
Focus on Seed Programs

The Seed Industry in Jordan

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Introduction

Jordan is located between 32° and 29° N latitude and 39° and 35° E longitude. It is bordered by the Palestine Authority in the west, Iraq and Saudi Arabia in the east, Syria in the north and Saudi Arabia in the south.

The country has a total area of 8.93 million hectare of which arable land occupy 7.8%. Agricultural production is mainly rainfed (98%) and field crops (i.e. cereals, food and feed legumes), orchards (mainly olive trees) and vegetables occupy 65.5%, 25.5%, 9.0%, respectively.

Jordan has a Mediterranean type climate. The country has several agro-climatic zones with extreme variations in rainfall, temperature, soils and cropping patterns (Table 1).

Agricultural production is important in the national economy and accounts for 7.5% of National Gross Product (NGP). The population is estimated to be 4.25 million

with annual growth rate of 3.2%. About 22% of the population depends on agriculture for living.

Wheat, barely, lentil, chickpea and vetches are produced during the main winter growing season. Irrigated agriculture is concentrated in the rift valley (Jordan valley) where vegetables and citrus are the main crops. In the south eastern part of the country cereals and forage crops are grown under pivot irrigation. The Jordan River, springs, wells and dams are used for irrigated agriculture.

Agriculture Sector Policy

In Jordan the agricultural sector plays an important role contributing to national income and employment. The government policy supports the development of the sector by expanding the agricultural area and improving the supply of inputs. It encourages new technology and crops by employing better approaches in research and extension, water harvesting techniques, irrigation systems, control of

input prices, promoting agricultural development projects and supporting minimum guarantee prices. The government buys local wheat and barley production at international price to encourage farmers to increase production; and also assists farmers to export surplus production of other crops

to neighboring countries.

Jordan has 690,000 ha arable land of which 410,000 ha is under cultivation (Table 2) representing 59.4%. The remaining 27.6% of arable land is not utilized.

Table 1. Agro-climatic zones, area and cropping patterns in Jordan

Climatic zones	Annual rainfall (mm)	Area in ha (million)	% area	Crops grown
Arid zone	< 200	8.028	90	Cereal and forages (irrigated)
Marginal zone	200 – 300	0.562	6.3	Cereals
Semi arid zone	300 – 500	0.134	1.5	Cereals, food and feed legumes
Semi wet zone	> 500	0.098	1.1	Orchards
Rift valley (Jordan valley)	200 – 350	0.098	1.1	Orchards, vegetables, cereals (irrigated)
Total		8.93	100	

Source: Ministry of Agriculture/Department of Statistics-Jordan

Wheat, barley, chickpea, lentil and vetch occupy (107591 ha) of the area planted under rainfed condition. In 1988, tree crops occupy 38% (157,000 ha) and vegetables (tomato, cucumbers, potato, others) occupy 11% (45,000 ha). The summer crops occupy the remaining 8% of the area.

Table 2. Land use classification in Jordan

Land use	Area in ha (millions)	%
Range	7.5	84
Forests	0.07	0.8
Agricultural land	0.69	7.8
Urban areas	0.67	7.5
Total	8.93	100

Source: Agricultural statistics, Ministry of Agriculture; Annual Reports, Economics Department

National Seed Policy and Laws

The Agriculture Law No. 44 of 2002 provides the framework for variety release and registration, seed production, quality control and seed trade. The regulation and its guidelines cover variety registration, seed production, seed processing, seed marketing, seed quality control and seed trade (import-export). Seed multiplication, production, processing and marketing are prohibited unless it is registered as described in the law. The regulations covers seed trade, import, export and produce of agricultural crops:

- Control of seed production (1987)
- Conditions for variety registration (1990)
- Conditions for seed trade (1990)
- Seed trade of agricultural crops (1990)
- Licensing seed companies (1990)
- Licensing agricultural companies for seed import (1990)
- Variety registration of agricultural crops (1993)

- Seed production and trade of cereals, forages, vegetables and fruit trees (1996)

The agricultural law exempts seed and mother plants imported for multiplication from taxes. For example the private sector is allowed to import inbred lines free of tax to encourage seed production locally.

