biodiversity challenge needs to be at the heart of international cooperation for sustainable development and poverty reduction. (https://www.cbd.int/development/about/important.shtml).

Biodiversity provides people with basic ecosystem goods and services. It provides goods such as food, fibre and medicine, and services such as air and water purification, climate regulation, erosion control and nutrient cycling. Biodiversity also plays an important role in economic sectors that drive development, including agriculture, forestry, fisheries and tourism. More than three billion people rely on marine and coastal biodiversity, and 1.6 billion people rely on forests and non-timber forest products (e.g. the fruits from trees) for their livelihoods. Many people depend directly on the availability of usable land, water, plants and animals to support their families. In fact, ecosystems are the base of all economies. The health of an ecosystem is closely related to the quality of life of its inhabitants. Biodiversity is a key component of the "environmental health" pillar of sustainable development. (www.fao.org/docrep/017/i3157e/i3157e10.pdf).

It is no secret that, with increasing pollution, global warming and climate change; dwindling natural resources and biodiversity; and impending food, water and energy crises, sustainability is an issue and a necessity that is on the rise. It occupies the minds of the majority of the scientific community and the well educated. The first Egyptian science center and a pioneer of science communication in the North Africa and Middle East region, the mission of the Bibliotheca Alexandrina Planetarium Science Center (PSC) is to promote science and technology among Egyptian school students and the public at large, demonstrating and emphasizing their relevance to everyday life. A major aspect of the PSC's role, as any other science center, is to raise and increase awareness about contemporary global issues. To really fulfill their missions, science centers are required to take a proactive approach towards reaching out to the masses to alert, educate and guide them towards sustainability and a cleaner, healthier and safer future. www.iucn.org/news_homepage/news_by_date/?.../

Within this context, in its ten years of operation since 2002, the PSC has given special attention to global issues through ongoing and annual activities and events, which include the School Year Program dedicated to school groups, the Summer and Mid-Year Programs tailored for students on vacation, as well as the annual Science Festivity, and the World and Arab Environment Days celebrations. Throughout the same strategy, the Center has also developed and conducted a myriad of workshops and other hands-on and interactive activities dedicated to environmental issues, conservation and efficiency, in addition to the interactive exhibition "Biodiversity: Play and Learn!", the first to be entirely developed and fabricated by the PSC Team. In 2012, the PSC, as well as the North Africa and Middle East Science centers network (NAMES), of which the PSC is a founding member, are partaking in global action associated with the Rio+20 Summit. Among the purposes of this year's activities is to raise the public's awareness of the importance of conserving our limited natural resources, and preserving the environment through increasing knowledge about the impact of phenomena that take place on the Sun on the nature of our Mother Earth. The PSC will dedicate one of the booths in the Science Festivity Village to a (Planet Under Pressure) PUP-related activity entitled "PSC World Park". The activity, in which animators will work every 15 min with 20 students, will be a simulation of the globe with its seven continents. www.iucn.org/news_homepage/news_by_date/?.../

Moreover, in collaboration with the Research, Development & Innovation Program (RDI) and the American University in Cairo (AUC), the PSC is developing a science bus program entitled "Science on the Go", which targets school students, 9-12 years of age. The purpose of the "Science on the Go" bus is to deliver hands-on science activities and exhibits to school students within school premises, providing them with an enthusiastic ambience that takes them out of the school mood. It features four rooms representing the four most important rooms of any house; kitchen, bathroom,

bedroom and living room. Different activities will be conducted and discussed in each room including nutrition, environment, energy, chemistry, among others.

