

Focus on Seed Programs

The Uzbekistan Seed Industry

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Introduction

Uzbekistan is located between longitude 64°E and latitude 41°N and bordered by Kazakhstan in the west and north; Afghanistan and Turkmenistan in the south, and Kyrgyzstan and Tajikistan in the east.

Uzbekistan has a total area of 44.8 million hectares. About 4.5 million hectare is arable, of which 4 million hectare is irrigated. Agriculture plays a major role in the economy, employing 44% from a total population of 26.8 million (1.7% growth rate) and contributing 38% to the GDP.

Uzbekistan has extreme continental type climate, with hot dry summers, unstable weather in winter, and a wide variation in seasonal and daily temperatures. The desert and steppes are characterized by short winters with thin and unstable snow cover, and hot dry dusty summers. The mountains (over 600 masl) have high rainfall (up to 200 mm per year).

In 1996, the Government of Uzbekistan adopted an agricultural development policy (Resolution of the Cabinet of Ministers No. 157) to achieving food security and economic development. The policy enabled rapid economic growth in the agricultural sector, particularly in the development and adoption of modern wheat and cotton varieties. In view of the increasing population, further advances are required in agricultural research to achieve increased production and productivity.

Table 1: Area, yield and production of major crops in Uzbekistan (2005)

Crops	Area (000 ha)	Yield (t/ha)	Production (000 t)
Cotton	1393	2.6	3621.8
Wheat	1428.3	4.2	6041.7
Barley	64.4	1.4	90.8
Rice	47.8	3.1	149.6
Sorghum	2.8	1.7	4.8
Rye	7	2	14
Oat	1.5	2.8	4.2
Millet	4.5	1.8	8.1
Maize	13.6	3.8	51.7
Total	1565	4.1	6364.9
Chickpea	15	1.7	25.5
Mung bean	7	2	14
Soy bean	0.6	1.2	0.7
Lentil	1	1	1
Total	23.6	1.7	41.2
Ground nut	9	2.1	18.9
Safflower	27.1	0.5	13.6
Sesame	2.3	0.6	1.4
Sunflower	10.5	1.1	12
Total	48.9	0.9	45.9
Alfalfa	134.2	11	1476.2
Fooder beat	2.7	23.5	63.5
Total	136.9	11.2	1539.7
Maize (silage)	78.8	16	1260.8
Maize ¹ (silage)	65.2	11.5	749.8
Agricultural crops	3246.6	2.3	7582.4
Vegetable crops	235.6	20.2	4763.9
Total	3482.2		12346.3

Source: MAWR; ¹double cropping

The main crop grown in Uzbekistan is cotton, followed by wheat, barley, rice, maize, potato, vegetables, and fruits (Table 1). However, cotton and winter wheat occupies 80% of the total irrigated area. During the first six years of independence, the area under cotton was reduced from 2 to 1.4 million ha and mainly replaced by wheat. In order to attain food security, wheat became the second important crop to cotton; the area under irrigation increased substantially, currently reaching over 1.4 million ha, including rainfed production. The increase in cultivated areas stimulated the use of modern production techniques such as improved varieties, certified seed and better agronomic management practices.

The average wheat yield is 4.2 t/ha, almost three times higher than in 1994. Annual average wheat grain production has reached 6 million tons, and the country is now self-sufficient in grain production.

National Seed Policy and Regulatory Framework

In a national drive for food security, the Government of Uzbekistan has set a clear goal of liberalizing its agricultural economy by reducing the role of the public sector and encouraging private sector participation and investment. The economic liberalization, coupled with policy and regulatory reforms pursued by government had a profound impact on the organization of the agricultural sector in general and the seed sector in particular.

National Seed Policy

In Uzbekistan, the national seed sector is in a state of transition. There is a mix of public sector and domestic private seed companies, cooperatives, and farmers involved in seed production and supply. The policy and regulatory framework support the role of the private seed sector in the seed industry.

It is important for the government to enact a clear, stable and consistent seed policy, which defines the organizations, functions and linkages and stipulates the mechanisms for coordinating activities and

monitoring the progress of the national seed industry. A National Seed Council is envisaged, which will assist the government in formulating policies and guide the development of the national seed industry.

Regulatory Framework

Within the context of the national seed sector, the regulatory framework encompasses laws, regulation, procedures, and guidelines that govern the organization and management of variety development, testing, registration, and release; seed quality assurance; international seed trade (import or export); plant quarantine and phytosanitary issues; international conventions on intellectual property rights, plant genetic resources and biosafety, which directly or indirectly impact on exchange and access to genetic resources and modern technology. A review of existing regulations and instruments on quality control and seed certification has been made.

The national Seed Law #267-I was adopted on 29 August 1996 and amended by Law #252-I of 25 April 1997 and Law #772-I (Chapter XV) of 15 April 1999. The law covers agricultural seeds and aimed at the conservation and use of genetic resources in plant breeding programs to develop new varieties and establish effective seed production and quality control system.

Variety Registration and Release

The regulation for the State Register of Agricultural Crops is governed by Annex #2 of the Resolution (of the Cabinet of Ministers of the Republic of Uzbekistan) #553 of 18 December 1997. The regulation maintains a state register of agricultural crops recommended and released in Uzbekistan. All plant varieties grown on large areas should be included in the register.

The State (Agricultural Plants) Variety Testing Commission (SVTC), based on its charter adopted by MAWR Order #30 of 31 January 1997, administers the register. The SVTC is a legal entity responsible for testing new varieties before release.

Plant Variety Protection

The 'Breeding Achievement Act' #270-I of 29 August 2002 covers intellectual property rights, including procedures for testing and granting protection, breeders' rights and the patent office. In October 2004, Uzbekistan became the 57th member of the International Union for Protection of New Varieties of Plants (UPOV). The regulation and criteria used in PVP Act for registering new crop varieties and for granting plant breeders' right is in line with UPOV Convention. The varieties have to be distinct, uniform, stable, and not exploited before the date of application for the registration. The PVP Act also grants the public or community the rights to authorize the use of local landraces and wild species found in their habitat.

