



SEED INFO

Official Newsletter of the WANA Seed Network



Seed Info No. 42

January 2012

EDITORIAL NOTE

Seed *Info* is designed to stimulate information exchange and regular communication between seed staff in the Central and West Asia and North Africa (CWANA) region. Its purpose is to help strengthen national seed programs and thus improve the supply of quality seed to farmers.



The WANA Seed Network corner provides information on activities related to global and/or regional cooperation and collaboration to facilitate the development of a vibrant regional seed industry. In this issue, we highlight the ECOSA 2011 Seed Trade Conference and the Regional Workshop on Seed Policy in the Economic Cooperation Organization (ECO) region, both held in Istanbul, Turkey. The workshop on Seed Policy was organized by the International Center for Agricultural Research in the Dry Areas (ICARDA) and the Food and Agriculture Organization of the United Nations (FAO) and attracted 35 participants, representing all member countries of the ECO.

In the **NEWS AND VIEWS** section, Niels Louwaars from Plantum-NL presents the role of the seed association for a healthy seed industry. The article discusses the evolution of the international seed trade and with it the international seed association and, lately, the emergence of regional and national seed associations in various parts of the world.

There is news from regional and/or international organizations, such as the International Union for the Protection of New Varieties of Plants (UPOV) and the South Asian Association for Regional Cooperation (SAARC). SAARC members are set to create a regional seed bank and a regional rapid response mechanism to fight natural disasters such as cyclones and earthquakes.

The section on **SEED PROGRAMS** includes news from Egypt, Ethiopia, India, Morocco, and Pakistan. The Ethiopian report covers the outcomes of a regional seed workshop on variety identification and maintenance, organized by ICARDA in collaboration with the Ethiopian Seed Enterprise (ESE) and the Ethiopian Institute of Agricultural Research (EAIR). USAID Famine Fund Project provided financial support for the participants from Egypt, Ethiopia, and Pakistan.

The workshop members shared experiences on accelerated seed multiplication to counter the wheat rust threat in Egypt, Ethiopia, and Pakistan. News from Pakistan focused on the release of bread wheat varieties in 2011 by the Punjab Seed Council. ICARDA, with the USAID Famine Fund Project, is supporting accelerated seed multiplication and popularization of these newly released varieties. They work with public and private sector partners to ensure availability and access to seed for farming communities across the country.

The **RESEARCH** section captures information on adaptive research or issues relevant to seed program development in the region and beyond. This issue features an article entitled 'Use of Tissue Blot Immunoassay and Sequential Sampling to Determine Pea Seed-borne Mosaic Virus Seed-to-Plant Transmission Rates' by Joop van Leur *et al.*, NSW Department of Primary Industries, Tamworth, Australia. Standard procedures for the detection of PSbMV seed transmission are based on the group testing of greenhouse grown, 2 to 3 week old seedlings with ELISA. The paper describes the suitability of testing etiolated plumules of pea seed germinated on filter paper by tissue blot immunoassay (TBIA) to quantify differences between pea seed lots and genotypes in SPT rates. TBIA is less costly than ELISA and has been successfully applied for detecting seed transmission for several viruses including PSbMV. Statistical tests were applied that provide reliability ranges and assist in determining the appropriate sample sizes to quantify the SPT rates of different seed lots.

Seed Info encourages the exchange of information between the national, regional, and global seed industries. We encourage our readers to share their views and news through this newsletter. Your contributions, in Arabic, English, or French, are most welcome.

Happy New Year

Zewdie Bishaw, Editor

WANA SEED NETWORK NEWS

This section presents information on the WANA Seed Network, including network activities and reports of the meetings of the Steering Committee and the WANA Seed Council.

ECOSA 2011 International Seed Trade Conference

The Economic Cooperation Organization (ECO) was initially established as a trilateral organization of Iran, Pakistan, and Turkey in 1985. Its purpose was to promote multi-dimensional regional cooperation to create sustained socioeconomic growth in the member states. In 1991, with the break-up of the former Soviet Union, six newly independent countries – Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan – joined the organization. Afghanistan became a member in May 1992.

Establishment of ECOSA

A TCP seed project (TCP/INT/3102 (C) (Strengthening Seed Supply in the ECO Region with Emphasis in Central Asia) was jointly implemented by ECO, FAO, and ICARDA from 2006 to 2008. During this period a series of regional activities were carried out to create a strong basis for a regional seed market, linked to the global seed industry. The project laid the foundations for harmonizing the regulatory framework for a variety release and PVP mechanism, a seed certification scheme, and phytosanitary measures as key elements towards creating a ‘regional seed market’. In July 2008, the ten ECO member countries endorsed the formation of the ECO Seed Association to lead and strengthen the on-going regional initiatives.

The association creates a forum for a public-private sector partnership for promoting seed trade among ECO countries and beyond. It will represent the interests of the seed industry, and facilitate dialog with governments to create an enabling policy and regulatory framework for the development of a competitive seed sector. As seed trade expands, there will be direct impacts on agriculture and food security.

ECOSA Board meeting

ECOSA held its Board meeting 17 November

2011 in Istanbul Turkey where the achievements of the 2011 action plan were reviewed and the action plan for 2012 was developed. It was reported that the legal hurdle for official and formal registration of ECOSA as a regional organization has now been completed. ECOSA was formally registered as a regional entity in Turkey on 26 August 2011 by Cabinet Decision number of 2011/2258. ECOSA could be expanded beyond its current borders and the ECOSA members’ duties, responsibilities, and benefits will be determined and published on the website.

ECO Seed Trade Conference

Organizing an international seed trade conference is one of the main goals of ECOSA. ECOSA 2011 was sponsored by the Turkish Seed Union (TÜRKTÖB) and organized in conjunction with the annual Turkish Seed Fair, 17-19 November 2011. The conference consisted of a series of presentations and discussions made by the representatives of public and private seed companies and institutions from the ECOSA member countries. The fair attracted a wide range of public and private agriculture research for development institutions and companies. Seeds, varieties, inputs, agriculture machinery, and seed and crop processing and packaging technologies from local and international markets were exhibited. These proved to be valuable eye openers and unique opportunities for the workshop participants to identify immediate and future sources of such supplies for their institutions and companies.

ECOSA establishment and registration is a major achievement of the ICARDA partnership building activities in the area of regional seed market development. ICARDA’s catalytic role was crucial for ECOSA as the 10 member countries and associated staple food crops fall within ICARDA’s geographical mandate and targeted research for development agenda.

Abdoul Azîz Niane, ICARDA, P.O. Box 5466, Aleppo, Syria; E-mail: a.niane@cgiar.org

Workshop on Seed Policy in the ECO Region

ICARDA and the FAO, in collaboration with ECO, organized the Regional Workshop on Seed Policy for the ECO Region, 12-13 October 2011 in Istanbul, Turkey. The workshop attracted

35 participants, representing all the member countries of ECO – Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Turkey, and Uzbekistan. In addition, participants from Lebanon attended the workshop. Participants came from a broad range of institutions in the seed sector including both the public and private sectors.



Participants of workshop on seed policy in ECO region

The purpose of the workshop was to discuss the role of a seed policy in strengthening national programs and, against that background, to collect information on the status of the seed sector in the region. FAO, ICARDA, and international consultants provided background information on key issues in seed program development, with emphasis on the policy dimensions. The national representatives then reported on the situation in their countries, following a framework proposed by the organizers. Simultaneous translation was provided to facilitate discussion, which was active and highly engaged throughout.

