

# Focus on Seed Programs

## The Seed Industry in Turkmenistan

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### Introduction

**T**urkmenistan is located in south west Central Asia and lies within 35°48' and 42°48' N and 52°27' and 66°41' E north of the Kopetdag (Gershi) ridge of the Turkmen-Khorasan mountain range between the Caspian sea in the west and Amu Darya river in the east. It is bordered by Kazakhstan (north), Uzbekistan (north east/east), Afghanistan (south-east), Iran (south) and the Caspian Sea (west). The northern and central part of the country is occupied by a sandy desert in the Turan lowlands, the center by the Zaunguz and the south eastern by the Karakum (about 80% of territory). In the south the desert turns into the Kopetdag hills and foothills. Almost 20% of territory is mountainous.

Turkmenistan has a total area of 49.1 million ha. In 2007, agricultural land covered 40.2 million ha, with about 1.8 million ha arable crop area (irrigated) (of which 0.24% are perennial crops) and pastures occupy close to 38.4 million ha. The expansion of arable land for further development comes mainly from pasture lands which are estimated at 17.7 million ha and located in the old delta and foothill plains.

In 2007, the population was 5.11 million, with 54% living in rural areas. The population density is 13.6 inhabitants/km<sup>2</sup>. The country is divided into five administrative provinces (velayats) and 52 districts (etraps), with 21 towns and 76 villages.

Turkmenistan has a continental type climate with very cold winters and very hot and very dry summers. Spring is usually short, from March to April. During the first part of May there is an extreme rise in temperature where frequent rains are common. The summer season is long, from mid May until the end of September, characterized with high air temperatures of over 40°C (land temperature in oases is 5-7°C higher) and lower air humidity (30-35%). The frost-free period ranges from 187 to 200 days in northern-eastern regions (Dashoguz velayat) and 230-250 days in other regions. Average annual precipitation is around 250 mm. Under arid conditions and high temperatures, evaporation is 20 times higher than precipitation. Thus, agricultural production is mainly based on irrigation.

Turkmenistan has taken a cautious approach to economic reform, using its natural resources (gas) and cotton production to sustain its economic development. Turkmenistan has reached self-sufficiency in food production and reduced food imports. The savings are being directed to investments in the agricultural and other sectors of the economy. However, in order to strengthen the agricultural sector, there is a need diversify crop production, thereby improving the economic well-being of more than 54% of the rural population who depend on agricultural for additional sources of income. Private farms receive state support, there is no taxation, aiming to increase the size of private farms for steady

growth in income. However, provision of seed of improved varieties is lacking, and privatization goals remain limited.

## The Agricultural Sector and Policy

**D**uring the former Soviet Union, Turkmenistan grew few crops, and food items were imported from other regions of the Soviet Union. For over 50 years cotton was grown as a monoculture and as a result, production of cereals, vegetables and fruits was neglected. Since independence, however, the Government has sought to diversify the agricultural sector and implemented the Grain Development Program (the Agricultural Development Program is in preparation) in order to ensure national food security.

'Strategy of Economic, Political and Cultural Development of Turkmenistan by 2020', is the basic government document guiding the national program for the development of the agricultural sector, focused on irrigated agriculture with necessary support for organized national seed supply. The program aimed at doubling irrigated areas before 2020 and producing up to 5 million tonnes of wheat and 1.5 million tonnes of cotton fiber.

Transfer of land to private ownership began in 1993 and is free. Agricultural producers are free from all taxes including those on land and water. Turkmenistan is successful in nurturing its economic potential and raising the living standards of its population, due to a prudent strategy of political, economic and social development. Gross domestic product per capita at purchasing power parity has increased 7.9 times since independence (from 1991 to 2007).

### Agricultural production systems

Turkmenistan has total of 25 billion m<sup>3</sup> of water resources per year (90%) from four major rivers, the Amu Darya, Murgab, Tedjien and Atrek, and small rivers and underground water. The country is largely desert and dependent on intensive irrigated agriculture. Annually, about 17.5 billion m<sup>3</sup>

(90.6%) of water is used for irrigation. The irrigation networks (canals, reservoirs) spread over more than 77,000 km, and the Karakum canal, the largest irrigation construction in the world, irrigates more than one million ha, almost half of irrigated area in the country. The irrigated regions (Kopetdag, Tedjen-Murgab, middle and lower Amudarya oases) differ in climatic conditions, soil fertility, productivity, etc.

The total irrigated area increased substantially from 970,000 ha at independence in 1991 to 2,300,000 ha in 2006. From 2,100,000 ha (91.3%) irrigated area cereals and legumes occupy 52.2%, cotton and industrial crops (30.4%), vegetables and potato (1.7%), forages (7%) and perennial crops (1.7%) From the total irrigated area (2.3 million ha) about 538,700 ha (23.4%) is of poor quality due to poor drainage systems, 32,000 ha (1.4%) due to high water tables and 1,650,200 ha (71.7%) due to different levels of salinity where more than a third require compulsory annual leaching.