Seed Quality Control and Certification

The law on 'Certification of Products and Services' #1006-XII of 28 December 1993 and the Law on 'Standardization' are general certification regulations in Uzbekistan. The State (Agricultural) Seed Certification and Quality Control Center (SSCQCC) is the government agency assigned for seed quality control and certification. The SSCQCC was established under the Ministry of Agriculture and Water Resources (MAWR) by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan #421 of 31 October 1995.

The objectives, tasks, and functions of the SSCQCC are stipulated by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan #553 of 18 December 1997. A major document governing the status of the SSCQCC is Annex #1 to the Resolution #553 of 18 December 1997.

The SSCQCC was accredited by State Committee on Standardization, Metrology and Certification (Uzgosstandart). The Certification Order PSMK-02-2003 is the officially accepted document used by the SSCQCC for national seed certification system under the agreement reached with Uzgosstandart. The document stipulates detailed procedures for certifying agricultural seeds and defines an order of

seed (except cotton seed). It is used not only by the SSCQCC, but also by seed production farms, seed procurement centers, seed processing plants, and seed producers. It complies with the requirements for RST UZ 5.0 and RD UZ 51-62 standards.

Plant Quarantine

The Resolution of the Cabinet of Ministers #449 of 5 December 1995 stipulates the phytosanitary and veterinary regulations. The State Inspection for Plant Quarantine under the MAWR carries out phytosanitary and veterinary control of seeds, and issues certificates for seeds exported, imported or transited in the country.

According to the Law for Agricultural Plants Protection #116-II of 31 August 2000 and the Regulation on Procedure for Certification of Products (Annex to Resolution of the Cabinet of Ministers #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.

Agricultural Research and Variety Development

In 2002, the State Scientific Committee was re-organized and re-named Center for Science and Technology (CST) under the Cabinet of Ministers in Uzbekistan. The Center finances state programs on research, science, and technology development.

Variety Development

In Uzbekistan, agricultural research, crop improvement and seed production of cereals, legumes, oilseeds and forages is carried out by various institutes, including the Uzbek Research Institute for Irrigated Cereal and Legume Crops (Andijan, and Gallaayal), Uzbek Research Institute of Rice (Tashkent), Uzbek Research Institute of Plant Industry (Tashkent), Uzbek Research Institute of Horticultural Crops,

Uzbek Research Institute of Cotton, Uzbek Research Institute of Cotton Breeding and Seed Production, Tashkent State Agricultural University, Samarkand Agricultural Institute, Andijan Institute of Cotton Breeding, and other research institutes.

Uzbek Research Institute of Plant Industry

Uzbek Research Institute of Plant Industry (UzRIPI) was established in 1924. The institute is responsible for plant genetic resources conservation and has undertaken plant breeding program for sunflower, groundnut, triticale, and other irrigated cereal crops. It has six departments (Documentation, Introduction, Field Crops, Wild Species, Vegetable Crops and Potato, Fruit Crops) and laboratories (Seed Testing, Viticulture, Biochemistry). There are two branches, in Andijan and Surkhandarya provinces.

UzRIPI provides 400–600 accessions of different crops annually to 20 research institutions for further evaluation, of which 250–350 are cereals, legumes, and oil crops.

ICARDA supported the building of a National Genebank at UzRIPI and trained staff on the documentation of genetic resources collected in the country. The documentation unit has established a computer database according to international norms. The seed-testing laboratory was established in 1999, and used for monitoring seed quality in genetic resources conservation. After the reconstruction of the storage unit, the cereals, legumes, and oilseed accessions were transferred to a long-term storage. So far, 15,000 accessions of different crops have been stored after rejuvenation and testing for moisture content and germination.

Uzbek Research Institute for Irrigated Cereal and Legume Crops

The Uzbek Research Institute for Irrigated Cereal and Legume Crops (UzRII) was established in Andijan by the Ministerial Decree # 413 in 1997. According to the Decree, 11 new experimental stations (except Gallaayal Research Station) were established for crop improvement and seed

sector development in each of the provinces. It has eight laboratories working on variety development, plant physiology, and seed production of cereal and legume crops.

UzRII collaborated with the Krasnodar Agriculture Research Institute where many varieties from Russia were introduced, evaluated, and released. These varieties have shown good yield potential under irrigated condition and have increased the average yield potential of wheat by almost two fold since independence.

The Gallaayal Research Station is one of the oldest centers. It was established in 1913 and currently operates (from 1997) under UzRII. It has a long experience on rainfed agriculture and has made significant contributions to variety development and seed production in wheat, barley, legumes, safflower, and alfalfa.

Since 1999, the institute has been collaborating with the international agricultural research centers (ICARDA, CIMMYT), receiving over 2000 breeding lines of cereals and legumes each year. The objective of the breeding program is to develop cultivars having good grain quality, high yield and resistance to diseases under irrigated and rainfed conditions.

Uzbek Research Institute of Rice

The Uzbek Research Institute of Rice (UzRI-Rice) is responsible for rice crop improvement and seed production. The Nukus Research Station was established in 1971 to conduct basic and applied research on rice and legume crops through multidisciplinary approach and to increase overall rice production and improve grain quality for improving the livelihoods of farmers in Karakalpakstan region. It has four research laboratories on rice, wheat, sorghum, mung bean, soybean, and chickpea.

The Rice Research Station was involved in five projects on the breeding of rice, mung bean, soybean and wheat as well as wheat and rice rotation systems. The institute is responsible for variety development and seed multiplication of rice

in the Karakalpakstan region and has released early maturing and disease and drought tolerant rice varieties for irrigated conditions (Jaykhun, Istiqbol, Avangard, Alanga, Tolmas, etc) particularly for the Aral Sea Basin.