In 2000, the Government of Jordan enacted Law No. 24 of 2000 for the protection of new plant varieties. The Law was published in the official gazette on the second of July 2000. The WTO and UPOV agreements and conventions were taken into account in preparing the document. The law elaborates the conditions and procedures required for granting the protection of new plant varieties as well as other related legal issues such as right of priority, provisional protection, publication, licensing, ownership, cancellation of the registration, general rules and variety denomination. The four essential conditions for granting the protection to a variety under this law are distinctness, uniformity, stability and novelty. The Ministry of Agriculture will prepare related regulations and directions of the law. The Ministry is expected implementing the law during the second half of the year 2002 (Law no. 44 of 2002).

Background of Seed Sector

Seed production of cereal crops began in the 1970s. However, a comprehensive Seed Production Project was started in 1982 with financial support from German Agency for Technical Cooperation (GTZ). The Ministry of Agriculture (MOA) through the Seed Multiplication Project (SMP) was an overall coordinator of the project, which involves the National Center for Agricultural Research and Technology Transfer (NCARTT) and the Jordan Co-operative

Corporation (the former Jordan Cooperative Organization). The program was implemented under the Wheat Improvement Project from 1982-1992. During the project period the government produced seed of improved varieties of wheat and barely to meet farmers' requirements. Later on the program included seed production of crops such as lentil, chickpea and vetch. Since 1992, the program continued as Seed Multiplication Project through the financial support of the government and coordinated by the Ministry of Agriculture.

Agricultural Research and Crop Improvement

The national agriculture research programs in Jordan are carried out by the National Center for Agriculture Research and Technology Transfer (NCARTT), which was established in 1985, under the umbrella of the Ministry of Agriculture. NCARTT operates as a semi-autonomous institution with administrative and financial independence. NCARTT has a mandate to conduct and/or coordinate applied agricultural research and transfer of technology at the national level in collaboration with public and private agricultural institutions. It is responsible for introduction of adapted varieties to national breeding programs through collaborative research with international agricultural research centers such as Arab Center for Studies of Arid and Dry Lands (ACSAD) and the International Center for Agricultural Research in the Dry Areas (ICARDA). NCARTT is also responsible for the identification, testing, and transfer of improved technologies for adoption by farmers. The universities in Jordan are also involved in agricultural research and variety development.

NCARTT's headquarters is located at Al-Hussein Agricultural Experiment Station at Baqa'a. It has six Agricultural Regional Research Centers based at Deir Alla,

Khaldieh, Mushaqaq, Rabba, Ramtha and Shoubak and operates 12 research stations representing different agro-ecological conditions of the country (Table 3).

Table 3. Distribution of agricultural research stations and crops handled

Agro-climatic zones	No. of Stations	Crops handled
Marginal zones (200-300 mm)	2	Barley, feed legumes
Semi-arid zones (300-500 mm)	3	Wheat, chickpea, lentil, vetch, sesame, sorghum
Jordan (Rift) valley	1	Wheat and vegetables under supplementary/full irrigation

The national research program focuses on variety development of self-pollinated crops while for cross-pollinated crops the main interest is aimed at improving agronomic packages to increase the yield potential of imported varieties.

The national agriculture research program is funded by the government and supported by international agricultural research centers. The institutes maintained close collaboration with regional and international agricultural research centers such as Arab Center for Studies of the Arid Zones and Dry Lands (ACSAD) and the International Center for Agricultural Research in the Dry Areas (ICARDA) and with bilateral donor agencies such as United States Agency for International Development (USAID) and German Agency for Technical Cooperation (GTZ) to strengthen national crop improvement and seed production programs.

The framework of the national program on plant breeding, variety development,

evaluation, release and registration in Jordan is presented in Figure 1.

Variety Development

In Jordan variety development is a public sector activity. The government supports the public breeding program to ensure the availability of adapted varieties with high yield and quality. NCARTT and universities are responsible for variety development and have technical collaboration with several international agricultural research institutes such as ICARDA and CIMMYT.