The presentations gave a comprehensive overview of the seed sector in the region, and highlighted some key constraints. They showed a wide diversity of experiences among the ECO countries and provided opportunities for sharing that experience. However, it was also recognized that, as there is no general model, a policy must be developed to address the specific context and needs of each country.

Based on these presentations, four working groups were organized in which eight questions were formulated and discussed. The conclusions of the working groups were presented at a plenary session. The main themes and conclusions of the workshop, from both the formal presentations and the group discussions, are summarized below.

- A policy should provide a long-term vision and framework for the development of the

seed sector by guiding decisions and resource allocation for all elements of the seed chain, from breeding to seed use by farmers

- The overall purpose of the policy is to improve the quality, choice, and security of seed supply to farmers in all parts of the country
- The policy should define the roles of the public and private sectors, and should facilitate coordination (and seed flow) between institutions, companies, and non-governmental organizations, where these exist
- The policy and the plan must be in harmony with other strategic documents for agriculture, rural development, and the wider economy
- The relationship between the policy and existing/proposed laws for seeds and varieties should be made clear to ensure that they are complementary
- An action plan should be prepared to implement the policy and a mechanism should be established for monitoring its impact against defined indicators
- For successful implementation, it is important to secure strong political support for the policy. To achieve this, it may be helpful to prepare a briefing paper to explain key issues in the seed sector, and their socio-economic implications, particularly for domestic food security, which is an increasing concern in many countries
- A process of wide consultation among stakeholders should take place during the preparation of the policy so that all relevant issues are reflected in the final document, and to avoid the need for frequent revisions
- The policy should embrace all components of the seed system, including recognition of the informal sector as the main supplier for certain crops and locations. This will give legitimacy to local seed production initiatives that may evolve into more formal entities over time
- When a sufficient number of companies exist, the establishment of a National Seed Association should be encouraged. This would be a very positive step in representing their collective interests and developing the market for high-quality seed
- There could be substantial benefits to both seed trade and seed security from the free movement of seeds and varieties within the region. Efforts should be made to achieve political support for such an initiative

- Wider knowledge of, and active participation in, international seed organizations would assist more countries of the region to develop export markets and enter the global seed trade.

During two days of intensive discussion, the workshop provided participants with a clear understanding of the purpose and content of a seed policy, and the process by which it can be developed. The organizers anticipate that participants will share their experiences of the workshop with their professional colleagues in order to reflect on the status of their national seed program. Through this process, they may also identify elements of the seed system that could strengthen the productivity and security of agriculture and in which FAO/ICARDA could provide assistance.

Zendie Bishan, ICARDA, P.O. Box 5466, Aleppo, Syria; E-mail: z.bishan@cgiar.org and Thomas Osborne, Agriculture and Consumer Protection Department, FAO, Rome, Italy; E-mail: thomas.osborn@fao.org

NEWS AND VIEWS

News, views and suggestions on the seed industry are included in this section. It is a discussion forum for seed sector professionals.

Seed Trade Associations: Key to a Healthy Seed Industry

Historical context

The history of seed trade is as old as agriculture. Knowledge based agriculture, including scientific plant breeding, mechanization, commercialization, diversification, and specialization at various stages of agricultural development, led to the emergence and progressive development of an organized seed sector in developed countries. Along the way, the business of producing and marketing seeds expanded; this triggered the establishment of national seed associations to represent and protect the interests of the private seed sector. For example, the American Seed Trade Association, established in 1883, immediately started lobbying to halt those government seed distribution programs competing with the private sector. The growing movement of varieties and seeds across national borders

early in the 20th century led to the formation of the International Seed Trade Federation (now International Seed Federation-ISF) in 1924 to streamline the international seed trade. In developing countries, the shift from a development oriented, formal seed system dominated by the public sector to a more diversified market oriented system led to the emergence of the private sector too. Such diversification paved the way for the emergence of interest groups which needed representation within the national seed industry, thus giving birth to national seed associations.

Role of seed trade associations

The seed sector is a complex one for policy makers. Seed has a number of different functions in society:

- Basic input for crop production and, thus, an important part of food security and rural development policies
- New varieties are a starting point for innovation in agriculture and horticulture, and seed is thus an issue in innovation policies
- Seed is a commodity that may be commercialized, making seed the subject of commercial policies
- Seed is a carrier of biodiversity and is thus linked to environmental policies.

Seed associations can present clear views to policy makers on behalf of their members.

Effective partnerships: A seed association represents the interests and protects the rights of its members. Thus an association should have sufficient expertise to be an effective partner to policy makers at the national, regional, and international levels. It should discuss possible bottlenecks and provide solutions to emerging issues to create a healthy seed industry.

In most countries, the seed sector is highly regulated, and seeks to protect farmers from planting sub-standard seed, and, at the same time, create a level playing ground to prevent cheap, low quality seed suppliers creating undue competition within the seed industry. An effective seed association can help frame an effective regulatory framework limiting excessive costs arising from any inefficiencies of the public sector. The framework would address variety registration, IPR protection, seed quality assurance, and phytosanitary issues. It should facilitate healthy functioning of the seed sector and representation to the relevant bodies of the seed industry.

Service provisions: Apart from creating a window for discussion with policy makers, seed associations can also provide various services for their members. These may range from market data collection and information exchange, to services related to joint quality control and legal advice to strengthen the capacity of its members. In addition, many seed associations create a platform for their members to establish priorities for pre-competitive research programs that the government may (co-)finance.

Impartial representation: Seed associations have to resolve some challenges with respect to finance, capacity, and representation. Any seed association that represents the private sector ideally has to be financially independent from other stakeholders, such as government and farmers. This means that it should run on contributions from the members. This can only happen if the members see the need for such an association – that they get back enough for their money in terms of services even though the returns on their investments may not always be measured in monetary terms. It has to be borne in mind that a seed association brings together competitors in the market, who have some opposing interests, but who definitely have parallel interests on many fronts. Discussions on contribution levels and voting rights are issues at all times in such associations. The level of funding is directly linked with the capacity of the association to involve itself in relevant debates. Associations can have several staff themselves, or use specialists from member companies to represent the whole industry on specific issues. The latter is very common, but in order for such individuals to represent all it is essential that the association itself has sufficient capacity to determine industry positions on policy issues. In countries where a large share of the seed is produced by public enterprises, the representation becomes even more complex, especially where these associations cannot take policy positions independently from their parent ministries.

Regional and global linkages: Seed associations often collaborate and participate in regional and global associations, such as the International Seed Federation. The difference between national and regional associations is that the national associations have a clear target for their lobbying – the national governments. For most regional associations the target is less clear. Many operate

mainly as a platform for national associations and regionally operating companies, preparing policy positions that they can put to their target groups. Ideally, regional seed associations are dependent on strong national organizations. It is important that such regional and international associations do not voice the positions of internationally operating seed companies only, as these may, in some cases, have different interests from the locally operating companies.

In summary, seed associations have an essential role to play in the development of a mature seed industry in any country. Governments should be happy with a well-informed seed association even when their positions in relevant policy issues differ. It is the task of an association – while representing the interests of the members – to contribute to solutions to problems arising at the policy level.

Niels P. Louwaars, Plantum-NL, Rotterdam, Netherlands; E-mail: niels.louwaars@wur.nl

Egypt Appoints New Head of CASC

In Egypt, the Central Administration for Seed Certification (CASC) is an autonomous body operating under the Agricultural Research Center (ARC) of the Ministry of Agriculture and Land Reclamation (MALR). It is primarily responsible for implementing a seed certification scheme in the country. The agency is also responsible for DUS testing and acts as the secretariat of the Permanent Committee for Variety Registration, the supreme body responsible for variety release.