Uzbek Research Institute of Horticulture

The Uzbek Research Institute of Horticulture (UzRI-Horticulture) is under the aegis of the Uzbek Scientific Production Center for Agriculture. The project has been envisaged as a national network of multidisciplinary research on major horticultural crops. The UzRI-Horticulture has seven main branches and 18 experimental stations to undertake the coordinated research projects on horticultural crops in Uzbekistan.

The Government realizes that the private sector has a comparative advantage in variety development. In line with the "Breeding Achievement Act," the Government provides all possible support to the private sector plant breeding. Therefore, as the private sector develops, the government will systematically reduce its activities or participate on a commercial basis to avoid unfair competition. The Government of Uzbekistan will make all efforts aimed at modifying the appropriate legislations, guidelines, and normative acts to facilitate private sector plant breeding of all agricultural crops.

Research on Seed Technology

There are three main agricultural universities in Uzbekistan, namely; Tashkent State Agricultural University, Samarkand Agricultural Institute, and Andijan Institute of Cotton Breeding. Each of them has a department of seed science and technology. The departments undertake academic education, training, research, and advisory services in seed production, storage, quality, certification, physiology, entomology, and pathology, planning and implementation of projects, and course curriculum development for postgraduate courses. The Tashkent State Agricultural University and

the Samarkand Agricultural Institute have started offering short-term training courses and have established postgraduate degree courses (M. Sc.) for students specializing in seed science and technology.

Variety Testing, Registration, and Release

The State Variety Testing Commission (SVTC) is a national agency entrusted with the responsibility for variety testing, registration and release system. The Commission conducts two types of testing for release of varieties and hybrids: (i) value for cultivation and use (variety performance trials); and (ii) distinctness, uniformity and stability (morphological description of varieties) and plant variety protection rights (patentability). The variety release system for agricultural crops requires both tests for inclusion in the state register of agricultural crops released in Uzbekistan. The variety release system has a network of 12 state variety testing experimental stations and 36 special state variety trail sites in different agro-climatic zones of the country. All SVTC stations are testing cotton and other industrial crops, whereas eight stations are testing cereal and legume crops.

Variety performance testing requires three years of field evaluation in various locations, extensive screening for disease resistance and grain quality. The promising lines that survive rigorous testing can be proposed at the SVTC meetings held in December every year. The sub-committee for each group of crops, which includes nearly all researchers, critically examines the performance data submitted to the SVTC and recommends the variety for registration and release. The recommendation by the sub-committee will be submitted for formal approval and release to the Ministry of Agriculture and Water Resources. Upon approval, the SVTC publishes the variety in a state register for agricultural crops.

About 153 cereal, legume, oil seed and forage crop varieties were released by the SVTC (Table 2), 67% of which were bred by

the national agricultural research institutes. Wheat is the most important crop and it had the largest proportion of released varieties. Fifty-seven varieties of bread and durum wheat, barley, chickpea, lentil, vetch, groundnut, etc., were selected from the germplasm and breeding materials received from the CG centers and other countries.

Table 2. Number of varieties released and on recommended list in 2005

Crops	National	Foreign	Total
Cereals	72	41	113
Legumes	14	2	16
Oilseeds	4	4	8
Forages	16		16
Total	106	47	153

Source: State Variety Testing Commission

The SVTC proposed a major overhaul of the entire variety release system and suggested to drop the assessment for agronomic performance for wheat, to allow varieties to enter the market fast, reduce costs, and give farmers more choices. After objections from the research community, producer groups and seed company representatives, the recommendation has reversed opting to retain agronomic merit as a requirement for wheat variety release. However, the debate for release requirements is likely to continue for some time.

Variety Maintenance

The owner of the variety, the public research institute or private breeding company or their agent is responsible for variety maintenance and breeder seed production. The institute (originator of the released variety) verifies the maintenance of the protected variety. Employees of the institute entrusted with the responsibility are entitled to enter premises and facilities of the persons or companies given the permission to handle the protected variety, and request from such persons necessary documentation and information to ensure proper control.

For cereals, variety maintenance begins after few years of selection trials. The breeder bulks purified lines to produce breeder seed and foundation seed. Breeders regularly maintain the variety and produce breeder seed to ensure its performance and quality each year. The government allocates specific quotas to each foundation seed production farm under the Ministry of Agriculture and Water Resources, and decides the selling price. The quantity of foundation seed produced is increasing annually.

The private seed companies undertake seed production and marketing of sunflower, chickpea, and alfalfa except for cotton and vegetable crops. Analysis of production data shows that during the last two years the private companies have produced 500 tons of foundation seed of cereal, legume, oil seed, and forage crop varieties. Detailed information on the breeder and foundation seed production for important crops is presented in Table 3.

The variety maintenance procedure (e.g., wheat) is as follows:

- **First year spike selection nursery:** About 2000–3000 spikes are selected from typical plants of promising lines. Each spike is planted in rows and observations are recorded during the entire growth period, including disease reaction, and the material is bulk-harvested using mass selection.
- **Second year spike selection nursery:** Selected materials from the first year are planted in 10m² plot and evaluated for disease reaction, and mass selection is used to advance the generation.
- **First year seed multiplication nursery:** Selected materials are planted under conditions representing farmers' situations, evaluated for disease reaction, and mass-selected.
- **Second year seed multiplication nursery:** The same procedure is followed as in the first year and is undertaken at the experimental farms of the research institutes.

- **Super elite seeds (breeder seed):** It is produced by experimental farms of the institute, elite seed farms, and private farms.
- **Elite seeds (foundation seed):** It is produced by elite seed farms and private seed companies.