The government policy encourages the private sector (private agricultural companies) to enter crop research and variety development. However, the private sector is not involved in variety development of self-pollinated crops. Instead the private sector is involved in imported vegetable varieties and trading in agricultural inputs.

The list of cereal, food and feed legume varieties currently recommended in Jordan is shown in Table 4.

Table 4. List of crop varieties released in Jordan

Crop	Varieties
Wheat	<u>Hourani Nawawi</u> , <u>Hourani27</u> , <u>ACSAD 65</u> , <u>Deiralla 6</u> , <u>Sham 1</u> , <u>Deiralla 2*</u> , <u>Deiralla 4*</u> , <u>Jubiha*</u> , <u>Rabba*</u> , <u>Petra*</u> , <u>Amra*</u> ,
Barley	Rum, ACSAD176, Deiralla106*
Lentil	Jordan1, Jordan2, Jordan3
Chickpea	Jubiha1, Jubiha2, Jubiha3
Vetch	Common vetch

Note: *: Varieties not widely adopted by farmers

Variety Evaluation

Before the new variety is released, it is subject to variety trials including on-farm trials and demonstrations in the farmer's fields. Performance trials (VCU) and description trials (DUS) take two to three years. The promising varieties will be compared with local or existing commercial varieties using all recommended packages.

Variety Release

The breeders and the agronomists at NCARTT and MOA (Variety Evaluation Committee; VEC) submit their reports to the National Committee for Seed Certification (NCSC). The NCSC verifies both VCU and DUS data and the recommendations of the VEC for variety release or rejection. Upon acceptance of varieties, the NCSC gives a name to a variety and forward them to

Variety Registration Committee (VRC) at the Ministry of Agriculture. The registration of varieties is the responsibility of a committee that is formed by the laws given to the Minister of Agriculture based on Law 44 of 2002. The Registration Committee register both newly released and imported varieties.

The NCSC is composed of ten representatives drawn from relevant government institutions, seed producers and farmers groups. It consists of representatives from:

1. National Center for Agricultural Research and Technology Transfer (DG, NCART)
2. Agricultural Extension and Rural development Administration (Director, NCARTT)

3. Technology Transfer, Training and Information Department (Director, NCARTT)
4. Seed Multiplication Project (Coordinator, NCARTT)
5. Technical Assistant (to DG, NCARTT)
6. Plant Production Department (Director, Ministry of Agriculture)
7. Faculty of Agriculture (Representative, University of Jordan)
8. Jordan Farmer's Union (Representative, NGOs)
9. Jordan Cooperative Corporation (Representative)
10. Agricultural Materials Merchants Association (Representative)

Once the varieties are released, the Seed Multiplication Project and the Jordan Cooperative Corporation are informed to multiply seed of these varieties for distribution to farmers.

Variety Maintenance

After the release of the variety, breeders in NCARTT are responsible for variety maintenance and multiplication of early generations under the supervision of the Seed Multiplication Project of the Ministry of Agriculture.

Seed Production

The National Center of Agriculture Research and Technology Transfer (NCARTT) and Jordan Co-operative

Corporation (JCC), a semi-governmental organization, carry out seed production of both cereals and legumes (Fig 2). Both NCARTT and JCC produce seed under the direct supervision of the Seed Multiplication Project.

NCARTT is responsible for variety maintenance of breeder- and Basic-seed production. The Jordan Cooperative Corporation produces Certified Seed on contract with farmers. The JCC provides seed, fertilizers, herbicides and machinery for planting and harvesting, with reasonable prices. The contract-grower manages the crop to produce high-quality seed.

The national seed demand calculated on a four-year renewal rate is 1688 ton for wheat, 1600 ton for barley, 79 ton for chickpea and 100 ton for lentils. However, each year, the Seed Multiplication Project produces 2500 ton of wheat and 1500 ton of barley seeds. Small quantity of lentil, chickpea and vetch seed is also produced (Table 5).

There is less involvement of the private sector in the cereal and legume seed industry. The JCC is considered quasi-private sector because it is run according to government policy, but individual farmers are voluntary members. However, some private farmers have been producing onion seed recently.

