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Inventory- Users and Providers of Genetic Resources

Nagoya Protocol



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BIODIVERSITY AND PROTECTED AREAS EXPERT

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Inventory: Users and Providers of Genetic Resources

Several actors are involved in the implementation of the Nagoya protocol, including governmental, non-profit sectors, botanic gardens, seeds collections, gene banks, research collections, universities, zoos and aquaria. In addition, industrial sectors such as pharmaceuticals, cosmetics, agribusiness and horticulture, wildlife traders, and farm animal breeders / livestock producers will be affected from the implementation of this protocol in Jordan. All sectors are using genetic resources either for commercial or non-commercial values.

This document was prepared to understand the potential users and providers of genetic resources and traditional knowledge associated with genetic resources in Jordan (Annex I).

Part One: Users of Genetic Resources in Jordan

Several potential users of genetic resources and traditional knowledge associated with might occur in Jordan according to the following descriptions arranged according to genetic resources uses types:

1.1 Health and Personal Care

It is represented by three major parts which are: 1) pharmacy, 2) herbal medicine and 3) cosmetic and personal care. The following illustrate each part with more details.

1.1.1 Pharmacy

Pharmacy industry uses a wide range of genetic resources for research and development purposes including plants, animals, bacteria, protists, fungi and viruses (or their parts or derivatives). It is considered the third-largest foreign currency earner for Jordan after clothing and potash exports, with an export volume rising close to \$181 million in 2001 from \$154 million in 2015 (Al-Wazaify and Younis, 2016). Currently, there are 8,414 registered pharmacists in Jordan, where the majority (93.3%) are privately owned, and the others are governmental or pharmacies of the United Nations Relief and Works Agency for Palestine Refugees in the Near East.

Due to the growing interest in pharmacy; Jordan Food and Drugs Association (JFDA) was established in 2003, to regulate drugs, ensure quality control, and oversee food safety and hygiene services. In addition, five clinical research organizations occur in Jordan that are specialized in pharmaceutical research services for the pharmaceutical industry and these are:

1. The International Pharmaceutical Research Center (IPRC)

2. Triumpharma
3. Acdima
4. The Jordanian Pharmaceutical Research Centre
5. The Pharmaceutical Research Unit

Moreover, several pharmaceutical companies are actively working in Jordan such as, but not limited to Hikma Pharmaceuticals, Dar Al Dawa, the Jordanian Pharmaceutical Manufacturing Co JPM Group, Amman Pharmaceutical Industries, and Pharma International Company. All companies contains research units aiming to investigate genetic resources and development for discovering new active substances.

Pharmacy is becoming a common educational branch in the majority of the universities in Jordan, where the two main public schools of pharmacy are located at the University of Jordan (JU) in Amman and Jordan University of Science and Technology (JUST), located in Irbid. They aims to promote a high caliber of pharmaceutical education, scientific research, and community-based services.

1.1.2 Herbal medicine

It is considered a common activity in Jordan, where hundreds of herbalists are distributed over the Jordanian territories, and practicing their knowledge about plants usage in medicine on local communities and Jordanian citizens. A study which was conducted by Abu-Irmaileh and Afifi, 2003 showed that the number of handled medicinal plant materials in around 100 herbalist shops exceeds 150 plants. Plant parts used in the herbal medicine varied from the leaves, flowers and shoots, fruits, seeds, corn silk, oil and rhizomes. Those herbalists obtain genetic resources and the majority of them holds the traditional knowledge which highlight the importance of targeting them as a key stakeholder in the future.