CASC was established when the Central Administration for Seed (CAS) was separated into two forming a Central Administration for Seed Production and CASC. The technical and administrative procedures for variety registration were modified and its management transferred from ARC to CASC. Decree No. 937 of 1995 was promulgated to broaden its functions and membership, which includes the heads of research institutes (ARC), CASC, and representatives of the Egyptian Seed Association and four seed companies. Decree No. 867 of 1997 assigned responsibility for variety description tests (DUS) and variety performance tests (VCU) to CASC. Decree No. 82 of 1998 establishes the policy and provides guidelines for the procedures for the release of crop varieties developed by ARC. The decree envisages the establishment of a Variety Release Advisory Committee consisting of nine

members with three each from ARC and ESAS and one each from private seed companies – CASP, CASC, and the Egyptian Association of Plant Breeders.

In a recent staff change, Eng. Abdel Badeea Soliman became the new under-secretary of Central Administration for Seed Testing and Certification. The former undersecretary, Eng. Salah Moawed, became Head of Services Sector and Follow-up in MALR.

Mona El Kassier, CASC, Giza, Cairo, Egypt; E-mail: secretariat@casc-eg.com

Ethiopia Establishes Agricultural Transformation Agency

The Government of Ethiopia has recently established an Agricultural Transformation Agency (ATA). The Agency promotes agricultural sector transformation by supporting existing structures of the government, private sector, and other non-governmental partners to address systemic bottlenecks. The Agency is expected to deliver on a priority national agenda to achieve growth and food security.

The formation of the ATA is the result of two years of extensive diagnostic study across eight sub-sectors of Ethiopia's agricultural system in a highly consultative, multi-stakeholder process led by the Ministry of Agriculture with the support of the Bill & Melinda Gates Foundation. Modeled after similar public-sector bodies in Asia (Taiwan, Korea, Malaysia, etc.) that played important roles in the growth of those national economies, the Agency's structure and function is focused on nimble, innovative, and results-oriented support to a range of partners in the agricultural sector.

Programmatically, the ATA will focus on a set of high priority initiatives identified by the Ministerial Council. It is expected to engage in six or seven areas of focus, including seeds, markets/cooperatives, technology access and adoption, and extension and research. Across the thematic initiatives, the ATA engages public, private, and non-governmental stakeholders to support strategic planning, manage and strengthen implementation capacity, and test innovative models. The Government of Ethiopia and a wide range of development partners will finance ATA. For more information, please visit the website at www.ata.gov.et

Ethiopia Holds National Seed Conference

In Ethiopia, the beginning of agricultural research and attempts to modernize its agriculture by emerging private 'estate' farms occurred in the 1960s. Later on, large state farms, producer's cooperatives, and the resettlement programs in the 1970s led to the beginning of an organized seed sector. The culmination of these efforts was the establishment of the Ethiopian Seed Enterprise (ESE) in 1979. The first decade of the ESE was guided by the centrally planned economy of socialist principles. In 1991, the country changed course and embraced a market economy.

The National Seed Policy and Strategy (1992) was developed with an emphasis on the farmers' role in genetic resources conservation and the informal seed sector as well as having a strong public and private sector role in plant breeding and seed provision. In the meantime, the national seed industry policy inspired the enactment of several seed related proclamations.

The country also moved from centralized to decentralized institutional arrangements in agricultural research, seed delivery, and related services. In addition to the Ethiopian Institute of Agricultural Research (EIAR) at the federal level, seven Regional Agricultural Research Institutes were established during the late 1990s to serve regional states. Similarly, as well as ESE, three Regional Public Seed Enterprises were also established in the late 2000s in addition to the 27 private seed producers and six Farmers' Cooperative Unions operating in seed sector across the country.

In Ethiopia, as in many other developing countries, the informal seed sector is predominant, but the importance of improved seed for enhancing crop productivity and production is gaining recognition by the government. The formal seed sector has not yet developed to a level commensurate with the demands of the farming community, and demand is outstripping supply, particularly for hybrid maize seed. Although inadequate, commendable attempts were made to strengthen the formal sector through public and emerging private seed producers including the Ethiopian Seed Growers Association.

In line with recent developments and emerging issues in the seed sector, it became imperative to review the progress and to develop a strategy for the future direction of the seed system in order to strengthen both formal and informal seed systems

in the country. To this effect, EIAR and ESE took the initiative and organized a national seed conference, the first of its kind where national and international experts shared their experiences in the development of the seed industry.

This international conference presented experiences from Africa and other parts of the world in some 37 papers, structured along the following thematic areas:

- (i) Policies, strategies, and institutions for the development of an Ethiopian seed system
- (ii) Role and performance of the formal seed system
- (iii) Experiences of the informal/farmers' seed system
- (iv) Integrating the formal and informal seed systems
- (v) Case studies on the integration of the formal and informal seed systems.

The conference was held 1-3 June 2011 in Addis Ababa, Ethiopia. About 120 participants representing national seed sector stakeholders from the public and private sectors and international organizations attended the conference. The conference provided an opportunity to review the status of the seed industry and made recommendations for amending the policy and regulatory frameworks for its development.

Fikre Asnake, Debrezeit Agricultural Research Center, EIAR, Debrezeit, Ethiopia; E-mail: fikreasnake@yahoo.com

SAARC Plans Seed Bank for Rapid Response in Disaster

The South Asian Association for Regional Cooperation (SAARC) members are set to create a seed bank and a regional rapid response mechanism to fight natural disasters. SAARC countries will sign two trade and customs related deals – an agreement to create a seed bank and a path-breaking accord on a regional rapid response to fight natural disasters, such as cyclones and earthquakes.

SAARC, set-up in 1985, includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. Leaders of the member countries meet at a summit every year, which seeks to boost trade, economic, and cultural links. The deals paving the way for a *SAARC Seed Bank* and a regional *Rapid Response to Natural Disasters* are expected to be key achievements of the Summit in 2011 as farming is predominant in all south Asian nations and they face frequent natural disasters.

According to the draft agreement of the SAARC Seed Bank, the member countries will set up a regional seed bank to help farmers get quality seed from the reserve in case of a shortage due to natural calamities. Under the arrangement, each member state of the bloc will take the initiative to be self-sufficient in seed to meet their own requirement and contribute to ensuring food security in the region. It will widen the scope for sharing expertise and experience in technology and help develop stress tolerant varieties. The proposed seed bank will help countries cooperate in exchanging seed of their high yielding varieties that are already in the public domain and do not fall under intellectual property rights.

The SAARC Agreement on Rapid Response to Natural Disaster will help the member-nations deal with the calamities that most frequently visit South Asia. The SAARC Disaster Management Centre in New Delhi has prepared a draft agreement to enhance cooperation on disaster management among the member countries.

Source: Plant Breeding News 228 11Oct 2011

UPOV Membership Reaches 70 and is Growing

On 8 July 2011, the Government of Peru deposited with the Secretary-General of UPOV its instrument of accession to the International Convention for the Protection of New Varieties of Plants (UPOV) of 2 December 1961, as revised at Geneva on 10 November 1972, 23 October 1978, and 19 March 1991. For Peru, the Convention entered into force one month after deposit of its instrument of accession, i.e. on 8 August 2011. On that date, Peru became the 70th member of the Union; and according to the notification, protection is available to all plant genera and species.

The purpose of the UPOV Convention is to encourage the development of new varieties of plants by granting breeders an intellectual property right on a set of clearly defined principles. To be eligible for protection, varieties need to satisfy certain conditions, such as being distinct from existing, commonly known varieties and sufficiently uniform and stable.