The private seed companies and farmers produce seed of vegetables and ornamental plants. The Southern Companies produce potato seeds of grade E for distribution to farmers at low price compared to imported seed of the same grade. Private companies such as SPONTA and DRAGA import adapted varieties grown under irrigation.

Fig 1. Plant breeding scheme and variety development for cereals in Jordan

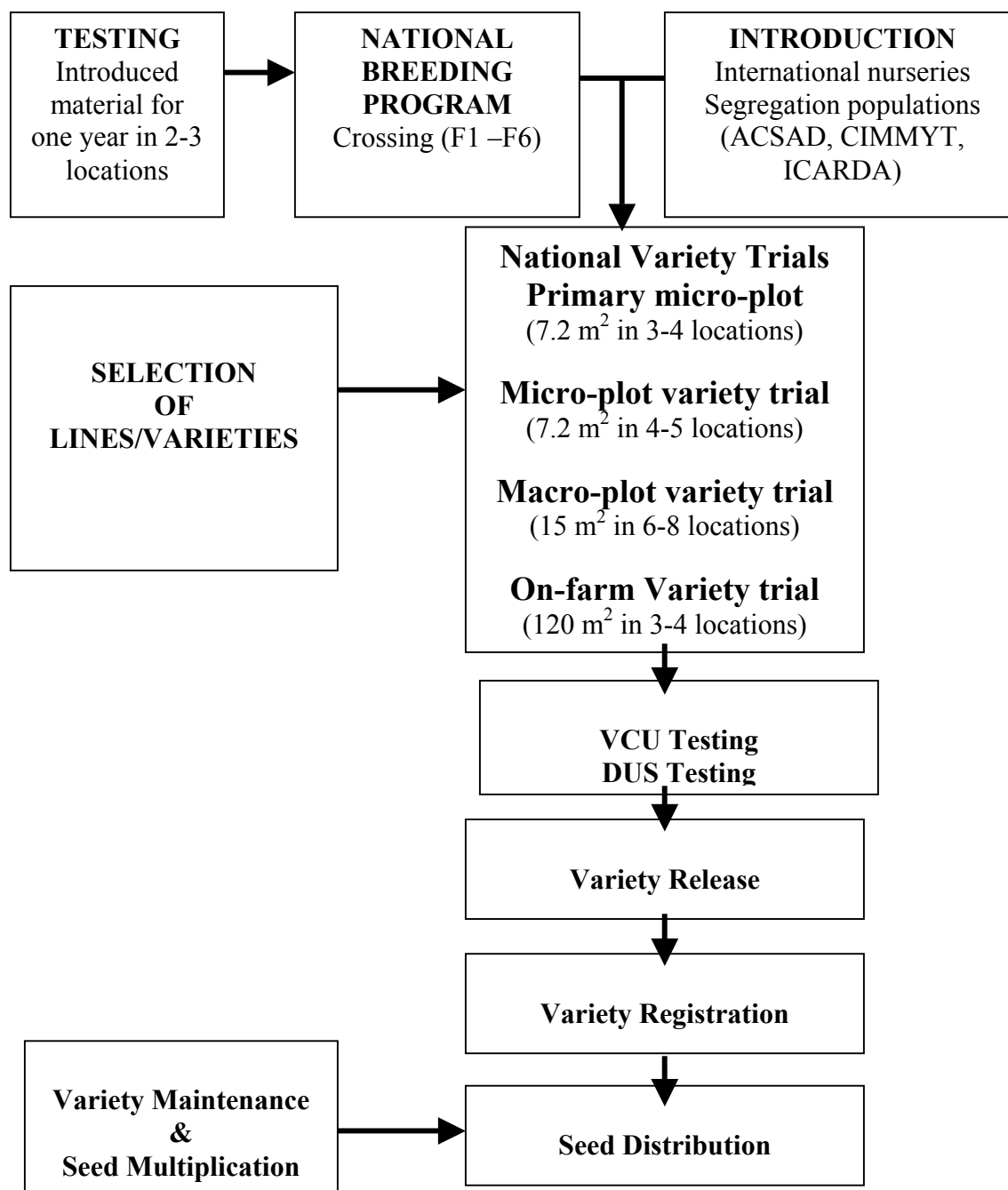


Table 5. Quantities of basic and certified seed production (tonnes) in Jordan (1995-2002)

