KUWAIT:

COUNTRY REPORT TO THE FAO INTERNATIONAL TECHNICAL CONFERENCE ON PLANT GENETIC RESOURCES

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Note by FAO

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CHAPTER 1
Current Situation

1.1 LOCATION

The State of Kuwait is situated at the northwestern corner of the Arabian Gulf between latitudes 28° 30`N and 05`N and longitudes 46° 35`E. The total land area of the country is estimated at about 17818 km^2 (1,781,800 ha) including the land areas of the offshore islands.

1.2 CLIMATE

Kuwait experiences two main season summer and winter. The weather during November to February is mild to cool, with average minimum temperatures in January falling to 7°C (1962-89). Precipitation is scanty, from October till May averaging 105 mm per year. In summer, the temperatures become very high, especially during July and August, with a mean of 37°C.

1.3 TOPOGRAPHY AND SOIL

Nine geomorphic provinces can be recognized in the desert of Kuwait namely: coastal flat, northern gravely flat, Al-Huwaimiliyah undulated plain, western calcretic plain, southern sandy flat, Jal Azzor escarpment, Wadi Al-Batin and major ridges and depressions. The soil surface is mostly covered by loose mobile sediments that are continually transported under the persistent action of the wind. They are deposited around buildings, roads, farms and other man-made structures, resulting in acute environmental problems. Four main soil groups have been recognized: desert soil, desert-regosol intergrade soils, lithosol and alluvial soils. The desert soil are sandy in texture, with a peak structure and an organic content of less than 1%. The desert-regosol intergrade soils have a coarser texture and no hardpan. Lithosols are undeveloped shallow soils overlying sedimentary gypsiferous sandstone.

1.4 THE VEGETATION

The Vegetation comprises of perennial herbs and ephemerals that very seasonally depending on winter rainfall. Five major plant communities are recognized *Haloxylon salicornicum*, *Rhanterium epapposum*, *Cyperus congolmoratus*, *Zygophyllum qatarense*, and *Panicum turgidum*. The communities are associated with *Stipagrostis plumosa*, *Moltikiopsis ciliata*, *Plantago boissierii*, *Schimpera arabica*, *Arnebia decumbens*, *Astragalus* spp. and others. In general, there are 374 species of indigenous and naturalized species to Kuwait related to 55 families. Annual species are most dominating followed by shrubs and trees.

1.5 WATER SOURCES

Ground water is the only currently available in-country natural water resource that can be used directly without recycling or treatment. This water is found in the Dammam Kuwait Group and Upper Kuwait limestone layers. The water salinity is in order of 4000 mg/l. About 60 mg/d of ground water are used in the major agricultural areas (Wafra and Abdaly). The current uses of brackish water include mixing with distilled water for cattle rearing, dairy farms, landscaping, households, greenery and agriculture production and others.

Recycled or treated industrial and municipal wastewater are another source of available water. Three treatment plants were developed and reactivated to treat-municipal-water Namely Ardiya, Rekka and Jahra. Treated municipal wastewater is one of the best sources of water for afforestation and greening purposes because the salinity is relatively low (1300-2400 mg/l TDS), and the water contains both organic and inorganic material with nutrient value. Fresh water is mainly produced through desalination plants (about 95%) and the remaining is produced from the groundwater aquifers. Due to limited capacity of reservoirs, water consumption is almost equivalent to water production through desalination plants.

CHAPTER 2
Agricultural Development

Kuwait's plant production is low because the climate is harsh precipitation is highly limiting and water for irrigation is highly brackish (3,000-9,000 ppm TDS). Local plant production is practiced mainly in the two border areas: Wafra in the south and Abdali in the north. Plant production embraced not only open-field activities, but also protected environments. Three types of agricultural production are practiced in Kuwait:

- irrigated crops, mainly tomatoes, cucumbers, peppers, and eggplants; fruit trees, (mainly date palms), forages (alfalfa and clover) and cereals;
- irrigated pasture to a very limited extent;
- afforestation of shelter belt trees.