In another development, the Council of UPOV met in Geneva on 20 October 2011 to take stock of the Union's work of the past year and approve the next biennium's program and

budget. To mark the 50th anniversary, UPOV organized the ‘Symposium on Plant Breeding for the Future’, which reviewed recent developments in plant science and looked forward to the challenges and opportunities for applying those scientific developments in plant breeding (http://www.upov.int/en/documents/symposium_2011/upov_sym_ge_11_1.html).

The Council has also agreed with the Secretariat of the ITPGRFA, on a research project on the economics of the Multilateral System of the ITPGRFA, based on information available from the Plant Variety Database (PLUTO).

Cooperation in the examination of new plant varieties has expanded considerably. In 2011, there was agreement between members of the Union for cooperation in the examination of distinctness, uniformity, and stability for 1990 plant genera and species. This compares to the agreement for 1400 in 2010. The Council noted a record number of plant variety protection titles granted in 2010; the number exceeding 11,000 for the first time (a 3% increase on 2009). A record 90,214 titles in force was recorded in 2010, representing a 4% increase on the number for 2009.

UPOV is an intergovernmental organization based in Geneva. For further information please contact: UPOV Secretariat: 4, Chemin des Colombettes, CH-1211 Genève 20; Tel: +41-22-33891 11; Fax: +41-22-7330336; *E-mail*: upov.mail@upov.int; *website*: <http://www.upov.int>

CONTRIBUTIONS FROM SEED PROGRAMS AND PROJECTS

In this section we invite national seed programs, projects, universities, and regional and international organizations to provide news about their seed-related activities.

Ethiopia Hosts Regional Workshop on Variety Identification and Maintenance

Background

A wheat stem rust race, ‘Ug99’, was first detected in Uganda in 1999. It was subsequently detected in Kenya (2002), Ethiopia (2003), Sudan (2006), Yemen (2006), and Iran (2007). CIMMYT and ICARDA prepared a joint proposal entitled ‘Accelerating seed multiplication to combat the threat of stem rust in wheat’ for selected target countries

most prone to food insecurity. These included Afghanistan, Bangladesh, Egypt, Ethiopia, Nepal, and Pakistan. ICARDA was entrusted with a leadership role in implementing project activities in partnership with NARS of Egypt, Ethiopia, and Pakistan.

The following approaches were used to address the project objectives:

1. Identifying promising stem rust (Ug99) resistant wheat lines combined with better agronomic performance
2. Fast track testing and release of stem rust resistant varieties through dialogue with stakeholders
3. Popularization and demonstration of newly released rust resistance wheat varieties
4. Accelerated seed multiplication of promising lines (pre-release) or released varieties (breeder, pre-basic, and basic seed)
5. Accelerated large-scale certified seed multiplication of released varieties by linking with the existing public and/or private seed sectors
6. Creating awareness at the national level to mobilize policy support.

The project is working with a broad range of seed sector stakeholders, including agricultural research centers (NARS), public and private sector seed providers, agricultural extension services, and farmers to implement the objectives. In 2010-11, NARS in partnership with CIMMYT, and ICARDA released 12 Ug99 resistant varieties in the three target countries – four in Ethiopia, two in Egypt, and six in Pakistan.

Workshop objectives

Fast-track variety release and accelerated early generation seed multiplication are one of the major constraints in this endeavor. In recognition of this, a regional workshop on Variety Identification and Maintenance was organized by ICARDA in collaboration with ESE and EIAR 19-22 September 2011 in Kulumsa, Ethiopia. The workshop served as a forum for the three target countries and:

- Shared experiences on fast track variety release and innovative procedures of rapid seed multiplication and dissemination of new improved varieties under the project
- Provided technical knowledge on the requirements of variety release processes (description, registration) and variety

maintenance to maintain varietal purity and seed quality

- Established partnerships for continuous collaboration on the rapid release and dissemination of varieties for greater food security and economic growth.

Workshop participants

A total of 25 scientists and technical staff from the three participating countries, Ethiopia, Egypt, and Pakistan, attended the workshop. The workshop program included introductory and country presentations, working group sessions, hands-on practical demonstrations on variety identification and maintenance, and field visits.



Participants of the regional workshop on variety maintenance

Workshop Program

The practical sessions and presentations covered a wide range of issues related to variety evaluation and release, accelerated early generation and large-scale seed multiplication for dissemination of improved varieties to farmers.

Workshop recommendations

Based on the presentations, country reports, working group sessions, and discussions, which took place during the workshop some of the lessons learned and recommendations are highlighted as follows:

Variety development, evaluation, and release: Variety development, evaluation, and release are closely interrelated. Procedures followed in all three countries are rather similar based on well-established standards, but with certain variations.

- Fast track variety release, using one-year, multi-location adaptation trials was adopted. In Ethiopia, two Ug99 resistant varieties were

immediately released after one year testing. Afghanistan imported seed of a Ug99 resistant variety tested at the national level to augment accelerated seed multiplication in the country. Both practices significantly contributed towards fast release and dissemination of improved varieties

- It is possible to shorten the time it takes for variety evaluation and release through some innovative approaches. In Pakistan, the best performing lines may enter different variety trails at the same time instead of entering subsequent trial stages for releasing a new variety
- There is scope for simplifying the bureaucratic procedures that delay variety release and registration by having a national variety release committee representing key stakeholders, including the private sector, farmers, agro-industry, etc.
- Participation in regional variety testing and harmonizing seed regulatory frameworks would facilitate the rapid access of farmers to improved varieties in the region
- Experience gained in introducing and disseminating disease resistant varieties from countries with relatively better seed programs to those with less developed seed programs appeared useful

Accelerated seed multiplication: For variety dissemination, two issues need to be satisfied – variety maintenance and early generation (breeder, pre-basic/basic) seed production and large-scale certified seed commercialization, and promoting dissemination through farmer-to-farmer diffusion. The workshop participants recommended institutionalization of the approaches followed during rapid dissemination by the project as summarized below:

- Promoting pre-release multiplication of carefully selected, promising lines. If such varieties are not released, the cost could be covered by selling the seed as grain
- Exploiting opportunities for off-season multiplication under irrigation in areas with suitable environmental conditions
- Establishing a functional variety maintenance unit (equipped and staffed) to ensure early generation seed production to produce sufficient seed for commercialization

- Exploring the possibility of involving the private sector in variety maintenance, and pre-basic seed production and marketing of public-bred varieties
- Strengthening linkages among seed sector stakeholders i.e. research, seed producers, and technology transfer institutions
- To improve secondary dissemination, the following strategies are recommended:
 - Strengthen seed extension to assist farmers to maintain the quality of their own saved seed



Field visits to seed multiplication of rust resistant wheat varieties; Kulumsa ARC, ELAR (top); Gonde-Ethaya basic seed farm, ESE (middle); and farmer's fields in Bekoji, Arsi Zone (bottom)

- Promote farmer-based seed production and marketing schemes and create functional linkages with formal sector institutions (research, seed, input providers, credit facilities, etc.)
- Use of clean grain fields as alternative sources for seed in case of an emergency situation.
- In Egypt, the national average wheat yield is above 7 Mt/ha whereas it is less than 3 Mt/ha in both Pakistan and Ethiopia. There are huge opportunities for sharing and exploiting the new technologies and expertise that exist in different countries.

AbduRahman Besbir, Ethiopian Seed Enterprise, P.O. Box 2453, Addis Ababa, Ethiopia; E-mail: abdurahmanb@gmail.com

Implementing PPV and FR Act 2001 in India

The World Trade Organization's TRIPS Agreement (Article 27.3(b)) imposes an obligation on all member countries to protect plant varieties either by patents, or by *sui generis* regimes or a combination of both. India adopted the *sui generis* option to fulfill its WTO obligation and developed a Protection of Plant Varieties and Farmer's Rights (PPV&FR) Act, 2001. The Act involves all commercial actors concerned with plant genetic resources (PGR) management, i.e. breeders and farmers.