However, poor planning of irrigated land use, lack of proper crop management, improper use of mineral fertilizers, pesticides and defoliant, together with low density drainage collection systems and inadequate irrigation networks installed usually in land-bed (with 55-60% effectiveness), results in over flooding (water logging), salinization, etc., with negative consequences. These are being addressed by the reconstruction of irrigation systems, use of water saving technologies, realization of efficient water networks, and cleaning and discharging contaminated and over mineralized drainage water into the Turkmen lake in the heart of the Karakum desert with collection network of 1100 km. Implementation plan of these measures has started within the National Plan on Environmental Protection (2002).

### Agricultural production and productivity

Crop production is affected by important biotic stresses such as yellow rust of wheat (up to 40% loss), sunny bug and weeds, as well as abiotic constraints such as drought,

heat, and high soil salinity. To achieve sustainability the government emphasized the need to improve productivity and quality of cereals (wheat and possibly oats, barley, triticale and maize) through use of new adapted crop varieties and efficient cropping systems, and reinforcing legume and oil seed production to diversify the agricultural sector

Area, production and productivity of major agricultural crops from 2002-04 is presented in Table 1. In 2006, about 3,515,400 tonnes of bread wheat was produced from 916,500 ha with an average yield of 3.84 t ha<sup>-1</sup>. Similarly, 850,000 tonnes of raw cotton was produced from an area of 651,500 ha with an average yield of 1.31 t ha<sup>-1</sup>. However, poor harvests in recent years have led to a 46% decline in cotton exports. About 120,000 farmers are employed in grain production and 220,000 farmers in cotton production.

**Table 1. Area, yield and production of major crops in Turkmenistan (2004)**

Crops	2004		
	Area in ha ('000)	Productivity (t ha <sup>-1</sup> )	Production in tonnes ('000)
Wheat	902.7	3.3	2844.1
Rice	33.2	2.9	98.8
Others	14.5	2.9	41.7
Sub-total	950.4		2984.6
Cotton	607.4	1.2	731.0
Sugar beat	5.0	7.5	37.7
Sub-total	612.4		768.7
Vegetables	28.2	18.6	525.2
Melons	8.0	25.9	207.7
Potato	9.8	21.3	208.3
Sub-total	46.0	x	941.2
Forages	24.8	8.7	216.4
Perennial crops	38.2	NA	NA
Gardens & berries	18.0	6.23	112.1
Vineyards	20.2	13.6	273.7
Total	1633.6		2312.1

Source: Turkmenmillyhisabat; NA=not available and total production figures excludes perennials

In 2004, the 15th People's Council (*Khalk Maslahati*) adopted the Land and Water Code of Turkmenistan, promoting private entrepreneurship for establishing conditions for rational use and protection of lands and

the environment, and improving agricultural production by different farming sectors.

The Government of Turkmenistan adopted a favorable enabling policy environment for agricultural development, encouraging private agricultural producers (farmers) to increase production and productivity. The share of the private sector in gross agricultural production has exceeded 80% (Table 2). All production of vegetables, potatoes, fruits and grapes is handled by private farmers, including cattle and poultry, but except for pedigree stock. Agricultural producers are exempt from all types of taxes and there is no limitation to production of cattle and poultry by the private sector.

**Table 2. Agricultural crop production by public and private sector in 2005**

Crops	Production in MT ('000)			
	All farms	Public sector	Private sector	Private farms (%)
Wheat	3111.1	1729.3	1381.8	44.4
Rice	89.5	66.5	23.0	25.7
Raw cotton	737.1	736.8	0.3	0.04
Sugar beet	67.3	67.3		-
Vegetables	600.1	56.9	543.2	90.5
Melons	245.0	24.9	220.1	
Potato	229.3	2.6	226.7	89.8
Fruits & berries	130.6	16.5	114.1	87.4
Grapes	322.1	87.0	235.1	73.0
Total	5532.1	2787.8	2744.3	49.6

Source: Ministry of Agriculture

## National Policy and Regulatory Framework

Figure 1 presents the organizational structure of the national seed sector in Turkmenistan. The Ministry of Agriculture (MoA) has overall responsibility for coordination, production and control of agricultural and horticultural seeds through the Agricultural Production Services and Scientific Division of the MoA. They supervise the agricultural research institutions which develop new crop varieties and organize seed multiplication and quality control at scientific experimental centers and specialized seed farms in the regions. Apart from the agricultural research

institutes, there are special subdivisions of the MoA including the State Variety Testing and Seed Inspectorate and Plant Quarantine with branches in the regions.