1.1.3 Cosmetics and personal care

The users of this sector show a rather minor demand for new genetic resources due to the highly cost-intensive and time-consuming introduction of new ingredients since a large variety of plants already used. Cosmetics and personal care is practiced either by companies or individuals in Jordan such as:

1. Al Madaen Chemicals: It deals with Dead Sea Soaps, Normal Soaps, Naked Soaps, Dead Sea Bath Slats, Dead Sea Hand Wash, Dead Sea Lotions, Dead Sea Body Wash, Camel Milk Face and Body Soaps
2. Al-Riyad Group Chemicals: It deals with Powder Detergents and Toilet Soaps

3. Al-Safadi for Industry and Trade: its business activities deals with Sanitary Papers, Facial Tissues, Toilet Rolls, Kitchen roll, Insert diapers, Handkerchiefs, and Wet wipes
4. Jordan Egyptian Co. Cosmetics Chemicals: All types of Dead sea cosmetics and soaps
5. Juman Chemicals (Cosmetics): Dead Sea Skin Care, Dead Sea Facial Care, Dead Sea Medical Care, Medical Cosmetics
6. Munir Sukhtian Group Chemicals: All types of cosmetics and sanitary chemicals (soaps, toothpaste, crèmes, etc.)
7. Sigma Detergent: Laundry Care, Homecare, Personal Care, Industrial and Institution Products, Private Labeling

In addition, several attempts were established by individuals in different localities in Jordan to use plants resources in creating cosmetics and market it to their surroundings.

1.2 Ex-Situ Collections

1.2.1 Botanic Garden

Botanic garden could act as intermediaries for genetic resources, providing plant material and fungal specimens for non- commercial uses to other organizations and\ or individuals including but not limited to research institutes, universities, companies and researchers within and outside Jordan.

In Jordan, the Royal Botanic Garden (RBG) was founded as a non-governmental, non-profit entity in 2005 to conserve the native flora of Jordan. It is located in Tal Al-Rumman, about 25 km north of Amman, on steep slopes overlooking King Talal dam. The RBG envisions a society where there is no longer a need for plant conservation, where the interdependency between people, plants and ecosystems is well understood, and where all Jordanians are assured of a dignified and sustainable life.

1.2.2 Herbarium

Several herbariums exists in Jordan, and belong to different institutions as follows

1.2.2.1 National Herbarium of Jordan

The National Herbarium of Jordan was established at the Royal Botanic Garden to preserve important native specimens and relevant material, and make the specimens available throughout the country. In addition, it was established to provide institutions, scientists, students and other interested parties with a

collection of high-quality herbarium specimens for all the flora of Jordan. The National Herbarium of Jordan launched the National Virtual Herbarium (NVH) in 2012, to allow online consultation of specimens from all of Jordan's herbaria. More than 2,700 specimens are now available onscreen at the NVH, and specimens will continue to be added until the entire flora of Jordan is represented.

1.2.2.2 Herbariums within Universities

The major herbarium is located at the University of Jordan, where it contains about 60,000 specimens collected from various parts of Jordan representing at least 90% of Jordan's Flora. Some of the specimens found are brought as an exchange material between Jordan and some Arab or European countries. A database for majority of the specimens has been established to facilitate quick access to information related to collected specimens. The herbarium consists of a main hall containing plant collection, tables for display and study, exhibitions cupboards, binocular microscopes, shelves for books, computer attached to internet service and few more facilities. In addition, there are two research laboratories for postgraduate students, a tissue culture room, and a pressing room. Moreover, the herbarium is sets adjacent to the greenhouse which is also used for research, teaching and demonstration of related material. The herbarium also includes a front fenced small yard containing living collection of species of some rare and endemic collection of plant specimens. Other herbariums exists at Yarmouk University, which is located at the northern part of Jordan. This herbarium contains more than 20,000 floral specimens collected from various localities in Jordan.

1.2.2.3 Herbariums at Jordan's Protected Areas

Several herbariums were established by the Royal Society for the Conservation of Nature (RSCN) in most of the established protected areas such as Mujib Biosphere Reserve, Ajloun Forest Reserve, Dana Biosphere Reserve, Yarmouk Protected Area and Dibeen Forest Reserve. Although upgrade of the herbariums are needed in means of preservation techniques, and facilities, but they contain important plants species collected from different localities within the protected areas.

1.2.2.4 Herbarium at National Agricultural Research Center

The Herbarium at NARC hosts around 3617 specimens, among which some valuable specimens that had been collected during late 19th century.

