مجلس البحث العلمي

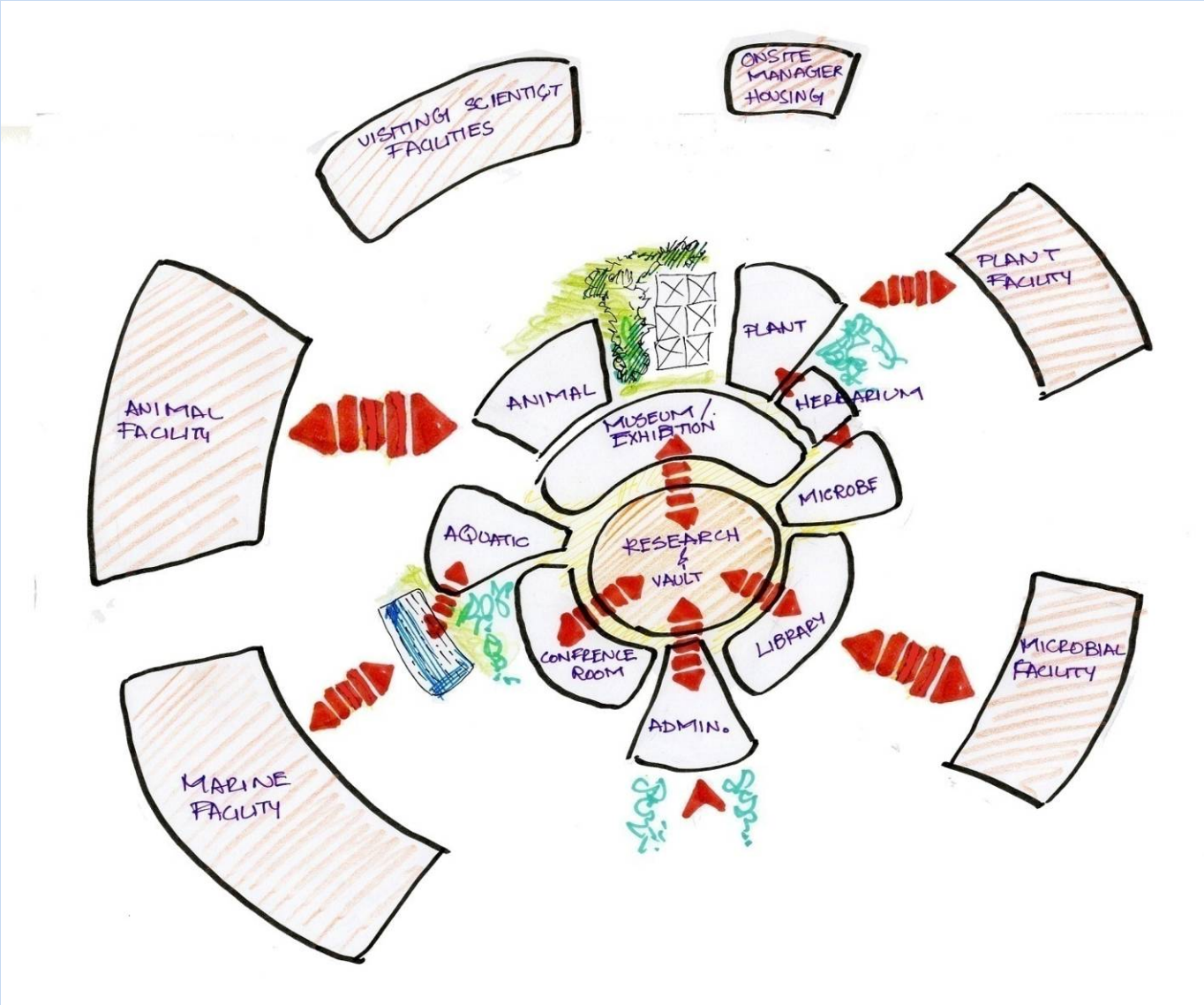
نحو نظام ابتكار وطني فعال

Genetic Resources

Animal and Plant Genetic Resources Center

Dr. Nadiya Al-Saady, 2012

The proposed structure of the facility is in line with the vision, mission and needs of the APGRC



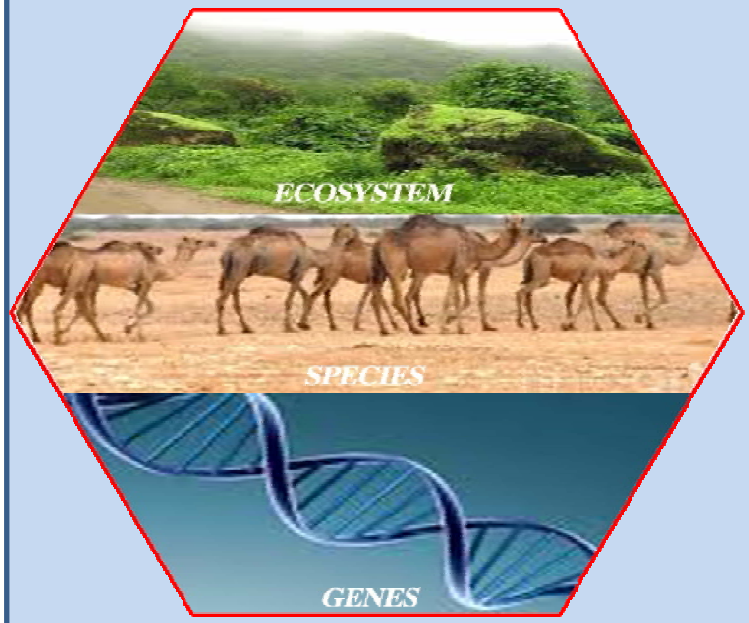
The anticipated plot area for the APGRC including future expansions is around 50 hectares, and preferably to be located near the new University and the Science & Technology City.

Public Awareness: Genetic Resources Our Heritage

- 29th April -1st of May 2012
- 7 schools – 450 students
- Interactive activity
- Themes: marine, plant animal & microbial worlds

… biodiversity, the variety of life on earth, includes ecosystem diversity, species diversity, and genetic diversity.

Biological diversity - or biodiversity - is a term used to describe the variety of life on Earth. It refers to the wide variety of ecosystems and living organisms: animals, plants, their habitats and their genes (IUCN)



Ecosystem

- Deserts, mountains, agricultural land, wetlands , islands , marine areas, etc.

Species

- Mammals, plants, birds, amphibians and reptiles, fish, microalgae, sea grasses, corals, mollusks, crustaceans, and echinoderms, fungi, bacteria, virus, etc.

Genetic

- Plant cultivars and land races, crop wild relatives, local breeds of livestock, fish and microbial species, etc.

Genetic resources are defined as biological materials of actual or potential value containing functional units of heredity (Article 2, CBD)

Oman has unique, diverse climatic conditions, size and geographical location ….

- The Sultanate of Oman, located in the Southern-Eastern corner of the Arabian Peninsula occupies a total land area of 309,500 km^2.
- It encompasses a wide variety of topography such as; mountain ranges, Coastal plains, desert plains and coast line
- In the Southern part, Dhofar region has a subtropical climate with seasonal rainfall. The majority of biodiversity exists in this area.
- The rest of the country has mainly dry climate.

Agricultural and Livestock Research Strategy (2011 -2015)

"In the south of Oman, between Mirbat and Hadbin, an environment, in which coral reefs and sea weeds coexist, is unique. One is typically tropical, the other typically temperate: yet we have both."

Dr Michel Claereboudt , 2011

… Oman is blessed with abundant and unique fauna and floral biodiversity

- The biodiversity of Oman reflects its position between two bio-geographic regions, northern Oman's more closely resembles that of Asia, whereas further south the principal influence is Africa.
- Oman is endowed with about 47 species of terrestrial mammal, 19 species of marine mammals, over 1000 fish species, 1,208 species of plants, around 10 livestock species, 128 breeding species of birds, over 130 coral species, and 5 turtle species.