The Grain Producers Association (Turkmengallaonumleri), Food Industry Association and State Cotton Corporation (Turkmen Pagta) also maintain a state seed fund for seed production, processing, storage, and distribution under the directives of the MoA at prices agreed by the government with the Ministry of Economy and Finance.

The MoA has strong interest in national seed sector development, by providing the necessary scientific and financial support for agricultural research, variety development and seed supply.

### **National Seed Policy**

The ‘Strategy of Economic, Political and Cultural Development of Turkmenistan by 2020’ recognized the need for an organized national seed supply and the role of relevant agencies in providing farmers with quality seed of new crop varieties. The MoA is responsible for providing policy directives and overall development of the national seed sector as described earlier. Meanwhile, continuous agricultural sector reforms will ultimately affect the cereal and cotton production sector, the overall organization of the seed sector and role of public and private sector.

For major crops such as wheat and cotton the government enacted resolutions for organizing seed production in line with economic reforms in agriculture and the need for providing incentives for seed producers and users. ‘Strategy 2020’ stipulates wheat and cotton varieties and target certified seed production and distribution which is determined by the MoA and approved by relevant agriculture agencies with participation of regional governors.

There are government measures to increase funds (25%) for seed farms, for

fertilizers and water use limits, provision of seed processing machines, laboratory equipment, and training of seed producers in international centers like ICARDA, TACIS, CYMMIT, AVRDC, etc. as state support for seed production.

### **Regulatory Frameworks**

The ‘Law on Seeds’ No 7725 of 25 June 1999 stipulates the legal framework for seed production including state control mechanisms and the organization and function of various agencies. The areas of state regulation include: (i) identifying major objectives in seed sector development; (ii) establishing seed procurement for certain crops and varieties; (iii) stimulating production of high quality seeds; (iv) implementing rigorous standards; (v) licensing seed production business; (vi) registration of new varieties; (vii) establishing state seed reserve; and (viii) organization and control of seed production.

Regulations prescribing the norms in seed production and control are:

- ‘Law on licensing’ No 7645 of 10 May 2006, a regulation on licensing seed production, determines the responsibility of business entities involved in seed production, processing, storage and distribution to comply with established licensing conditions, rules and norms of state standards, methodological and technological requirements for seed production.
- ‘Law on standardization’ No 4065 of 11 February 1999 stipulates the standards and the requirements for seed quality. This law has since been revised taking into account national interests and pertinent international standards (TDS-GOST) and certain parameters of seed for planting. In establishing seed reserves, business entities have to comply with state standards for handling seed lots, processing, storage, laboratory testing, distribution (in conformity with

the characteristics of crops), varieties and seeds. State standards also envisage the use of appropriate techniques during seed sampling and analysis by laboratories.

- ‘Law on certification of products and services’ No 4114 dated 12 February 2000 provides the legal basis for quality control and certification to be in compliance with state standards for seed production. Seed of crop varieties included in the state register for use in Turkmenistan and subject for distribution have to be certified and their origin, varietal characters, and planting quality have to be confirmed. The State Variety Testing and Seed Inspectorate is a certification agency, and issues certificates to ensure the quality of seed used by the consumers. Annually about 80,000 seed certification analyses are carried out by the laboratories.
- In accordance with the special decree of the President of Turkmenistan, plant breeding and foundation seed production of wheat and cotton will be conducted by research institutions only in accordance with appropriate methods and instructions. Specialized seed farms produce later generations (C1 to C3) of seed to satisfy the needs of the country for wheat and cotton.
- Seed of released and promising wheat and cotton varieties are subject to extra payment for procurement prices: breeder seed (3 times), foundation seed (2.5), Certified 1 (1.8) C2 (1.5), C3 (1.3). Currently, additional payments for cotton seed are being revised and amended.
- The MoA adopted a regulation on state variety testing and release in agriculture, and submitted a draft law on plant variety protection rights (selection achievements). There is no specific legislation concerning plant genetic resources.

#### List of seed regulatory frameworks

Document	Law number and year of enactment
National plan for agricultural and seed sector development or policy in seed production	Constituted within national agricultural policy and strategy
Seed law	#7725 (25 June 1999)
Regulations on import and variety release for supply of super elite and elite seeds	#5521 (12 Sep 2002)
State variety register	#5408 (7 May 2002)
Regulations on seed production and seed processing	#7726 (25 June 1999)
Certification of products and services	#4114 (12 June 2000)
Regulations on import, internal trade and export of seeds	Every year
Resolution of Council of Ministers and Law on quarantine and phytosanitary measures	#449 (5 Dec 1995) & #2668 (25 May 1999)
Other documents of legal character, related to setting up and conducting seed production business	Available within overall development of seed sector
Regulation on state variety testing and release	#5145 (11 April 2001)

### Agricultural Research and Variety Development

Prior to 1991, most plant genetic resource conservation and breeding activities were coordinated by the Vavilov Institute in St Petersburg, Russia. To date, agricultural research and crop improvement has been conducted by crop-specific research institutes established as part of a ‘Turkmengrain’, within the government diversification policy. There are three main agricultural research institutes involved in cereal, cotton and vegetable improvement and natural resource (land) management. About 82% of commercially grown varieties come from abroad, and national breeding activities are relatively limited, with the exception of cotton, melons, onions and sorghum.