The PPV&FR Act provides an effective system for protecting plant varieties and the rights of farmers and plant breeders. It encourages the development of new plant varieties. The Act makes provisions for:

- PBR and registration of new (extant), essentially derived plant varieties that fulfill novelty, distinctiveness, uniformity, and stability requirements
- Rights of farmers to register their own varieties and the right to save, use, sow, re-sow, exchange, share, or sell farm produce including seeds,
- Disclosure requirement benefit sharing protection of extant varieties
- Grounds for challenging the registration and issuance of compulsory licenses.

The Central Government established the Protection of Plant Varieties and Farmers' Rights Authority on 11 November 2005. With the

establishment of the Authority and notification of PPV&FR Rules, 2003 and Regulations 2005, the Authority proceeded further in implementing the provisions. The Authority constituted several task forces to develop specific DUS test guidelines for different crop species and these were published in its Plant Variety Journal and were notified by the Central Government.

In 2007, registration of plant varieties started by the Authority with twelve crop species, which in due course has been extended to 54 crop species, including eight cereals, seven grain legumes, six fiber, one sugar, two tuber, eleven oilseed, two spices, twelve horticultural, and five medicinal and aromatic. To facilitate the registration of plant varieties, the Authority has opened two branch offices of the Plant Varieties Registry, one at Birsa Agricultural University (Ranchi) and another at Assam Agricultural University (Guwahati).

The Authority is also in the process of developing and validating guidelines for DUS testing of more than 44 crop species. So far (as of 15 November 2011) the Authority has received 3416 applications for registration of plant varieties, including open pollinated varieties, hybrids, parental lines, and transgenic varieties from different stakeholders, such as farmers and the public and private sectors, including multinational seed companies. The varieties, for which registration has been applied, are evaluated at DUS test centers nominated by the Authority. For the purpose of registration, the Authority has also developed a database of varieties – the Indian Information System – as per DUS Guidelines (IINDUS 08.1) and Notified and Released Varieties of India (NORV).

Varieties fulfilling all the requirements are eligible for registration and receive a certificate of registration. So far, the Authority has issued 305 certificates of registration in different crop species. The Authority is also maintaining a 'National Register of Plant Varieties' containing all the details of the registered plant varieties. This is kept at its headquarters in New Delhi. This Register is an authentication of the plant breeder's rights granted to the applicants.

Farmers have played an important role in the conservation of PGR and will continue to do so in the future. Because of their significant contributions in the past and present towards the conservation of PGR, farmers have an important stake in any legal regime on plant variety protection.

Under the PPV&FR Act, the Central Government has constituted a National Gene Fund. The Fund supports conservation and the sustainable use of genetic resources, including *in-situ* and *ex-situ* conservation, and strengthens the capability of the Panchayat to carry out such conservation and sustainable use. The Authority supports and rewards farmers, communities of farmers (particularly the tribal ones) and rural communities engaged in the conservation, improvement, and preservation of genetic resources of economic plants and their wild relatives particularly in areas identified as agro-biodiversity hot spots. (The Authority has identified 22 agro-biodiversity hotspots).

The Authority, in consultation with the Central Government, has started a *Plant Genome Savior Community Award*. The Award consists of cash, a citation, and a memento which is given annually with a maximum of five awards per year. The award is open to all Indian farming/tribal/rural communities engaged in the conservation, improvement, and preservation of genetic resources of economic plants and their wild relatives. Gram Panchyats, State Agricultural Universities, Krishi Vigyan Kendras, Indian Council Agricultural Research Centers, reputed research institutes, NGOs, community based organizations, and farmer's associations can sponsor applications. The Authority, as a mark of recognition for the selfless conservation of genetic resources by farmers/farming communities, awarded *Plant Genome Savior Community Recognition* certificates to five farmers/communities in 2007-08 and four farmers/communities in 2008-09.

Recently the Authority celebrated its seventh Foundation Day at which certain DUS test centers, institutions, and organizations promoting registration of plant varieties were given awards for their outstanding contributions.

P.L. Gautam, Protection of Plant Varieties and Farmers' Rights Authority, Ministry of Agriculture, S-2, A-Block, NASC Complex, DPS Marg, New Delhi-110012; website: www.plantauthority.gov.in

Status of Plant Variety Protection (PVP) in Morocco

The Moroccan PVP law came into force in October 2002, but the country did not become a UPOV member until October 2006. Since October 2002, the number of applications for

plant variety protection has reached 330. These include 182 varieties, which were protected, and 5, for which protection had expired. Currently 111 varieties are under examination, 24 applications have been refused, and eight applications were withdrawn by the breeders. The status of PVP in Morocco is presented in Tables 1, 2 and 3.

Table 1. Application and protection of species

Species	No. of applications	No. of protected varieties	No. of varieties under examination
Field crop	73	67	4
Fruit tree	112	41	67
Grapevine	32	8	11
Strawberry	24	14	10
Potato	58	45	2
Rose	3	02	
Vegetable	23	05	12
Myrtle	4		4
Blueberry	1		1
Total	330	182	111

Table 2. Distribution of applications and number protected by origin

Country	No. of applications	No. of protected varieties
Morocco	103	78
Netherlands	48	22
France	64	29
United State of America	45	17
Spain	32	17
South Africa	13	1
Ireland	12	11
Great Britain	4	04
Italy	6	1
Others	5	02
Total	330	182

Table 3. Applications and number protected in the public and private sectors

Breeder status	No. of applications	No. of protected varieties	Proportion protected (%)
Public	87	69	79
Private (national)	10	10	100
Private (foreign)	233	103	44
Total	330	182	55

Of the 330 applications received, 87 applications were from the national public sector, 10 from the national private sector, and 233 from the foreign private sector. Of these, 69 from the public sector, 10 from the private sector, and 103 from the foreign private sector were granted protection, bringing the total given protection to 182. This represents an overall success rate for protection of 55%. The rate for the public sector is 79%, that for the national private sector is 100%, while that for the foreign private sector is 44%.

In another development, the Service of Seed and Plant Control and Certification was upgraded to a Division. In 2010, a new office was created within the Ministry of Agriculture and Fisheries in Morocco, named the Office National de Sécurité Sanitaire des produits Alimentaires (ONSSA). This Office is in charge of all aspects of food safety, animal and plant control, and protection. The Office comprises three Central Directorates and 10 Regional Directorates.

In this new office of the ministry, the previous service in charge of the control and certification of seeds and plants was upgraded to a Division of Seed and Plant Control and Certification, with 10 Regional Services and three Services at the central level.

The services at central headquarter are located in Rabat and are:

- The service for homologation and protection of new varieties;
- The service for seed control and certification;
- The service for plant control and certification.

Ammar Tabiri, Division of Seed and Plant Control and Certification, Rabat, Morocco; E-mail: amar.tabiri@gmail.com

Pakistan Releases New Wheat Varieties

In Pakistan, variety release requires both value for cultivation and use (VCU) and distinctness, uniformity, and stability (DUS) tests. Pakistan Agricultural Research Council (PARC), with an exception for cotton, carries out national uniform yield trials for at least two years to examine agronomic performance and regional adaptation as part of the VCU test of the candidate variety. It is noted that if a breeder would provide a morphological data a promising line could be tested to confirm the information for one year only.

