Conservation of some medicinal plants in Qatar for food security and environmental sustainability

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Conference on "Wild, Medical Plants, Islamic Knowledge and Botanical Preservation in Qatar and the Gulf: An Interdisciplinary Approach".

Conservation of some medicinal plants in Qatar for food security and environmental sustainability

Elsayed Mohamed Elazazi

2017

Genetic Resources Department
Department of Agricultural research
Ministry of Municipality and Environment











Overview

- Conservation plant genetic resources strategy
- The current status of plant genetic resources in the State of Qatar
- The role of gene bank to conservation plant genetic resources for environmental sustainability including plant species mentioned in the Holy Qur'an;
- Explain the different methods to conservation plant genetic resources;
- Traditional and Potential uses of some Qur'anic garden plant their grown in the state of Qatar

First conservation processing it's mentioned in The Holy Quran

بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

حَتَّىٰٓ إِذَا جَآءَ أَمْرُنَا وَفَارَ ٱلتَّنُّورُ قُلْنَا ٱحْمِلْ فِيهَا مِن كُلٍّ زَوْجَيْنِ ٱثْنَيْنِ
وَأَهْلَكَ إِلَّا مَن سَبَقَ عَلَيْهِ ٱلْقَوْلُ وَمَنْ ءَامَنَ ۚ وَمَآ ءَامَنَ مَعَهُۥٓ إِلَّا قَلِيلٌ ﴿٤٠﴾

SAHIH INTERNATIONAL

[So it was], until when Our command came and the oven overflowed, We said, "Load upon the ship of each [creature] two mates and your family, except those about whom the word has preceded, and [include] whoever has believed." But none had believed with him, except a few.

Hud, 40

Responsibility

- The Qur'an has made it clear that Man should not ignore his responsibility of stewardship on earth. It is only when our ethical horizons extend to embrace not only mankind, but all generations and created beings that we can perform the noble role of stewardship on earth.

- The protection of nature and natural resources are deep-rooted in Islamic values and in Qatar's constitution. These principles have guided the state's laws, policies, national development and they also form the basis and spirit of this National Biodiversity Strategy and Action Plan.

Qatar National Biodiversity Strategy and Action Plan 2015-2025
MME 2014

World Population Prospects

	2017	2030
World total population	**7.6 billion**	**8.551 billion / 9 billion**
Arab population	**395 million**	
Qatar	**2.639 million**	

.

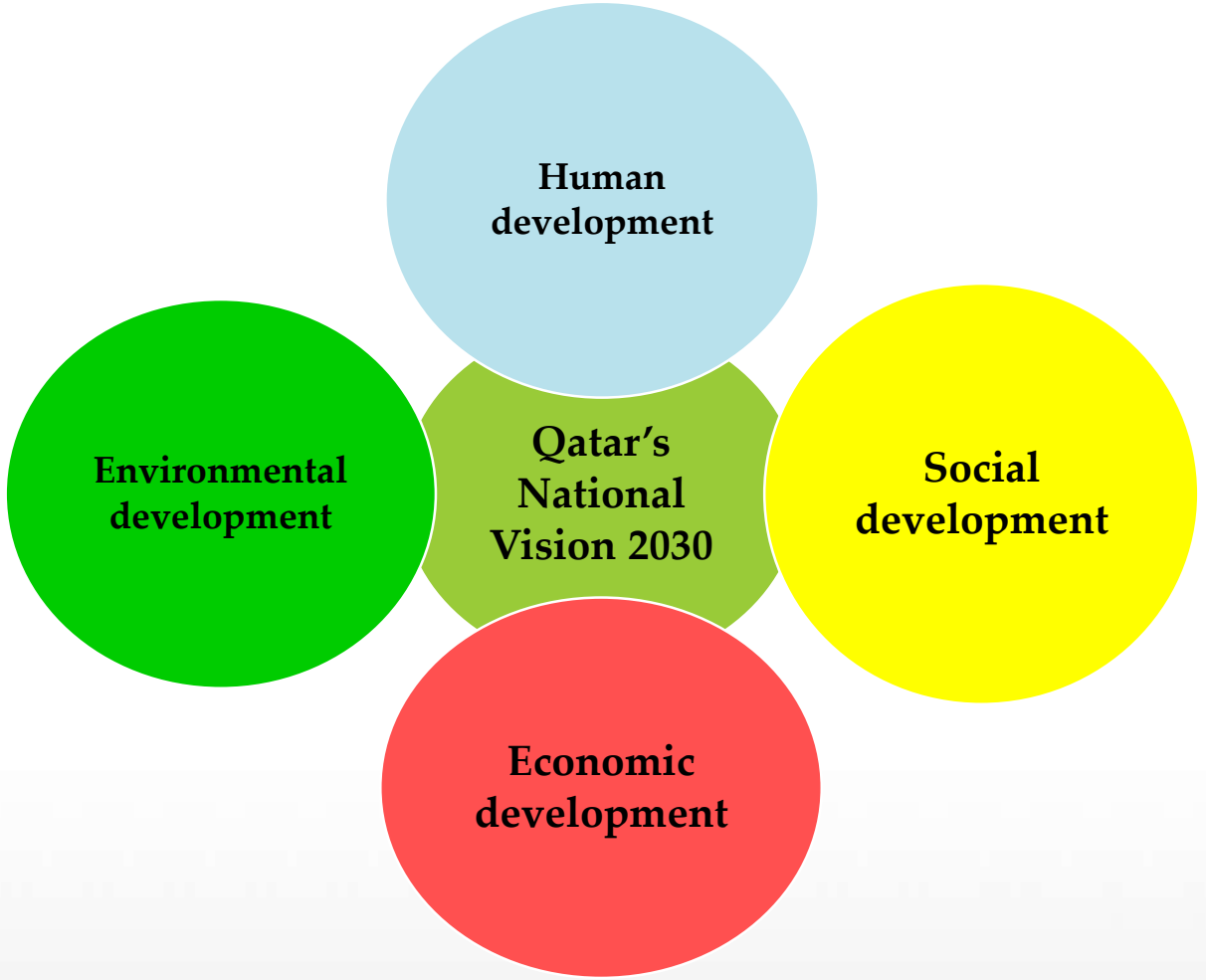
United Nations, Department of Economic and Social Affairs, Population Division(2017).*World Population Prospects: The 2017 Revision, Key Findings and AdvanceTables*. Working Paper No. ESA/P/WP/248

Purpose and Scope of the strategy

- **Article 33** of the Permanent Constitution for the State of Qatar, ratified in 2004, states

"The State shall conserve the environment and its natural balance for the comprehensive and sustainable use of its resources for all generations".

