



Variety Development and Variety Testing, Variety Registration (Release) and Protection (PVP) Systems in The Eco Countries

Suleyman KARAHAN*

Department of R&D of Hisar Seed Company, Sereflikochisar. Ankara-Turkey.

* Corresponding author e-mail: karahan1956@gmail.com

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ABSTRACT

The Economic Cooperation Organization (ECO) is an intergovernmental regional organization established in 1985 by Iran, Pakistan and Turkey for the purpose of promoting economic, technical and cultural cooperation among the Member States. In 1992, the Organization was expanded to include seven new members, namely: Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. Seed systems and seed trade in ECO region has been already constrained somewhat by regulations and policies that were established when formal seed production were dominated mainly by the public sector. Variety release procedures were designed to meet the needs of public research institutes and seed certification system was mainly focused on public or parastatal seed enterprises. Procedures for variety testing and approval constituted a significant barrier to seed trade and inhibited the spread of new varieties beyond national boundaries. This led to delays in release and often rejection of useful varieties that did not meet the criteria and procedures. A variety released in one country faced long battles to gain release in a second country. Commercial seed trade was also hampered by lack of intellectual property protection for plant varieties and by different procedures for import and export of seed. Under the FAO-ECO launched "Seed Sector Development in Countries of the Economic Cooperation Organization (ECO)", the Regional Seed Agreement and Regional Seed Strategy were developed. In this presentation, variety development; variety testing and registration; variety protection system in the ECO Countries have been evaluated.

Keywords: variety development, variety testing and registration; variety protection, ECO

Introduction

The Economic Cooperation Organization (ECO) is an intergovernmental regional organization established in 1985 by Iran, Pakistan and Turkey for the purpose of promoting economic, technical and cultural cooperation among the Member States. In 1992, the Organization was expanded to include seven new members, namely: Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

Especially in some ECO Countries, only a limited proportion of land has been planted with quality seeds of improved varieties and several factors limited farmer's access to better seed.,

In most of countries, governments have continued to control seed industry, even though public seed production

and distribution has usually proven to be an ineffective system of seed supply (Karahan, 2014a).

Considering the above mentioned constraints; the first initiative on harmonization of seed regulations of ECO member countries was FAO-ECO Technical Cooperation Program (TCP) project on "Strengthening the Seed Supply in the ECO Region" and was launched in 2006. And then, different activities and meetings were realized on this issue.

"The First Workshop on Harmonization of Seed Regulations under the TCP on Strengthening the Seed Supply in ECO Region" was organized by ICARDA, ECO, and FAO was hosted by the Federal Seed Certification and Registration Department (FSCRD) from 17-19 January 2007 in Islamabad, Pakistan. The

objective of the workshop was to review and discuss Variety Release and PVP (Plant Variety Protection) Systems and Phytosanitary / Quarantine Measures in ECO member countries.

The ECO Seed Association (ECOSA) was established in March 2009, in Antalya.

FAO/Turkey Partnership Programme funded project “**Seed Sector Development in Countries of the Economic Cooperation Organization (ECO) (GCP/INT/123/MUL)**” was built upon the achievements and lessons learnt from a concluded FAO/ECO regional seed project and above mentioned meetings and it was put in effect in May 2013 (Muminjanov, 2013a).

The series of workshops and Seed Trade Conferences under this project were organized (Turner, 2014a).

Under this project, the Regional Seed Agreement and Regional Seed Strategy (Strategy for Coordinated Development of the Seed Sector in Countries of the ECO Region) were discussed and developed at the Final Workshop of the project was held on 4-5 November 2015 in Antalya, Turkey (Turner, 2014c and Karahan, 2014c-d).

In this paper, variety development; variety testing and registration; variety protection system in the ECO Countries have been evaluated.

The Regulatory Framework of the ECO Countries (Karahan, 2014a)

Constraints:

- In some countries, although currently seed legislation is more or less developed and harmonized with many important international acts, however, the implementation of the legal acts by state bodies is unsatisfactory.
- In some countries, seed legislation is not developed and harmonized with many important international acts.
- Regulations are not implemented efficiently and correctly in some countries.
- Constraints in implementation of laws, policies and regulations of seed & plant protection and quarantine are main handicaps.

Recommended Strategies (Karahan and Turner, 2014; Karahan, 2014g; Turner, 2014c):

- ECO countries should take measures to make laws and regulations for easy movement of seeds. Governments should be encouraged for enactment of various seed policy bills into laws in the ECO countries. These laws may also regulate the way in which new crop varieties enter the market or there may be a separate law for plant varieties.