Season	Production (tone)									
	Wheat		Barley		Lentil		Chickpea		Vetch	
	Basic	Certified	Basic	Certified	Basic	Certified	Basic	Certified	Basic	Certified
1994/95	260	1511	10	1058	3	9	4	33		-
1995/96	396	2698	130	-	24	30	8	17		-
1996/97	373	2225	104	1266	9	29	6	20		-
1997/98	225	2336	82	1511	4	20	5	30		-
1998/99	18	247	-	57	4	-			-	-
1999/00	95	1627	12.5	464	4	-	4.4	-	5.2	-
2000/01	50	1256	12	752	5	-	1.5	-	4.8	-
2001/02	90	2600	100	1769	7.4	-	2.3	-	17	-
Total	1507	14500	450.5	6877	60.4	88	31.2	100	27	0

Source: Annual Reports, Seed Multiplication Project (1995-2002)

Seed Processing and Storage

Seed processing and storage is an integral part of the national seed program. Almost all seed processing plants and storage facilities belong to the public sector and are operated by agricultural research stations, the Ministry of Agriculture or the Jordan Cooperative Corporation.

Seed Cleaning

The Ministry of Agriculture has three seed plants each with a capacity of 1.5 tones/h and are located in northern, central and southern parts of the country. These plants are used for cleaning Pre-basic and Basic Seed. The Jordan Cooperative Corporation has two seed processing plants established in the main seed production areas in the central and northern parts of the country. These units have a capacity of 5 tones/h and operated for three months each year. The JCC seed plants are used for cleaning Certified Seed. There are two mobile seed cleaning machines operated by agricultural research stations to provide cleaning services to the farmers.

After cleaning the seed is treated with fungicides against smuts particularly covered and loose smut of cereals. Cleaned and treated seed are bagged in 50 kg bags and labeled with the following information: seed class, chemicals used, date and source of seed, etc.

Seed Storage

Each processing plant has storage facilities (Table 6). After harvest, seed lots are stored in the JCC stations for sampling and testing. An official sample is drawn and submitted to the central seed testing laboratory in NCARTT for quality tests. Samples, which meet national seed standards, are cleaned, treated and stored for next planting season. JCC has storage facilities with the capacity of 4000 tones located at the seed processing centers. Seed lots are sprayed with insecticides during storage to protect infestation against storage pests.

About 25% of cleaned and treated seeds are stored as carry-over to overcome shortage during drought years. The carry-over seeds are renewed annually.

Table 6. Location and facilities for seed storage

Location	Crops	Capacity (tonnes)	Annual Capacity (tonnes)	Facilities
Ramtha	Wheat, Barley	6000	2000	Warehouse
Mushaqer	Wheat, Barley	4000	2000	Warehouse, silo

Seed Marketing and Distribution

Seed marketing is carried out by Jordan Cooperative Corporation and there are no private retail seed dealers. The government announces the prices of seeds at the time of harvest. The wheat and barley in 2001/02 season were 200 and 150 JD/ tonne, respectively for and basic and certified seed. JCC markets seed with a margin of 32 JD per tonne at subsidized prices.

Imported seed is more expensive than locally produced seed. For example, bread wheat seed imported by the Southern Companies costs US \$ 450/tonne.

Seed Quality Control

There is no official seed quality control and certification in Jordan. The Seed Multiplication Project under the Ministry of Agriculture is responsible for field inspection whereas NCARTT is responsible for laboratory seed testing.

During the growing season the seed production fields are inspected by a joint team of staff from SMP and JCC based on national procedures and guidelines. At harvest, each seed lot is sampled and the sample sent to the seed laboratory at NCARTT for purity, germination and seed health testing. The accepted seed lots are processed, treated and stored for later planting in the season. Sometimes the seed testing results in NCARTT are confirmed at the Seed Unit laboratory of the University of Jordan.