#### Plant genetic resource conservation

Turkmenistan, in collaboration with ICARDA-CAC, established a gene bank for some agricultural crops. Since 2006, NRICC operates a national gene bank for

conservation of genetic resources. The conservation, regeneration of genetic resources of fruit trees and viticulture is assigned to a scientific experimental center in Maktynguly in the Balkan region.

### National Research Institute of Cereal Crops

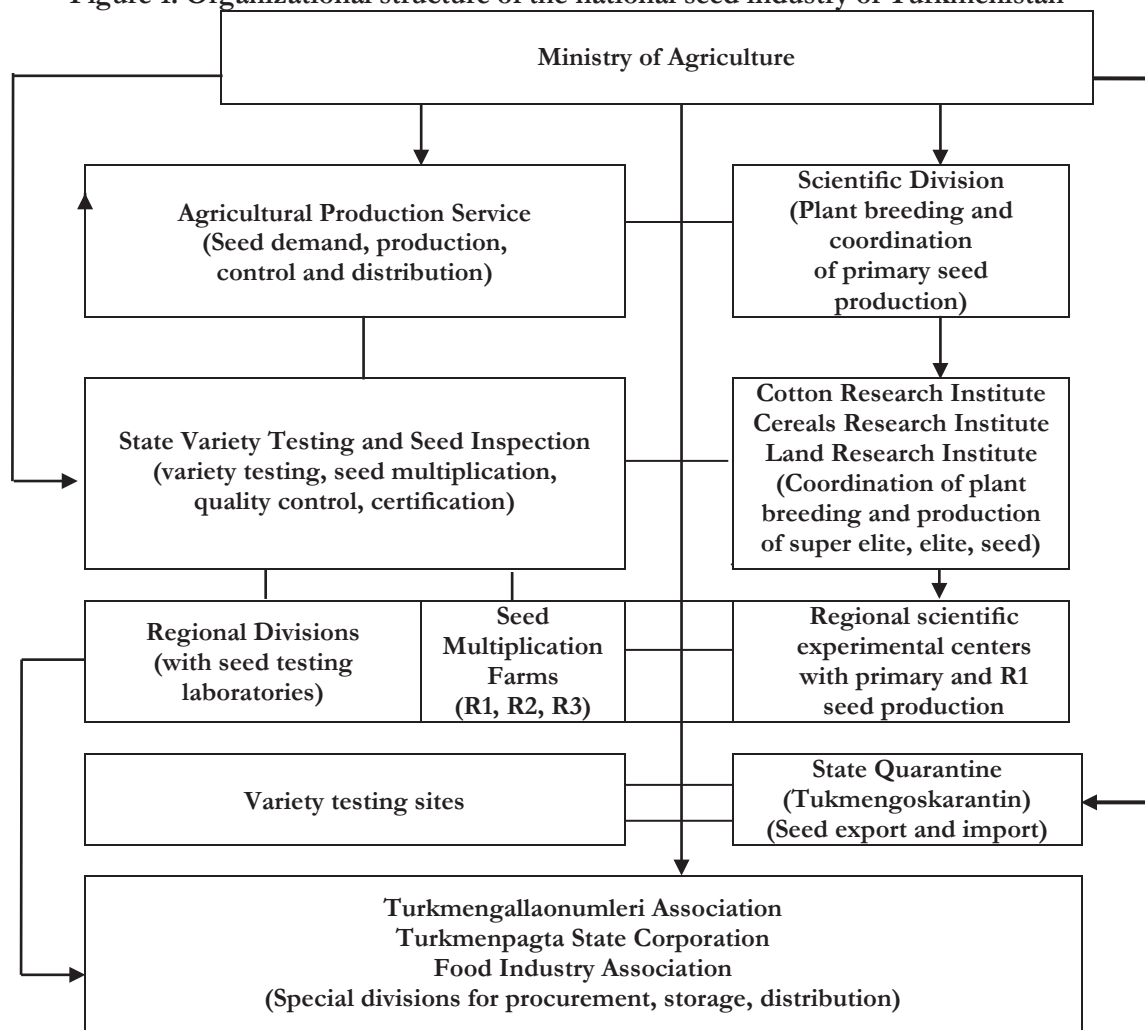
The National Research Institute of Cereal Crops (NRICC) is responsible for variety development, crop management and seed production. It has three main departments: cereal crops, legume crops and seed production. The institute has four branches, one each in Balkan, Dashoguz, Lebap and Mars provinces. The branches mainly deal with seed production of varieties released by the institute. The NRICC is responsible for breeding and primary seed production of wheat (bread and durum), barley, triticale,

maize, sorghum, chickpea, lentil, safflower, soybean and others.