- Rationalization and harmonization of the seed policies, laws, regulations for variety registration and variety protection in order to facilitate the movement varieties with fair and reasonable regulations to promote and develop seed industry in the region.
- The detailed technical content of these regulations is one main area through which regional harmonization can be achieved if the relevant specialists from each country have a consultation forum.
- If regulations place a heavy burden on the agencies responsible for carrying out the technical work then the tasks may not be done to the required standard, or there may be delays.
- Legal provision will be made to encourage private sector participation in Basic Seed production through access to Pre-basic seed of public sector varieties.
- A Seed Strategy-Policy provides an overall guideline for the development of the seed sector with a medium to long-term horizon but it should be revised on a regular basis to take account of the progress made. Therefore the Policy can be regarded as a broad umbrella covering all aspects of the seed sector, while the law(s) and regulations focus on specific elements of the policy that can be enforced.
- It is important that the policy and the law are in harmony with each other and certainly there must be no contradictions because that would cause confusion.

Breeding and Variety Development Activities of the Eco Countries

Constraints:

- There is lack of investment in research and development by the private seed sector in the most of ECO Countries. In some countries only public entities are involved in research programs.
- Especially public research institutions are not attractive for young scientists. Public research system is not properly functioning.
- Most of the varieties are released by public research institutes and hybrids are imported, therefore, still plant variety protection right is not applied.

Recommended Strategies (Karahan and Turner, 2014; Karahan, 2014g; Turner, 2014c):

- The public research has to be dedicated to the real need of the seed market, where there is a lack of good products.

- Access to foreign germplasm, but the recognition of Plant Breeders' Right is necessary.
- Breeding Activities should be done and supported also at private research Institutions.
- To achieve maximum impact, it is essential that improved varieties move quickly from research to farmers and with sufficient information to exploit their full potential in the production system.
- In the major cereal and legume crops, the International Agricultural Research Centers of the GCIAR work in close partnership with national research institutions.
- Closer integration of international and national efforts in plant breeding is strongly advocated, and this should include the sharing of trials information between national systems.
- Especially for hybrid maize and vegetables in which public breeding institutions cannot compete effectively with the large investments made by private companies who concentrate on profitable F1 hybrids. Public breeding programmes in these crops should be critically reviewed to decide if they are sustainable and competitive.
- In addition to national agricultural research institutes, Universities may also engage in plant breeding as part of their research programmes in genetics and agronomy.
- All member countries of the ECO are expected to use the resources of the major cereal and legume crops in gene banks managed by the CGIAR centers and this material is freely available under procedures established by the International Treaty on Plant Genetic Resources for Food and Agriculture (IT-PGRFA) using a Standard Material Transfer Agreement.
- It is therefore important that national gene banks are well-managed to ensure effective conservation of their stocks.

Jan (2014), mentioned in his country report (Report on status of Afghan national seed policy adoption & implementation) that, **in Afghanistan**, Agriculture Research Institute of Afghanistan (ARIA) is a public organization under MAIL with mandate for development & release of improved crop varieties and research on other crop husbandry practices to increase the productivity and resilience of agriculture in Afghanistan, through its 7 zonal and 10 sub stations at different Agro ecological zones spread across the country. ARIA as public department in with collaboration and funding of international research organizations only conducting conventional breeding methods (introduction&selection.

Afghanistan Scientific Academy and Agricultural colleges under ministry of higher education to conduct the research but their achievements are not sensible.

Research activities mainly dominated by crop sector specially cereal crops and only conducting by public departments or NGO's in with collaboration of MAIL, still private sector is not involved, while law and policies allowing them for investment.

In Azerbaijan, the research component of the agricultural innovation system consists of 26 research institutes. Of these, 15 come under the Agrarian Science Center (ASC) of the MoA, six under the Academy of Sciences.

The ASC was established in 1999 and coordinates the research programs and activities carried out by its 15 institutes. Research is carried out on the MoA's 20,000 hectares of land, at its experiment stations, base stations, and subsidiary experiment farms. The dissemination of the institutes' research outputs is coordinated by the MoA's Information Dissemination Unit.

The Agricultural Research Board (ARB) was formed in March 2000 to coordinate the reform of the competitive grants system and knowledge system. The Board is directly responsible to the State Commission for Assistance to Agricultural Private Farm Sector Development.

After 1991, research institutes lost their clients and entered a period of financial difficulty. As a result, they were forced to use their resources to generate income for operations. Typically, experiment stations that belong to the institutes are used to produce, process, and then market seed. With these market-oriented activities, the institutes have developed relations with private seed supply and plant protection companies. They have also maintained close ties with large private farms and state farms. In addition, experts at the experiment stations have, from time to time, developed relations with international organizations within the context of joint projects.