Humpback Whale (*Megaptera novaeangliae*)

Dionysia mira (Primulaceae) A endemic species. Found in some localities in the high altitudes of the Jabal Akhdar range in Northern Oman

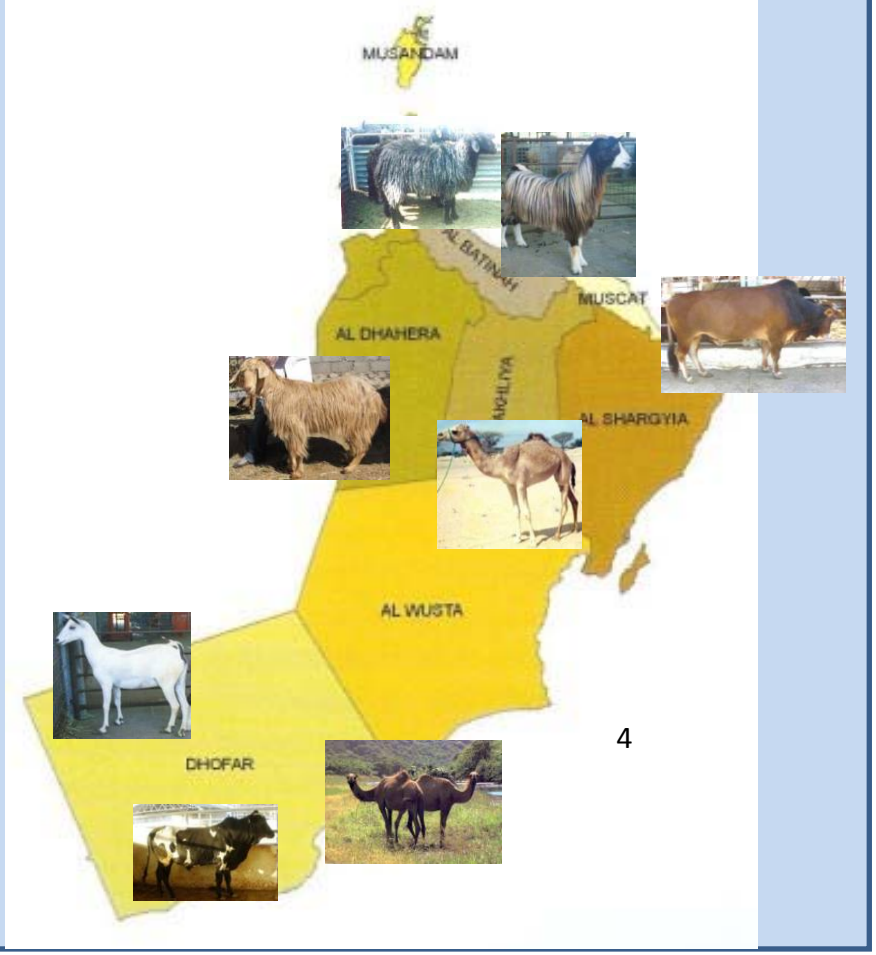
Arabian oryx (*Oryx leucoryx)*

Despite its arid climate, Oman possesses abundant domesticated animal genetic diversity…

❶ Animal

Species	Population	Breeds
Goats	1,619,990	6
Cattle	313,580	2
Sheep	380,000	1
Camels	124,520	8?
Donkeys	28,500	1
Total	**2,466,590**	

Livestock (FAOSTAT 2008-2009)



(Courtesy: Professor Osman Mahgoub, SQU)

… and benefits from numerous wild species, many of them being threatened

❶ Animal

Species category	Common Name	Category
Mammals	Arabian Oryx, Arabian Leopard, Arabian Tahr, Sperm whale, Somali white-toothed shrew, Arabian pipistrelle bat etc.	IUCN: Threatened (Vulnerable, Endangered & Critically Endangered)
Reptiles	Dhofar toad, Spiny-tailed lizard, Loggerhead turtle, Hawksbill turtle, Leatherback turtle, etc.	IUCN: Threatened (Vulnerable, Endangered & Critically Endangered)
Birds	Houbara bustard, Sociable lapwing, Glossy ibis, Egyptian vulture, Slender-billed curlew, Lappet-faced vulture etc	IUCN: Threatened (Vulnerable, Endangered & Critically Endangered)
Fish	Blind cave fishes, *Garra dunsirei* (Banister, 1987) and *Garra longipinnis* (Banister & Clarke, 1977)	IUCN:Threatened (Vulnerable)


5


6


7


8

Source: fourth national report to the Convention on National Biological Diversity (MECA)

A unique marine genetic diversity is accessible from the long shores of Oman recognized by scientists around the world

❶ Animal

- Many fish and coral species only found in specific parts of the Omani coast

- *Amphiprion omanensis*
- Omani clownfish: found only in Dhofar between Mirbat and Masirah in two distinct populations one north one south

- *Acanthatreas maxima.*
- This species was discovered in Muscat but later found along most of the NE Arabian Sea and Gulf of Oman.

- *Ferdina sadhensis*
- An unusual starfish endemic of the Eastern Indian Ocean and named after Sadh.

- **The southern coasts of Oman, The Arabian Sea coasts of Oman, are characterised with high rate of fish biodiversity. From this region, over 70 species of fishes were recorded for the first time in Oman and about 20 species are potential new species to science.**

(Photos: Courtesy of Dr . M. Claereboudt)

The unique geo-conditions have given birth to a diverse range of plant genetic resources…

Plant

Category	Crop Species
Field Crops	***Wheat, Barley, Oats, Sorghum, Maize, Chickpeas, Cowpea, Sesamum, Safflower, Sunflower, Cotton, Sugarcane, Alfalfa, Elephant grass, Tobacco, etc.***
Vegetable Crops	***Garlic, Onion, Watermelon, Muskmelon, Carrot, Sweet potato, Cucumber, Radish, Okra, Tomato, Lettuce, Cabbage, Cauliflower, Squash and Potato, etc.***
Fruit Tree crops	***Date palm, Mango), Acid lime, Sweet lime, Pomegranate, Grape, Papaya, Banana, Guava, Coconut, etc.***
Pasture trees, shrubs and grass species	***Prosopis cineraria, Acacia tortilis, A. ehrenbergaina, A. senegal, Anogeissus dhofarica, Maerua crassifolia, Ziziphus, Olea europaea, Blepharispermum hirtum, Calligonum comosom, Euclea schimperi, Pteropyrum scoparium, Maytenus dhofarensis, Cenchrus ciliaris, C. setigerus, Apluda mutica, Themeda quadrivalvis, Dactyloctenium aegypticum, Panicum turgidum, Pennisetum divisum etc.***

(Oman's FAO country report for PGRFA, MAF. 2008)

…as well as multiple land races that go way beyond the typical palm tree expected in the Arabian peninsula