Qatar's National Vision 2030

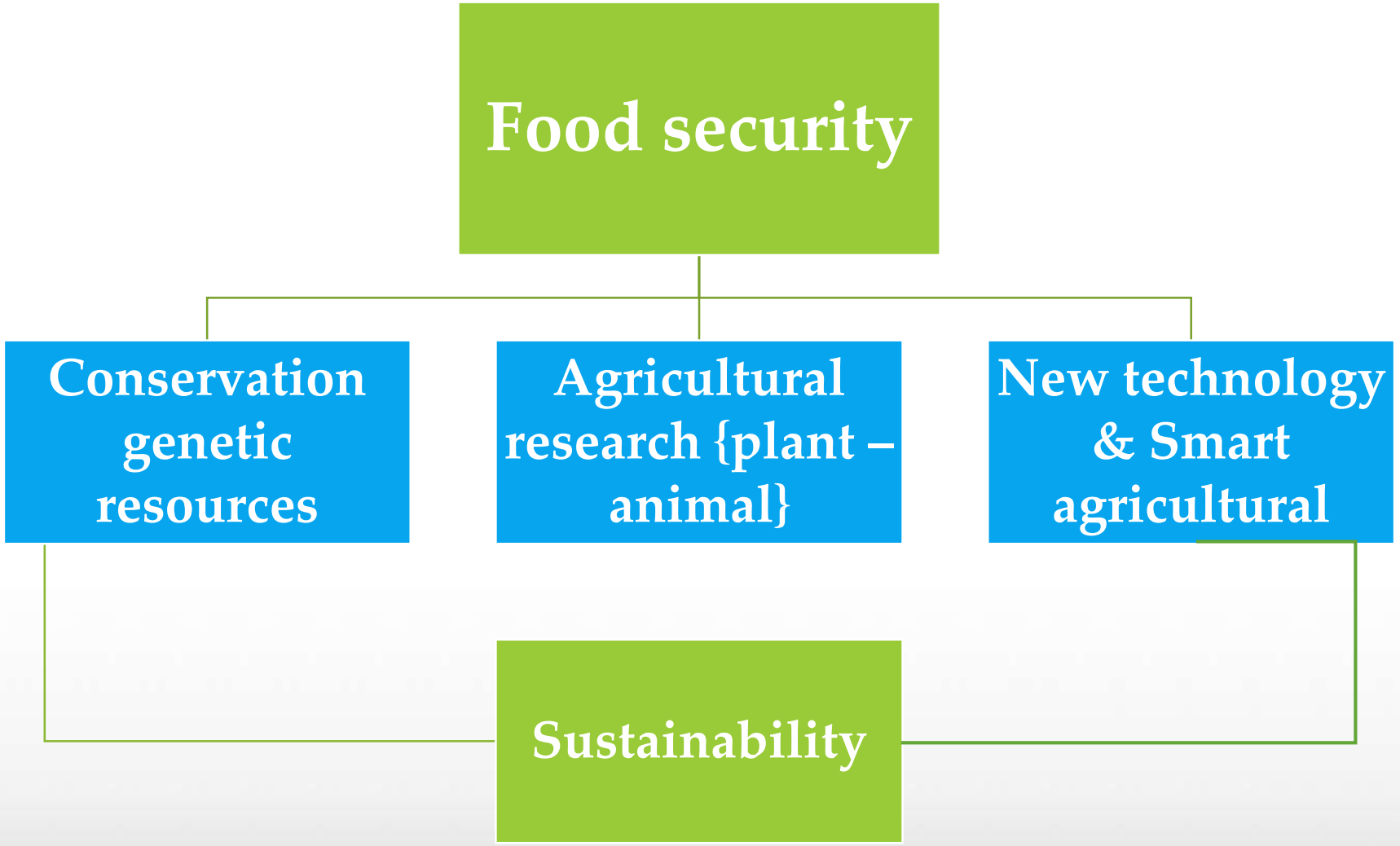


The Fourth Pillar– Environmental Development

The Vision states:

'The State of Qatar seeks to preserve and protect its unique environment and nurture the abundance of nature granted by God.

Agricultural research strategy 2017 - 2022



Genetic resources remain essential for future food security and sustainable agriculture

Conservation strategy

The two strategies are ex-situ and in-situ conservation and they are defined in Article 2 of the Convention on Biological Diversity (CBD, 1992) thus:

"Ex-situ conservation means the conservation of components of biological diversity outside their natural habitats“

"In-situ conservation means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticates or cultivated species, in the surroundings where they have developed their distinctive properties.“

Convention on Biological Diversity (CBD, 1992)

Ex situ Conservation Methods

- Seed Bank
- Field gene bank
- In vitro slow growth
- Cryobank (Cryopreservation)
- Pollen storage
- DNA storage
- Botanical Gardens

- Methods used depend on :
  - Mode of reproduction.
  - Storage behavior - inherent longevity and physiological storage behavior of the species as well as quality of material collected.
  - Resources - financial, human and institutional capabilities & technology.
- Different types of gene banks - depends on their purpose, objectives and priorities
- Different categories of gene bank- institutional, national, regional or international

Ex-Situ Conservation

Qatar plant gene bank information system

http://web1.mme.gov.qa/Qatargb/hotLine/PgrExchange.aspx

In-Situ Conservation Methods

The maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties."

(Convention of Biological Diversity)

- **Natural reserves**
- **Managed area**
- **Biosphere reserves**
- **On-Farm management**
- **On-Farm conservation**