The internal problems of the research institutes are equally serious. Just about everything is inadequate for production of useful research outputs. The institutes need a mandate, qualified personnel, sources of finance, and access to knowledge and information about new technologies. With limited financial resources and too many (and most of the time unqualified) personnel, it is unrealistic to expect new programs to be initiated. In the past, even when financial resources were available, around 70-75 percent was allocated to staff salaries and only around 9 percent to research activities. Yet, there is still some scope for improvement at the individual institute level.

Research structure is undergoing major structural, institutional, and organizational changes.

Institutes need a mandate, qualified personnel, sources of finance, and access to knowledge.

Research priorities need to be established, funding mechanisms developed, and agricultural research organizations reduced in number.

Large farms obtain information on new varieties from experts in institutes and international agencies. The role played by the extension and information unit in the Ministry of Agriculture is negligible.

An up-to-date agricultural knowledge and information system is required to set agricultural research priorities and to develop science and technology strategies (Turner, 2014b).

The Government expects reform of agricultural research to focus on the amount and quality of research work done. Its analysis has identified a need for research institutes in the areas of sericulture, viticulture, and fruit and vegetable farming to be reorganized according to the needs of the country. Finally, given the problems mentioned earlier, the research institutes can use existing resources (experiment stations, breeding farms, land, and farm equipment) more efficiently (Guliyev, 2014).

In Iran, in 1975, the Agricultural and Natural Resources Research Organization was established as a central agency to formulate policies, develop strategies, prioritize and coordinate the activities of agricultural research institutes. The organization played an important role in providing appropriate policies to increase production of agricultural and horticultural crops in the country.

In the 1990s agricultural research organizations have been restructured to improve their performance. In 1993, the Agricultural Research Organization was merged with the Directorates of Agricultural Education and Extension. In 2002, agricultural extension was separated from Agricultural Research, Education and Extension Organization.

In each province, agricultural research centers were also established to coordinate the activities of different branches of each research institute.

The Seed Control and Certification Department of the Seed and Plant Improvement Institute is responsible for the quality of imported seed.

At present the Agricultural Research and Education Organization administers an extensive network of agricultural research institutes working on different crops and agro-ecological regions. These include 12 semi-autonomous agricultural research institutes, which are commodity, multidisciplinary, or farming system oriented and linked to a network of 30 regional or provincial agricultural research centers.

In addition, agricultural research is also carried out by various organizations affiliated to the Ministry of Jihad-eAgriculture and colleges of agricultural sciences.

The Seed and Plant Improvement Institute is the largest agricultural research institute with the main mandate for improvement of strategic agricultural, horticultural and industrial crops. These crops include cereals, food legumes, oilseeds, forages and vegetables. Apart from basic research and crop improvement, SPII continue to play a major role in seed production and seed quality control and certification in the country. SPII has eight departments and at present employs 320 PhD and MSc level professional research staff and more than 400 technical staff (Karahan, 2014a).

In Kazakhstan, emphasis is given to the modern cultivars of staple crops and development/establishment of markets for local varieties is not a national priority.

The “Concept of agriculture development till 2010” has a section on plant growing diversification, which has directed to increase the areas under profitable crops and reception of high-quality, competitive production (MOA RK, 2004). According “Concept” there is a necessity to increase diversity in agricultural systems by the strengthening of breeding, seed-growing, and increasing of the areas under sowings of main crops.

Several scientific bodies affiliated to the state, such as the National Academy of Science, the National Research Institute of Agriculture, the National Research Institute of Fruit Growing and Viticulture, and the National Research Institute of Vegetable and Potato, carry out research on a modest scale. Research on wheat is shared between two ministries: that of agriculture and that of science (under the National Centre of Agricultural Research - NAZAI). The centre is responsible *inter alia* for the production of the elite generations used for certified seeds and intended for the market. Again, because of financial constraints, these seeds are unaffordable by farmers and serve only for experimental purposes.

The centre receives support from and collaborates with CIMMYT, ICARDA, CIP, ICRISAT and IPGRI. The national collections of plant genetic resources are located in various centres of research, botanical gardens or protected areas (Karahan, 2014a).

In Kyrgyzstan, the first experimental breeding stations in Kyrgyzstan (Kyrgyz SSR) appeared in 1925 and 1946 roughly covered all areas of the country, the breeding of sugar beet, corn, tobacco, wheat, fiber crops and medicinal plants, as well as fruit and vegetable crops. First winter wheat varieties were created in the 30s of last century, and corn hybrids in the 40's of the last century (Sergey, 2014).

After the country independency, national plant breeding programs significantly have been cut off and only few of them continue on their activities. Government through MoAM support plant breeders' activities for some numbers of priorities crops by giving resources such as field plots for multiplication breeders and super elite seeds.