Table 3. Breeder and foundation seed production (tons) of cereal, legume and oilseed crops (1991–2005)

Crops	Class	1991	1995	2005
Cotton	BS	650	550	500
	FS	2,600	2,400	2,000
	Sub-total	3,250	2,950	2,500
Wheat	BS	223	2204	5,690
	FS	3,540	22,045	45,560
	Sub-total	3,763	24,249	51,250
Barley	BS	25	15	11
	FS	478	345	150
	Sub-total	503	360	161
Chickpea	BS	9	12	15
	FS	45	55	61
	Sub-total	54	67	76
Safflower	BS	40	15	22
	FS	108	32	56
	Sub-total	148	47	78
Total		7,718	27,673	54,065

Source: MAWR; BS = breeder seed; FS = foundation seed

Seed Production

The impact of investment in agricultural research and crop improvement can only be realized through well organized seed production and supply that is based on a generation system. Agricultural research institutes, elite seed production farms, cooperatives and private farms produce different classes of seed. The agricultural research institutes are responsible for producing early generation materials, i.e., super-elite (breeder) and elite (foundation) seed, whereas the later certified seed generations (R1, R2 and R3)

are produced on specialized elite seed farms, seed companies, or private farmers.

Certified Seed Production

The Ministry of Agriculture and Water Resources plays an overall leading role in organizing certified seed production at the national level (Figure 1). The Grain Department of the Ministry of Agriculture and Water Resources has an overall responsibility for certified seed production of wheat, barley, triticale, and hybrid seed throughout the country. The department has 13 regional branches producing certified seed, except in the Andijan region where there is a special quota within the region. Cooperative (Shirkat) seed producers and some private seed farms also produce certified seed under the supervision of the Grain Department of the MAWR.

The public sector coordinates seed production for strategic crops such as cotton and wheat, while the private sector deals with non-strategic crops such as legume, forage, oilseed, and vegetable crops. The Grain Department produces wheat seed while barley, oat, oil seed and forage crops can be produced by eligible private seed enterprises and farmers. Most farmers are interested in growing these crops because there is no government intervention. They sign a contract with the Uzdonmakhsulot Stock Corporation (USC), an agency responsible for seed sale and distribution in Uzbekistan.

According to the government target, the planned certified wheat seed production is about 280,000 t/year produced by the state elite seed farms. The Seed Production Center of Cotton (SPCC) under the MAWR is responsible for certified cotton seed production, where 100,000 tons is produced each year.

Seed production is organized through contract between state farms and the USC. Seed growers must have a certificate from the MAWR to grow elite seed and should receive specialized training in seed production courses to be eligible to get the certificate, which otherwise prohibits them from producing seed.

The quantity of imported seed has decreased over the last five years. Only 500 tons of super-elite seed of winter wheat varieties were imported from Russia for further multiplication in 2005.

Internal Seed Quality Control

Agricultural research institutes have their own seed testing laboratories where they conduct purity, germination, etc., tests for cereals, cotton, and vegetables. There are 10 scientific staff working in the seed testing laboratories of the research institutes and their regional offices or experimental stations.

Seed Processing and Storage

The government organized regional seed processing facilities to reduce transportation cost, which are available throughout the country. All agricultural research institutes and/or centers have processing and storage facilities for breeder and foundation seed. Early generation seed (nucleus, breeder, and foundation seed) is cleaned by the respective research institutes (UzRII, UzRI-Rice, etc.) and agricultural research stations. There are 14 seed processing plants, with a total capacity of more than 5,900 tons, located in agricultural research centers and with private seed companies. Each research institute has storage facilities depending on the volume of seed produced.

USC has 13 regional offices each with seed processing and storage facilities. It has 47 seed processing plants and storage facilities throughout the country with total annual capacities of 450,000 to 650,000 tons. The USC is responsible for processing and storage of certified seed of self-pollinated crops (wheat) and hybrid seed (maize, sunflower). It is processing 293,000 tons of seed for sale to the cooperatives (shirkat) and private farms.

The Seed Production Center of Cotton (SPCC) and 'Uzsabzavoturug' Company are under the MAWR and are responsible for processing seed of cotton and vegetable crops, respectively. SPCC has 72 state elite

seed farms to produce breeder, foundation, and certified seed. 'Uzsabzavoturug' company has 17 elite seed farms with adequate facilities to produce all generations of vegetable seeds.

Law #935 of 20 June 2000 defines the regulation for procurement, allocation, and seed storage by grain-producing enterprises registered by the Ministry of Justice.

Table 4. Seed production (tons) in cereal, legume and oilseed crops (1991–2005)