Sustainability is a far richer concept than meeting material needs, surviving, or keeping a degraded planet from getting worse. A truly sustainable community supports the health and quality of life for present and future generations. Formal and informal educators are in a prime position to be able to weave these basics throughout all educational stages. Whether they start with an environmental issue or with fundamental ecological principles, educators can nurture the knowledge, skills, and values essential to sustainable living. And, that is what science communicators at the PSC are aiming at, especially now with the dawn of a new and improved Egypt, which will hopefully also be a Sustainable Egypt. www.iucn.org/news_homepage/news_by_date/?.../

Egyptian biodiversity signals the characters of three bio-geographical zones, Western Palearctic, Eastern Palearctic and Afrotropical. Egypt's first national assessment of biodiversity at the ecosystem level was carried out during 1996 - 1998 as part of weighing the completeness of coverage and status of existing protected areas (PAs) network as the main vehicle for biodiversity conservation (Abdel-Azeem and Salem, 2013; Shaltout and Eid, 2010). The flora of Egypt encompass some 2145 species and 220 infra-specific taxa of native and naturalized vascular plants; in addition to 175 species and subspecies of mosses rare and 13 hepatics. The preliminary red data list of the vascular plants includes 457 species (ca 20% of the total flora) classified into 14 extinct, 123 endangered, 54 vulnerable, 173 rare and 93 in terminate species. Alga diversity is just about 1500-2000 species (still need further studies). Twenty Important Plants Areas (IPAs) were selected using criteria that measure species vulnerability irreplaceability and richness; in addition to the threatened habitats. These IPAs harbor 46 endemics, 25 near endemic, 77 Mediterranean endemics and 278 national threatened species. Other areas are promising as IPAs but need further studies (4 close to the Mediterranean are in each of Nile, North Sinai, western and eastern desert. The agro-biodiversity in Egypt contributes 25.3% of the Egyptian flora, 38.1% of its genera and 63.6% of its families. The rophytes is the major represented life farm, followed by geo-helophytes. Most plants are "small range-narrow habitat-non abundant species; they are classic rarities that are often endangered or threatened (Shaltout et al 2009).

Salama (2011) stated that during the past three decades, Egypt has paid increasing attention to environmental issues at both official and popular levels aiming to improve the ethical management of our ecosystems and which are affected by many factors. The Egyptian environmental affairs agency (EEAA) was developed in 1980 for setting and implementing national environmental policies including conservation of biological resources and natural heritage, and, preservation of genetic resources of living species, animals or plants that are threatened with extinction. Challenges facing nature conservation include an absence of public awareness, which necessitates raising the efficiency of environmental education. A network of 27 protected areas of protectorates, extending over 15% of the total area of Egypt, is now established and these include over 20,000 flora and fauna species. Problems facing these protectorates and their management are discussed. The introduction of genetically modified crops (GM) is still limited due to the uncertain impact on the environment and biodiversity. Methods to raise the efficiency of the current management policy of our ecosystems are discussed.

In 1982, Egypt energetically began formulating the national body responsible for environmental issues in collaboration with all other concerned bodies; this is the Egyptian Environmental Affairs Agency (EEAA) (El-Badry, 1996). This represents the primary legislation for environmental management. It is of interest to note that ancient Egyptians were among the first to adopt measures for nature conservation. A national biodiversity strategy was established aiming to conserve and to

sustainably manage our natural heritage. Conservation of critical ecosystems and biodiversity has been mandated by regional and international conventions that necessitate the establishment of a network of protectorates to protect and conserve ecosystems, representative habitats, threatened species, cultural heritage sites and traditional knowledge. Today there are 114,000 protected areas around the world, covering 12% of the world's land surface. Egypt's experience with protected areas is rather young and goes back to 1983 with the passage of Law 102/83. Currently, much experience has been gained concerning the administration of these protectorates. Ras Mohamed National Park in South Sinai was the first protectorate in Egypt; by 2010 27 protectorates were established ; extending over 15% of the total area of Egypt (EEAA, 2006 a & b). These protectorates encompass 5121 and 17,309 flora and fauna species respectively, including endemic and many rare or endangered species; but this is less than the actual number as many species are not finally recorded. Still there are many unique ecosystems, important biological resources and outstanding landforms, which are not represented in the existing, protected areas and which are rapidly being lost or degraded. As a consequence, it is planned to expand the network of natural protectorates to reach 40 in 2017. Reef-based coast tourism in the Red Sea (snorkeling, diving) has expanded exponentially to the point where it makes a major contribution to the national economy. It is mandatory to protect these coral reef resources and manage them sustainably. In Egypt's case, the opportunities for financial gains through the promotion of ecotourism to protected areas are enormous. There are exceptional wild resources (coral reefs, spectacular desert land forms, rich fossil deposits and vast bird migrations) that underpin the economy and offer it a comparative economic advantage in the massive and growing nature based tourism industry.