Two existing units identified by a recent project for crop breeding in republic: the Institute of Land Culture for wheat, barley, maize and vegetable breeding, and Fodder Breeding Institute for pasture and fodder crops. They need changes to make them more autonomous, a management capable of developing realistic business plans, new equipment, training programmes, and adequate financial support.

Kyrgyz Research Institute of Agriculture is a major center for the developing of varieties and hybrids in Kyrgyzstan. Breeders developed more than 100 varieties and hybrids for such crops as winter and spring wheat, winter and spring barley, corn, as well as technical and legumes, for different climatic zones of the republic and in neighboring countries.

Kyrgyz experimental breeding station for sugar beets

Currently breeding work on sugar beet seed production has been stopped, and represented as cooperative, which produces seeds of alfalfa, sugar beets, wheat and barley.

Agricultural cooperative machine-testing station (MIS)

The main activities are breeding seed crops, livestock breeding and dairy production, and forage production. Breeding program was focused on wheat, barley and triticale.

Sugar beet seed production of "MIS" and its hybrids on CMS ones engaged for more than 50 years. Also on the basis of "MIS", there is a single plant in Central Asia for the preparation of sugar beet seeds. Sugar beet seeds are sold in local market and also in Russia, Belarus, Kazakhstan and Turkmenistan. "MIS" produce annually 110-140 tons of cereal seeds for breeding kennels whose seeds are used to grow super-elite and elite.

National Academy of Sciences of the Kyrgyz Republic

National Academy of Sciences (NAS KR - www.nas.aknet.kg) brings together 25 research institutes, including 5 (Forest Institute, Institute of Biotechnology, Botanical Garden, Institute of Soil Biology, Institute of walnut and fruit crops) which activities focused on collecting plant material, research work, plant breeding material of endemic, medicinal, fodder, fruit and flowers crops).

In Pakistan, the National Agricultural Research System (NARS) is the key aspect for bringing scientific advancements in a country. NARS is the single largest agricultural research system and is spread over Federal Research Institutes of the Ministry of National Food Security and Research (NFSR) and Pakistan Atomic Energy Commission (PAEC), Provincial departments, four agricultural universities/agriculture colleges. At the national level, variety development is coordinated by Pakistan Agricultural Research Council (PARC) and Pakistan Central Cotton Committee (PCCC). One of the main functions of PARC as an apex National Agricultural Research Organization is to conduct, promote and co-ordinate R&D activities in NARS. It is also the funding agency of projects of national importance.

Crop variety development is the main domain of public sector organizations in the provinces, and a substantial number of varieties were developed by provincial and federal research institutes through conventional/mutation breeding and using the tools of genetic engineering. At the national level, variety development is coordinated by Pakistan Agricultural Research Council (PARC) and Pakistan Central Cotton Committee (PCCC).

The Pakistan Agriculture Research Council (PARC) administers the largest portion of the Federal part of Agricultural Research. One of the main functions of PARC as an apex National Agricultural Research Organization is to conduct, promote and co-ordinate R&D activities in NARS. Overall, there are 74 Research establishments at Federal level and 106 Research institutes at provincial level. A substantial number of varieties were developed by provincial and federal research institutes through conventional/mutation breeding and using the tools of genetic engineering.

Priority of Government is specifically confined to major crops like wheat, cotton, rice & sugarcane. Vegetable crop variety development remained at low profile and consequently, depending on imported costly hybrid seed.

Pakistan Central Cotton Committee (PCCC) and The Pakistan Atomic Energy Commission (PAEC) use mutation breeding to develop grain legume, rice and cotton varieties.

National Institute of Biotechnology and Genetic Engineering contributes to the release of genetically modified crop varieties.

Some Agricultural Universities and faculties of agriculture are conducting research (Iqbal, 2014).

In Tajikistan, plant breeding in Tajikistan is mainly done by public institutions: Tajik Farming Institute of Tajik Academy of Agricultural Sciences with its regional

branches are dealing with breeding of cotton, cereals, pulses, forage crops etc.

Tajik Horticulture Institute of TAAS with its regional branches, breeding activities of potato, vegetables and fruits are carried out. Beside the TAAS, Institute of Botany, Plant Physiology and Genetics of Tajik Academy of Science and different departments of TAU are also conducting research on plants and basic works on plant breeding. National Centre of Plant Genetic Resources of TAAS owns Gene Bank and is responsible for collection, conservation, characterization and use of plant genetic resource.

Apart from public institutions, during the last decade there have been some farms from private sector showing interest for plant breeding. This trend is especially can be seen in wheat breeding, where private seed farms dealing with breeding are competing with public. The examples are the seed farm of “Chilgazi” in Isfara rayon and the seed farm of Latif Murodov in Hisor rayon (Husenov *et al.*, 2014 and Sanginov *et al.*, 2014).