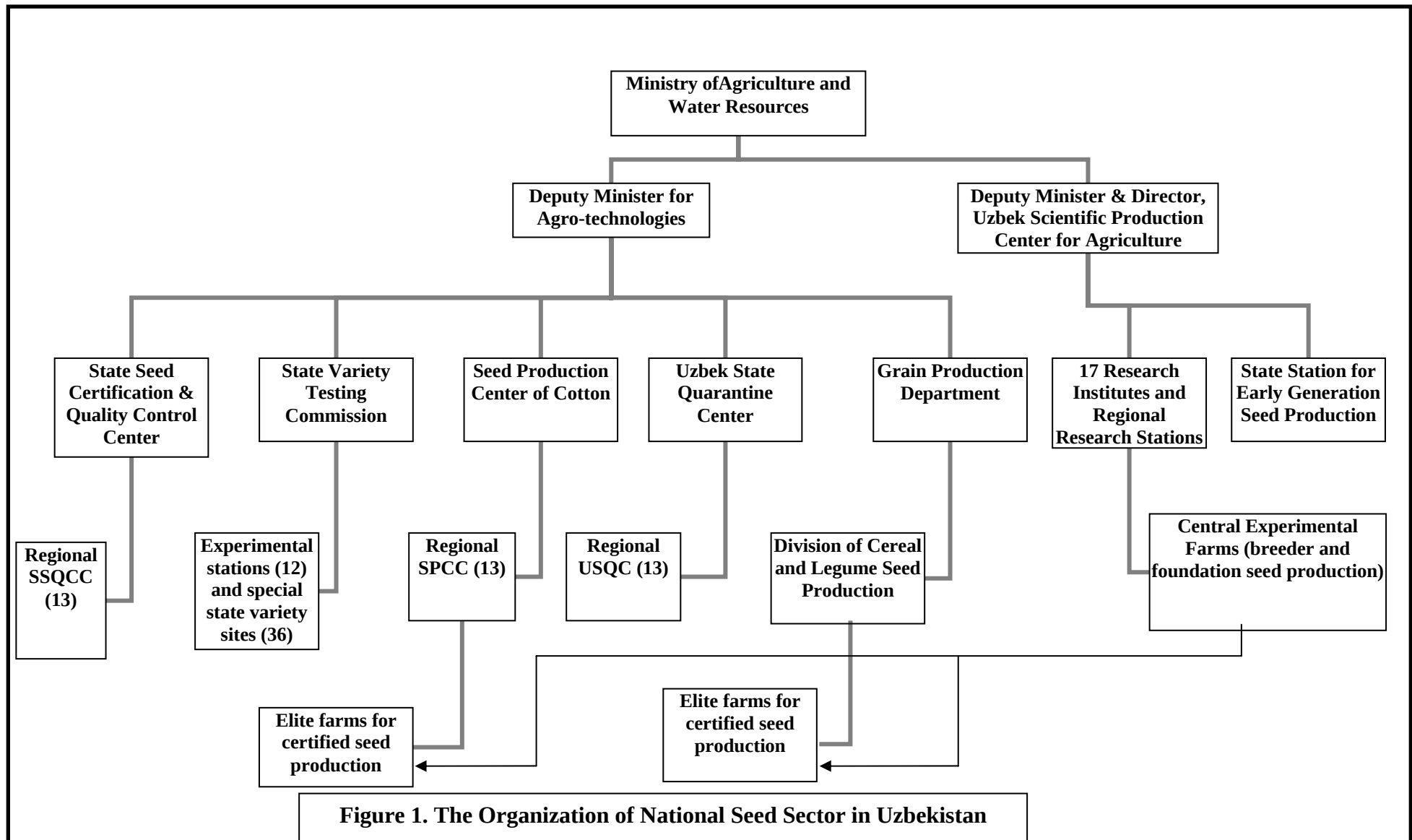
Crops	Class	1991	1995	2005
Cotton	R-1	16,600	14,800	12,000
	R-2	58,500	50,890	45,000
	R-3	51,650	45,510	40,500
		126,750	111,200	97,500
Wheat	CS	20850	186729	218,750
Barley	CS	2,500	1,875	750
Chickpea	CS	190	215	215
Safflower	CS	225	64	112
Total		150,515	300,083	317,327

Source: MAWR; CS = certified seed; R = reproduction

Seed Marketing and Distribution

The USC acts as a trade intermediary of the MAWR. It is responsible for distributing seed of agricultural crops except cotton and vegetable crops. Seed distribution remains centrally controlled by the annual resolutions of the cabinet of ministers. There are credit sales and shirkats (cooperatives), and private farmers can pay back the credit after harvests.

Farmers are also encouraged to produce and market seed within local communities. For crops such as groundnut, sorghum, alfalfa, and maize, which are not under government quota, farmers can produce seed according to local demand and the price is dependent on market forces. Farmers like to produce seed of crops not included in the quota system. Some farmers have used field days to promote the availability of good quality seed to fellow farmers, while others have used public meetings and ceremonies in their villages to market seed.



Seed prices

The Ministry of Finance determines the price of seed of major agricultural crops. The price of seed distributed by the public sector is low. For private companies, price is determined by supply and demand, especially vegetable seed, where there is better competition.

In self-pollinated crops, farmers may choose to source their own seed for the next planting season, making it difficult to estimate the actual seed demand by public and private sector enterprises each year. Seed prices also seem to be a problem in the production of seed of self-pollinated crops such as wheat, rice, soybean, mung bean, and groundnut by the private sector. However, seed growers and public elite seed farmers make more profit than other farmers, because there is a premium price of 200% and 120%, respectively for breeder and foundation seed (e.g., wheat). The seed prices are determined by the resolution of the cabinet of ministries.

Table 5. Prices of seeds of strategic crops (US\$/ton)

Crop	BS	FS	R-1	R-2	R-3
Cotton	1000	650	383	350	283
Wheat	366	267	145	—	—

BS, FS and R are breeder seed, foundation seed and reproduction seed, respectively.

Credits

It is important to establish a credit scheme that will provide a revolving fund to community-based organizations to buy seed from seed growers and provide new loans for resource-poor farmers to purchase seed. Some farmers usually loan seed to others farmers, which would be paid back in the form of grains, labor, or livestock

Seed Quality Control and Certification

The State (Agricultural) Seed Certification and Quality Control Center (SSCQCC) is responsible

for quality control and certification of agricultural crops. It was established in 1995 under the Ministry of Agriculture and Water Resources by Resolution 421 of 31 October 1995. The objectives, tasks and functions of the SSCQCC are stipulated by Resolution 553 of 18 December 1997. A major document governing the status of the SSCQCC is the Regulation on State Seed Certification and Quality Control Center in the Annex 1 to the Resolution 553. In Uzbekistan, certified seed should meet basic quality standards such as varietal purity, physical purity, germination and health standards before certification.

The government maintains quality assurance programs that monitor quality during seed production and ensure the supply of high quality seed to farmers. An array of 'conventional' field inspection procedures and seed quality testing methods are used to maintain the seed quality standards.