In-Situ Conservation?/ management

November 2016

After management

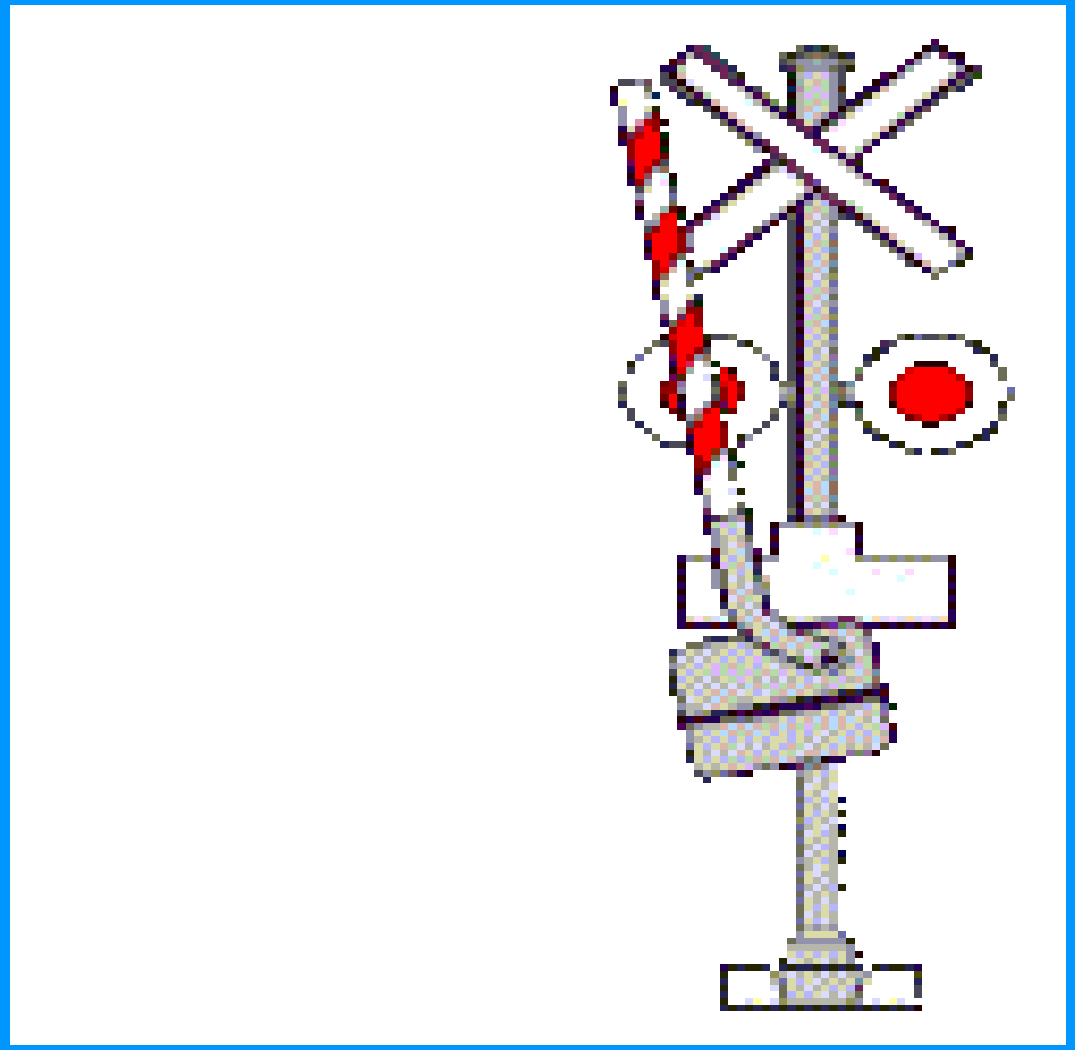
October 2017

Role of gene banks

- Gene banks are the storehouses of plant genetic resources, providing the raw material for the improvement of crops. **(Food security)**
- They play a key role in contributing to the sustainable development of agriculture, helping to increase food production and thus to overcome hunger and poverty.
- Inherent resistance to pests and diseases can be bred into crop plants, reducing the need to use chemicals that can have deleterious effects on farmers and the environment.
- The seeds contained in gene banks are a vital and irreplaceable resource, a heritage which must be conserved to provide future agricultural options in a world facing climate change and other unforeseen challenges.
- The sustainable conservation of genetic resources depends on effective actions by gene bank staff, who play a critical role in ensuring that germplasm is effectively and efficiently conserved.
- They need to apply proper procedures for handling seeds to ensure their survival and availability to present and future generations.

Rao, et al., 2006

What a gene bank conserves?

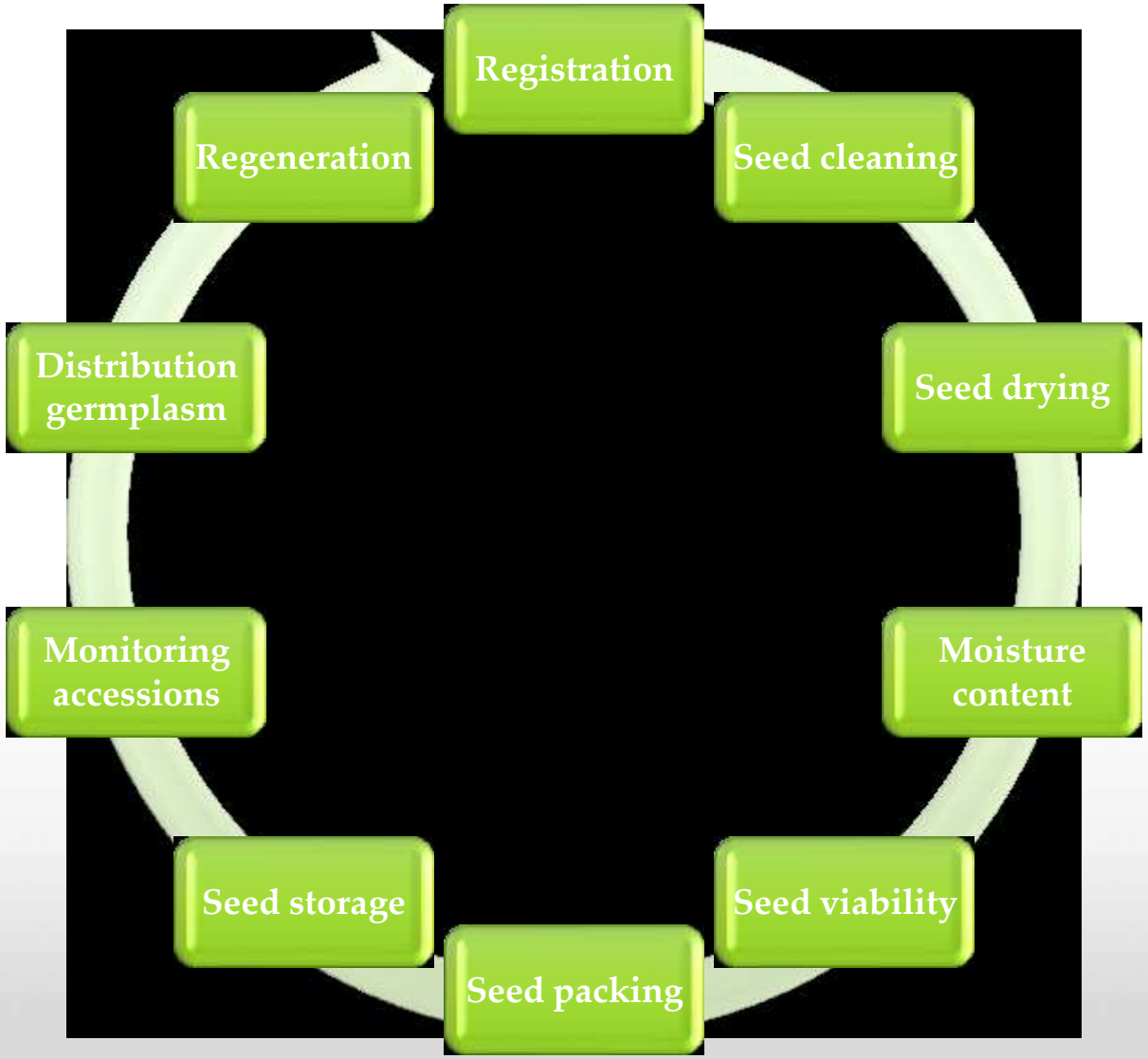


?

What a gene bank conserves?

- Policy requirements and mandate
- Institutional arrangements (long- vs short-term conservation)
- Historical load of collections
- User needs (actual or anticipated)
- Infrastructural and budgetary conditions
- Collecting strategies
- Data bank

Seed bank


Registration
Seed cleaning
Seed drying
Moisture content
Seed viability
Seed packing
Seed storage
Monitoring accessions
Distribution germplasm
Regeneration