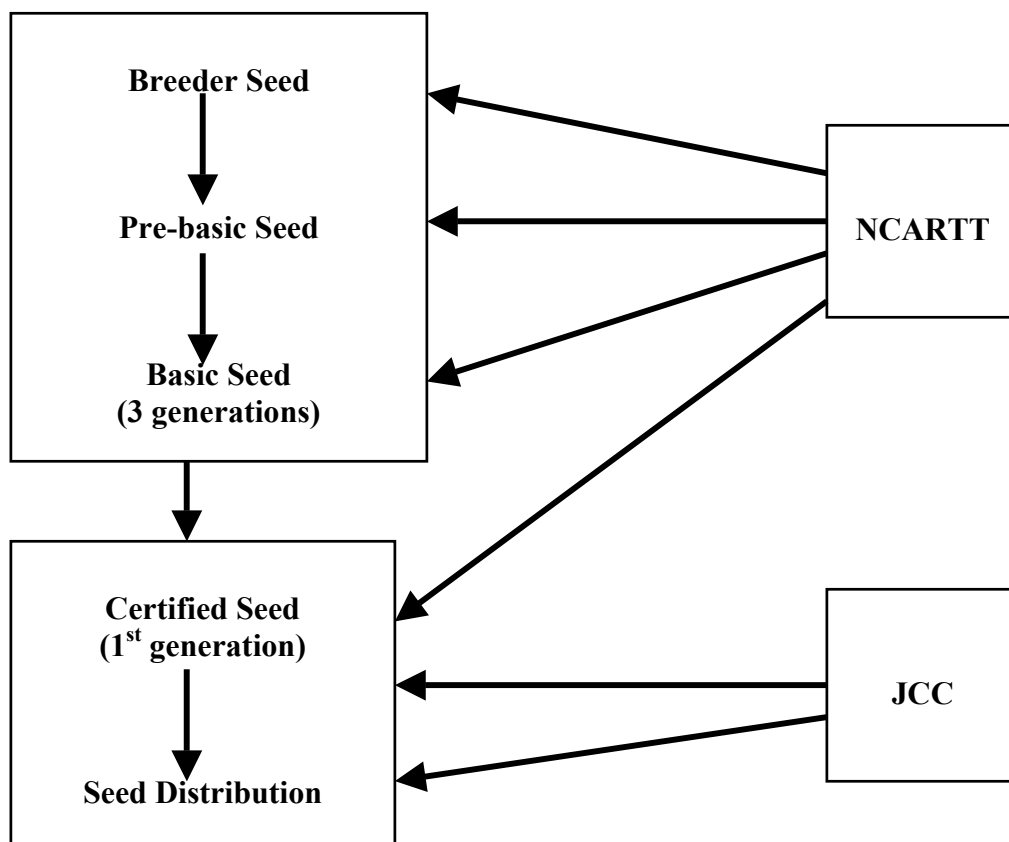
International Seed Trade

Jordan spends millions of Dinars to import seeds of agricultural and horticultural crops (Table 7). The Seed Technology Unit at NCARTT and the Import and Export Committee in the MOA are authorized to coordinate and regulate the quality of imported and exported seeds. Since April 1998, the private sector takes full responsibility to guarantee the performance of their varieties.

Table 7. Quantity of imported seeds and their value during the period 1993-2002

Year	Quantity (tonnes)	Value (Million JD)
1993	6,818	7,099
1994	7,873	7,717
1995	10,275	6,928
1996	794	6,985
1997	7,401	5,090
1998	5,216	NA
1999	4,819	NA
2000	5,443	NA
2001	5,822	NA

Fig 2. Variety maintenance and seed multiplication



Under the ‘Governmental Legislation (Seeds) Rules, 1973’ any one can import and export seeds subject to the following requirements:

- All imported seed shall bear a label with the following information: (a) crop/species; (b) variety; (c) quantity; (d) lot number; (e) % purity; (f) % germination; (g) % other seeds; (h) month/year of production; (i) date of expiry import or export permission for should be obtained from the Ministry of Agriculture importers should inform the Seed Unit and Import and Export Committee the arrival of the shipment

for drawing samples for testing seed quality.