Field Inspection

Maintaining variety identity is more important to ensure quality and meet consumer demand. Variety identity and purity must conform to regulations. The breeder and/or his authorized agent inspect breeder seed and foundation seed fields. The authorized agent should be trained by the breeder and be well acquainted with the characteristics of the varieties. Authorized official inspectors usually inspect certified seed production fields.

The number of inspections depends on the crop species and varieties. Self and many open-pollinated crop species generally require only one inspection. Hybrids and inbred lines require 4–5 inspections; at least one inspection during the vegetative growth stage (to check morphological characters), one or two during flowering (to remove plants that may show variation in inflorescence characters), and one during seed ripening (to remove diseased plants and noxious weeds). During inspection, check:

- if the field is located as indicated in the application form;

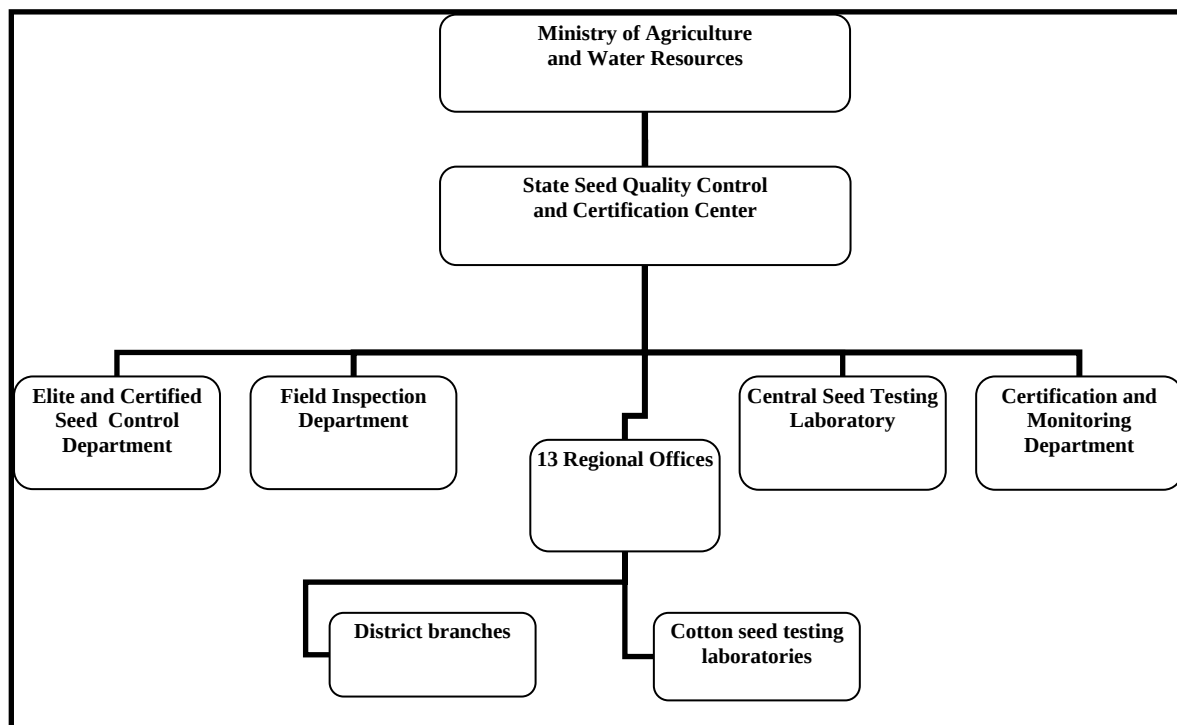


Figure 2. Structure of the quality assurance program in Uzbekistan

- the number of varieties grown (for some crops, each farm can grow only one variety of foundation or certified seed);
- the category of seed used (growers must show official certification or label from the seed lot or sack);
- isolation distances as required by regulation;
- previous cropping history as required by regulation.

Inspection is carried out by walking through the field, following a route that allows the entire area to be covered. Inspection should be carried out on limited areas, or sample of at least 100 m². Off-type counts in the sample area are then related to the estimated population to determine the cultivar purity for the crop.

Laboratory Seed Testing

The central seed laboratory of the State Seed Certification and Quality Control Center conducts seed testing for over 40 different agricultural crops. Cotton, wheat, barley,

alfalfa, sunflower, and chickpea represent approximately 80% of the seed samples tested annually. Every province has a regional laboratory for testing seed samples according to state-approved procedures for seed quality control. The Central Seed Laboratory receives seed samples from 13 regions of Uzbekistan and certifies the seeds before planting.

Seed Regulations and Standards

According to the seed law, seed quality control and certification is carried out by the government. The legal act stipulates procedures for seed quality control and certification, the responsible agency, seed related transactions, national seed reserve, and personnel.

Agricultural crop seeds to be certified in Uzbekistan shall comply with the following standards and regulations:

- GOST 20290-74. Agricultural seeds. Determination of planting quality.

- GOST 20081-74. Seed production process
- GOST 12036-85 Agricultural seeds: Rules of procurement and sample collecting methods
- GOST 12038-84 Agricultural seeds: Germination determination methods
- GOST 12039-82 Agricultural seeds: Viability determination methods
- GOST 12041-82 Agricultural seeds: Moisture determination methods
- GOST 12042-80 Agricultural seeds: Weight determination methods (1000 seeds)
- GOST 12043-88 Agricultural seeds: Origin determination methods
- GOST 12044-81 Agricultural seeds: Contamination determination methods
- GOST 12045-81 Agricultural seeds: Pest determination methods
- GOST 12046-85 Agricultural seeds. Seed quality documentation.
- GOST 12047-85 Agricultural seeds: Random seed quality determination
- PMG 36-2001 Rules for international standardization
- O'z DSt 1.19:2000 State standardization system of Uzbekistan: Conformance marks (labels)
- O'z RH 51-062-97 NSS UZ Product certification
- O'z RH 51-104:2000 NSS UZ Inspection check of products certified

Labeling Seed Lots

The state laws and standards for seed production require that all agricultural seed be labeled before marketing, although labeling requirements for agricultural crops may differ for flowers, trees, and shrubs. If the seed is treated, the label must state that it has been treated and shall be labeled with a poison symbol. The label should include: (i) variety name and seed category, (ii) production year, (iii) plot number, (iv) percentage by weight of pure seed, (v)

percentage by weight of all weed seed, (vi) percentage by weight of all crop seed, (vii) percentage by weight of inert matter, (viii) name and number per kg of restricted noxious weed seeds, and (ix) date of germination test. The label should include the name and address of the person who labeled the seed, or who sells or offers it for sale within the state.