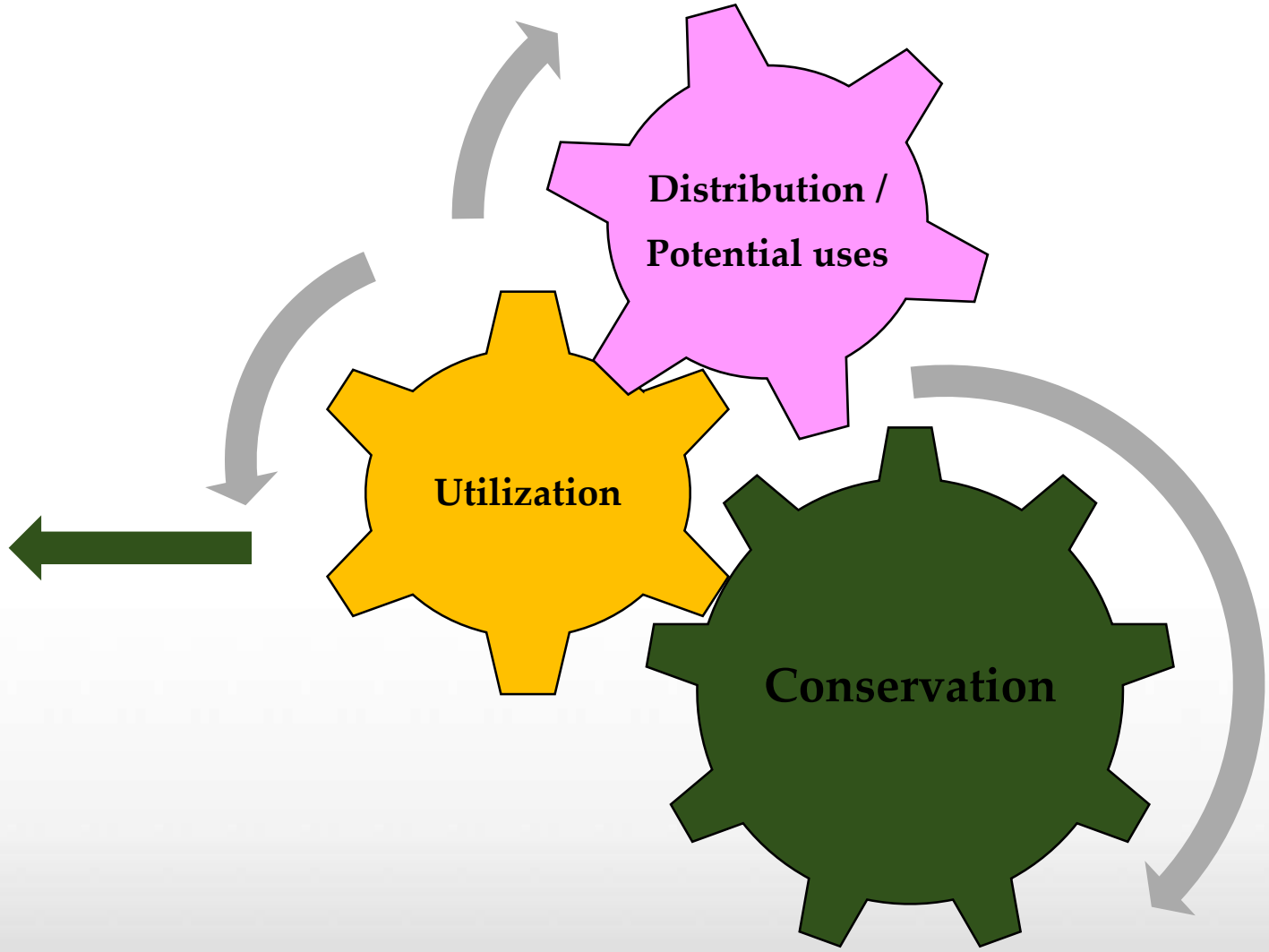
Important of plant genetic resources

- Plant genetic resources are a strategic resource at the heart of sustainable crop production.
- Source of future food and feed
- Crop improvement for food and nutrition security.
- Source types that are resistant to climate change
- Their efficient conservation and use is critical to safeguard food and nutrition security, now and in the future.
- Meeting this challenge will require a continued stream of improved crops and varieties adapted to particular agro- ecosystem conditions.
- Compensation species that are exposed to extinction

FAO. 2014

Uses of Plant Genetic Resources

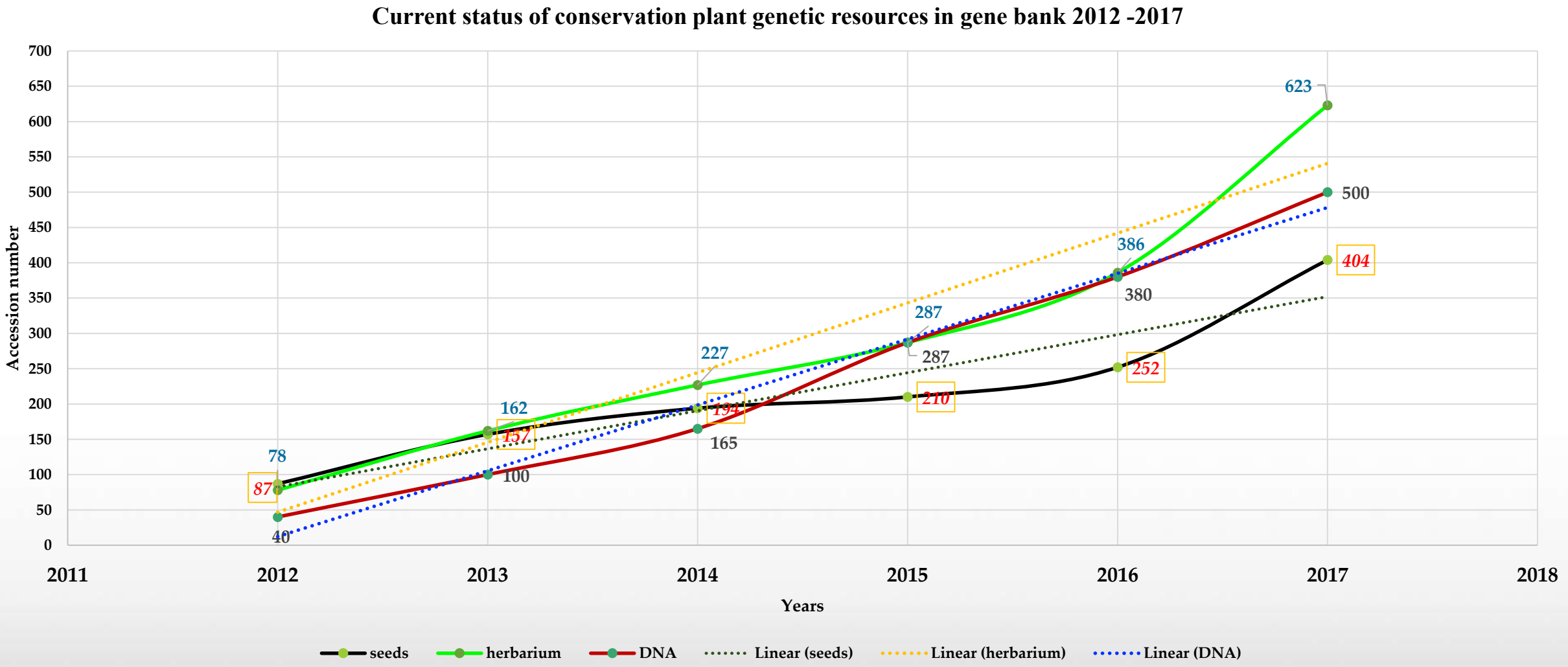
- Food
- Pharmaceutical industry
- Medicinal
- Industrial biotechnology
- Feed
- Agricultural biotechnology
- MP



Flora of Qatar

- Environment could have great impact on the biodiversity of flora and fauna, since limited number of wild plants and animals has been recorded in this area. The vegetation of Qatar is comprised of herbaceous plants, dwarf shrubs and a few tree species. Woody plants, succulents, and perennial grasses and sedges withstand successfully the severe drought of the summer.
- The checklist of plants in the State of Qatar has been reviewed many times, some reports listed 213 species, while others gave a list of 260 species, then the monograph of Batanouny listed 301 species in 207 genera and 55 families. Recently, Norton and his colleagues have increased the list of wild plants to nearly **400** species of which about **270** species are likely to be truly native.
- Flora is an important part of the Qatar biodiversity heritage and Qatar national vision 2030.
- The flora of Qatar and the Arabian Peninsula has always been important for the Arab people, as a source for livestock grazing, construction material, firewood and food.