1.2.3 Gene Banks

The national gene bank was established at the National Agricultural Research Center (NARC) aiming at conservation of native plant genetic resources and sustainable utilization. So far, the Gene bank at NARC holds around 675 different species represented by more than 4000 accessions of seeds and about 4000 accessions of Herbarium specimens.

1.2.4 Seed Banks

It was established by the Royal Botanic Garden in 2009, where a seed stock of 180 native plant species of Jordan were collected so far. Most seeds are dry and need no special treatment before storing. However, some seeds first require oven curing or are kept for a while in an incubator before being stored in the Seed Bank freezer. For short-term preservation, all seeds are kept in a walk-in freezer at temperatures between 0° C and -10° C, where long-term conservation requires even colder temperatures.

1.2.5 Cultural Collections

Culture collections typically use accessions for taxonomic identification, education and training and scientific research and discovery. Their main activities are identification and preservation, but they are also involved in other activities, such as projects to improve the coordination of microbial resource delivery to researchers, and developing tools to improve networking between culture collections and gene banks.

1.2.6 Museums

Museums could act as an intermediaries for genetic resources, providing specimens to other organizations in and outside Jordan. Specimens that are preserved within the museums are typically provided to other organizations (museums, research institutions or others) for non-commercial use as loans or exchanges for use in taxonomic identification and preservation of either paratype or a holotype specimens.

Museums with collections of plant and animal specimens also use genetic resources. Museums play an important role in conservation programs, providing expert knowledge and specimen identification, often to countries without the capacity to do so themselves. Museums depend on access to genetic resources to replenish collections and maintain active research programs. There are several museum in Jordan, all are situated within universities such as the Animal Museum (Natural History) at the University of Jordan and the Jordanian Natural History Museum at Yarmouk University. Recently, the Badia Research Program has established a museum in the eastern desert of Jordan to hold live-specimens from the Badia of Jordan.

1.2.7 Zoos and Aquaria

A total of three Zoos are located in Amman city, where they exhibit native and exotic animal's species. In addition, an aquaria was established by the Marine Science Station at Aqaba city, and exhibit native marine species collected from the Gulf of Aqaba. Recently, Al Mawa for Nature and Conservation was established as a sanctuary for confiscated animals. This site exhibit wild animals of native and exotic species.

1.3 Research Institutions and Universities

Research institutes and universities are considered the most important users of genetic resources in Jordan, since they are using these resources in basic academic research intended for publication and also in research for commercialization. Several research institutions exist in Jordan such as the Marine Science Station, National Agricultural Research Center and Badia Research Center. In addition, several NGOs contain research centers aiming to understand Jordan's biodiversity such as the Royal Society for the Conservation of Nature, Royal Marine Conservation Society of Jordan, and Royal Botanic Garden.

Universities in Jordan either public or private are considered as genetic resources users and they could play the role of genetic resources providers, since they contain research departments such as the department of biology, pharmacy, agriculture...etc, as well as supervising field localities. In addition, animal houses were created in the majority of public universities in Jordan.

1.4 Agricultural and Horticulture

It is represented by four major types which are: 1) agribusiness, 2) horticulture and 3) pest control. The following illustrate each

1.4.1 Agribusiness (Plant Breeding)

Agribusiness includes plant breeding and companies that develop crop protection products (including chemicals and plant breeding for resistance to pests and diseases). Breeding companies in the agribusiness sector rely on ex situ collections of genetic resources from around the world to provide inputs to breeding programs, pedigree information, and trait characterization. According to Laird and Wynberg, 2008; agribusiness companies prefer not to use traditional knowledge in product development in order to avoid legal and ethical complexities associated with such use.