Seed Certification

Certification Order PSMK-02-2003 is an official legal document used for certification by the SSCQCC. The document is obligatory and used by the SSCQCC and its central seed-testing laboratory, seed production farms, processing plants, procurement centers, and seed producers and consumers.

International Seed Trade

Regulation on the seed trade was issued in Resolution 290 of 13 August 2002. It controls seed import and/or export for cereal crops in Uzbekistan.

The government will provide assistance to any establishment requesting permission to import seed for research based on the terms stipulated in the normative documents. The government shall allow export of seed only after the national demand has been satisfied. The administrative procedures for import and export of seed will be reduced to a minimum and will comply with internationally acceptable quarantine procedures. Government will provide all possible assistance to expedite the shipment, customs clearance, currency exchange, issuing letters of credit, etc.

Uzdonmakhsulot Stock Corporation is responsible for seed import and export. About 500 tons of wheat breeder seed is imported from Russia and other neighboring countries each year.

Quarantine

Plant quarantine makes efforts to prevent the entry of a foreign pest to the country through legal restriction of the importation of plants and plant products. The Uzbek State Quarantine was established in 1934 by the Decree of the Former Soviet Union People Commissariat under the Union Plant Quarantine System. Currently, 13 regional plant quarantine stations are operational at the following entry points: (i) international airports in Tashkent Samarkand and Bukhara; (ii) sea port in Amudarya; and (iii) land border check posts at Olot, Khorezm, Usturt, etc. In each province, there are fumigation groups to prevent the spread of dangerous pests in the country.

In order to secure the distribution of healthy seed, plant quarantine officials inspect seed production fields for seed-borne fungal diseases and noxious weeds. Nine fungal seed-borne diseases are of economic importance, including karnal bunt, dwarf bunt, etc. of wheat.

The Uzbek State Quarantine Inspection (USQI) regulates noxious weeds. The USQI regulation (# 360 of 18 December 1995) contains the list of all prohibited noxious weeds in the country. Listed weeds may not be imported into Uzbekistan or moved within the country without special permission. USQI uses risk assessment as a basis for weed exclusion decisions.

Uzbekistan is free of many weeds, pests, and diseases of plants and animals because of the strict quarantine laws. All seed consignments entering the country are subjected to quarantine control, inspection, and treatment where necessary by the USQI. Phytosanitary certificates are required when importing or exporting seed or grain to the country.

There are two main categories for seed under the quarantine regulations:

- **Prohibited seeds** are not allowed entry into Uzbekistan unless for scientific purposes under strict control. In such

case permission is required for importation.

- **Restricted seeds** include a range of agricultural and forestry seeds through which serious diseases and pests could be introduced. There are two types of restricted seeds for quarantine purposes, restricted seed for sowing in quarantine areas and restricted seed for processing. Permission is required to import such seeds.

The Informal Seed Supply

Farmers and local development programs usually produce large quantities of seed outside the formal sector and without any official quality control. The formal public sector focuses on wheat and cotton. In 2005, for example, approximately 1.4 million ha each of wheat and cotton was planted at the national level, which required 97,150 tons of cotton seed (70 kg/ha) and 357,075 tons of wheat seed (250 kg/ha). In the same year, about 97,500 tons of cotton (100%) and 218,000 tons (61%) of wheat seed was made available from the formal sector. The informal seed system supplies more than 90% of the seeds of mainly vegetable and legume crops in Uzbekistan. It comprises mainly on-farm production, selection, and saving of seed as well as farmer exchanges in the local markets (cash, barter, in-kind loans).

The role of the informal seed system in germplasm conservation has been well documented. Several qualities make on-farm seed production a credible option for seed security of staple food crops, and these include:

- Broader national coverage
- Maintenance of crops not handled by the formal sector but which are vital for many resource-poor farmers
- Reasonable and affordable seed cost to farmers and availability of alternative arrangements for payment
- Inclusion of farmers' preferences in the production program

- Proximity of seed supply sources to the farmers
- Stability of crop yield through the use of genetically broad-based varieties or ecotypes

Seed Extension

The state programs for basic research, science and technology development and innovation is financed by the Center for Science and Technology (CST) under the cabinet of ministers of the Republic of Uzbekistan. The CST has a Department of Innovation (Extension), which is directly responsible for integrating the concepts and strategies of science promotion and cooperating with research institutes and universities. It provides extension services and technology transfer to farmers to help increase farm productivity both qualitatively and quantitatively, and to meet market demands and standards. The ultimate goal is to improve farmers' livelihoods in rural areas by providing funds to support extension and research for agricultural development. Variety development, seed production, and agronomic management techniques for agricultural crops are developed and recommended packages approved by researchers along with the extension staff through a two-year innovation project. Subsequently, those findings are transferred to target farmers through the scientific staff of the research institutes or extension services. Theoretically, bilateral transfer of information is recognized. Technology generated by researchers is transferred to extension workers, and then to farmers, while constraints encountered by farmers are transferred to researchers through the extension workers.