Collaborations for wheat breeding improvement with CIMMYT, ICARDA, International Winter Wheat Improvement Program (IWWIP), Oklahoma State University (OSU) and other research programs have been developed. New wheat lines from these programs have annually been received and tested under Tajik climate growing conditions. These collaborations were reason of releasing many varieties (Muminjanov *et al.*, 2008).

In Turkey, R&D studies started in 1926 with the establishment of “Wheat Research Stations”. Between 1926-1970, studies were concentrated on cultivation techniques such as soil tillage, sowing time, the amount of seed, fertilizer and chemical usage, etc.

In 1963, variety concept gained importance with the adoption of the Variety Registration and Certification Law.

After 1990, the studies on developing new varieties gained momentum and so many varieties developed in numerous species which are grown widely today.

The majority of public research in Turkey is carried out by research institutes and research stations under the General Directorate of Agricultural Research and Policy (TAGEM) affiliated to the Ministry. Public research institutions carry out joint research activities with other research institutions as well as universities and private sector organizations.,

The rights of production of newly developed varieties are transferred to TIGEM and private sector by contract in order to quickly spread the varieties to larger areas. Sunflower and wheat varieties developed by the Institutes are demanded by Chile, Spain, Azerbaijan, Sudan, Turkmenistan, and Iran; Osmancik rice variety is also demanded by Bulgaria, Ukraine, Russia, Macedonia, and Greece.

While private sector previously used to import seed mainly, in recent years as a result of the policies implemented by the Ministry, they have been also producing the hybrid or standard varieties developed by their breeding programs and by the institutes.

Besides MFAL, Tea Research Institute under the General Directorate of Tea Enterprises (ÇAYKUR) in Rize works on tea research, TMO works on poppy, and Sugar Institute under Turkey Sugar Factories Inc. (TURKSEKER) conducts research on agricultural and technological issues of sugar beet.

Some of the authorized private companies can do research and breeding activities, truly.

In Turkmenistan, 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.

Agricultural Production Services and Scientific Division of the MoA 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.

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 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 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.

In Uzbekistan, since independence, wheat has become second in importance to cotton. In order to attain food security, wheat area under irrigation increased over the years, currently at 1.3 million ha including rainfed

production. This increase in cultivated area stimulated the use of modern production approaches in the national wheat program (Akhmedov, 2014 and Akhmedov *et al.*, 2014).

In the past, many Russian and foreign wheat varieties were introduced to Uzbekistan and were widely grown in large areas. This scenario has changed with release of some newly developed wheat varieties by the national agricultural research programs.

In 2002, the State Scientific Committee was re-established and named as the Center for Science and Technology under the Cabinet of Ministry, Republic of Uzbekistan. The state programs for basic research, science and technology development and innovation are being financed by the Center. Since 1991, each year the Government has allocated US\$ 100,000 for wheat breeding program through the Science and Technology Center. This funding has accelerated the wheat breeding program resulting in developing new varieties where 37 winter and spring type bread and durum wheat varieties are currently released and under seed production. In order to further evaluate new breeding lines, more funding support will be critical.

Traditionally, wheat breeding has not been profitable enough to attract private sector interest and investment. But this is changing significantly with the new potential opened up by local institutes and a greater awareness brought about by the International Centers. One thing is certain - those involved in both the breeding and funding side will have a major say in setting the agenda for the future.

The future orientation is towards the development of hard and good quality wheat with ideal plant type.

Yield increase, as well as stabilizing agricultural production, is the priority challenge for the scientists and farmers in Uzbekistan.

The breeding and seed production activities in the Republic are carried out by different public research institutes and Stations (23) under Ministry.

Under MAWR has Uzbek Scientific Production Center for Agriculture, which includes in its membership 23 institutes and experimental stations 17 of which are dealing with the issue of selection and seed of various crops.

In addition to these research institutes in the Academy of Sciences there are several institutions that are engaged in breeding and seed row with / crops.

To disseminate knowledge on breeding and seed MAWR has universities and / institutions:

- Tashkent State Agrarian University,
- Andijan Agricultural Institute,
- Samarkand Agricultural Institute

Variety Testing and Registration (Release)

Constraints:

- Variety release procedures were designed to meet the needs of public research institutes in the most countries.
- Procedures for variety testing and approval constituted a significant barrier to seed trade and inhibited the spread of new varieties beyond national boundaries. This led to delays in release and often rejection of useful varieties that did not meet the criteria and procedures.
- A variety released in one country faced long battles to gain release in a second country.
- Insufficient variety testing and registration infrastructure is the case in the most of ECO Countries
- Variety release and seed certification systems not properly functioning.
- Introduction of new varieties of crops is very slow.