Most of the crops are irrigated by the drip system, using fresh water. The high temperatures are being controlled by cooling pads and fans. Current (last available statistics) production levels for the major commodities are shown as follows:

Current Plant Production in Kuwait

Commodity	MT Produced	Mt/Donum
Tomatoes	11,588	5,0
Cucumbers	12,600	12,5
Eggplants	3,299	5,5
Bell Peppers	211	5,0
Potato	1,575	3,0
Onions	3,240	3,0
Date Palm* (commercial)	0	-

***Private garden production not included.**

Crop losses are due to insects, diseases and pests that present major barriers. Poor quality, diseased and insect-infected transplants are frequently planted. The major problems with the soils are buildup of disease inocula, and nematodes and insects, and accumulation of pesticides, salts and oil fire-related contaminants, as well as a lack of organic matter. Protected environment agriculture has been largely in plastic-covered "tunnel-type" greenhouses, with no provision for heating or cooling.

CHAPTER 3
General Constraints to Agricultural Development

3.1 WATER RESOURCES AVAILABILITY

Water availability is the limitation most constraining agricultural production expansion. At current levels of pumping, over 80-90% of Wafra and Abdali agricultural areas well will yield water in excess of 7,500 ppm TDS by the year 2000; the aquifer water levels are decreasing as the water is being mined. Continuous full capacity use of desalinated plants is preferred to partial use, and this water could be used for agriculture.

3.2 ENVIRONMENTAL CONSIDERATIONS

The high temperatures though the months of May/June to September/October period create the need for thermal tolerance in plants. Or for the use of heat mitigation measures. While temperatures during the period November to April support agricultural production, the occurrence of sandstorms, particularly in known mobile sand belts, during the fall and spring, and low to freezing temperatures during January, create obstacles even during this period.

3.3 RURAL ECOLOGICAL RESOURCES

The rangelands are dominated by different types of communities and sub-communities of plants that provide feed for livestock. Before the Gulf crisis, approximately 500,000 animals frequented the desert, 84% of which were sheep. Rangelands have continued to deteriorate due to factors such as drought, overgrazing, off-road vehicle use, uprooting of woody shrubs, camping, gravel quarrying, improper sand control, and activities associated with Gulf war. The carrying capacity of the desert is low. Numerous symptoms of desertification are apparent. Sand encroachment in the farm areas has also prevented some land from being utilized to full capacity.

3.4 WAR IMPACT ON AGRICULTURAL DEVELOPMENT

On August 2/1990, the agricultural activities in Kuwait came to a complete standstill due to the invasion and subsequent war. The infrastructure and farmers' assents were destroyed during the military conflict near the border with Saudi Arabia (Wafra) and near the Iraqi border (Abdaly). All of the supplies were pillaged, the farms were littered with mines and unexploded ordnance, and the soil was contaminated with oil and partially combustion products. Experienced agricultural labor fled shortly after the invasion, due to entrenchment of the invading forces and the likelihood that full scale hostilities were eminent.

Moreover, due to the large number of devastated oil wells in two major areas (Burgan and Sabriya) the rangeland renewable resource in the areas became subjected to additional constraints such as physical and biochemical. These constraints resulted from mechanical activities such as placement of millions of land mines by the perpetrators, development of thousands of diches, ducts and bunker shelters and personal carrier movement. Chemical (pollutants) impact resulted from explosion and ignition of over 700 of the country oil wells that caused three types of pollution sources: soot oil spills and mist fall-out (aerosol deposit of crude oil). The impact of oil pollution on vegetation and soil indicated variations and decline species composition, structure and productivity in the polluted areas as well as nutritive variation in some range plants.

CHAPTER 4
In Situ Conservation

4.1 THE NATIONAL PARK/NATURE RESERVE OF KUWAIT

Perhaps the largest terrestrial ecosystem designated so far as protected area in Kuwait is located in the northeast of Kuwait known as the National Park/Nature Reserve of Kuwait. The park is about 330 Km^2 extending from Um-Alaish in the north to Kuwait Bay in the south and Hoban in the west to medirah in the east. The purpose of establishing Kuwait National Park/Nature Reserve is to set aside an area of physical and biological importance to conserve and manage natural renewable resources and to allow, to a certain extent, recreation, education and research opportunity to the public.