A major institution in Jordan which is actively involved in plant breeding is the National Agricultural Research Center (NARC). In addition, several other institutions exist such as Colleges of Agriculture in the Jordanian universities (i.e. School of Agriculture at the University of Jordan, Faculty of Agriculture at Jordan University for Science and Technology, Faculty of Agriculture of Jordan in Jerash, College of Agriculture at the University of Muta and College of Agriculture at the University of Balqa Applied), non-governmental organizations (Higher Council for Science and Technology, the Royal Scientific Society, the Society of Friends of Scientific Research, the Farmers' Union), the private sector and other regional institutions and research centers are established in Jordan such as International Center for Agricultural Research in the Dry Areas (ICARDA), The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), and the Arab Center for Studies salt where all are working in collaboration with national research institutions.

1.4.2 Horticulture

The horticulture sector includes a range of activities from amateur plant breeding for ornamental purposes (e.g. hobby gardening) to commercial vegetable production. The horticulture industry relies on plant genetic material that is already on the market or available from ex situ collections such as gene-banks or botanic gardens. New plant varieties are increasingly in demand for specialized food, feed and non-food uses. In particular, a small group of horticulture companies rely on the availability of new genetic resources to develop novel ornamental plants.

All aspects of horticulture can be found in Jordan such as arboriculture, fruit growing (tropical, subtropical and temperate zones), flower culture, vegetable production in the Jordan Valley (winter-autumn season) and in upland the (spring and summer season). Cultures under plastic house and in the open (vegetables, strawberry, and flowers) as well as citrus, banana, grapes, date palm, and low chill pome and stone fruits are concentrated in the Jordan Valley. Fruit, mainly olive, grape, peach, apple and fig is grown in the upland along the eastern mountains and on sand-loam soils in the southern and eastern southern part of the country. Vegetable growing is practiced in all regions. Arboriculture is in the eastern mountains on clay soils. Rainfed rangeland is in the Badia of Jordan.

The main research thrusts are the Ministry of Agriculture, National Agricultural Research Center, the Horticulture and Crop Science department at the University of Jordan. In addition, agricultural faculties at Jordan universities, the Higher Council for Science and Technology, the Royal Scientific Society and the Agricultural Marketing Organization is performing horticulture research and are directed to sustainable and cost-effective growing systems.

1.4.3 Pest Control

The demand for access to genetic resources in the pest control sector will increase, as all companies and institutions which work in this sector depend on the access to new genetic resources. Public institutions, universities and research institutions continue the traditional mutual exchange of genetic material, implementing research in cooperation with the countries of origin. Private companies mainly practice monetary benefit-sharing in form of single access fees or up-front payments. Several companies exist in Jordan such as but not limited to Arena public health pest control, Trap Pest Control, Saun Pest Control, Pesco Arab Pest Control Center, Advanced Pest Control Service, Alreef Company For Manufacturing Veterinary Drugs and Agrochemicals.

1.4.4 Farm Animal Breeders \ Livestock Producers

The dairy, livestock and poultry sectors involve substantial levels of international exchange of genetic material; breed development is primarily conducted by private companies supplying livestock to multinational markets. Beef, camels and sheep sectors rely to a lesser extent on international exchange of materials and breed development, but these sectors also have an international presence. Developments in genomics and quantitative genetics have improved breeders' ability to use genetic resources for breed development, enhancing the opportunity for use of new breeds for crossing.

There is a growing interest in research for camel's milk and other derivatives in this industry, particularly for medicinal purposes. Nonetheless, most of the exchange in genetic resources related to animal breeds concerns domesticated livestock rather than wild relatives.

1.5 Wildlife Traders

The wildlife trade involves live animals for use in specialist breeding and bio-medical research and as pets and for sport/hobbies (e.g. falconry). Most of the wildlife trade is covered by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Technical and scientific advances have allowed for increased use of captive breeding techniques to supply exotic species in the Jordan market, reducing reliance on wild-caught stock exported from species rich countries. Several wildlife traders are performing their work in Jordan, at small- scale such as the one which exists at the public animal markets or at global level where it is governed by CITES convention.