Recommended Strategies:

- For major crops, all countries have an official trials system for evaluating new varieties.
- Support involvement of private seed enterprises in variety development and release process and other research programs.
- Public and private sector should be supported for exporting their developed varieties.
- Facilitating of conducting of DUS/VCU tests
- Private sector will be facilitated to participate in variety testing trials force and DUS examination.
- The public research has to be dedicated to the real need of the seed market, where there is a lack of good products.
- The length of the variety registration period should be reduced to only two seasons or two years. This can greatly improve availability of improved seed varieties and increased private sector participation in the variety registration process.
- Extending the testing period delays the release of promising new material to farmers and reduces the impact of the gains made by plant breeders.
- The use of standardised trials protocols combined with good statistical designs increases the accuracy of data more than large numbers of trials sites.
- The standardization of trials procedures within the region will facilitate the comparison and exchange of information on new varieties.
- The status, membership and functions of this important Committee should be clearly defined in the Seed Law or its Regulations.

- It is important that the committee includes representatives of all the concerned stakeholders and is not controlled by public sector breeders. The NVRC may be designated as a technical sub-committee of the National Seed Board/Committee, which generally has the final authority for approving the registration and release of varieties.
- Carrying out DUS tests and VCU trials in parallel so that both sets of data can be presented to the National Variety Release Committee at the same time.
- Allowing a provisional or conditional release of a variety if there is some uncertainty about trials data.
- Allowing the pre-release multiplication and certification of promising varieties while still in the testing system so that large-scale multiplication can begin as soon as the variety is officially released/registered.
- Allowing fast-track registration of varieties that are already on the National List of other neighbouring countries with similar agro-ecology. This would be a key step towards regional harmonization and should ultimately lead to the establishment of a Regional Variety List for the major crops, thereby making considerable savings in the resources required for variety testing by each country.
- Establish officially the possibility for an ECO country to use DUS results obtained by the other ECO Countries and may be Russia, Ukraine etc.
- Strict regulation on transgenic (GDO) varieties for registration production and marketing shall be key issue.
- The regional variety catalogue should be established listing varieties that have been released in more than one ECO member country, hence enhancing access to information on the varieties available for farmers on the market in the ECO Region.
- Capacity development, where preparation of new generation of specialists in the seed sector should be a core.

In Afghanistan, at present, there is no independent agency responsible for the variety evaluation and release in Afghanistan. Presently, the DUS and VCU tests are not strictly followed by the variety testing and registration committees and mostly open pollinated and aged varieties are used in crop production chain.

Under FAO/EU Seed Project, ICARDA provided assistance in establishing a variety registration system through DUS testing of existing commercial varieties.

Collection and conservation of local plant genetic materials is also neglected, only national catalogue of wheat varieties is prepared and published.

Introduction of varieties from neighbour or region countries and application of hybrid seed production technology would accelerate the variety development & release process (Kugbei *et al.*, 2011).

In Azerbaijan, number of variety testing points has also been decreased, some of them were merged.

The State Service for Registration of Plant Varieties and Seed Control is responsible for variety registration.

In Iran, Seed and Plant Certification and Registration Institute (SPCRI) which has been established in 2004 is the national authority for the seed certification and protection of the new varieties of plant. SPCRI is a subsidiary body of Agriculture Research, Education and Extension (AREEO) of the Ministry of Agriculture.

The Registration & Protection department is responsible for granting PBR and also conducting DUS tests.

The agricultural research institutes conduct variety evaluation in different agricultural research centers (e.g 30 stations for cereals) representing different agro-ecological zones to identify promising lines suitable for major crop growing regions of the country.

The procedures of variety release and registration are similar to procedures practiced elsewhere except that the same institutes that bred the varieties are also responsible for final evaluation of the new varieties. The breeder or the research institute is responsible for variety performance trials. The trials compare the agricultural value of promising varieties with existing commercial varieties and identify those found to be superior in certain agroecological zones.

The Seed and Plant Improvement Institute is responsible for variety performance trials. After the report is reviewed and confirmed by the two Technical Committees and the Commission it will be submitted for approval to the Higher Council for Agriculture Research and Education (HCAREO).

The final report of performance trials is prepared by the breeder and submitted for release and registration to be reviewed at three levels i.e. (1) the multidisciplinary Technical Committee at the department level (e.g. Cereals Research Department of SPII); (2) the Technical Committee at the Institute level (e.g. SPII); and (3) the Research Project Coordinating Commission of the Agricultural Research and Education Organization. After the report is reviewed and confirmed by the two Technical Committees and the Commission it will be submitted for approval to the Higher Council for Agriculture Research and Education (HCAREO). The

HCAREO is composed of representatives of various research institutes, faculty members of agricultural colleges or universities, extension services and the Deputy Minister of Crop Production (Horticulture).