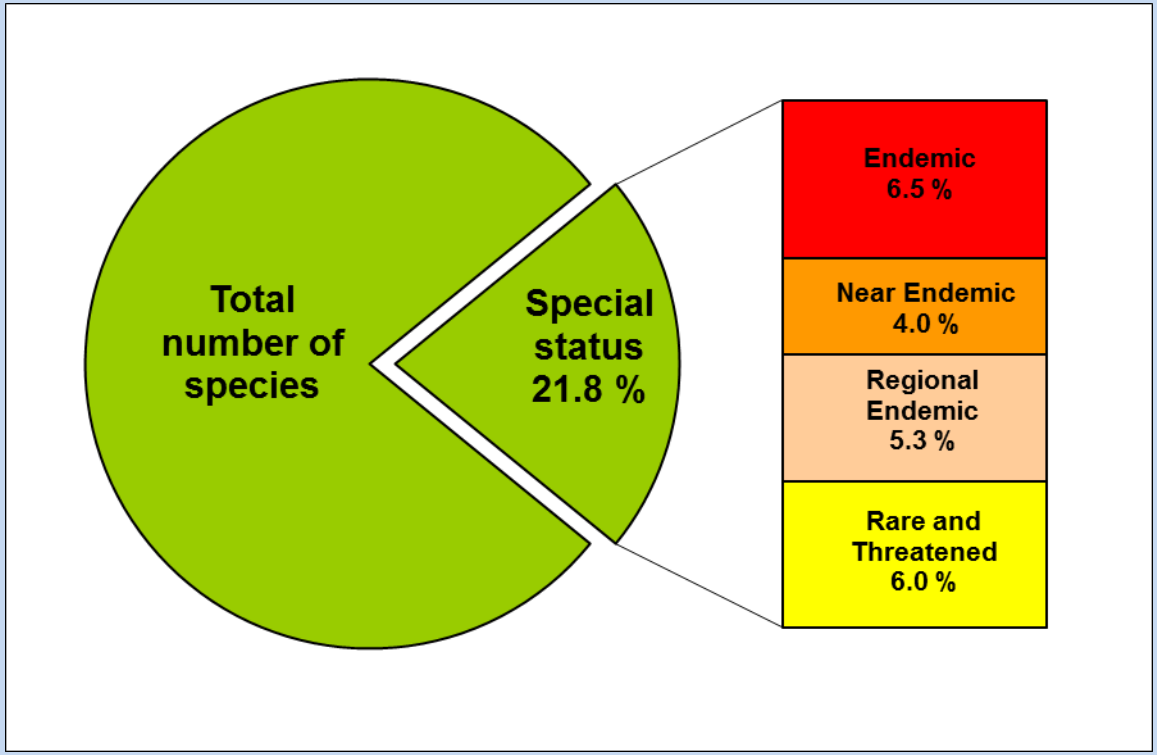
Plant

Crop	Local cultivars/landraces	Crop	Local cultivars/landraces
Acid Lime (*Citrus aurantifolia)*	Local (Lomy)	Mango (*Mangifera indica)*	Al-ward, Al-khokh, Al-halqoom, Quriate-15, Rumais-89, Muscati .
Alfalfa (*Medicago sativa*)	Bathini, Interior, Sharqiya, Rustaq, Quriati	Onion (*Allium cepa)*	Local
Banana (*Musa sp.)*	Fard, Barshi, Nagal, Somali, Malendi, Red	Papaya (*Carica papaya)*	Local seedy strains
Barley (*Hordeum vulgare)*	*Bathini, Doraqui*	Pearl millet (*Pennisetum glaucum)*	Tall local
Ber (*Zizipus mauritiana)*	Seeded, Seedless (Maqatmani)	Pomegranate (*Punica granatum)*	Malasi, Jabal akhdhar
Carrot (*Daucus carota)*	Local	Radish (*Raphanus sativus)*	Local
Chickpea (*Cicer arietinum)*	Local	Safflower (*Carthamus tinctorius)*	Local
Coconut (*Cocos nucifera)*	Local, Al-Malki	Sesame (*Sesamum indicum)*	Local
Cotton (*Gossipium arboreum)*	Brown	Sorghum (*Sorghum bicolor)*	Red, White
Cowpea (*Vigna unguiculata)*	Brown, Black, Mottled	Sugarcane (*Saccharum officinarum)*	Bahlawi, Nizwawi, Dhofari
Cucumber (*Cucumis sativus)*	Local, Dhofari	Sweet Lime (*Citrus limetta)*	Burgab, Daire
Datepalm (*Phoenix dactylifera)*	186 landraces	Sweet melon (*Cucumis melo)*	Local
Garlic (*Allium sativum)*	Bahla, Rustaq, Tanuf, Jamah	Sweet Potato (*Ipomoea batatas)*	Red, White
Grape (*Vitis vinifera)*	Black and White	Tobacco (*Nicotiana tabacum)*	Suwaida, Musdaria, Fannashia, Omlaein, Hitathi
Guava (*Psidium guajava)*	Red and White	Wheat (*Triticum aestivum)*	Coolah, Saraya, Hamira, Waledi, Missani
Maize (*Zea mays)*	White, Red, Yellow		

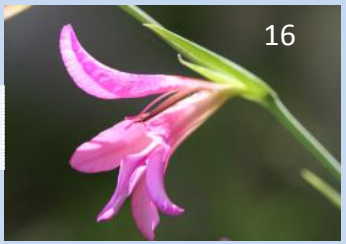
(Oman's FAO country report for PGRFA, 2008)

Overall, Oman is an important center of endemism for the plant kingdom

❷ Plant



Exacum aff. *affine*
Endemic,
Endangered



Gladiolus italicus
Rare, Near Threatened

Barleria samhanensis
Endemic, Critically
Endangered

Source: A. Patzelt, (2008), Oman Plant Red Data Book. Report, Oman Botanic Garden, Diwan of Royal court

…extensive efforts are under to understand and utilize the genetic diversity inherent in Oman's plants

Plant

Ministry of Agriculture and Fisheries Wealth:

- Surveying, inventorying, collecting, and conserving Plant genetic resources
  - (wheat, barley, vegetables and rangeland species)
- Seed multiplication and distribution
- Ex-situ conservation
- On farm conservation
- Field genebanks
- Protected areas
- Genetic diversity studies
- Improvement programs for PGR

(Oman's FAO country report for PGRFA, 2008)

Triticum in Oman

Genetic Resources and Crop Evolution 50: 83–87, 2003.

A note about *Triticum* in Oman

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Key words: Landrace, New botanical varieties, Oman, *Triticum*

Abstract

Little is known about the diversity of wheat (*Triticum* spp.) in Oman. Results of a survey conducted in two remote mountain oases of northern Oman indicate that there exists considerable morphological variation within and among the five traditional landraces of wheat cultivated. Within two of the landraces grown on irrigated terraces, sized between 2 and 100 m^2, two new botanical wheat varieties (*Triticum aestivum* var. *baladseetense* and var. *maqtaense*) were identified of which the agronomic properties, in particular tolerance to drought and heat, and the nutritional value require further investigation.

Introduction

The Arabian peninsula and Oman, situated at its eastern edge, have an ancient cultivation history of both bread wheat (*Triticum aestivum* L. s. l.) and durum wheat (*Triticum durum* Desf.; (Schwartz 1939; Guarino 1990)). However, given Oman's long geo-political isolation, little is known about the morphological variation, genetic structure, the agronomic properties (such as tolerance against heat, drought and salinity) and quality characteristics of these traditional wheat landraces. Due to the aridity of its climate (from 30 to 300 mm annual precipitation compared to a potential evapotranspiration > 2000 mm) irrigation is necessary for crop growth all over in Oman except for the southernmost area which is characterized by a summer monsoon. This leads to only about 2% of Oman's total land surface, equivalent to 150,377 ha being cultivated (Anonymous 1995).

Commodity wise and technologically irrigated crop production in Oman is divided into two sectors. The first one is in the flat, northern Al-Batinah region where a modern, market-oriented agriculture on large land holdings focuses on the production of vegetables for human consumption, and on corn (*Zea mays* L.) and alfalfa (*Medicago sativa* L.) for milk production. This system depends on furrow and sprinkler systems drawing subsurface water from pump wells. These are fed by aquifers originating in the Jabel Akhdar mountains (Figure 1).

The second sector, which is of interest for this study, consists of traditional, mainly subsistence-oriented oasis systems which date back over 3000 years and produce dates (*Phoenix dactylifera* L.), wheat, sorghum (*Sorghum bicolor* Moench s. l.), barley (*Hordeum vulgare* L. s. l.), alfalfa, lime (*Citrus aurantiifolia* (Christm. et Panz.) Swingle), garlic (*Allium sativum* L.), onion (*Allium cepa* L.) and banana (*Musa* spp.) in rotation systems on small terraces sized between 2 and 100 m^2. Located in mountain valleys of the North and Central Oman mountains, these systems rely on ancient spring or falaj irrigation infrastructure which tends to rapidly deteriorate as the economic pressure of a globalized food commodity market reached these villages with the advent of modern access roads.

The basic irrigation infrastructure of the falaj systems has been intensively investigated by several authors (Cost 1983; Dutton 1986; Norman et al. 1998; Omezzine and Lokman 1998; Wilkinson 1974, 1977).

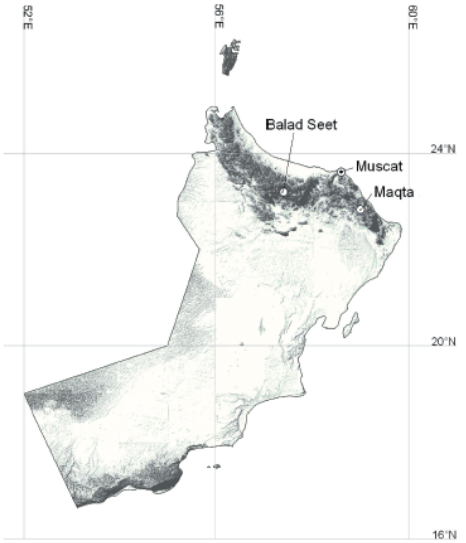

Figure 1. Map of Oman indicating the location of the two mountain oases of Balad Seet and Maqta where the wheat germplasm was collected.

The water use efficiency and nutrient cycling of traditional and introduced crop species in traditional mountain oases of Oman is one of the subjects of an ongoing interdisciplinary project on 'Transformation Processes in Oasis systems of Oman' conducted jointly by scientists from the German Universities of Tuebingen, Stuttgart and Kassel, the German Archeological Institute and Sultan Qaboos University in Oman.

First wheat collections by the Omani Ministry of Agriculture differentiated a number of landraces (Sarraya, Walidi, Cooley, Greda, Missani and Hamira) which were found to be increasingly replaced by higher-yielding modern varieties (Anonymous 2000). In 1996 the total area sown to Omani wheat typically growing from November to April (Alkhtar 1981) in Interior, Sharquia, Dhahera, and Musandam was only about 238 ha compared to 1000 ha in 1988.

The purpose of this pilot study was to collect wheat seeds from farmers' fields in two remote mountain

Buerkert et al 2003

Emmer (*Triticum dicoccon* Schrank) in Oman

Genetic Resources and Crop Evolution 51: 111–113, 2004.

Short communication

Emmer (*Triticum dicoccon* Schrank) in Oman[†]

K. Hammer[1,*], A.A. Filatenko[2], S. Alkhanjari[1,3], A. Al-Maskri[3] and A. Buerkert[1]
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Received 6 February 2003; accepted in revised form 25 April 2003

Key words: Morphological classification, Oman, *Triticum dicoccon*

Abstract

Emmer (*Triticum dicoccon*) was collected recently in northern Oman. The material was analyzed morphologically and phenologically. It belongs to the Asiatic emmers (subsp. *asiaticum*) and not to the Ethiopian ones (subsp. *abyssinicum*), distributed in Ethiopia and Yemen, as originally expected. The determination of the material resulted in var. *hausknechtianum* and var. *aeruginosum*.