The Federal Seed Certification and Registration Department conducts DUS tests for two years, or two cropping seasons, for description of the candidate variety. Once the trials are completed, the data on the candidate variety is submitted to the National Seed Council (for national release) or the Provincial Seed Council (provincial release) for approval and release. After its approval by the PSC, then it is submitted to the NSC for notification and commercialization.

This year, 2011, was a productive one for the wheat research program in Pakistan. The Seed Council released five wheat varieties, three from AARI (one in Jan 2011), and one each from BARI, NARC, and RARI on 26 June 2011. Some of these

varieties were in the second year of NUWYT in the 2010-11 crop season where seed is being multiplied by the NARS, and the public (Punjab Seed Corporation) and private sectors (Table 5).

New wheat varieties, developed through extensive research, have greater yield potential and resistance to biotic and abiotic stresses. In Punjab, substantial resources are allocated to develop the agriculture sector; it is a priority of the government for this sector to achieve self-sufficiency. Farmers were urged to grow the latest, high yielding, approved varieties to make the country self-sufficient in agricultural commodities, paving the way for increased exports to earn foreign exchange.

Table 5. List of bread wheat varieties released in June 2011

Local name/line	National/international source	Pedigree and selection history	Institution	Variety
V-04178	National crossing block	SHALIMAR8890/A204//MH.97 PBP2864521-A-6A-3A-1A-0A-8A-0A	AARI	AARI 2011
V-5066	National crossing block	AMSEL/ATTILA//INQ.91/PEW 'S'	AARI	Punjab 11
V-5082	National crossing block	CHENAB.2000/INQ.91	AARI	Millat 11
6C016	CIMMYT	HXL75732/BAU//PASTOR CMSS97Y03676S-040Y-050M-040SY-030M-21SY-010M-0Y-0SY	BARI	Dahrabi 2011
NR356	2nd EBWYT, CIMMYT	Oasis/Skauz//4BCN/32/Pastor CMSS00Y01881T-050M-030Y-030M-030WGY-33M-0Y-0ID	NARC	NARC2011
V-032862	23rd SAWSN-W 2005** (E.No.127)	PRL/PASTOR/2236(V.6550/SUTLEH-86) BR.44893-B-6B-1B-0B	RARI	AAS2011

Note: Ug99 resistance; **Semi-arid wheat screening nursery-white
Source: WRI, AARI, Faisalabad, Pakistan

RESEARCH NOTES

Short communications on practical research or relevant information on agriculture or seed technology are presented in this section.

Use of Tissue Blot Immunoassay and Sequential Sampling to Determine Pea Seed-borne Mosaic Virus Seed-to-Plant Transmission Rates

Joop van Leur, Bruce McCorkell¹,
Mohammad Aftab² and Safaa Kumari³

Introduction

Pea seed-borne mosaic virus (PSbMV, genus

Potyvirus, family *Potyviridae*) is an important virus of pea (*Pisum sativum*) in all regions of the world where the crop is grown. It can cause significant economic losses by reducing yield and lowering the quality of the harvested grain (Khetarpal and Maury 1987, Coutts *et al.* 2009). Very high PSbMV seed-to-plant transmission (SPT) rates can be found in Australian commercial field pea cultivars (Coutts *et al.* 2008). Compared to other potyviruses, PSbMV has a relatively small host range and, therefore, limited survival possibilities between growing seasons other than through infected seed. Use of PSbMV-free seed limits development of the virus in commercial crops, even with susceptible cultivars, but requires continuous and universally applied seed testing. Incorporating resistance is, therefore, an economic solution to control the virus in the long term.

The PSbMV-*Pisum sativum* pathosystem is well researched. Four pathotypes and three single recessive resistance genes have been found, with

¹ NSW Department of Primary Industries, Tamworth, Australia.

Corresponding author, Email: joop.vanleur@industry.nsw.gov.au

² Department of Primary Industries Victoria, Horsham, Australia

³ International Centre for Agricultural Research in the Dry Areas, Aleppo, Syria

one gene, *sbm-1*, providing complete resistance to all pathotypes (Gao *et al.* 2004). This gene has no undesirable linkages and can be detected by a relatively simple test using mechanical inoculation at the seedling stage. A program to incorporate this gene in advanced Australian breeding material is being pursued (van Leur *et al.* 2007). Pea genotypes that lack genes that code for complete resistance can still differ in partial resistance to PSbMV, which can be expressed as a lower frequency of seed embryo infection (Wang and Maule 1992). Such genotypes are as useful in commercial production as those with complete resistance. However, this types partial resistance cannot be identified easily as it requires exposing the pea lines to high PSbMV infection and testing an adequate number of the harvested seed for SPT rates.

Standard procedures for the detection of PSbMV seed transmission are based on the group testing of greenhouse grown, 2-3 week old seedlings with ELISA (Albrechtsen, 2006). This method is very suitable to determine whether seed lots are below the low levels considered safe for sowing, but less so to quantify higher SPT rates. In addition, the method requires a substantial amount of greenhouse space and labor and is, therefore, difficult to apply in a breeding program where large numbers of entries have to be evaluated. We have explored the suitability of testing etiolated plumules of pea seed germinated on filter paper by tissue blot immunoassay (TBIA) to quantify the differences between pea seed lots and genotypes in SPT rates. TBIA is less costly than ELISA and has been successfully applied for detecting seed transmission for several viruses, including PSbMV (Makkouk and Kumari, 1996). Statistical tests were applied that provide reliability ranges and assist in determining the appropriate sample sizes to quantify the SPT rates of different seed lots.

Methodology

Seed germination and testing

Pea seed was germinated on pH neutral germination paper (R6, Swift and Company Ltd, Mulgrave, Australia), cut in strips of 9.5 cm by 44 cm, which were folded to form 11 ridges of 2 cm depth. The folded paper was placed in plastic containers (standard disposable food containers) 10 x 17 x 6 cm³. Tap water was carefully added to the containers and after the paper was fully

saturated, excess water was discarded. Thirty seeds of a seed lot were placed in each container – three seeds per ridge – plus five seeds of a check with a known high PSbMV SPT rate in the last ridge. The containers were closed and incubated in the dark. Six seed lots from a yield trial grown at the Tamworth Agricultural Institute (TAI) in 2008, which had been exposed to severe PSbMV pressure from early in the season, were used to study the effect of two different incubation temperatures. The seed lots were incubated without light at 15°C and 22°C, using a Contherm 6400CP culture chamber (Rowe Scientific Ltd, Brisbane, Australia). After 5 days and 13 days, respectively, most of the germinated seed had formed plumules with a length up to 5 cm (Picture 1). The plumules' tops (depending on the length of the plumules, but generally 2-3 cm long) were excised and individually blotted on nitrocellulose membranes (Schleiger & Schuell Protran, 0.45 µm), cut to 9.5 x 5 cm² size (allowing 200–220 blots/membrane). For germinated seed that had not formed plumules, the hypocotyls were cut at the seed end and blotted at the end of each series. Notes were taken on the number of fully germinated seed, seed without plumules, as well as mouldy seed. Membranes were processed at the virology laboratories of DPI-Victoria or ICARDA using polyclonal antiserum as described in detail elsewhere (Makkouk and Kumari, 1996). Blots were considered positive if at least half of a blot's imprint on the membrane was showing a purple color (Picture 2). For each seed lot/temperature combination 120 seeds (four containers) were tested. The experiment was repeated twice, in May and August 2010. The same seed lots were tested as well by sowing 100 seed/lot in commercial potting soil in an insect proof, temperature controlled (18-21°C) greenhouse during May 2010. Three weeks after sowing, all emerged seedlings were tested by TBIA for the presence of PSbMV.