Upon approval of the variety release the certificate of registration is signed by the Minister of Jihad-e-Agriculture and sent to the Agricultural Research and Education Organization.

After the variety is released breeders or the breeding institutes are responsible for variety maintenance and seed production of early generation materials (breeder, prebasic and basic seed) based on the plan of the Crop Technical Committee.

In Kazakhstan, the structure of State Variety Testing Commission includes 12 provincial and 3 regional inspectorates, 4 state stations and 70 variety testing plots, 2 laboratories for assessment of the grain quality. Annually in test for economic utility are about 800-900 varieties and hybrids.

In Kyrgyzstan, the State Center for Variety Testing and Genetic Resources (SCVTGR) is responsible body. In order to preserve the genetic diversity of flora in Kyrgyzstan, as well as for breeding purposes by the Ministry of Agriculture, Water Resources and Food Processing, "Plant Genebank" was established in 2009.

SCVTGR also conducts variety testing and registration of agricultural crops in the state testing plots (SCVTS - 13 around country, excluding Naryn region) and field testing usually takes 2-3 years for yields.

Field methodology includes DUS and VCU tests.

Annual results are officially published once a year in a catalogue "National Variety List" (Muminjanov, 2013).

In Pakistan, the Seed Act (1976) provides a regulatory framework for variety registration and seed quality control.

Federal Seed Certification Agency (FSCA) & National Seed Registration Agency (NSRA) merged together as Federal Seed Certification & Federal Seed Certification & Registration De (FSC&RD) in 1997.

When a breeder selects a candidate variety, simultaneously submits seed sample (Breeder/ Nucleus Seed) of candidate variety along with its tentative "Botanical Description" to two agencies. (1) PARC (all crops except cotton) and PCCC (cotton varieties only) and (2) FSC&RD.

Variety Evaluation Committees (VECs) of PARC & PCCC evaluate candidate varieties in National Uniform Yield Trials (NUYT) or National Coordinated Varietal Trials (NCVT) various specific locations in the province/country.

VCU evaluation is at least for two years.

DUS test is two seasons/years with a minimum two replications.

A variety that meets the requirement of VCU and DUS is then accepted for registration and release.

Respective Provincial Seed Council during after Spot Examination and discussion approves variety and recommends its approval from National Seed Council.

After Seed Amendment Bill, the role of private sector companies, seed dealers and seed processing units can be enhanced, creating conditions for making available the pre-basic seed for the production of basic and certified seed in the private sector (Iqbal, 2014; Shah *et al.*, 2014 and Karahan 2014b).

In Tajikistan, every new plant variety to enter the production must go through official testing and then be registered. In Tajikistan, "State commission of plant variety testing and variety protection" (SCVT) is the official authority responsible for variety testing and release. SCVT conducts DUS and VCU tests of new varieties.

SCVT, according to the variety testing results and decision of the commission, annually updates the State Register (Catalogue) of commercial and protected plant varieties (Ministry of Agriculture, Tajikistan and Mahkamov, 2014)

In Turkey, Variety Registration and Seed Certification Center (TTSM) located in Ankara is responsible for the plant variety registration and seed certification in Turkey under MFAL.

After becoming a member of UPOV in 2007, TTSM has been conducting DUS tests according to the UPOV rules in Turkey.

Registration process is performed in two separate stages with simultaneously conducted VCU and DUS tests by VRSCC. Vegetable, fruit, grapevine, and strawberry species are registered with DUS tests only.

The varieties are registered for a certain period which is 10 years for field crops and vegetables. There is no time limit for fruits, grapevines, and strawberry varieties. The registered varieties are listed in the National Variety List (Mermer and Karahan, 2014).

In Turkmenistan, 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.

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.) and hybrids submitted for state variety testing.

Applications should then be submitted to the State Variety Testing and Seed Certification organization with the required documents.

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.

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 (Saparmuratov *et al.*, 2014).

In Uzbekistan, the regulation for the State Register of Agricultural Crops is governed by Resolution of 1997. The regulation maintains a state register of agricultural crops recommended and released in Uzbekistan. The State Variety Testing Committee (SVTC) is a national agency under MAWR entrusted with responsibility for implementing the variety testing, registration and release system. The SVTC is a legal entity whose functions include the testing new varieties of agricultural crops developed by the breeders before their official release.

The SVTC has proposed a major overhaul of the entire variety release system with changes being implemented since 1991. All stations of SVTC were oriented to test cotton and other industrial crops. Eight additional stations were established in different regions for testing cereals and legume crops.

State Commission conducts testing of varieties and hybrids in two directions: VCU and DUS tests.