The habitats are dominated by the following plant communities: *Rhanterium*, *Haloxylon*, *Halocnemon*, *Seidlitzia*, Nitraria, and *Zygophyllum.* Thirty nine species were identified at the coastal plain and 87 species in the desert habitats. The park is a major source of plant genetic diversity in the country.

The Ministry of Defense commenced protection measures of the park in December 1995 by erecting a fence and patroling throughout its boundaries.

4.2 SULAIBIYA RESEARCH STATION

In 1979, an area was set aside to establish a satellite field station for conducting range management research and conserving the renewable natural resources in the Rhanterium/Cyperus steppe. The area (20 Km^2), located in Kabd (southwest of Kuwait City), was named Sulaibiya Field Station (SFS). It was surrounded by two meter high chain fence and had a one million gallon capacity reservoir supplied with brackish water of 3,500-4,000 ppm. More than 60 species are recorded in the area.

4.3 RANGE EXCLOSURES

There are several exclosures that are designated to protect specific or plant species in Kuwait namely: Rawdatain, Mutla, Doha, Minagish, Abdaliyah and Maqwa. The vegetation in the areas are monitored by the Public Authority for Agriculture and Fish Resources.

CHAPTER 5
Ex Situ Conservation

5.1 KUWAIT UNIVERSITY HERBARIUM

The number of native and naturalized species in Kuwait is 374 as reported in the checklist of the Flora of Kuwait, 1994. The number of plant specimens at Kuwait University Herbarium in the prewar period was 22,000. The current number in 4,225 species.

5.2 SCIENCE MUSEUM

The Science Museum contains the following number of specimens from the Kuwait's desert and marine ecosystems: 130 plants, 10 reptiles, 200 insects, 110 fish and marine, 2 birds and 4 mammals.

CHAPTER 6
Institutional Setup

The Public Authority for Agricultural Affairs and Fish Resources (PAAFR) is the center for agricultural development in Kuwait. PAAFR, previously a department in the Ministry of Public Works, is frequently referred to as an autonomous authority. It has a board and a Director General, who also acts as Chairman, and is responsible to the Minister of the State. The total staff of PAAFR amounts to less than a thousand personnel of whom more than 50% have degrees in agriculture or related subjects. PAAFR has an important role to play in promoting agriculture, livestock and fisheries. It supports the needs of producers and workers in the agriculture sectors.

Kuwait Institute for Scientific Research (KISR) has major role in conducting agricultural research. Under the umbrella of general research in Life and Environmental Sciences, a position held by the Deputy Director General, the institute carries out research related to the environment and agriculture under three divisions: Division of Environmental and Earth Science, Division of Water Resources and Division of Food and Biological Resources. A large portion of KISR's efforts is directed to plant, livestock and fisheries primarily in the Division of Food Resources and Biological Resources (FBRD).

The FBRD currently has more than a hundred staff, with plans to employ more. Of the Division of Food and Biological Resources, more than 20% of its projects are in the Aridland Agriculture Dept.

The institute functions as a focal body for genetic engineering, tissue culture research and planning for conservation of biological diversity. *Ex situ* and *in situ* conservation of plants are also conducted by the Environment Protection Authority (EPA), which is in charge of environmental issues, and *in situ* biological conservation. Kuwait University (KU) in-house facility and provides technical capability for development of strategic programmes and country action plans. KU is also involved in *ex situ* conservation of plant genetic resources programmes. The Ministry of Health (MOH) established the Islamic Medical Hospital that uses plants of important medical values.

The Ministry of Defense (MOD) is recently involved in *in situ* conservation efforts by establishing Kuwait's National Park. Kuwait Environment Protection Society (KEPS) a local NGO is also responsible for enhancing environmental awareness and education programmes development.

CHAPTER 7
Development of Strategic Plans for Utilization and Conservation of Plants Genetic Resources

7.1 THE NATIONAL BIOLOGICAL DIVERSITY STRATEGY OF KUWAIT

Kuwait has signed the International Convention on Biological Diversity which was launched at the Earth Summit in the 1992. Though it has yet to ratify convention, Kuwait has embarked on the preparation of a National Biodiversity Strategy, central activity called for in the Convention's articles. The National Strategy, initiated and funded by United Nations Development Program (UNDP), is being coordinated through the offices of the Environment Protection Authority (EPA) with technical assistance from the International Union for Conservation of Nature (IUCN).