Introduction

Emmer belongs to the oldest crops of the world (Zohary and Hopf 1993; Damania 1998). Emmer was domesticated from the wild progenitor *Triticum dicoccoides* (Körn. ex Asch. et Graebn.) Schweinf. in its area of natural distribution, that is in the mountains of the Fertile Crescent, in Iran, Iraq, Jordan, Syria, Israel and Palestine (Perrino et al. 1996). Later on, the domesticate experienced a large distribution from Northern Africa through most parts of Europe and the Mediterranean area to Central Asia (Szabó and Hammer 1996; Filatenko et al. 2001). In the South the emmer reached Ethiopia. But there have been no relevant reports of emmer from the Arabian peninsula (Schwartz 1939; Mandaville 1990) with the exception of Yemen from where it was reported under the folk-name of 'alas' (Flaksberger 1935; Dorofeev et al. 1979; Wood 1997). The same folkname was reported for the first time from Oman in the last decennium of the 20th century (Guarino 1990) indicating the long overlooked *Triticum dicoccon* Schrank for remote parts of Northern Oman. New exploration confirmed the existence of emmer in Oman. In March 2002 it was possible to collect seeds (Hammer et al. in print) as a contribution to conserve and use the genetic diversity of emmer.

Material and methods

Six populations of emmer have been collected in Oman in 2002, however recent cultivation of this crop was observed, that is all samples have been obtained from seed stores. Soon after collecting, the material was grown in experimental fields at Witzenhausen (Germany) in May 2002. Four samples showed a reasonably good germination and could be used for a phenological and morphological examination (anatomical differences have been already described by Percival 1921), according to the standard procedure developed by the Vavilov-Institute in St. Petersburg (Russia) (Dorofeev et al. 1979). Chromosome numbers were counted from the root-tips of germinating plants using aceto-carmin as a colorant.

[†]Dedicated to the memory of the outstanding Armenian wheat researcher P.A. Gandilijan (15-3-1929–26-3-2001).

Results and discussion

Different morphological types could be found during a first evaluation of the seed samples. All samples contained also seeds *of Triticum durum* Desf., *T. aestivum* L. s.l., *Hordeum vulgare* L. s.l., *Avena sativa* L. (2n = 42 according to our determination) and other crop plants, such as *Raphanus sativus* L. and weeds.

Description of the emmer-plants: Root system little developed. Plant height low or medium (Misfat village, no. 4). Number of shoots per plant low (Misfat, no. 3, somewhat higher). Straw very thin (2.0–2.5 mm), somewhat thicker in Misfat (no. 3). Straw filled or nearly filled, also in the uppermost internodia. Leaves erect, nearly touching the shoot. Leaf-blades short (upper leaf 11–28 cm), narrow (3–10 mm), silky pubescent. Upper leaves with a few cilia. Leaf blade generally without hairs, very seldom with some short hairs. Spikes short, medium dense or dense (D = 30–44). Awns 1.5–2 times longer than the spike, soft. Empty glumes oblong egg-shaped with a short keel-tooth. Side nerve little developed, tapering into a small elevation. Shoulder absent (see Figure 1). Grain 8–10 mm long, 2.0–3.0 mm high and 2.0–3.0 mm wide, of dark colour.

Some characters resembled the emmers of Ethiopia (*Triticum dicoccon* subsp. *abyssinicum* Vav.), which are also distributed in Yemen (Wood 1997) and India, particularly filled straw, cilia on the silky-pubescent upper leaf blades, spikes oblong-rhombic, straw and anthers violet. These characters can be interpreted as a special adaptation to the conditions of Southern Arabia.

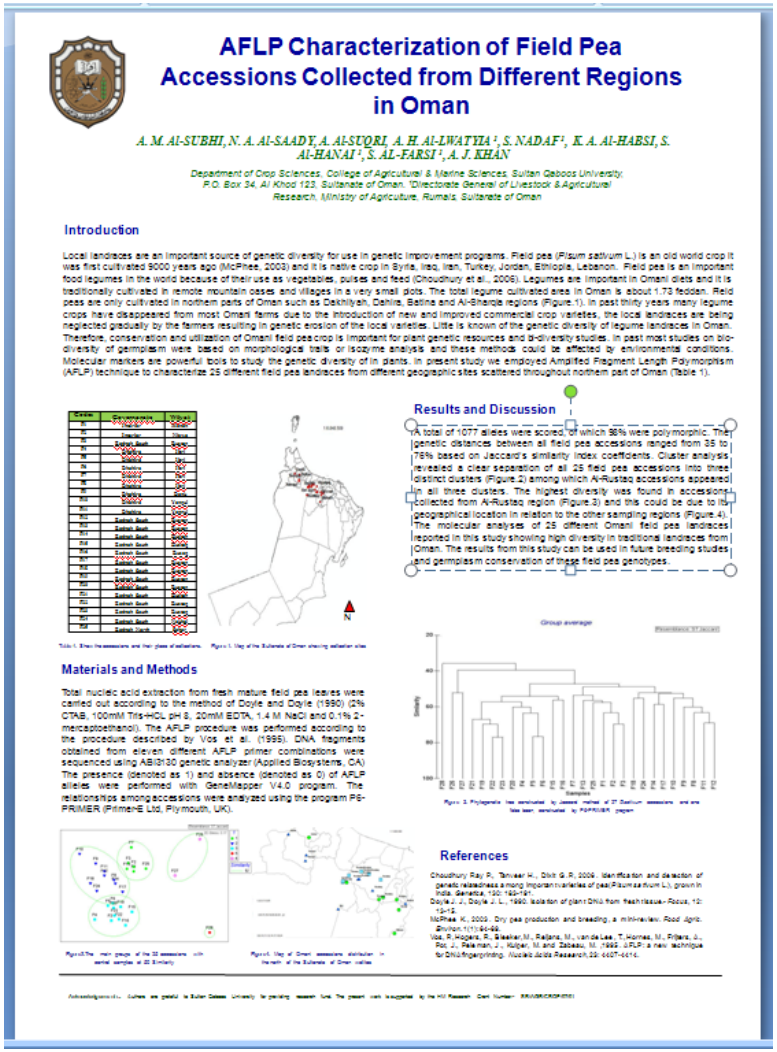
But most of the characters observed prove that the material belongs to Asiatic emmer (*T. dicoccon* subsp. *asiaticum* Vav.). A detailed infraspecific determination resulted in var. *hausknechtianum* A. Schulz and var. *aeruginosum* Flaksb. which are the most common races from Asia. Both races belong to convar. *transcaucasicum* Flaksb., the known distribution of which also includes Iran.

Therefore, the introduction of emmer into Oman might have occurred from Iran via the Gulf of Oman. The time of introduction is still unclear. Similar introduction routes could be shown for *Coriandrum sativum* L. in which a specific race has been described from Oman (var. *omanense* Diederichsen – Diederichsen and Hammer 2003).

Figure 1. A sample of *Triticum dicoccon* subsp. *asiaticum* var. *hausknechtianum* from MAF Bahla (North Oman) reproduced in Witzenhausen (23. 07. 2002). x 1.

Buerkert et al 2004

Collection, Characterization & Conservation of Legume Genetic Resources in Oman



AFLP Characterization of Field Pea Accessions Collected from Different Regions in Oman

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Introduction

Local landraces are an important source of genetic diversity for use in genetic improvement programs. Field pea (Pisum sativum L.) is an old world crop it was first cultivated 9000 years ago (McPhee, 2003) and it is native crop in Syria, Iraq, Iran, Turkey, Jordan, Ethiopia, Lebanon. Field pea is an important food legumes in the world because of their use as vegetables, pulses and feed (Choudhury et al., 2006). Legumes are important in Omani diets and it is traditionally cultivated in remote mountain oases and villages in a very small plots. The total legume cultivated area in Oman is about 1.73 feddan. Field peas are only cultivated in northern parts of Oman such as Dakhiliyah, Dahira, Batina and Al-Sharqia regions (Figure.1). In past thirty years many legume crops have disappeared from most Omani farms due to the introduction of new and improved commercial crop varieties, the local landraces are being neglected gradually by the farmers resulting in genetic erosion of the local varieties. Little is known of the genetic diversity of legume landraces in Oman. Therefore, conservation and utilization of Omani field pea crop is important for plant genetic resources and di-versity studies. In past most studies on bio-diversity of germplasm were based on morphological traits or isozyme analysis and these methods could be affected by environmental conditions. Molecular markers are powerful tools to study the genetic diversity of in plants. In present study we employed Amplified Fragment Length Polymorphism (AFLP) technique to characterize 25 different field pea landraces from different geographic sites scattered throughout northern part of Oman (Table 1).

Results and Discussion

A total of 1077 alleles were scored, of which 98% were polymorphic. The genetic distances between all field pea accessions ranged from 35 to 78% based on Jaccard's similarity index coefficients. Cluster analysis revealed a clear separation of all 25 field pea accessions into three distinct clusters (Figure.2) among which Al-Rustaq accessions appeared in all three clusters. The highest diversity was found in accessions collected from Al-Rustaq region (Figure.3) and this could be due to its geographical location in relation to the other sampling regions (Figure.4). The molecular analyses of 25 different Omani field pea landraces reported in this study showing high diversity in traditional landraces from Oman. The results from this study can be used in future breeding studies and germplasm conservation of these field pea genotypes.