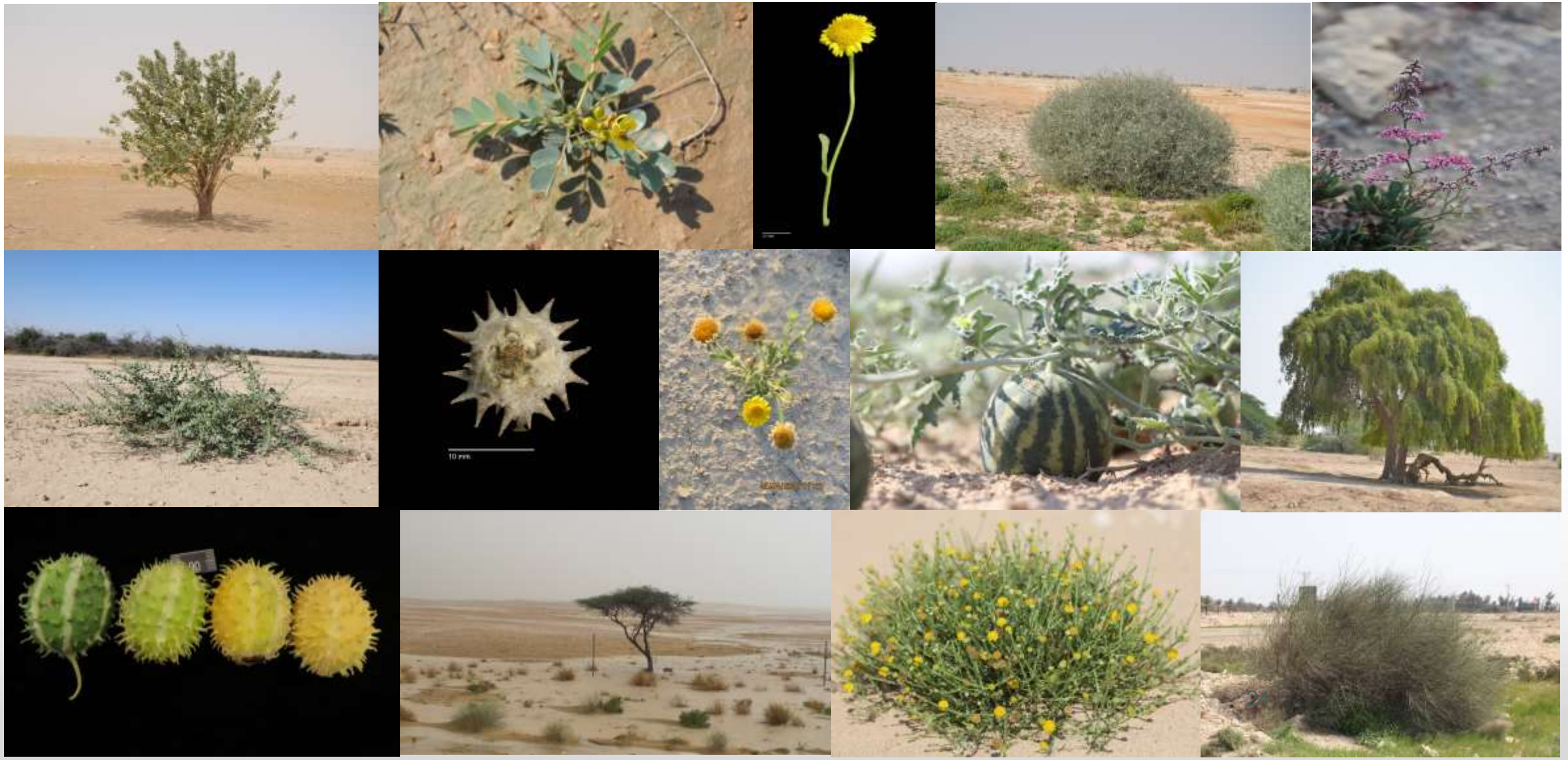
Current status of conservated plant genetic resources



MME, 2017

Current status of some conservated Qatari medicinal plants

> 45 % from our conserved germplasm medicinal plants



Medicinal plants and Traditional Knowledge

- Medicinal plants have been used in developing countries for thousands of years. World Health organization (WHO) estimated that 70-80% of the population living in Africa, India and other developing nations depend on traditional healthcare systems for primary healthcare.

Traditional medicine, health maintenance

- Traditional medicine (TM) is an important and often underestimated part of health services. In some countries, traditional medicine or non-conventional medicine may be termed complementary medicine (CM). TM has a long history of use in health maintenance and in disease prevention and treatment, particularly for chronic disease.

Number of MPs threatened and cultivated globally

Type	Number	%
Number of flowering plants worldwide	422000	
Number of plants threatened	295400	70 %
Number of MPs	77000	17.1 %
Number of MPs threatened	15000	20.8% globally
Number of MPs traded globally	3000	4.2 %
Number of MPs cultivated	900	1.3 % internationally

RAJESWARA, et al., 2012

MEDICINAL PLANTS

- Number of MPs species used medicinally: 35,000 to 70,000 worldwide
- Leading exporting countries: China >India > Germany(china & India major producers, > 40% of global bio-diversity.
- International market of herbal products = $ 62 billion(India's share in global export = 0.5 %)
- In India, herbal sector turnover = Rs. 4200 cr./annum, with AGR of 20 – 30 %.
- India: 47,000 plant sps.→ 15,000 MPs → > 1000 sps. Are under various degrees of threat
- As per latest IUCN list, 200 ***RED LISTED*** MPs sps. identified in India (critically endangered- endangered-vulnerable-lower risk-data deficient)