Professional Training

In Uzbekistan, the development of the national seed industry is at crossroads. The public seed sector personnel have

accumulated a wealth of experience in implementing assigned government tasks under centrally planned economy, but lack experience in operating under a market-oriented economy. A transition from a centrally planned to a free market economy requires individuals with broad technical, practical and managerial knowledge and experience and clear understanding of the future trends in the seed industry at the national, regional and global levels. A dynamic human resource base is critical for the development of an effective and efficient national seed program. Training plays a greater role in providing the required leadership and managerial expertise in policy, regulatory, technical, institutional, and organizational reforms in the seed sector. It is essential for Uzbekistan to develop a strategy for its human resource development and allocate sufficient resources to realize these objectives. The training strategy should identify personnel and training needs, provide appropriate training, and adapt to the changing requirements to meet the need of the diverse stakeholders in the seed sector.

Within the framework of the educational reform program of the Government of Uzbekistan, the universities have established two faculties in crop improvement and seed science in the Tashkent State Agricultural University and Samarkand Agricultural Institute in 2003 and 2002, respectively. Since 2005, regular two-year M. Sc. courses were initiated in both universities.

National Seed Organizations and International Membership

There are no professional or trade associations at the national level. Uzbekistan is not a member of ISTA, ISF, OECD, CBD, or IPPC, except UPOV and WTO. In October 2004, Uzbekistan became the 57th member of the International Union for Protection of New Varieties of Plants (UPOV). The PVP law on "Breeding Achievement" for registering new crop varieties and for granting plant

breeders' rights is in agreement with the UPOV Convention.

The Working Party on the accession of Uzbekistan was established on 21 December 1994, and it became an observer of the WTO. Uzbekistan submitted its memorandum on the foreign trade regime in September 1998 and a first meeting of the Working Party was held in July 2002. The country began bilateral market access negotiations with interested members on the basis of initial offers in goods and services submitted in September 2005. The third meeting of the Working Party took place in October 2005.

Constraints of the Seed Sector

Most cereal, legume, oilseed and forage crop varieties are still imported from Russia. The national seed system is not well organized, and seed production is centralized by government through direct participation of agricultural research institutions and cooperatives. The government is responsible for seed of strategic crops and the involvement of private sector is limited. Moreover, good quality seed of non-strategic crops is not available to the farmers.

Seed production, marketing, pricing and distribution remain centrally controlled, based on annual resolutions of the cabinet of ministers, and are not well developed because of a lack of technical expertise for establishing and implementing a comprehensive seed program. The major seed enterprises produce cotton and wheat seed only.

Recommendations for the Seed Sector

Agricultural policies aimed at achieving food security need to emphasize seed system strategies that will ensure availability of good quality seed to farmers at the right time. An

in-depth assessment of the seed supply sector in Uzbekistan is essential before any realistic effort for the development of the seed sector can be designed.

This document has examined the national seed sector, including issues relevant to variety development, release and maintenance; seed production, processing, storage and marketing; and seed quality control and certification. Furthermore, the document analyzes important linkages between the seed supply systems and other services. Alternative strategies that can be adopted by policymakers based on the prevailing conditions in the country are proposed.

Seed production and marketing

- The private sector should be encouraged to participate in seed production and marketing including early generation seed.
- The private sector should have access to publicly developed varieties at reasonable price.
- In light of Uzbekistan's accession to the WTO, a free seed pricing strategy should be gradually implemented.
- Unfair competition between state and private seed production and marketing enterprises should be avoided and, if at all, it should be equally distributed.
- Government should consider enacting investment promotion programs for new entrants into the seed production and marketing business.
- A National Seed Council should be set up to oversee seed industry development, with representatives from all stakeholders including research and the private sector.
- A national seed industry association should be constituted, which includes all companies, enterprises, etc, involved in seed production and marketing.
- A regional seed association should be established to support harmonization at regional levels.

- To support and establish a more profitable environment, membership of the OECD, ISTA and ISF should be encouraged and technical support provided for the purpose.
- Harmonization of policies and regulatory framework; common protocols for variety testing, evaluation, release; and quality control and certification should be initiated at the regional level.
- Terminologies for seed production and marketing should be harmonized with those used internationally.

Seed quality control certification

- Strengthen plant quarantine, seed quality control and certification legislation in accordance with international treaties and conventions.
- Adequately equip seed quality control and certification and quarantine institutions to facilitate their activities.
- Provide information and support to increase awareness among farmers about seed quality control, certification, and quarantine issues.
- Strengthen the training of specialists in seed production, certification, quality control, and quarantine.
- Streamline and strengthen the legal system for plant breeders' rights.
- Develop an accreditation system for certification or delegate certification rights to third parties through the quality control authority without compromising the quality of seed.
- Develop human resources at all levels with special attention on policy and regulatory framework reforms, marketing, seed business administration, financial accounting, and seed quality assurance.

Conclusion

Considering that varieties developed in Uzbekistan are more suitable to local conditions, the national breeding programs and seed production should be given high priority. In view of the drastic changes in the economy (90% of land in private hands), new approaches in seed production should be developed to meet the requirements of the private sector. For strategic crops like cotton and wheat, decisions should be taken gradually, while market relations should be applied in the near future for other crops.

The new strategy is to facilitate the development of the seed sector in the following areas:

- Timely and effective provision of adequate quantities of high quality seed of high-yielding varieties of target crops at affordable prices to farmers.
- Assistance in the development of seed industry infrastructure and services, and the creation of a favorable environment for private sector investments in the seed industry.
- Development and support for the private sector in the production of seed to meet the requirements of the agricultural sector.

Suppliers should have detailed and accurate information on seed use and demand to plan an effective seed production and distribution. The government should organize a system for timely collection and dissemination of information, which will enable seed producers and suppliers to develop management strategies and tools.



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