Part Two: Providers of Genetic Resources

Jordan could play a role as a genetic resources provider either at the in situ conditions or ex situ collections levels. The following provides a tentative details about the potential providers of genetic resources in Jordan, noting that some of these are playing an intermediate role in genetic resources:

2.1 In Situ Genetic Resources

Several entities are responsible for the in situ conservation, which is in accordance are considered as a genetic resources providers. These entities are represented by:

2.1.1 Rangeland and Forestry

The Forestry Department as well as the Rangeland Department at the Ministry of Agriculture are considered a major genetic resources providers since they manage a wide spectrum of rangeland reserves which are distributed in different localities in Jordan. In addition, the forestry department manage forested areas in Jordan which contains an extraordinary variety of wild fauna and flora species.

2.1.2 Protected Areas

The Royal Society for the Conservation of Nature has the mandate to establish and manage protected areas in Jordan with nine protected areas established so far, and these are: 1) Yarmouk Protected Area, 2) Ajloun Forest Area, 3) Dibeen Forest Area, 4) Mujib Biosphere Reserve, 5) Dana Biosphere Reserve, 6) Fifa Protected Area, 7) Qatar Protected Area 8) Shumari Wildlife Reserve and 9) Azraq Wetland Reserve. All protected areas were established since they conserve a representative sample of vegetation cover in Jordan that holds the presence of a diverse groups of animals and plants.

In addition, two additional nature reserves are currently managed by the Aqaba Special Economic Zone Authority and these are: 1) Wadi Rum World Heritage Site and 2) Aqaba Marine Park. Also, Petra was recently nominated to be established as a protected area which if designated will be managed by Petra Authority. These areas contains wild fauna and flora species and enormous habitats which provide a place for genetic resources interest.

2.1.3 Special Conservation Areas

Some special conservation areas (SCAs) exists in Jordan and are managed by different institution to conserve wild species of fauna and flora such as: 1) Tell El- Rumman SCA which is managed by Royal Botanic Garden, 2) Jarash

Sanctuary for Wildlife Species which is managed by Al Mawa for Nature and Conservation (Princess Alia Founddation), Sharhabil ben Hasnah SCA which is managed by Friends of Earth, Hima Bani Hashim managed by the Ministry of Agriculture and IUCN, and Wadi Gharba SCA which is managed by Birds Watching Society

2.2 Ex Situ Genetic Resources

The following could play a role as genetic resources providers, though they could have a role as users of genetic resources (details on each are found in the previous section- users of genetic resources).

1. Royal Botanic Garden
2. Museums
3. Culture Collections
4. Universities and research institutes
5. Agribusiness and horticulture
6. Gene Bank
7. Seed Bank

Part Three: Potential ABS Initiatives and Business Models

The Nagoya Protocol is considered the first internationally agreed and legally binding mechanism for a "Payment for Ecosystem Services"; thus, it contribute to sustainable development and the green economy. Thus, several initiative are applicable and recommended once the bylaw of access and benefits sharing is adopted by the government including

- Awareness raise, dialogue and information exchange
- Traditional Knowledge Documentation
- Develop in-country research capability and institutions
- Technology Transfer
- Targeted financial support for capacity-building and development initiatives through the Nagoya Protocol's financial mechanism, the Global Environment Facility (GEF).

Business models for access and benefits sharing could be established. However, due to the complexity of parties involved as users and providers, then the business models are numerous. As an example, cosmetics or pharmaceuticals requires more complex value chains rather than biotech sector, which in accordance require a continuous supply of genetic resources for the production of the final product and often involves third parties.

In order to create a clear business models in Jordan, the government of Jordan represented by the Ministry of Environment shall adopt the bylaw and create any necessary regulations and procedures to facilitate the access to genetic resources and the traditional knowledge associated with in a clear, transparent and participatory manner. In addition, the Nagoya Protocol should be used as an instrument to attain sustainable development, the Aichi targets, and to put Green Economy into practice.