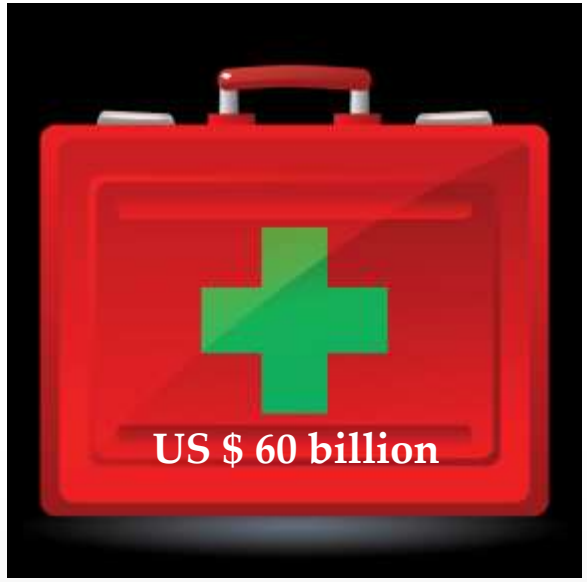




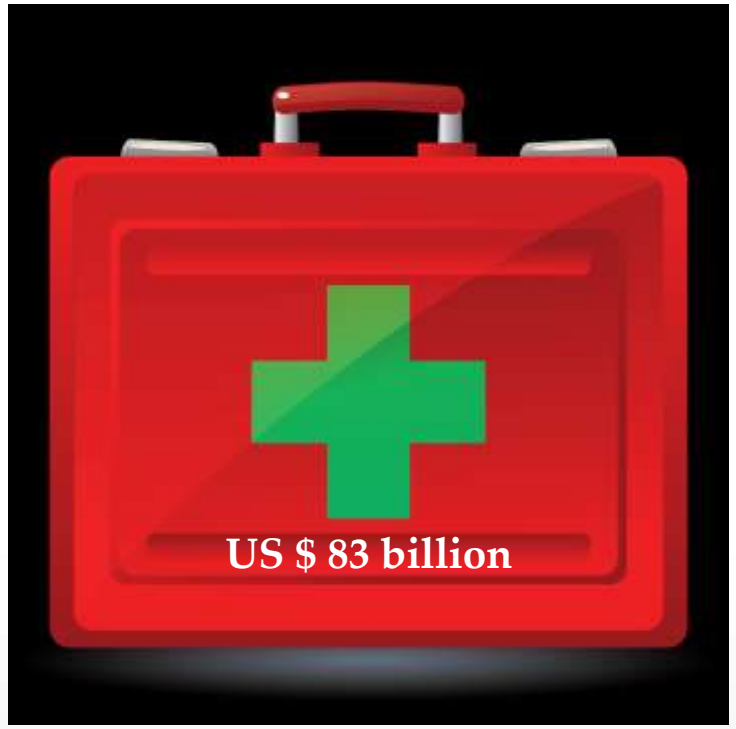


THE GROWING VALUE OF INTERNATIONAL TRADE IN HERBAL MEDICINES

Estimated value of herbal medicines in the US in 2000



Estimated global value of herbal medicines in 2003



Estimated global value of TCM in 2012

https://stateoftheworldsplants.com/2017/useful-plants.html

Global trade in aromatic plants and their products

Particulars	Trade
Aromatic plants traded in the world	400 types of essential oils
Value of essential oils traded in the world	US$ 5 billion in 2011
Value of aroma chemicals in the world	US$ 2.8 billion in 2011
Global trade for flavours & fragrances	US$ 22 billion in 2010
Global trade in cosmetics	US$ 300 billion in 2010











Unique Qatari medicinal plants

Plant adaptations to extreme environments
Medicinal uses
Fodder
Food

Senna italic Mill.

Sana / Senna/ Ishrij

- **Native / Common**
- **Medicinal uses:** Leaflets without petioles are beaten and obtained powder is used in given in 0.25 gram dose along with honey for **backache, sciatic, joints pain and headache and migraine**.
- **Veterinary uses:** The whole plant is given to cattle for **rheumatic/joints pains**. The same practice is supposed to be effective for increasing milk produ alog

Senna tea

senna alexandrina **Rahmatullah et al., 2010**

Vachellia nilotica

Acacia nilotica / QARZZ / Dyeing Acacia

Introduced /Widespread

Traditional medicinal uses

- Anti-cancer and anti tumours
- Antiscorbutic
- Astringent
- Diuretic
- Intestinal pains and diarrhea
- Nerve stimulant
- Used for colds, congestion, coughs, fever, leucorrhea, smallpox and tuberculosis
- Tanning and dying leather (high content of polyphenolics)
- Arabic gum

A Guide to Medicinal Plants in North Africa

Salvadora persica L.

Siwak / Arak / Khamt / Toothbrush tree

Rare in Qatar / introduced

Shoots, Roots and fruits are used
Anti-microbial activity
Antifungal
Antibacterial
Tooth paste
roots used as toothbrushes
fruits edible and used as a carminative, anthelmintic, vulnerary, stomachic, antiseptic and anti inflammatory and good for spleen, gum, scabies, syphilis, gonorrhea and the fruit edible as appetizer

https://www.haad.ae/HAAD/LinkClick.aspx?fileticket=aXlF48IewNY=&tabid=791

Citrullus colocynthis (L.) Schard.

Bitter gourd / Colocynth / Hanzal

Native / Widespread

1.Medicinal uses: Oil obtained from seeds is applied on head for **hair loss**. Fresh juice of the leaves is externally applied daily for a month, which is claimed to be effective in **baldness.**

2.Fresh juice of *Colocynthis* mixed with equal quality of Sodium chloride. It is warmed over fire till it dries up. This power is given 1gram twice a day after meal as a **stomachic** and appetizer given in constipation.

3.Veterinary uses: The half piece (approx. 100 grams) of ripened fruit is given twice a day to cattle for treating **indigestion, colic pain, cough and intestinal worms**.

Rahmatullah et al., 201

Vachellia ehrenbergiana (Forssk.) Schweinf.