The breeding program uses world wheat germplasm collections to develop new varieties adapted to local climatic conditions and better agronomic management. It has developed new bread wheat (*Turkmenbashi*) and durum wheat (*Turkmenbashi-1*), sorghum (*Turkmenistan-8*), and maize (*Annu-62*) from introductions to Turkmenistan.

Moreover, winter wheat varieties (*Bitarap*, *Lebap-1*, *Altyn Asyr*) were also developed and released for irrigated conditions. At present, NCRICC has already submitted to the State Variety Testing Committee several new varieties of bread wheat (*Miras*, *Annan*), durum wheat (*Akbash*, *Karakylchyk*), triticale (*Rubnama*, *Hasyly*), chickpea (*Akbal*), sorghum (*Turkmenistan-10*) and maize (*Paytagl*).

Figure 1. Organizational structure of the national seed industry of Turkmenistan



### **Cotton Research Institute**

The Cotton Research Institute (CRI) develops cotton varieties with deciduous properties, and suitable for cultivation in harsh conditions such as drought, high temperatures, and low water use combined, but with high quality fiber and yield.

At present, CRI has branch offices or experimental stations in five provinces, with six laboratories and 110 scientific staff working on different aspects of variety development, plant physiology and seed production. *Eloten-7*, a variety with a medium fiber type, was released in 2000 and now occupies more than half of the cotton planting area in the country. Fine fiber type varieties (*Eloten-14* and *Eloten-21*) have better economic returns compared to obsolete varieties (*9871-I* and *9938-I*).

Turkmenistan was the world's tenth-largest cotton producer. There is a well developed cotton seed production program.

### **Research Institute of Crop and Land Management**

The Research Institute of Crop and Land Management (RICLM) has branches in all five provinces with over 300 scientific and technical staff. In collaboration with scientists from Turkmen Agricultural University, RICLM is expanding its research on plant breeding, particularly vegetables, melons, fruits and grapes.

RICLM is developing heat resistant, highly productive vegetable varieties adaptable to hot and severe continental climates, resistant to diseases, with high quality fruits for fresh consumption, and suitable for mechanical harvesting and processing. During recent years, the institute has identified prospective varieties of tomato, cucumber, pepper, egg plant, garlic, melon, water melon and pumpkin. The breeding program resulted in releasing high yielding varieties of tomato (*Gok-yayla*, *Kopetdag*, *Balkan*, *Serdar*) and cucumber (*Gyaurs-3*, *Toso-1* and *Ahal*), and the Central Experimental Station produces elite seed of these varieties.

RICLM is also responsible for quality control of mineral fertilizers and pesticides (local and imported) which are recommended for use in agriculture. It is also working in introducing water-saving technologies for crop production.

### **Variety Testing, Registration and Release**

The State Variety Testing and Seed Certification of the MoA is responsible for variety testing and release. The MoA together with agricultural research institutes approves crop varieties for testing and release. New crop varieties and hybrids submitted for state variety testing has to be equal or surpass the best released varieties in productivity (yield) or product quality.

An application for new crop variety developed by a breeder (or group of breeders) for testing and inclusion in the State Variety Register, should be submitted by the breeders' organization (research institution, company, etc.). Applications should then be submitted to the State Variety Testing and Seed Certification organization with the following documents:

- Application for inclusion of a variety in the State Variety Register and recommended for use in the country.
- Proposed variety name and proposed agro-climatic region for variety testing.
- Breeders licence and number of breeders.
- Description of new variety in an established format.
- Comparative evaluation of quality indicators of the new variety based on data provided by the applying institution.
- Phytopathological and entomological tests on stability of a new variety after artificial infection.
- Guarantee of provision of the required amount of seed of any new variety for experiments and testing.

- Pictures of the variety (for cotton varieties: genetic homogeneity, pictures of two sympodial branches, 2-3 pappus and 2-3 fiber staples).

New varieties developed by research institutions have to undergo three years of examination, compared with the best commercial variety, before submitting for state variety testing.

### State variety register

Since 2004, the State Variety Testing and Seed Inspectorate maintain the list of crop varieties in the State Variety Register, allowed for use in Turkmenistan. Foreign varieties not registered in the State Register are subject to state variety testing before seed can be imported and distributed.