Business model shall contribute to improve enabling environments for Access and Benefits Sharing including awareness raising; technology transfer, know-how transfer, training, direct investments, and joint research. Therefore, it is highly recommended for any business models to be established in Jordan to raise the capacities of users and providers of genetic resources toward:

1. Capacity to comply with the obligations of the Nagoya bylaw in Jordan.
2. Capacity to negotiate mutually agreed terms
3. Capacity of local communities and relevant stakeholders, including the business sector and the research community, to implement the protocol effectively
4. Capacity of countries to develop local research capabilities to add value to their own genetic resources

Based on the Business Model Canvas tools, several steps are required to develop a proper business plan and these are:

Step One: Identify Users

Potential users (customer) for the plants genetic resources and\ or the traditional knowledge associated with are the pharmaceutical companies either in Jordan or at the international levels. Examples on these companies based in Jordan are Hikma Pharmaceuticals, Dar Al Dawa, the Jordanian Pharmaceutical Manufacturing Co JPM Group, Amman Pharmaceutical Industries, and Pharma International Company. The key resources which will be used is represented by the plants genetic resources which will be used to develop the products for commercialization purposes.

Step two: Value (Genetic Resources) proposition

If any pharmaceutical company will request the access to genetic resources and\ or the traditional knowledge associated with, then it has to initiate a process of studying the active ingredients (substances) in specific herbal plants species in Jordan. They could have the benefits of the traditional knowledge associated with (once documented) in order to develop their pre-access conditions to genetic resources that include

- Developing the research proposal
- Apply for a prior informed consent according to the developed bylaw
- Obtain the approval letter
- Secure research funding
- Market analysis
- Pre-products analysis and testing

This step shall be followed by a comprehensive research and development stage which include publications for documentation of the research result, and creating the business plan for a better marketing and revenues enhancement.

Step Three: Channels

It is necessary to establish the mechanism to connect the users with the genetic resources providers, through legal means including the articles stated in the bylaw of access and benefits sharing. Part of channels which could be created is the Mutually Agreed Terms and the Prior Informed Consent. Such channels shall be observed and supervised by the Competent National Authority directly in order to ensure compliance to the bylaw and its regulations.

Step Four: Revenue Scheme

Based on the developed bylaw, the Ministry shall obtain part of the financial rights from the gain generated from any access to genetic resource and / or traditional knowledge associated with not less than 5% representing incomes or returns. In addition, the Ministry shall ensure the fair and equitable sharing of benefits derived from the gain generated for the benefit of the local community through the non-material incentives of supporting the development of infrastructure and SMEs, educational programs, Technical and other techniques and gender-sensitive.

Annex I: Matrix of Users and Providers of Genetic Resources (GR)

Sector	Sub- sector	Genetic Resources		Dependency on use of GR			Examples from Jordan
		Users	Providers	Low	Medium	High	
Health and Personal Care	Pharmacy	√		√	√		<ul style="list-style-type: none"> • Jordan Food and Drugs Association • The International Pharmaceutical Research Center (IPRC) • Triumpharma • Acdima • The Jordanian Pharmaceutical Research Centre • The Pharmaceutical Research Unit • Hikma Pharmaceuticals • Dar Al Dawa • The Jordanian Pharmaceutical Manufacturing Co JPM Group • Amman Pharmaceutical Industries • Pharma International Company • Pharmacies department with Jordan's private and public universities
	Herbal medicine	√				√	<ul style="list-style-type: none"> • Herbalists
	Cosmetics and personal care	√		√	√		<ul style="list-style-type: none"> • Al Madaen Chemicals • Al-Riyad Group Chemicals • Al-Safadi for Industry and Trade