Salam

Native / Widespread

Many medicinal uses are recoded

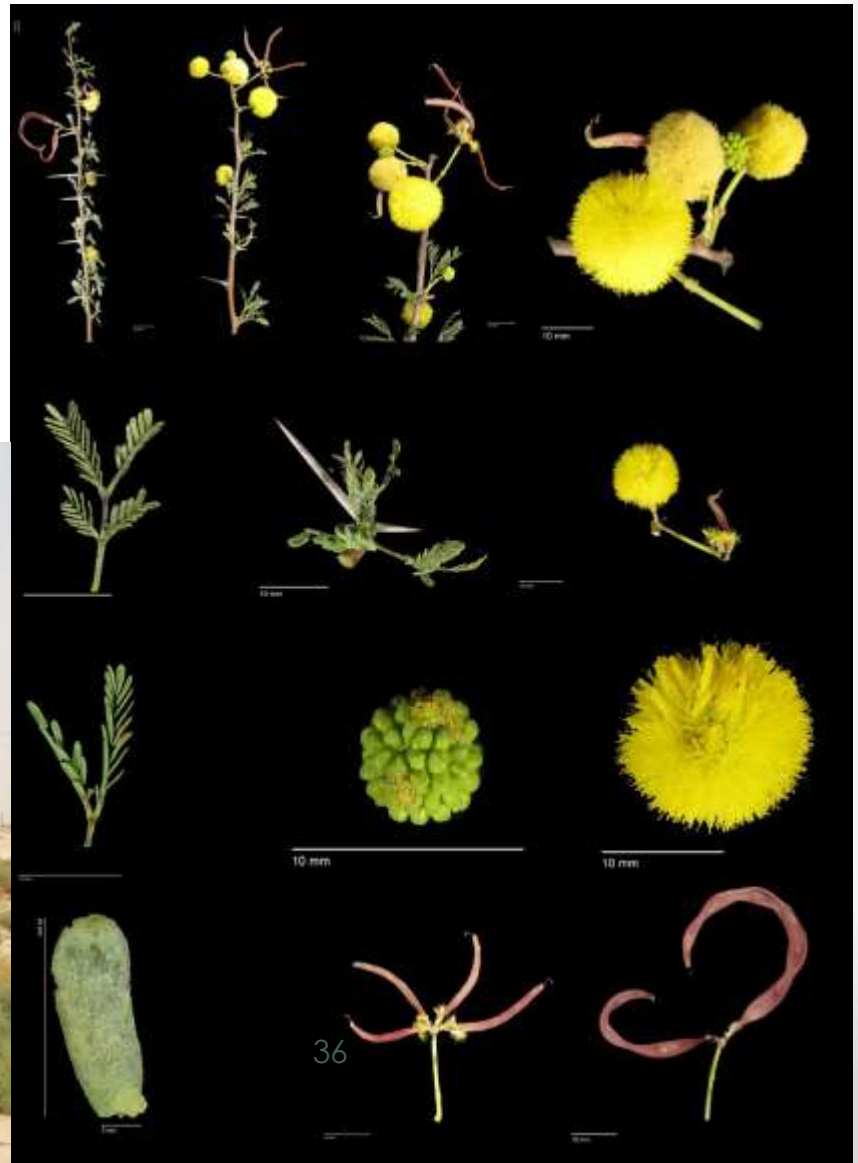
livestock feed

an important fodder plant for camels, goats and sheep

bees which make *Acacia* honey

charcoal and firewood

low quality **gum**



Fao

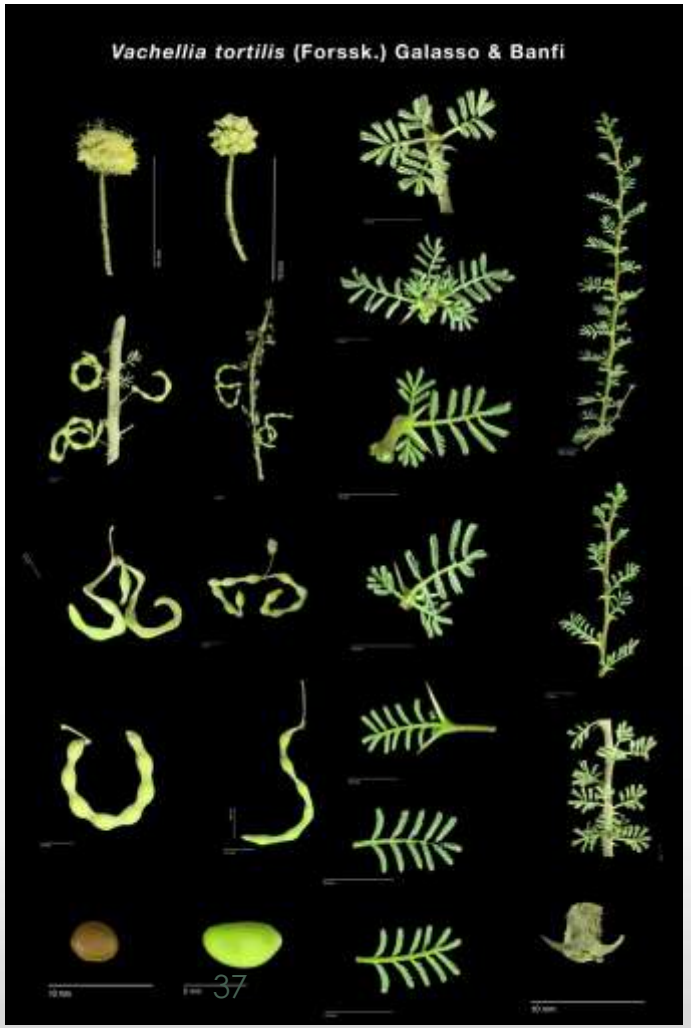
Vachellia tortilis / Acacia tortilis

Samar

Native / Common

Traditional medicinal uses

- **Anthelmintic**
- **Antidiarrhoea**
- **Asthma diseases**
- **Pulmonary diseases**
- **Vermifuge and dusted onto skin ailments**
- **Fodder (19 % protein)**
- **Reclaiming dunes**
- **Gum**



Cymbopogon commutatus (Steud.) Stapf

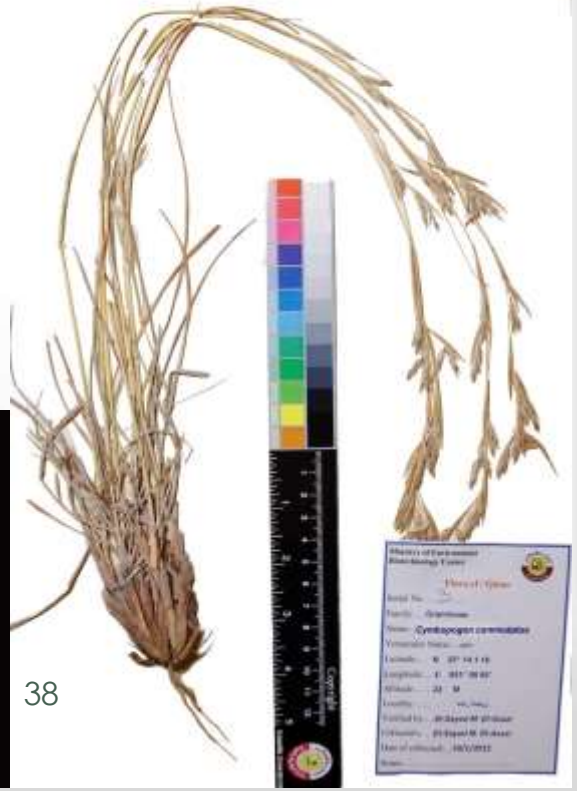
Askhabar / Iskhabar / camel grass

Native / Widespread

Ethno-botanical use: **perfume, insect repellent, aromatic, principle; astringent, diuretic, emmenagogue.** It is contains aromatic principle, small bunches sold in an herbalist shop in certainly has a history of medicinal use, probably as an infusion or tea, in Arabia In Sinai tribes, infusion of this plant is diuretic, **emmenagogue, and treats infertility. It is treat cold, influenza, diabetes, and stomachache.**

In India and Pakistan Cymopogon species are cultivated for the extraction of the **aromatic** oil, **perfume** and insect repellent.

Zohara Yaniv, Nativ Dudai - 2014



Rhanterium epapposum Oliv.

AlARFAJ

Rare / Native

Very important grazing plant, especially for camels. Young leaves used for food preparation as a spice. In some places it used to be gathered for fuel when no other woody species were available.

A total of 51 compounds representing 76.35%–94.86% of flowers, leaves and stems oils, a rich source of monoterpenes which have biological activities.

Marwa and Abdelrhman, 2016

Calotropis procera Aiton) W.T.Aiton

Ushar / Ushaar

Native / Widespread

Traditional medicinal uses

Asthma, Cold, Cough, Chronic eczema, Dysentry, Diarrhoea, Elphantiasis, Heart disease, Leprosy, Rheumatisam, Skin dieases

used as a traditional medicinal plant in India; it is used in that country to treat common diseases such as **fevers, rheumatism, indigestion, cough, cold, eczema, asthma, elephantiasis, nausea, vomiting, diarrhea.** It is used both internally as well as externally. The plant has **CNS (Central Nervous System)** activity; scientific research shows analgesic, anticonvulsant, anxiolytic (inhibits anxiety) and sedative effect. It may be used with success in the **treatment of Syphilis**. The root bark has a digitalis-like effect on the heart. This is powerful beneficial effect on patients with heart failure, arterial fibrillation and a rapid ventricular rate. However, **calotropin**, a compound in the latex of this plant is **very toxic**.

Bhumika Yogi, et al ., 2016 http://www.tropilab.com/giantbloodflowertincture.html

Teucrium polium

Jaad

Native / Widespread

Drink as a tea

Teucrium tea

-Used for treat abdomen pain and chest infections

-Medicine for rheumatism, diabetes and public health.

-They filling the pillows by Jaad to enjoy leaves smell

used for different diseases such as diabetes, rheumatologic diseases, inflammation, and gastrointestinal disorders

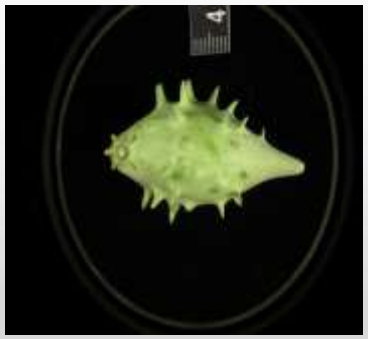
diabetes, gastrointestinal disorders, rheumatism, inflammations, also used as diuretic, antipyretic, tonic, diaphoretic, analgesic, antihyperlipidemic and other disorders.