Materials and Methods

Total nucleic acid extraction from fresh mature field pea leaves were carried out according to the method of Doyle and Doyle (1990) (2% CTAB, 100mM Tris-HCL pH 8, 20mM EDTA, 1.4 M NaCl and 0.1% 2-mercaptoethanol). The AFLP procedure was performed according to the procedure described by Vos et al. (1995). DNA fragments obtained from eleven different AFLP primer combinations were sequenced using ABI3130 genetic analyzer (Applied Biosystems, CA). The presence (denoted as 1) and absence (denoted as 0) of AFLP alleles were performed with GeneMapper V4.0 program. The relationships among accessions were analyzed using the program PB-PRIMER (PrimerE Ltd, Plymouth, UK).

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Acknowledgements: Authors are grateful to Sultan Qaboos University for providing research fund. The present work is supported by the RO Research Grant Number: SR/AGR/CROP/07/01

Morphological and Molecular Characterization of Omani Indigenous Fenugreek accessions

Morphological and Molecular Diversity within Omani Cowpea (*Vigna unguiculata* (L.) Walp.) Landraces

Characterization of Omani Faba bean accessions according to their molecular and morphological traits

Banana Diversity in Oman

Analysis of genetic diversity in banana cultivars (*Musa* cvs.) from the South of Oman using AFLP markers and classification by phylogenetic, hierarchical clustering and principal component analyses[*]

Umezuruike Linus Opara,[†1] Dan Jacobson,[2] and Nadiya Abubakar Al-Saady[3]

Evaluation of Genetic Diversity in Omani Banana Cultivars (*Musa* cvs.) using AFLP Markers

Nadiya Al-Saady, Abbas Al-Lawati, Ali Al-subhi and Akhtar Khan

The climatic conditions and multiplicity of ecosystems also mean that Oman has a rich microbial life

❸ Micro organism and fungi

- Marine sponges, corals and invertebrates harbor diverse and unique bacterial strains
- In addition, Oman's desert soils contain unique species of bacteria Including "water tracking cyanobacteria" – hydrotaxis
- Marine Microalgae and diatoms adapted to growth in Oman's Costal waters are also a useful resource for future biotechnological Projects in collaboration with other Centers of excellence in Oman
- The role of microbes in soil stabilization and water retention is also important
- Marine Microbial Diversity needs to be mapped and conserved due to its immense biotechnological potential (e.g. Quorum sensing inhibitors from Oman Marine Bacteria offer potentially new antibiotics)


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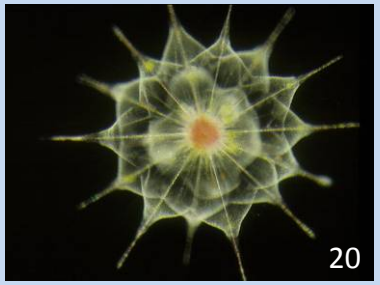
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The climatic conditions and multiplicity of ecosystems also mean that Oman has a rich fungal diversity

❸ Micro organisms and fungi

- With Oman's unique and highly endemic species, unique fungal strains will be associated with them.
- Little is known about the fungal communities of Oman.
- Of the little that is known, many new fungal species have been described which could be beneficial to humans and agriculture.
- Fungal species could be the cause of diseases in agriculture; they could also be effective as bio-control agents for pests and diseases in agriculture, or could yield novel natural products with exciting chemistries.

"It is estimated that there could be at least 7,200 species of fungi in Oman, at the moment only about 200 of them are known"

Professor Mike Deadman, 2010

Message 1: Oman has diverse, unique genetic resources

UNIQUENESS AND DIVERSITY ARE THE SOURCES OF VALUE IN GENETIC RESOURCES

Food security could be enhanced through the conservation and better exploitation of indigenous genetic resources…

Economic benefits

Over the next 40–50 years, the world's population is projected to reach 9 billion, up from 6.8 billion

Genetic resources in agriculture are the key to food security

Agro-ecosystems capacity to maintain and increase their productivity, and to adapt to changing circumstances, is critical to the food security of the world's population

Genetically diverse populations provide a range of options to meet future challenges

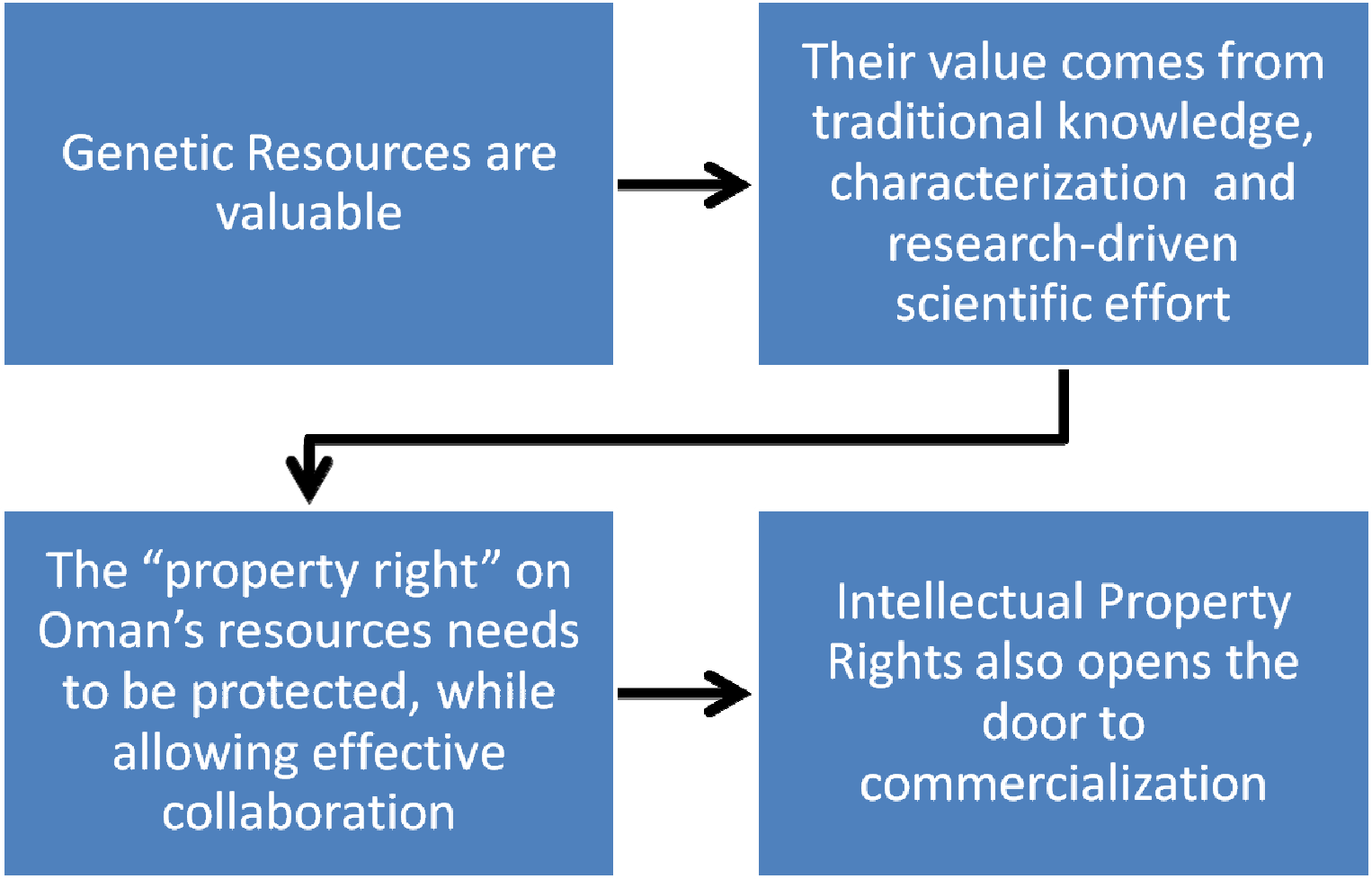
The conservation of agricultural genetic resources in the Animal & Plant Genetic Resource Centers genebank will provide insurance to future food security crises

New genetic resources for agriculture that are yet unknown could be uncovered

The Genetic resources in the genebank would be a source for future breeding programs to improve agricultural production

The creation of Intellectual Property Rights related to genetic resources would protect and enhance Oman's assets