							<ul style="list-style-type: none"> • Jordan Egyptian Co. Cosmetics Chemicals • Juman Chemicals (Cosmetics) • Munir Sukhtian Group Chemicals • Sigma Detergent
Ex-Situ Collections	Botanic Garden	√	√			√	<ul style="list-style-type: none"> • Royal Botanic Garden (RBG) • Botanic gardens within Jordan's public universities
	Herbarium	√	√			√	<ul style="list-style-type: none"> • National Herbarium of Jordan at RBG • Herbariums within public Universities such as University of Jordan and Yarmouk university • Herbariums at Jordan's Protected Areas managed by Royal Society of the Conservation of Nature (RSCN) • Herbarium at National Agricultural Research Center (NARC)
	Gene Banks	√	√			√	<ul style="list-style-type: none"> • National Gene Bank at NARC
	Seed Banks	√	√			√	<ul style="list-style-type: none"> • National Seeds Bank at RBG • Seed bank at NARC
	Cultural Collections	√	√			√	<ul style="list-style-type: none"> • Culture collections at public universities of Jordan such as the University of Jordan
	Museums	√	√			√	<ul style="list-style-type: none"> • Animal Museum (Natural History) at the University of Jordan

							<ul style="list-style-type: none"> • Jordanian Natural History Museum at Yarmouk University. • Badia Research Program museum in the eastern desert • Animal Houses at public universities of Jordan such as Yarmouk university, Hashemite university and Jordan University for Science and Technology
	Zoos and Aquaria	√	√			√	<ul style="list-style-type: none"> • Marine Science Station Aquarium at Aqaba • Ghamadan zoo • Al Yadoudah Zoo • Jordan Zoo • Prince Hashem Bird Park
Research Institutions and Universities	Research Institutions and Universities	√	√			√	<ul style="list-style-type: none"> • NARC • Marine Science Station • Research center at RSCN • Research center at Royal Marine Conservation Society of Jordan (JREDS) • Research center at RBG • Biological departments at Jordan's public and private universities • Medicinal and pharmacies departments at Jordan's public and private universities
Agricultural and Horticulture	Agribusiness (Plant Breeding)	√	√			√	<ul style="list-style-type: none"> • NARC • School of Agriculture at the University of Jordan

							<ul style="list-style-type: none"> • Faculty of Agriculture at Jordan University for Science and Technology • Faculty of Agriculture of Jordan in Jerash • College of Agriculture at the University of Mu'ta • College of Agriculture at the University of Balqa Applied • Higher Council for Science and Technology • The Royal Scientific Society • The Society of Friends of Scientific Research • The Farmers' Union • The Bee's Keeper Union • International Center for Agricultural Research in the Dry Areas (ICARDA) • The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) • The Arab Center for Studies in salt
	Horticulture	√	√			√	<ul style="list-style-type: none"> • Ministry of Agriculture • NARC • Horticulture and Crop Science department at the University of Jordan • Agricultural faculties at Jordan public universities • The Higher Council for Science and Technology • The Royal Scientific Society • The Agricultural Marketing

							Organization
	Pest Control	√				√	<ul style="list-style-type: none"> • Arena public health pest control • Trap Pest Control • Saun Pest Control • Pesco Arab Pest Control Center • Advanced Pest Control Service • Alreef Company For Manufacturing Veterinary Drugs and Agrochemicals
	Farm Animal Breeders\ Livestock Producers	√				√	<ul style="list-style-type: none"> • Public universities in Jordan such as the university of Jordan and JUST • Livestock owners Associations
Wildlife Traders	Wildlife Traders	√			√	√	<ul style="list-style-type: none"> • Several companies exists and it is available at RSCN database for CITES convention • Eid et al, 2011. Animal Trade in Jordan (available online)
In Situ Genetic Resources	Rangeland and Forestry		√			√	<ul style="list-style-type: none"> • Ministry of Agriculture • Greater Amman Municipality • Jordan Valley Authority • Aqaba Special Economic Zone Authority (ASEZA) • Petra Authority
	Protected Areas		√			√	<ul style="list-style-type: none"> • RSCN • ASEZA • Petra Authority
	Special Conservation Areas		√			√	<ul style="list-style-type: none"> • RSCN

							<ul style="list-style-type: none">• ASEZA• Petra Authority• Princess Alia Foundation- Al Mawa for Nature and Conservation• Royal Botanic Garden• Ministry of Agriculture- Hima Bani Hashim• Friends of Earth- Sharhabil ben Hasnah SCA• Birds Watching Society- Wadi Gharba SCA
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