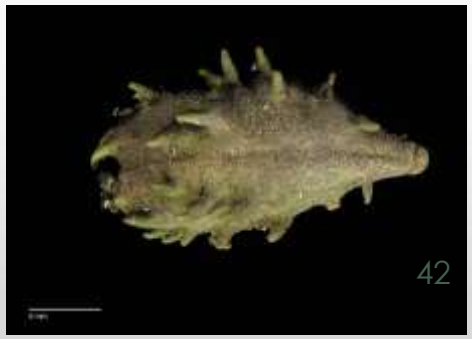
Nidal Jaradat, 2016

Glossonema edule N. E. Br.

Attar, Glossonema edule, jarawa, yarawa

Native / Widespread / near endanger
Edible (seeds, plants, and maybe the pod
Animal feed
Fruit edible fresh and cooked
Many medicinal uses recorded





Neurada procumbens L.

Sa'adan / Spiny desert fruit

Native / Common / Widespread

Drought tolerant plant,

It has been considered **edible** by Bedouin and has been traditionally as a medicinal herb.

Medicinal uses:

This recipe is said to be very effective demulcent and **strong tonic especially for male.**

nerve tonic especially for male. This is also reported as **a strong stimulant for debility and impotency.**

Chen et al., 2004

Cordia sinensis L.
Bambar

Native / Rare / Endanger

Ziziphus spina-Christi (L.) Sm.

Areen /Kanar / Sidr / Christ thorn

Introduced / Common

Food: Fruit - fresh, dried or cooked

Fodder

Fuel, Timber , Alcohol

Medicine:

anthelminthic and antidiarrhetic

young leaves is used to reduce eye inflammations

A powder made from the charred thorns is used as an antidote to snake bites

The roots are used to treat headaches

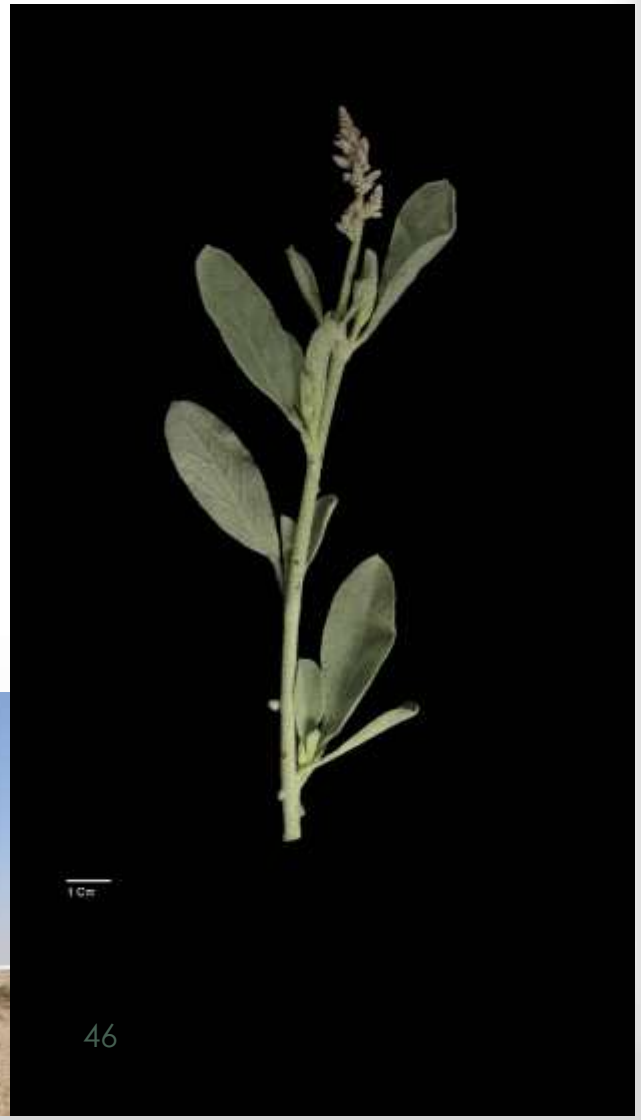
Aerva Javanica (Burm.f.)

Twaim / Tarfa

Native / Widespread

Population was using Twaim leaves to filling mattresses and pillows

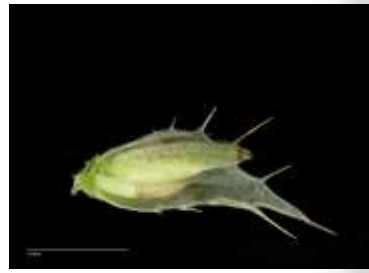
- The decoction as a gargle for toothache. Paste made up of leaves and inflorescence is externally applied to heal the wounds and inflammation of human being as well as livestock. The cottony seeds for stuffing pillow used in chorea and lumber pain. The decoction purgative and anthelminticin cattle.



Rahmatullah et al., 2010

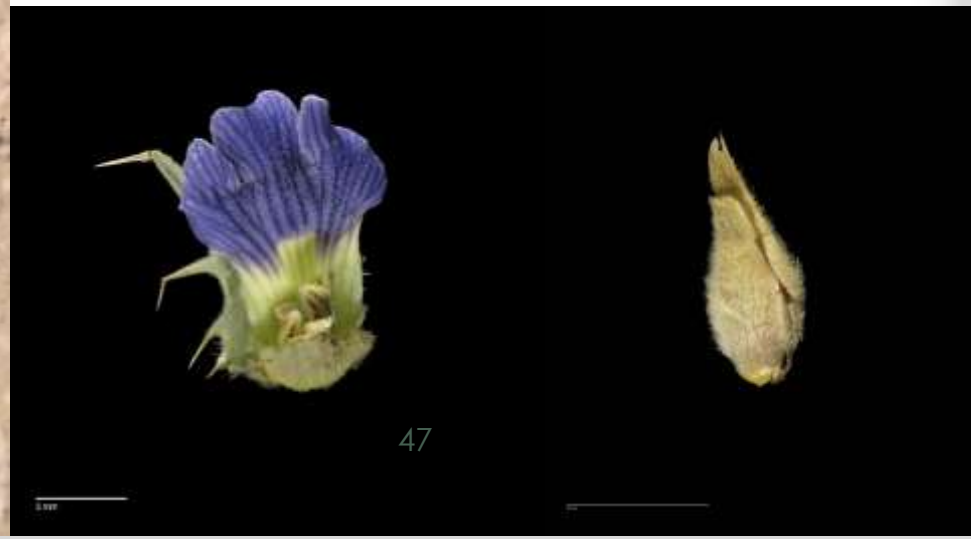
Blepharis ciliaris (L.)B.L.Burtt.

Najayae/ Shouk AlDab



Native / common / Frequent

Medicinal uses: The powder of the root along with black pepper and honey is given in cough, phlegmatic cough and flue.



Rahmatullah et al., 2010

Capparis spinosa L.

Caper / *Shafallah*

Native / Widespread

Perennial plant

Food

edible bud and fruit (caper berry)

Medical uses

The economic importance of (young flower buds, known as capers, are greatly favored for seasoning and different parts of the plant are used in the manufacture of medicines and cosmetics)

Could be cultivated. Economic value

Sharrif, et al., 2012

summary

- > 45 % from our conserved germplasm medicinal plants
- 404 seeds accession are conserved in gene bank
- 500 DNA accession are preserved in gene bank
- More than 3500 herbarium specimens
- Food security and Sustainability main strategy target
- Finally, Plant genetic resources provided powerful tools for humanity to enhancing our child's future, so it is necessary to preserve the natural plant genetic resources on which sustainable development is based.
- plant genetic resources might be helpful in the achievement of Qatar food insecurity

Thank you

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