**Table 3. Number of released crop varieties in Turkmenistan, 2004**

Crops	No.	Crops	No.
Winter wheat	7	Apples	13
Durum wheat	2	Pears	12
Winter barley	3	Plums	9
Rice	5	Cherries	14
Maize	13	Peaches	16
Sub-total	30	Apricots	13
Cotton (medium fiber)	18 (11/7)	Viticulture	21
Sugar beet	6	Technical	4
Sub-total	24	Universal	4
White cabbage	5	Perennials (total)	106
Onion	4		
Cucumber (open field)	5		
Tomato (open field)	17		
Water melons/melons	14 (3/11)		
Subtotal	45		

**Note:** The list does not include subtropical nut trees, forage and legumes with limited areas

### Formal Seed Production

The formal seed production primarily consists of the public sector. The objectives are to supply high quality wheat, rice, cotton, and

sugarbeet seed at a reasonable price. Apart from developing new crop varieties, scientific and experimental institutions produce breeder and foundation seed in specialized seed farms. The licensed seed farms (*daibanbirlishiki*) produce certified seed (R1, R2, R3) of cotton (95,100 ha) and wheat (102,000 ha). The State Cotton Corporation (*Turkmenpagta*) has elite seed production divisions and processing plants for production, processing, storage and distribution of cotton seed. The Grain Producer Association (*Turkmenagallaonumleri*) is a network of production and processing companies (production, processing, storage, and distribution) that produces wheat and rice seed, and the Turkmenistan Food Industry Association produces sugar beet seed. The state controls the varietal composition and seed production.

Seed production is a licensed business and the MoA issues licenses in accordance with established guidelines. Annually, the government adopts resolutions on the amount of cotton, wheat, rice and sugar beet seed for production, including state seed reserve of these crops. The MoA through the Council (*Genesh*) of Agriculture defines seed production farms, range of crops, varieties and classes for seed production, order and terms of approbation of seed production and establish procedures for quality control of seed produced by seed producing entities.

Wheat and cotton seed production is compulsory and restricted to those released and in the Variety Register according to established procedures and under the control of the MoA. The regional inspection services control seed production by specialized seed farms in line with state and interstate standards, and issue certificates ensuring the adequacy of seed quality. Annually, 250,000 tonnes of wheat, 10,000 tonnes of rice, 130,000 tonnes of cotton and 100 tonnes of sugar beet certified seed is produced (Table 4), and substantial areas will be planted based on the seed rate (Table 5). During the last five years, bread (*Turkmenbashi*, *Bitarap*) and durum (*Turkmenbashi-1*) adapted wheat



varieties with high yield and quality were extensively used in production.

Prior to 1991, plant breeding and seed production were centralized and there was no functioning private sector. Traditionally, import and distribution of potato seed for early spring planting, early maturing vegetables (cabbage, carrot, tomato, greens) and greenhouse plants, were handled by specialized public sector entities. Most vegetables are produced under poor conditions in the country.

In 2005, the MoA and the World Vegetable Center (AVRDC) signed an agreement on research and development of the vegetable sector using germplasm from world and/or regional collections.

To date there is no seed production by the private sector. There are needs, not only to improve production, but also to coordinate the import of some seeds, where local production is not possible because of climatic conditions or lack of skills.

**Table 3. Breeder and foundation seed production (MT) in Turkmenistan (1991-2005)**

		1991	1995	2005	2007
Cotton	BS	650	550	500	525
	FS	2600	2400	2000	2150
	Sub-total	3250	2950	2500	2675
Wheat	BS	223	2204	5690	5500
	FS	3540	22045	45560	44450
	Sub-total	3763	24249	51250	49,950
Barley	BS	25	15	11	14
	FS	478	345	150	170
	Sub-total	503	360	161	184
Chickpea	BS	9	12	15	13
	FS	45	55	61	54
	Sub-total	54	67	76	67
Safflower	BS	40	15	22	20
	FS	108	32	56	52
	Sub-total	148	47	78	72
Total		7718	27673	54065	52948

**Table 4. Amount of certified seed production (000 t) in Turkmenistan, 03-2007**

	2003	2004	2005	2006	2007
Cotton	122	130	135	140	138
Cereals	235	238	238	246	250
Rice	9	8.7	10.1	11.2	10.5
Potato	0.9	1.3	1.4	2.2	2.3
Sugar beet	0.09	0.1	0.10	115	0.1
Total	367	378.1	384.5	399.4	400.9

**Table 5. Seed rates (kg ha<sup>-1</sup>) for seed production**

Seed category	Cotton	Wheat	Rice	Potato	Sugar beet
Pre basic	50	160	150	2100	6-8
Basic	65	180	170	2200	7-8
C 1	80	200-210	190	2300	8-10
C 2	110-120	200-220	200	2500	10-12
C 3	120	220-240	210	2700	10-12

## Seed Processing and Storage

Turkmenistan has 26 seed plants comprising 12 cereal seed processing plants with a total capacity of 300,000 tonnes, and 25 cotton seed delinting plants with 140,000 tonnes capacity. It has a wide range of modern machinery for seed cleaning, treatment, and packaging. The high capacity seed processing plants are computerized to gather data from receipt of raw seed to dispatch of cleaned seed for marketing or distribution. All seed cleaning equipment belongs to the government and functions by the special order of the Cabinet of Ministers.