Statistical analysis

The calculation of the upper and lower confidence limits for the transmission rates is derived from the determination of confidence intervals for the binomial population parameter *p* (Zar, 1996).

$p = \frac{X}{n}$ (*p* = proportion of positives in a sample, *X* = number of positives detected, *n* = sample size)

The confidence interval for *p* is calculated using a relationship between the F distribution and the

binomial distribution (Fisher and Yates, 1963).
The lower confidence limit for p is calculated as:

$$L_1 = \frac{X}{X + (n - X + 1) F_{d(2), v_1, v_2}}$$

where v_1 = numerator df = $2(n - X + 1)$, and v_2 = denominator df = $2X$

The upper confidence limit for p is calculated as:

$$L_2 = \frac{(X + 1) F}{X + (n - X + 1) F_{d(2), v'_1, v'_2}}$$

where: v'_1 = ndf = $2(X + 1)$, and v'_2 = ddf = $2(n - X)$.

These confidence interval formulae can be written in Excel (Microsoft Corporation) using standard spreadsheet functions⁴:

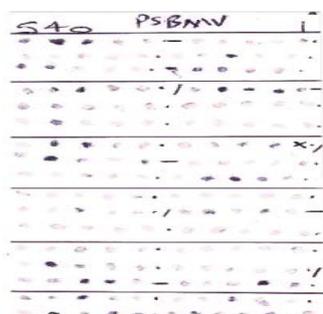
Lower limit: $100 * (IF(X=0,0,X/(X+(n-X+1)*FINV((1-P)/2,2*(n-X+1),2*X))))$

Upper limit: $100 * (IF(X=0,(1-((1-P)/2)^(1/n)),IF(X=n-1,(1-P)/2)^(1/n),IF(X=n,1,(X+1)*FINV((1-P)/2,2*X+2,2*(n-X))/(n-X+(X+1)*FINV((1-P)/2,2*X+2,2*(n-X))))))$

where: P = confidence interval (often 0.95, for a 95% confidence interval);



Picture 1. Five day old plumules of seed germinated on folded filter paper at 22°C.



Picture 2. Processed tissue blot immunoassay membrane. The first five blots of each series are from a check seed lot with a high PSbMV SPT transmission rate.

⁴ An Excel spreadsheet with the formulas can be requested from Bruce McCorkell (bruce.mccorkell@industry.nsw.gov.au)

Results and Discussion

Testing under controlled conditions provided fast results that were comparable to those from greenhouse grown plants (Table 1), but were obtained in far shorter time and by using less space. Also, germination on filter paper allowed testing of poorly germinating seed that would not have emerged if sowed in soil. Placing the seed in the ridges of folded paper rather than on flat paper supports the plumules of the germinating seed; it also lowers cross contamination from mouldy seeds. The test results did not appear to be affected by the incubation temperature. The infection rate in 5-day old plumules from seed germinated at 22°C was similar to that of the 13-day old ones grown at 15°C.

Blotting individual plumules or hypocotyls is time consuming, but a trained operator can blot a box with 35 germinated seed in 20 minutes. However, compared to the standard ELISA test on group samples of greenhouse-grown seedlings, less time, antisera, and other resources are used. TBIA also has the advantage that the actual seed test can be done in a different location from the membrane processing and that there is no time limit on the processing after samples are blotted. Generally, PSbMV infection in the field is well below the rates measured in the seed tests (van Leur, unpublished results). A possible explanation would be that PSbMV infected seed is less vigorous. However, we did not find a difference between the overall infection rates of seed between testing 5-day old plumules of seed germinated on filter paper or two week-old seedlings grown in a greenhouse. No higher infection rate was observed in poor or slowly germinating seed from which hypocotyls rather than plumules were tested.

Determining the correct sample size depends on the infection level; the lower the SPT rate, the larger the sample size needed to get an acceptable confidence range (Table 2, Figure 1). The method is well suited for a sequential sampling approach. After results are obtained on a single batch of 30 seed, further tests can be made on lots that appear to have low infection levels. Susceptible genotypes with high transmission rates can be rejected after testing only a limited number of seed, while tests can be repeated on those entries that appear to have low transmission rates. The simplicity of the methodology and the possibility to process membranes elsewhere make it particularly suitable

for breeding programs that have no in-house virology expertise or equipment. The method can be applied as well to other crops; we successfully

applied the same methodology to determine *Cucumber mosaic virus* SPT rates in narrow-leaf lupins.

Table 1. Percentage PSbMV positives in plumules from seed germinated on filter paper at two different temperatures and in greenhouse grown seedlings from six different seed lots

Variety	Incubation at 15°C			Incubation at 22°C			Greenhouse grown		
	Total ¹⁾	% pos. ²⁾	Conf. ³⁾ range	Total	% pos.	Conf. range	Total	% pos.	Conf. range
Excell	238	48	43-55	240	36	31-43	73	52	43-64
Kaspa	237	21	16-26	239	22	17-28	91	22	14-32
Morgan	233	3	2-7	239	3	1-6	99	4	1-10
Parafield	237	20	16-26	238	18	14-24	99	23	16-33
Celine	239	10	6-14	240	11	8-16	94	15	9-24
Snowpeak	238	5	3-9	239	5	3-9	93	9	4-16

¹⁾ Total plants tested; ²⁾ Percentage PSbMV positive; ³⁾ Upper and lower confidence limits at 95% confidence interval

Table 2. Upper and lower confidence limits for a 95% confidence interval and different sample sizes with sequential sampling

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Confidence interval (%)	95%	95%	95%	95%	95%	95%
No. seeds sampled per test	30	30	30	30	30	30
Cumulative no. of seeds sampled (n)	30	60	90	120	150	180
No. positive seeds per test	4	3	4	2	2	4
Cumulative no. of positive seed (X)	4	7	11	13	15	19
Level of infection	13.3%	11.7%	12.2%	10.8%	10.0%	10.6%
Lower 95% confidence limit	3.9%	5.0%	6.4%	6.0%	5.8%	6.6%
Upper 95% confidence limit	30.7%	22.6%	20.8%	17.8%	16.0%	16.0%

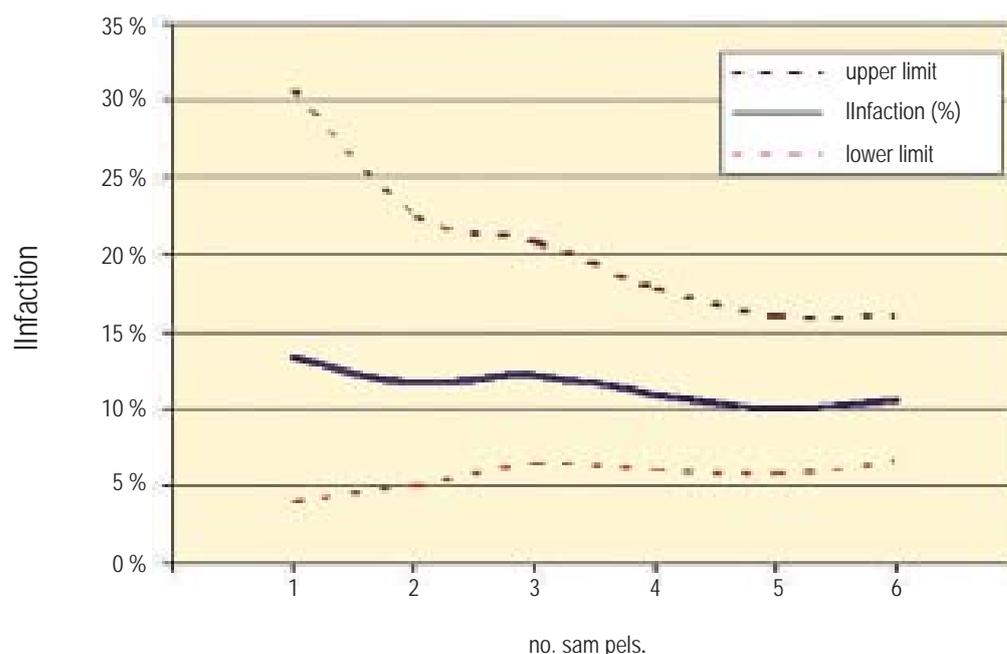


Figure 1. Relation between samples size and confidence limits at a given infection rate