Genetic engineering programs in Egypt started in 1990 and procedures for commercializing GM crops were established in 1998 by ministerial decree. Most of the environmental concerns about GM technology in plants follow from the possibility of gene flow to close relatives of transgenic plants, the possible undesirable effects of the exotic genes or traits (e.g. insect resistance or herbicide tolerance) and the possible effect on non-target organisms. Generally, public awareness about biotechnology is limited and often misconceived or misunderstood. There is currently a debate centered on ethics, morals, rights, farmers' opinions, consumers and future generations. Nonetheless, cultivation and commercialization of a B.t. maize variety in an area of 2000 hectares has been approved. Increased productivity of B.t. maize can offset the annual importation of 4.5 million tons. Currently, most of the research and field trials in Egypt is carried out by the Agricultural Genetic Engineering Research Institute (AGERI) and these are concerned with the development of insect resistant long staple cotton, potatoes and squash; virus resistant sugarcane and figs; drought resistant rice and wheat. The slow passage of GM crops from experimental, to trial, to commercial stage includes the lack of capacity to negotiate licenses, to use genes and research techniques patented by others – especially for crops with export potential that must also meet regulatory requirements (Mansour, 2009).

The foregoing review clearly indicates the importance of the environment for our survival and the pressing need for maintenance of nature in a state that supports human life. Promoting awareness and improved ethical management of our ecosystems for development is essential and this includes various issues such as atmosphere, land resources, agriculture, biodiversity, sea and fresh water resources, toxic chemicals, hazardous wastes, solid wastes and sewage. In Egypt, we need a national natural history museum; that should be established as a central institution for taxonomic research, preserving specimens and supporting it; with well-trained scientists and technicians. The national bank for genes has to be well established for biodiversity conservation. Seeds of threatened plants have been selected, processed and stored in the bank and 35,000 specimens of plant genetic origin are now available. Laws must be enacted

to prevent killing and trade in wild birds and to forbid hunting in protected areas. We must stop collecting sea cucumbers, and apply techniques for conservation of marine animals, sharks, reptiles, corals and mangroves. Also, enforcement must be devised to improve regulation of the import and export trade in wildlife products. Populations of many wild animals and plants, both terrestrial and marine have declined and a number of species are on the verge of extinction. So, a hunting management unit has been established to manage these problems in the protectorates. On the national heritage list are many endemic species of medicinal plants, which are found in protected areas; these are on a database that includes their distribution, abundance and phenological features. A total of 592 species have been collected from the Western and Eastern deserts and Sinai. An encyclopedia of these plants is being prepared. Careful programmes for their conservation however are still required. Medicinal plants have traditionally been used as a source of affordable and accessible primary health care in Saint Katherine by the Bedouins. The dry processed medicinal plants are being sold to tourists with benefits returning back to the Bedouin community. So, Egyptian national biodiversity strategy has a vision of sustainable development; that includes economic, environmental, and social sustainability, which can be achieved by rationally managing natural, physical, and human capital. Biodiversity is a natural capital that underpins sustainable development in many ways. Poverty eradication, food security, provision of fresh water, soil conservation, and human health all depend directly on maintaining and using biological diversity and therefore sustainable development cannot be achieved without the conservation, sustainable use and sharing of benefits of biological diversity.

Moreover our Mission is to achieve by 2020 a significant reduction in the current loss of Egypt's biodiversity in order to ensure that are resilient and continue to provide essential provisional and regulatory services, through their conservation and sustainable use.

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