Registration is made for the respective region.

Gossortkomissiya published annually the State Register and Bulletin (FAO-SEC and MAWR of Uzbekistan, 2014) (Mukhamedov, 2014).

Plant Variety Protection (PVP) (Plant Breeders Rights)

Plant Breeders Rights provide a property right so that the breeder of a new variety can obtain income from the use of that variety by others for a certain period.

Constraints:

- Most of the varieties are released by public research institutes and hybrids are imported, therefore, still plant variety protection right is not applied.
- Even some countries are UPOV members and have PVP laws; they do not have enough system to control and they are reluctant to reinforce law provisions.
- The royalty payment system works well in 'mature seed markets' where production and marketing are controlled by a strong regulatory framework. It may be more difficult to implement

and enforce when many farmers save their own seed or where the seed supply system is relatively unregulated.

- It should be emphasised that the breeder only benefits from these property rights if there is an effective royalty collection system supported by a reasonable mechanism for enforcement.

Recommended Strategies:

- Access to foreign germplasm, but the recognition of Plant Breeders' Right is necessary.
- Facilitation for membership with UPOV and having PVP law for the variety protection.
- UPOV is able to provide guidance on the preparation of national PVP Laws and ECO countries planning such a law are recommended to contact the UPOV Secretariat at an early stage in this process.
- UPOV members exchange information about the varieties they have protected and this can save on the costs of DUS testing.
- It is recommended that the law on plant variety protection is kept separate from the law on seeds because these are different types of legislation.
- Effective mechanism for collecting royalties on crops.

In Afghanistan, according to the National Seed Policy, although plant variety protection including provisions for Plant Breeders' Rights and Plant Patents are not considered as issues with immediate consequence for the country.

In Azerbaijan, PVP related law is "Selection achievements". Legal document meets international standards and comply with the requirements of UPOV. Relevant law for the UPOV Convention was passed in December 2003 and Azerbaijan joined the International Convention of UPOV in December 2004.

In Iran, country is not a member of UPOV and currently its sui generis system is applicable only for Iran's residents. The Plant Varieties Registration, Control and Certification of Seeds & Seedlings Act of 2003 has provision on this issue. 18 years variety protection.

Seed and Plant Certification and Registration Institute (SPCRI) conducted a FAO TCP project entitled: Strengthening Capacity on Plant Variety Protection (PVP) which has been implemented during 2007-09 in the Institute.

A book entitled Principles of Plant Variety Protection was also compiled by a group of authors in Persian language, funded by the project.

In Kazakhstan, since the Republic of Kazakhstan law on the protection of selective breeding achievements

was enacted in 1999, the system of protection - including plant varieties - has not been noticeably amended. Currently, the issue of Kazakhstan acceding to the International Convention on the Protection of New Varieties of Plants (convention) is discussing.

The Committee and the State Commission for the Testing of New Varieties of Agricultural Plants (commission) are in charge of plant variety protection.

The Kazakh legislation and the convention provide for the temporary legal protection of a new plant variety. The duration of protection complies with convention provisions. Also, a patent's validity can be extended at the patent holder's request.

In Kyrgyzstan, Law of the Kyrgyz Republic “**On Legal Protection of Selection Achievements**” came into force in 1998 and amended in 2003, 2005 and 2006.

The royalty collection system is in place and is expected to be fully operational in the near future. Varieties may be protected by Kyrgyz patent. An agreement to simplify the system for foreign companies to protect their varieties is also in place. Farms are now able to multiply seed under license agreements with the plant breeder or license holder and to pay royalties through the Kyrgyz Patent Office (Islamov *et al.*, 2007).

In Pakistan, Seed Act, 1976 which scarcely contains IP protection provisions. This law does not provide protection to the rights of Plant Breeders.

The Plant Breeders' Rights Acts, 2015 was passed in Parliament in 2015 that registration for protection will be established under IPO-Pakistan. It provides 20 years protection for the crops and 25 years for trees and wines (Shah, 2014).

In Tajikistan, the Law of the Republic of Tajikistan “On the Plant Variety Protection”, #672, December 29, 2010 (Husenov, 2014).

In Turkey, in 2004, the “Protection of Breeder's Rights of New Plant Varieties Law” No. 5042 was accepted implemented effectively. The law has been prepared in full compliance with the EU directives. With the approval of this Law, application was made for UPOV membership and Turkey was approved as the 65th member of UPOV in November 2007.

Implementations under the framework of this law are carried out in accordance with CPVO (Community Plant Variety Office). Data related to breeders' rights are transferred periodically to CPVO, and CPVO central database can be utilized online by Turkey.

In Uzbekistan, the ‘Breeding Achievement Act’ 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 UPOV.



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