## Seed Marketing and Distribution

The two main crops, wheat and cotton, cover up to 90% of total cultivated area and is fully planted with guaranteed quality seed. The State Cotton Corporation (Turkmen Pagta) sells seed cotton to public sector producers at prices agreed with the Ministry of Economy and Finance, based on the type and seed class (reproduction). The volume

of seed produced (accounting for probable re-sowing) is 130,000 tonnes. Similarly, the Grain Producers Association (Turkmengallaunumleri) will provide 250,000 tonnes of wheat seed both to public and private producers. All wheat seed is handled by specialized public sector seed farms.

Locally (region and district) seed is distributed both by the public and private sector. In the public sector, seed is distributed by the State Corporation (Turkmen Pagta) for cotton seeds, the Association of Bread Producers (Turkmengallonumleri) for wheat and rice seed; and the Association of Food Industry (Marysheker) for sugar beet seed, with participation of marketing and certifying agencies from relevant institutions. For vegetable, forage, potato seeds and planting stock of fruits and vines, seed is distributed by the private sector at agreed prices by local traders and without certification.

The seed price includes cleaning, treatment and storage costs. The purchase prices (state order) for grain are stable at 215.6 Manats tonne<sup>-1</sup> (US\$77/t). For seed producers, the seed price could be 1.3 to 3 times more than grain purchase price and 745 Manats (US\$266/t).

### Informal Seed Sector

The informal sector covers mainly the need of vegetable and melon production. Table 6 shows that the vegetable sector requires about 135 tonnes of seed, overwhelmingly provided by local producers including traditional seed sources. There is no domestic breeding program for vegetables and no organized seed production. Most vegetable seed is sold mainly by foreign companies and mostly by local businesses, which often distribute seed not included in the State Variety Register, and of unknown origin and low quality. Seed producers have limited technical know-how and infrastructure for seed production of vegetables, melons and gourds. It is necessary to establish private companies

similar to Sortsemovosh, which will regulate vegetable seed production and will have an opportunity to cooperate with international organizations like AVRDC.

**Table 6. Area cultivated and seed requirement for vegetable crops**

	Area (000 ha)	Seed rate (kg ha <sup>-1</sup> )	Amount required (tonnes)	%
Tomatoes	16.3	1.8	29.8	57.2
Bulb onion	2.6	13.0	33.8	9.1
Carrot	2.3	7.0	16.2	8.1
Cucumber	2.3	5.0	11.5	8.1
Cabbage	2.2	2.0	4.4	7.7
Pepper, egg-plant and others	1.3	2.5	3.3	4.6
Pumpkin	0.8	3.5	2.8	2.8
Greens	0.4	15.0	6.0	1.4
Beetroot	0.3	14.0	4.2	1.0
Glass-house plants	-	-	≤1	-
Melons and gourds	8.0	-	22.0	100
Watermelons	5.3	3.0	15.9	66.3
Melons	2.7	2.2	6.1	33.7
Total	28.5	-	113.0	100

There is massive increase in demand for ware potatoes, from 160,000 tonnes in 2005 to 300,000 tonnes in 2020, to keep pace with anticipated population growth. All potato seed for planting over 10,000 ha is imported, due to the absence of local production, with an estimated annual demand of 20,000 to 30,000 tonnes. Taking into account that potato seed production is handled mainly by the private sector, storage from June to February (9 months) is problematic without adequate storage facilities. Thus, the private sector imports seed potato during October-November from Uzbekistan and Russia.

In principle, organization of local potato seed production using the true potato seed method is possible in some mountain regions of the country (Baharly and Tahtabazar etraps). However, this requires scientific and technological support, including large capacity refrigerators, pesticides and professional breeders with organized seed production through joint ventures with foreign companies.

Garlic is the second most important crop, with seed demand of about 100 tonnes (and a planting rate of 1.5 t ha<sup>-1</sup>). Vegetative multiplication is widely used in viticulture, fruits and floriculture. Planting stock of these crops is provided by the 'Gok-Gushak' (Green Belt) fruit farm joint stock company under the Ministry of Environment Protection, and some private companies.

### Seed Quality Control

The State Variety Testing and Seed Certification, under the MoA, is responsible for quality control and certification of seeds including approbation of seedlings, laboratory analysis, analytical and technical services. The agency has chemical, technological and seed testing laboratories attached to cotton processing plants in the regions.