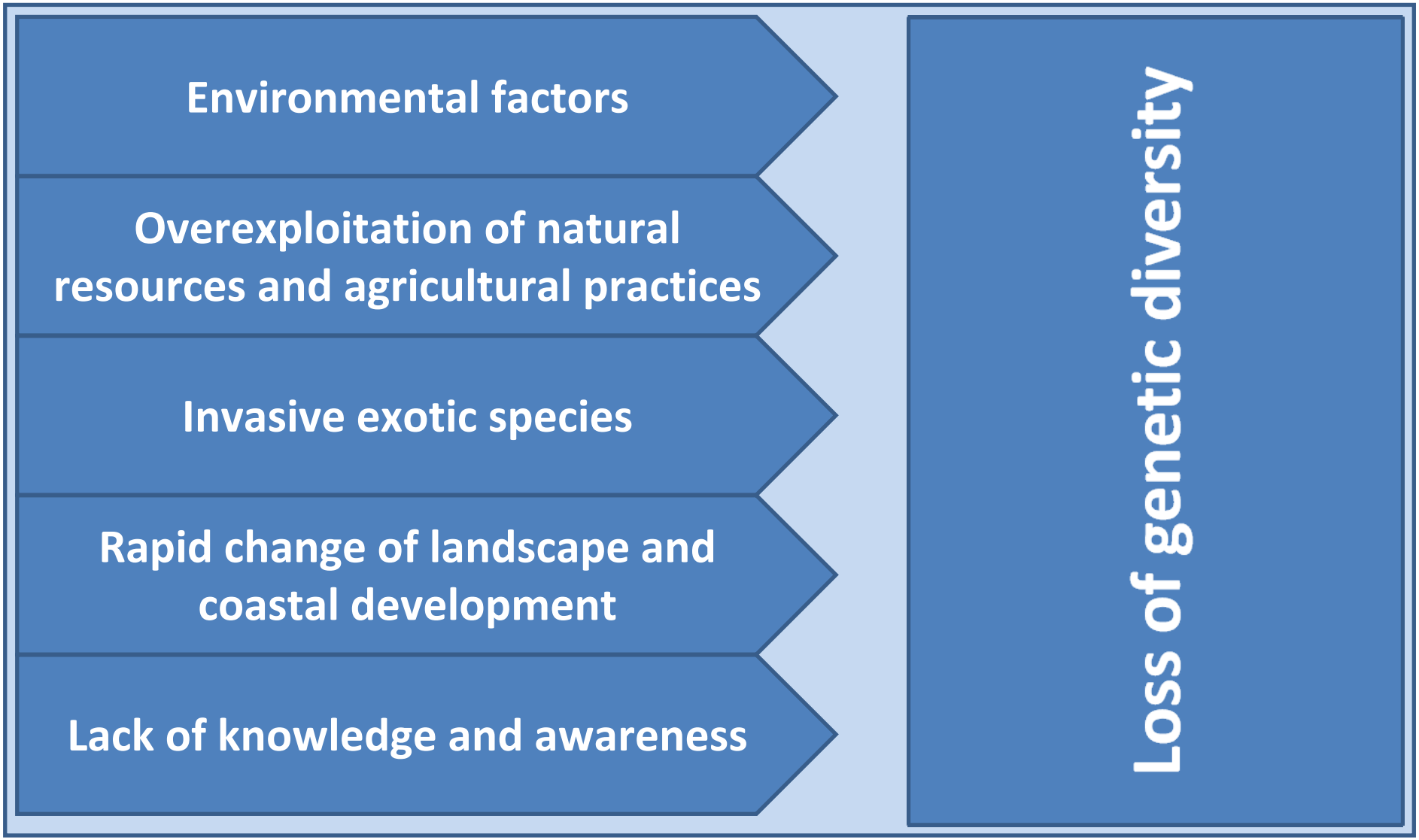
Economic benefits



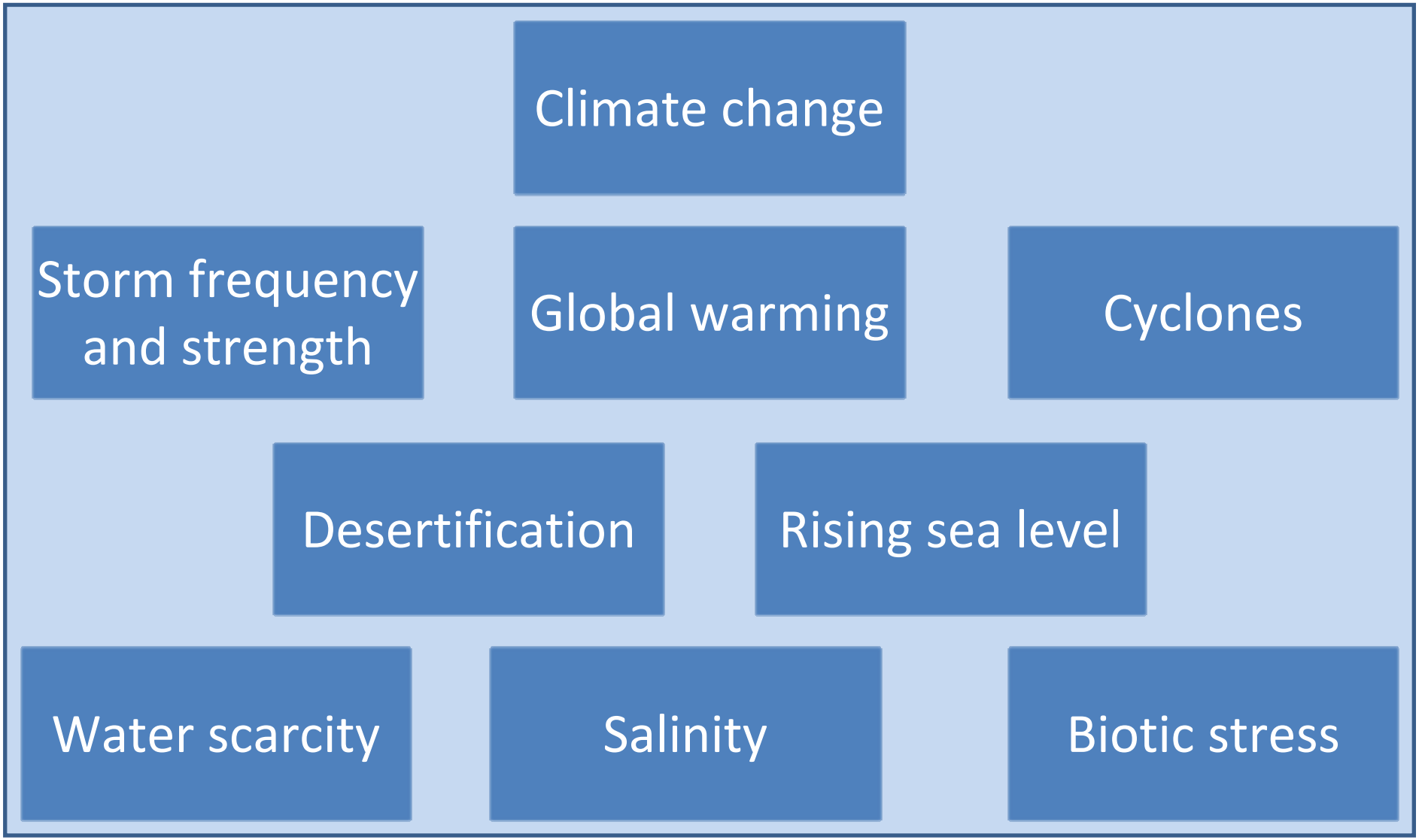
Message 2: Genetic resources, if used sustainably and creatively, could generate substantial benefits for Oman

VALUE FROM GENETIC RESOURCES COULD BE CREATED THROUGH FOOD SECURITY, HEALTH PRODUCTS, BUSINESS OPPORTUNITIES AND TOURISM

These genetic resources and the associated values are under threat due to a range of factors ...



A range of global and regional environmental factors put genetic diversity at risk…



… a changing landscape made worse by lost traditional agricultural practices and hence genetic biodiversity

Rotational herding	Overgrazing
Diverse crops	Mono-culture
Extensive agriculture	Intensive agriculture

Message 3: Many shocks to our environment are jeopardizing our genetic resources and associated benefits

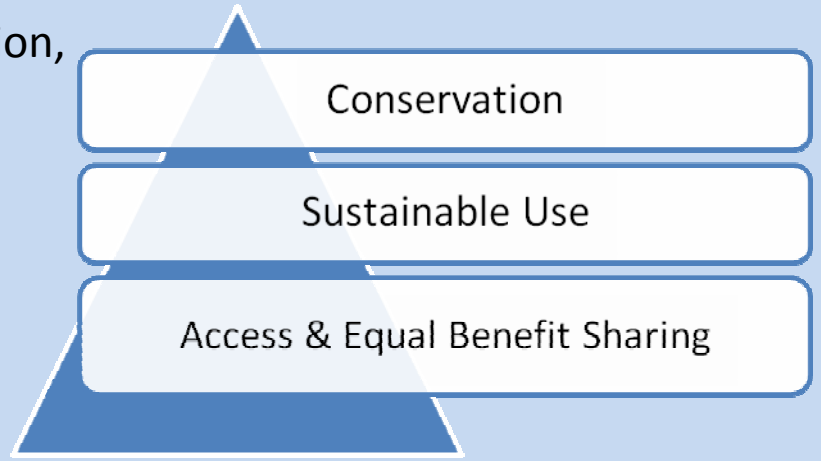
GLOBAL AND LOCAL THREATS PUT OUR GENETIC RESOURCES AT RISK AND WITH THEM OUR HERITAGE AND POTENTIAL BENEFIT

Oman is committed to global initiatives in biodiversity conservation in general and genetic resources in particular