- Any variety imported to Jordan should be tested for adaptation to local condition. During the first year the private sector is allowed to import a small quantity of seed of the new variety to evaluate adaptation to Jordanian conditions. Then the private sector is allowed to import and market large quantity of seed of adapted varieties.

NCARTT and MoA monitor the quality of imported seed to safeguard the interest of the seed industry and farmers.

Seed Research, Training and Extension

The generation and transfer of agricultural technology require a well-organized extension system. Adequately, trained extension staff can play an important role in this endeavor. In Jordan several meetings, trainings and workshops are conducted every year to improve the skill of public sector employees and farmers in crop production with emphasis on seeds. National training programs are held according to local needs. The Seed Unit of ICARDA trained a number of government employees in the seed sector.

International Collaborations

The Ministry of Agriculture and NCARTT, through GTZ Seed Project, had established a longstanding collaboration with the University of Jordan and the Seed Unit of ICARDA. The project has built a Seed Unit with full-fledged laboratory facilities at the University of Jordan to assist human resource development in the region. Several regional, sub-regional and in-country seed courses were organized in collaboration with ICARDA and the University to utilize these facilities. Moreover, several postgraduate students were also trained at the University of Jordan through ICARDA assistance.

Jordan is a member of international conventions such as EPPO since 1997 (<http://www.eppo.org>) and the International Plant Protection Convention since 1970 (<http://www.fao.org>).

Jordan is a founding member of the WANA Seed Network since its establishment in 1992. It is a 'lead country' to compile rules and regulations for seed trade (import-export) in member countries, a very

important topic which could encourage regional seed trade and facilitate easier movement of seed between countries of the region.

Constraints of the Seed Sector

There are a number of constraints that affect the performance of the national seed program in Jordan. The following are key constraints which hinder the development of the seed sector:

- Lack of improved varieties suitable for different agro-ecological zones particularly for stress condition such as drought and high temperature
- Weakness of agricultural extension programs to educate farmers on use of quality seed
- Lack of qualified staff for planning and implementing seed programs including variety development, seed production, seed quality control and certification
- Lack of technical staff, particularly field inspectors to ensure seed quality
- Lack of sufficient area, proper rotation for seed production in research stations
- Mixing of varieties during planting or harvesting due to inadequate supervision
- Lack of mechanical harvesting technology to expand legume production
- Lack of legislation and regulations governing seed production and marketing
- Government pricing policy that distorting the performance of the seed sector
- Limitation of government budget for agricultural and seed projects

Recommendations for the Seed Sector

The following are recommended to improve the national seed supply system in Jordan.

- Establish centers to provide training in agricultural research, seed technology and extension
- Implement laws and regulations to

guarantee and safeguard the interest of plant breeders, seed producers and farmers

- Train technical staff for operation of field equipment
- Up-grade field inspection operation through training and better management
- Establish adequate crop rotation to ensure quality seed production on research stations

Table 8. Standards of wheat and barley for field and seed in Jordan

Standards	Seed Class		
	Prebasic	Basic	Certified
<i>Field Standards</i>			
Rotation (min years)	2	2	2
Isolation (min meter)	2	2	2
Other varieties (max no.)	1/3000	1/2000	1/1000
Other species (max., no) ^a	1/9000	1/2000	1/1000
Noxious weed (max., no) ^b	1/9000	1/2000	1/3000
Infected plants (max., no) ^c	1/3000	1/2000	1/1000
<i>Seed Standards</i>			
Pure seed (min., %)	99.9	99.7	99.7
Other crop seed (max., %)	0.1	0.1	0.1
Weed seed (max., %)	0.25	0.25	0.25
- Cephalaris spp. (no/kg)	50	50	50
Infected seed (max., %)	None	None	None
- Nematodes (max., no/kg)	10	10	10
Germination (min., %)	85	85	85
Moisture content (max., %)	12	12	12

^a *Vicia* spp. and all crops whose seed size is similar to barley or wheat; ^b *Avena* spp., *Lisaea* spp., *Centaurea* spp., *Setaria* spp., Triticale, and all weeds with similar seed size to barley or wheat; ^c Smut of wheat and barley

Source: WANA Seed Network, 1999



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