In accordance with Seed Law No 7725 dated 25 June 1999, the MoA participates in international and regional cooperation in seed production and working with ICARDA, CIMMYT, AVRDC, TACIS, TIKA, and Semins (ex Royal Sluis).

### International Seed Trade

Seed import focuses on vegetables and forages, specifically for early maturing crops where there is no domestic seed production. The seed import is carried out by private companies. There are permissions required to import and export seed for main crops such as wheat and cotton. Seed can be imported and exported only under special resolution of Council of Ministers.

At present seed import includes potato for early spring sowing (10,000 tonnes) early maturing cabbage; early maturing tomato for open fields (2 tonnes) and greenhouses (1 tonne); carrot (6 tonnes); pepper, spinach, greens (0.5 tonnes); and sweet corn (6 tonnes). There is also interest for import of early maturing maize hybrids, food legumes, forage crops and others depending on demand. There is a

possibility for highly productive wheat varieties (taking into consideration preliminary state testing) with valuable milling and baking quality in the private sector (farms). Seed production issues also reflected in ICARDA-CAC and TACIS programs (cereals, legumes, forages, etc.). These programs anticipate improving breeding methodology and introduction of highly productive varieties, adaptive to local conditions, using gene-pools of world collections.

A Dutch company, Royal Sluis (currently Semins), periodically imports vegetable and water melon seed (mainly hybrids) for open and greenhouse production.

### National Quarantine Service

The Resolution of the Council of Ministers No. 449 of 5 December 1995, stipulates the phytosanitary and veterinary regulations. A Law on Plant Quarantine No. 2668 was enacted on 25 May 1999. The State Inspection for Plant Quarantine under the MoA carries out phytosanitary and veterinary control of seeds, and issues certificates for seeds exported, imported or transited in the country. The Council of Ministries is the only body who can issue permits for seed import and/or seed export.

According to the Law for Agricultural Plants Protection No 116-II of 31 August 2000 and the Regulation on Procedure for Certification of Products (Annex to Resolution of the Council of Ministers Nos 318 dated 6 July 2004) and Rules of Main State Veterinary Control Department of 25 July 2003, all seeds produced locally, imported, exported, or transited are subject to obligatory phytosanitary and veterinary control.

The State Plant Quarantine Inspection (Turkmengoskarantin) is responsible for quarantine services and operates in accordance with approved rules and procedures. The quarantine measures are aimed at preventing the introduction of quarantine pests, diseases and weeds,

which may cause economic loss to the country. Seed import is allowed based on import quarantine permission issued by Turkmengoskarantin, stipulating conditions of import and use and phytosanitary certificates of international standards, issued by the exporting country's quarantine and/or plant protection agencies, certifying phytosanitary condition of the material and compliance with Turkmenistan state standards (TDS) or higher. Seed import is allowed only for those crop varieties and hybrids which are included in the State Variety Register. There is also an introductory-quarantine nursery operated by Turkmengoskarantin (Etrap Mahtumkuli).

### Constraints for Seed Sector Development

The main constraints for the development of the national seed industry in Turkmenistan include the following key factors:

- Monopoly of wheat and cotton seed production and supply operated by the public sector, and dilapidated seed processing equipment compared to technologically advanced cleaning, treatment, and packaging equipment available for use by some producers or cooperatives.
- Extremely weak organization of seed production of barley, maize, alfalfa, etc., at all levels of seed supply (variety use, production technologies, seed production and distribution).
- Poor organization of seed production and supply of vegetable and potato seed at the national levels despite increased local demand for seed.
- Limited seed export opportunities due to absence of organized seed production within the country, low provision of equipment and material resources, and limited range of local varieties, suitable for cultivation in other countries and climatic conditions

### Recommendations for Seed Sector Development

The following are recommended to improve the development of the seed sector in Turkmenistan:

- Increase the participation of the private sector to diversify the seed delivery of major crops, and move away from present seed provision, dominated by the public sector.
- The Government to continue to support seed production and supply for non-profitable crops suitable for less favorable areas, and which are not likely to attract private sector investment. It is also important that such Government initiatives do not hinder private sector development due to unfair competition.
- The Government to encourage small and medium sized private enterprises/companies/seed growers to undertake quality seed production of less important crops such as legumes, oilseeds, forages etc., to increase both availability and efficiency of seed distribution systems for the benefit of farmers, especially for those crops that are not under the direct monitoring of the Government. Even for crops such as cotton and wheat, decentralized production under varying agro-climatic conditions will be desirable.
- Provision of credit facilities or investment for the private sector, for better equipment, etc., for the development of the seed sector.
- Organization of the seed sector by establishing a seed trade association, responsible for the seed sector.