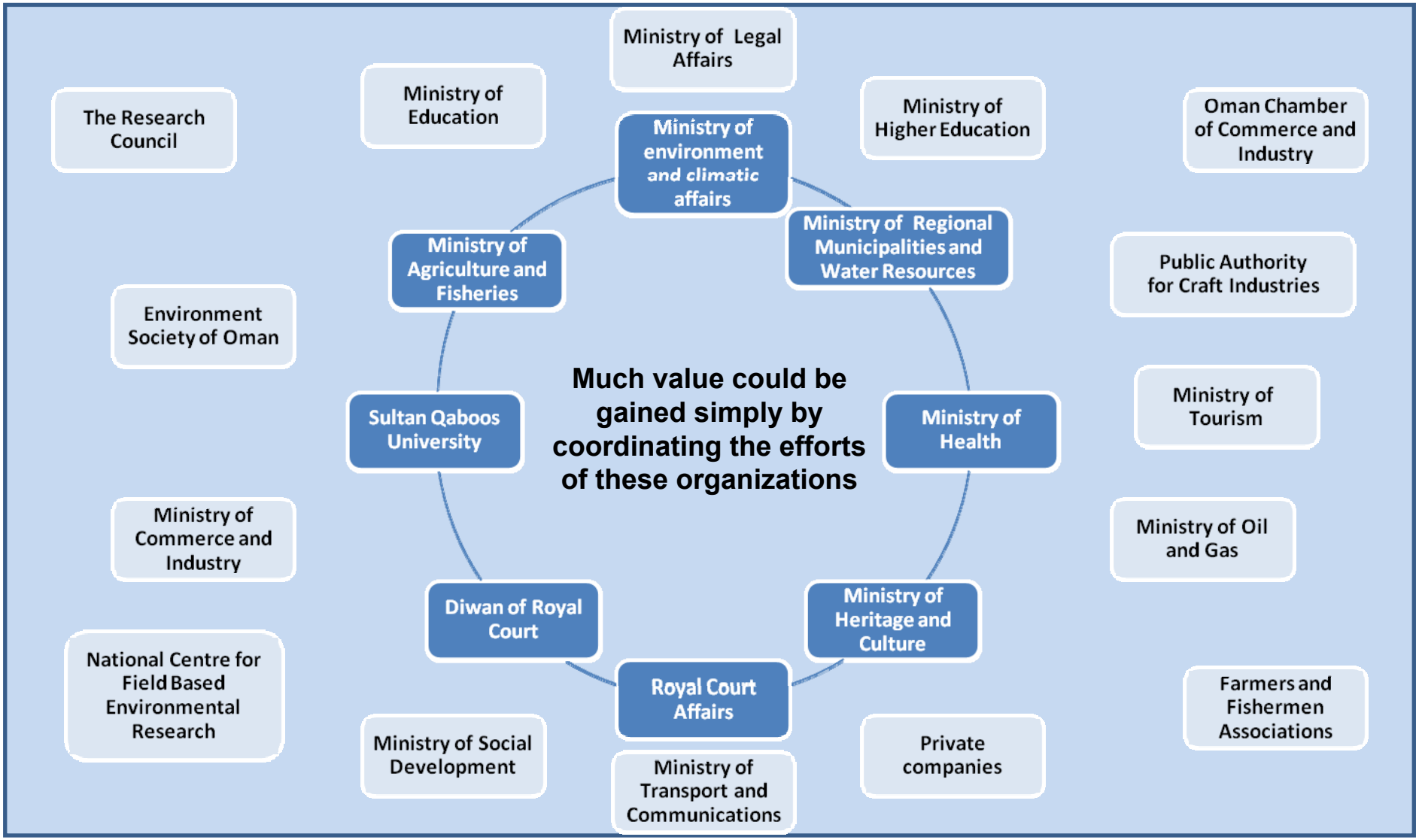
- Royal Decrees were issued on the ratification of international treaties such as:
  - The convention of Biological Diversity (CBD) (Royal Decree No. 119/1994)
  - The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (Royal Decree No. 10/1997)
  - The International Treaty on Plant Genetic Resources for Food and Agriculture (57/2004)

- The overall aim of the CBD focuses on conservation, sustainable utilization and fair and equitable benefit sharing as per the Nagoya Protocol

- A National Biodiversity Strategy and Action Plan (NBSAP) was published in 2001…



… but national efforts are fragmented among organizations working directly or indirectly on genetic resources…



Other challenges for a sustainable conservation/utilization of genetic resources include lack of human capacity….

- Few scientists are available in the country in the field of genetic resource conservation especially those fully associated with conservation of genetic resources.
- Lack of glamour in the field of genetic resource conservation discourages the younger generation from perusing this field.
- More and more people are seeking jobs in the urban community thus farms are being tended by expatriates hence valuable traditional knowledge is not passed down from generation to generation.
- No incentives are available to encourage the individuals to continue to work on the area of conservation .
- Lack of sufficient support to help individuals realize the full potential of local genetic resources and the economic and social gain from them.

… lack of a unified reference national database and proper management and monitoring of genetic resources ….

There is currently no national database of the genetic resources of Oman.

Databases exist in the different organizations mainly for use by the specific organization.

The national database accessible to all stakeholders would encourage standardization of data and encourage communication amongst the different stake holders.

The database would enable international collaboration and assist in fulfilling some of Oman's obligations under international treaties.

The monitoring systems are at an early stage of development.

Message 4: Efforts have been made so that there is a strong foundation on which to build a center but more is needed

THE GENETIC RESOURCES SECTOR COULD FURTHER EXPAND THROUGH A COORDINATED, SUSTAINED AND AMBITIOUS PLAN

The APGRC will aim at excellence across all the areas relevant to genetic resources, from education and research to innovation and investment…

Mission

To promote the recognition, sustainable utilization and valuation of the genetics diversity inherent in Oman's animals, plants and microorganisms as a natural heritage resource.

Motto

Oman's collaborative organization for advancing sustainable use of animal and plant genetic resources through education, research and innovation.

Vision

In the coming decade, the APGRC will develop as a collaborative hub for all animal and plant genetic resources activities. It will promote the sustainable use of knowledge across economic sectors and social segments and create value from world-class research and practical innovation. This national collaborative effort will be open to the world of international science and have a specific concern for building a recognized local capacity in the field of genetic resources.

… the comprehensive goals should complement and reinforce each other in an integrated, open center

Goals

Policy

Coordination:
Strengthening dialogue, coordination and synergy among stakeholders

Advice:
providing advice on genetic resources-related policies, laws and regulations based on sustainable development

Building capacity and expertise

Documentation:
production of an accessible inventory and a description of Oman's wealth of genetic resources

Conservation:
conservation, management and characterization of Oman's genetic resources to facilitate its use

Research:
identification, quantification and mitigation of the threats impacting genetic resources

Education:
Building capacity and excellence in the field of genetic resources for the national benefit

Extracting value

Utilization:
facilitation of the sustainable use of its genetic resources for the benefit of all of the people of Oman

Services:
enhancing economic opportunities for rural citizens, communities, and society as a whole

Innovation
translating research outputs into viable business propositions

Investment:
facilitating genetic resources-related foreign direct investments in Oman

The first activities to start (and to continue) shall be the on-going collaboration with stakeholders and focus on awareness

Themes	Programs			
Conservation	In situ conservation	Ex situ conservation	On farm conservation	Conservation method advice
Database, access and documentation	Information system backbone	Focal Point for International Treaties	Data collection and maintenance	Public awareness
Policy and Advisory	Genetics Foresight	Strategic priorities for genetic resources	Coordination and dialogue platform	Policy advice and sustainable regulations
Research and Training	In-house research	Research grants and collaboration	Postgraduate research training	Continuing and professional education
Services and development	Extension services	Community engagement	Genetic resources development	Value-added Product development
IP and Innovation	IPR assistance and advice	Knowledge broker	Genetic innovation grants	Acquiring and protecting IP
International Collaboration and investments	Data and genetic resources networks	Collaborative research projects	Expert and scholar mobility	One-stop shop for investment and FDI