The overall objective of the Strategy is to conserve Kuwait's biological diversity, ecological systems and processes.

The strategy formulates an integrated approach to biodiversity issues in all sector and at all levels of governance in Kuwait. The intention is to develop a concise, non-technical, multi-sectoral planning document which can be readily understood at all levels. The strategy presents the primary goals and objectives of biodiversity conservation, set out the justification issues. The strategy also includes an action plan, with appropriate measurable targets to redress the situation.

The strategy contains a series of guidelines for policy makers and decision takers to try to ensure that biodiversity considerations are fully integrated into the national planning and development process.

The strategy is based on a thorough analysis of the best information available; this is particularity true with regard to an understanding of the status and trends of Kuwait's biological resources, the socio-economic dynamics which contribute to biodiversity loss, and the prevailing policy and legislative environment.

7.2 AGRICULTURAL MASTER PLAN

The goal of developing a master plan for agricultural development is to set forth a development study for the agricultural sector (plant and animal production) that focuses on major requirements (including technology development, water, manpower, land and others) for the development of agriculture in Kuwait. The plan was developed by Kuwait Institute for Scientific Research (KISR) upon request from the Public Authority for Agriculture and Fisheries (PAAFR) and support from the Kuwait Foundation for the Advancement of Sciences (KFAS). The plan considered current and projected demands, present and projected production, the harshness of the climate and mobile sand encroachment, the limited availability of the resources and the production thrusts that can be developed, biological manipulation and extensive range and animal production. The plan links agricultural development with the environmental constraints, especially water and sand encroachment on agricultural areas.

7.3 SOIL SURVEY AND LAND RECLAMATION PROGRAM

The soil survey project was also initiated by KISR upon request from PAAFR. The project is geared to delineate arable and highly potential arable lands, update the soil map of Kuwait and provide other developments such as upgrading research facilities related to soil management and conservation and training of local manpower.

The land reclamation program focuses on existing agricultural areas such as Wafra and Abdaly and implements a plan for alleviating soil problems such as salinity, erosion and sand encroachment. This long-term development project will lead to improving the situation of the agricultural areas and will reduce the negative impact of desertification.

7.4 GREENING PLAN

A major project for the "Preparation of a Strategic and Master Plan for Greenery Development in the State of Kuwait" is currently being developed. This project was almost complete at the time of the Iraqi invasion. The project has been amended to meet post-liberation needs and also to include

assessment of culture techniques to preserve the germplasm of the genotypes that showed unusual tolerance to the environmental conditions. The proposed project will provide new horizons in urban forestry, establish oases, and develop an oasis entry (agricultural and greenery belt) based on water conservation measures. The overall objective of this endeavor is to achieve the optimal beautification of the country utilizing sound water management practices.

7.5 ACTION PLAN PRESCRIPTION

1. The preparation of biological diversity country strategy is the first systematic attempt to assist in establishing baseline information on the country's biological diversity, and basis for national action programmes on conservation of biological diversity and sustainable use of its components.

2. The preparation of studies to establish national lists of species for biodiversity:

- To identify components of biological diversity, including species collection and identification, and evolution of data needed for effective monitoring of those components.
- To identify processes and categories of activities which have or are likely to have significant adverse impacts of the conservation and sustainable use of biological diversity.
- To develop national action plans or programmes for the conservation and sustainable use of biological diversity.
- To develop maintain necessary legislation and/or other regulatory provisions for the protection of threatened species and populations.
- To conduct technology assessment on any biotechnology transferred material and processes.

3. The care and improvement of the local animals, plants and microbial genetic resources by:

- Urgent action for the security and sustainable use of plant and animal genetic resources for food, agriculture .
- Putting strategies and programmes of priority for in-situ conservation and sustainable use of plant and animal genetic resources for food agriculture based on country studies.

- Promotion of utilization of, as well as research on poorly known, but potentially useful, plants and crops, where appropriate.