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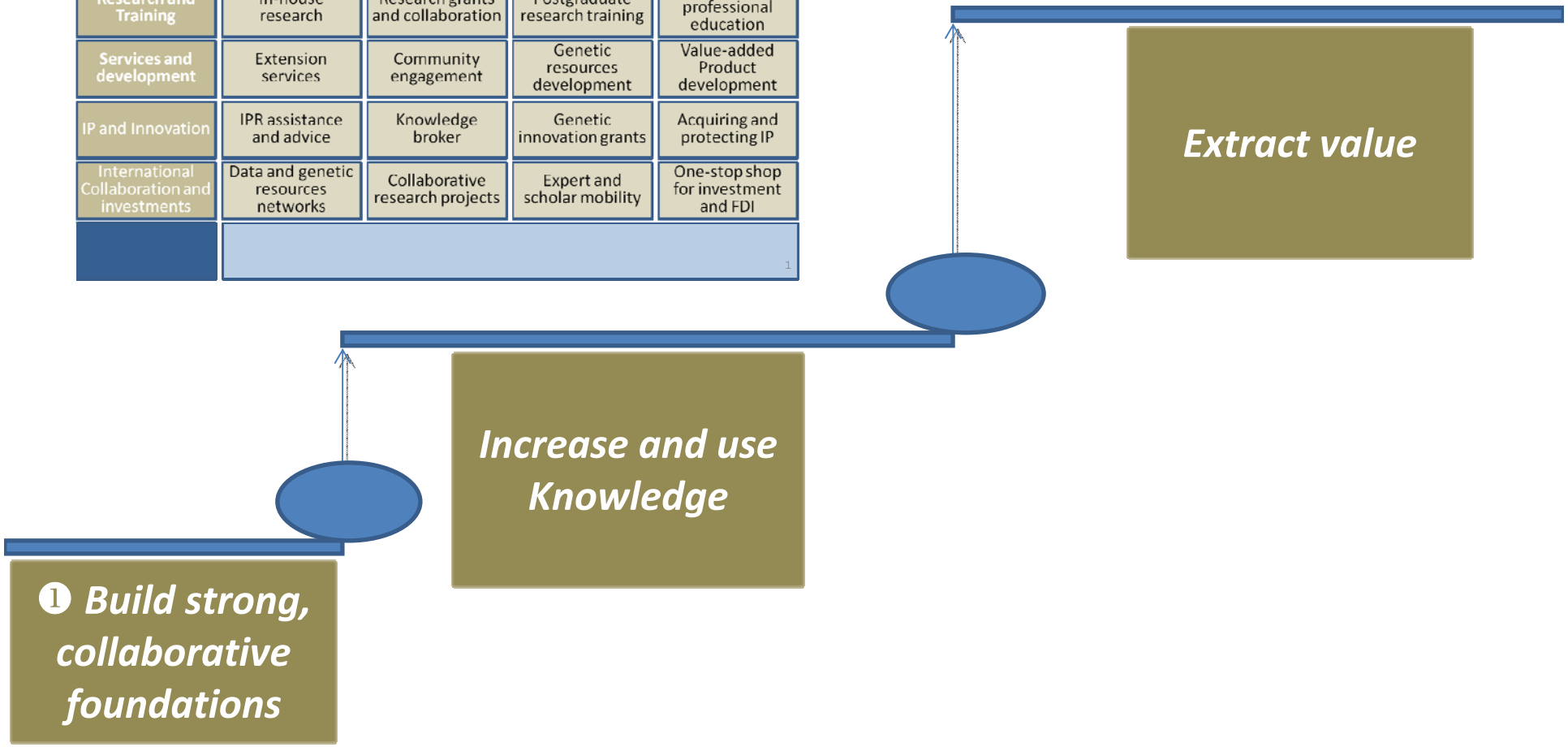
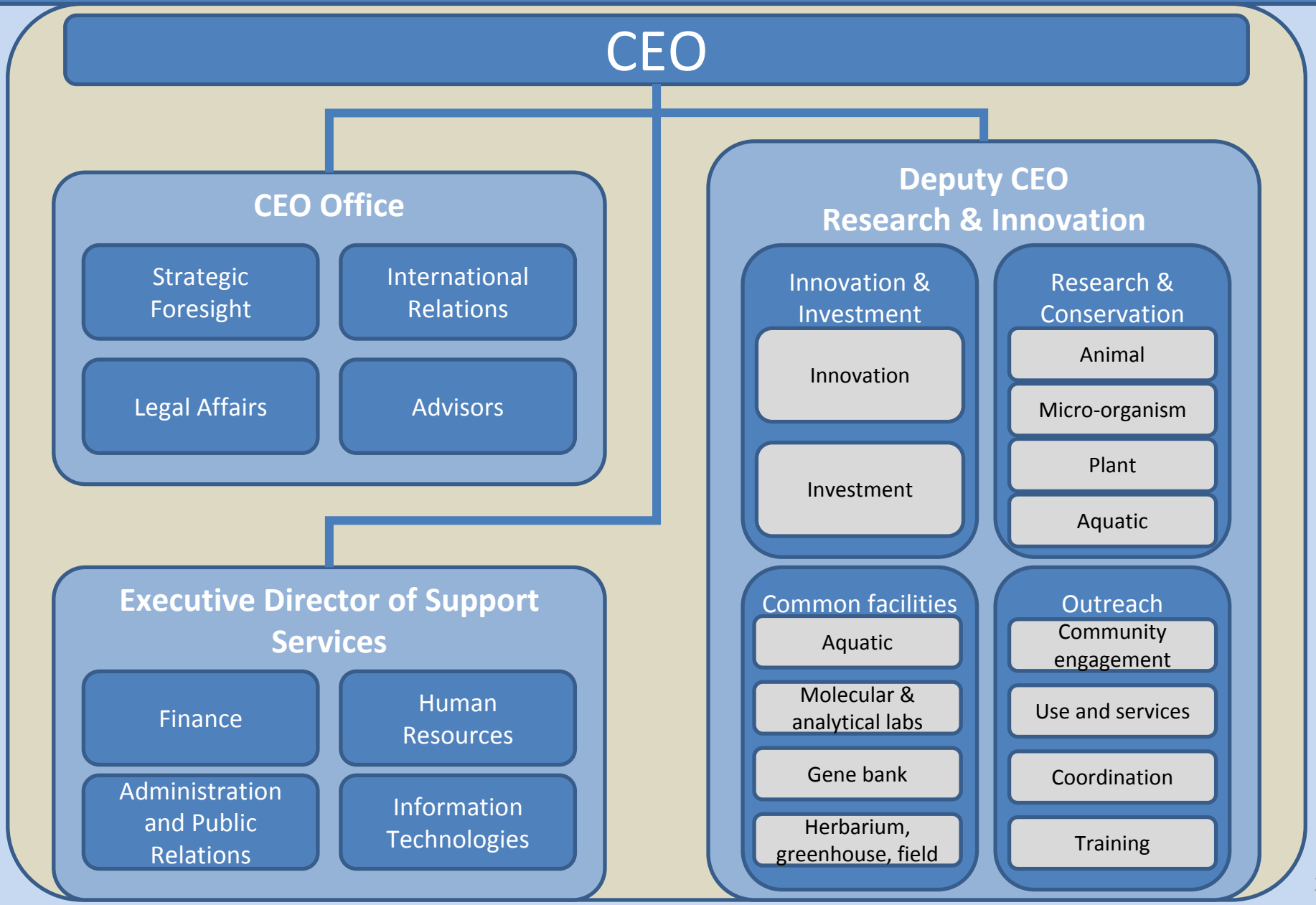


The organization of the APGRC will be based on clear responsibilities and program allocation in line with the center's mission and goals



A NATIONAL COORDINATED EFFORT TO USE MODERN GENETIC SCIENCE AND TECHNOLOGY IN ORDER TO TRANSITION TO A KNOWLEDGE-BASED ECONOMY USING OMAN'S UNIQUE RESOURCES

ANIMAL AND PLANT GENETIC RESOURCES CENTER

Definition & scope

Genetic resources are biological materials of actual or potential value containing functional units of heredity = THE BIODIVERSITY AT THE GENETIC LEVEL THAT COULD BENEFIT OMAN AND OMANIS

The Animal and Plant Genetic Resources will be about conserving Oman's unique resources *AND* using them sustainably

Mission

To promote the recognition, sustainable exploitation and valuation of the genetics diversity inherent in Oman's animals, plants and microorganisms as a natural heritage resource.

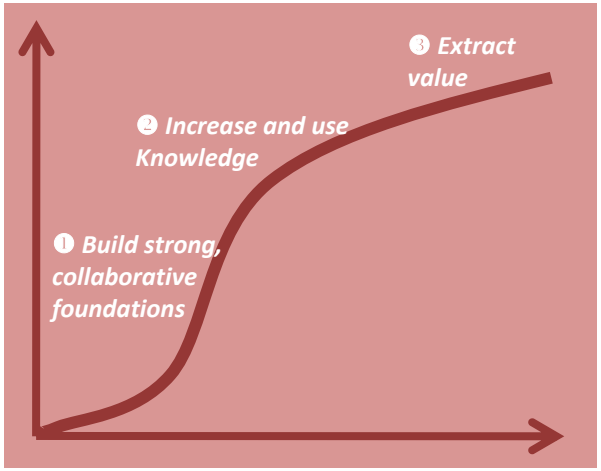
APGRC *= Oman's collaborative organization for advancing sustainable use of animal and plant genetic resources through education, research and innovation.*

Goals

❶ Policy	❷ Building capacity and expertise		❸ Extracting value	
Coordination	Documentation	Conservation	Utilization	Services
Advice	Research	Education	Innovation	Investment

TANGIBLE BENEFITS

- **Capacity Building:** Scientists, experts and technologists ✓
- **Food Security:** Increased productivity and sustainability of agricultural marine resources ✓
- **Human Welfare :** Health benefits, traditional & advanced pharmaceuticals using biotechnology ✓
- **Economic benefits:** Intellectual Property, knowledge & innovation ✓



Coordination and Dialogue Platform

مجلس البحث العلمي

نحو نظام ابتكار وطني فعال

غرين العالمية للتوثيق و التدريب

Grin-Global Documentation Training

التوثيق، تنظيم وادارة بيانات البنك الوراثي، والتدريب في نظام البنك الوراثي للتوثيق– غرين العالمية

Documentation, management and administration of gene bank data; a training of the gene bank documentation system Grin-Global

8th and 9th May 2012.
Muscat

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