References

- Albrechtsen, S.E. 2006. Testing Methods for Seed-transmitted Viruses: Principles and Protocols. CABI Publishing, Wallingford, UK. Coutts, B.A., R.T. Prince, and R.A.C Jones. 2008. Further studies on Pea seed-borne mosaic virus in cool-season crop legumes: responses to infection and seed quality defects. *Australian Journal Agricultural Research* 59: 1130-1145.
- Coutts, B.A., R.T. Prince, and R.A.C. Jones. 2009. Quantifying effects of seedborne inoculum on virus spread, yield losses, and seed infection in the Pea seed-borne mosaic virus-field pea pathosystem. *Phytopathology* 99: 1156-1167.
- Fisher, R.A. and F. Yates. 1963. Statistical Tables for Biological, Agricultural and Medical Research. Longmans, Essex, UK pp.1-3.
- Gao, Z., I.E. Johansen, S. Evers, C.L. Thomas, T.H.N. Ellis, and A.J. Maule. 2004. The potyvirus recessive resistance gene, sbm1, identifies a novel role for translation initiation factor eIF4E in cell-to-cell trafficking. *Plant Journal* 40: 376-385.
- Khetarpal, R.K. and Y. Maury. 1987. Pea seed-borne mosaic virus: a review. *Agronomie* 7: 215-224.
- Makkouk, K.M. and S.G. Kumari. 1996. Detection of ten viruses by the tissue blot immunoassay (TBIA). *Arab Journal of Plant Protection* 14: 3-9.
- Wang, D. and A.J. Maule. 1992. Early embryo invasion as a determinant in pea of the seed transmission of pea seed-borne mosaic virus. *Journal of General Virology* 73: 1615-1620.
- van Leur, J.A.G., M. Aftab, T. Leonforte, S. Moore and A.J. Freeman. 2007 Control of Pea seed-borne mosaic virus in field pea through resistance breeding. Page 154 in Proceedings 16th Biennial Conference of the Australasian Plant Pathology Society, 26-29 September 2007, Adelaide, Australia.
- Zar, J.H. 1996. Biostatistical analysis 3rd ed. (Prentice-Hall of Australia P/L, Sydney, Australia) pp. 524-525

MEETINGS AND COURSES

Announcements of meetings, seminars, workshops, and training courses appear in this section. Please send in announcements for national, regional, or international workshops, seminars, and training courses organized in your country for inclusion in the next issue.

Conferences

AFSTA Congress 2012: The congress will be held

at the Zanzibar Beach Resort, Zanzibar, Tanzania, 5-8 March 2012. For more information visit <http://afsta.org/congress-2012-information/>.

ISF World Seed Congress 2012: ISF and the Brazilian Seed Association (ABRASEM) rescheduled the ISF World Seed Congress to 26-28 June 2012 in Rio de Janeiro, Brazil. Registration will be open in January 2012. For more information, visit <http://www.worldseed2012.com/>.

Indian Seed Congress 2012: The National Seed Association of India, under the theme 'Seeding Rural Prosperity', will organize an Indian Seed Congress from 10-11 February 2012 at Pune, Maharashtra. The Congress will provide a platform for all stakeholders to come together and have serious interactions for the development of the Indian seed industry. The Congress, being an international event, will also provide a platform for the seed men of the world to congregate, interact with members of the Indian seed industry, and deliberate on various issues – technical or otherwise – that affect the seed industry in India and abroad. For more information, please visit the website at <http://www.indianseedcongress.com/>

Courses

Postgraduate Training Course: Quantitative Genetics in Plant Breeding

The National Institute of Agricultural Botany will run its two-week postgraduate level training course, Quantitative Genetics in Plant Breeding, from 19–30 March 2012 in Cambridge, UK. The course introduces participants to methods in quantitative genetics and statistics. Course content ranges from the well-established (for example variety trial design and analysis) to more contemporary methods (such as linkage disequilibrium mapping and genomic selection). The emphasis is on the practical application of the methods to breeding programs, with the theory covered in sufficient depth to allow confident evaluation and application of methods to plant breeding programs. The course provides an opportunity for participants to become familiar with the concepts and utilization of contemporary methods and software at all stages in the breeding process. Further information is available by contacting the course director by email at courses@niab.com or by calling the course administrator on +44 1223 342269.

Executive Course on Seed Industry Program

The Turkish Seed Industry Association in cooperation with Cornell University and Sathguru Management Consultants will organize an executive course, 'Seed Industry Program', from 23-26 January 2012 in Antalya, Turkey. The purpose is to have information on the most recent developments and innovations in the global seed industry for participants from the seed sector who are investors, decision makers, managers, researchers in the private and public sectors, and the faculty in seed and plant breeding institutions.

The content of the program will consist of key areas such as:

- **Trends and strategies** (the big picture – global seed industry trends, dynamics of emerging markets, competitive benchmarking, enterprise valuation dynamics and consolidation strategies, public-private partnership options and strategies)
- **Research and technology** management (genetic resource access and breeding strategies in the public and private sectors, intellectual property protection, trends and innovations in corporate breeding initiatives, biotechnology for trait-specific genetic resource development, regulations, and product delivery)
- **Regulation** (trends in regulation, impact of regulation on cost, timelines and market access)
- **Markets and marketing** (innovations in market access and seed delivery, innovative products, new markets and novel delivery options, valuation principles and valuation metrics for the seed industry, IT solutions for enhancing seed sector productivity, gaining strategic leadership in technology and markets).

For information, please contact: Dr Müfit Engiz, Secretary General, Turkish Seed Industry Association, Ankara, Turkey; E-mail: mufitengiz@turkted.org.tr; www.turkted.org.tr

Short course on Plant Variety Protection

This course facilitates the introduction and practical implementation of Plant Breeders' Rights (Plant Variety Protection) in countries where legislation on this matter is being developed or has recently been passed. The following subjects will be introduced through lectures and discussions in working groups:

- Legal aspects: legal framework, UPOV system, other sui generis systems, patents, legislation relating to genetic resource use
- Institutional aspects: procedures and administration, organisational set-up, variety registration systems, collaboration in testing
- Technical aspects: DUS principles, UPOV technical guidelines, field testing, biochemical/molecular techniques, statistics, data analysis, reporting, variety denomination
- Exploitation of Plant Breeders' Rights: exploitation of rights, royalty collection systems, enforcing rights, farm saved seed.

Practical training on DUS testing forms part of the course and visits will be made to seed certification services, breeding companies, and the Aalsmeer flower auction.

Naktuinbouw organizes the course in collaboration with Wageningen UR Centre for Development Innovation, part of Wageningen UR. Naktuinbouw is responsible for DUS testing of all varieties of agricultural, ornamental, and vegetable crops for Plant Breeder's Rights in the Netherlands, on behalf of the Dutch Board for Plant Varieties and the European Community Plant Variety Office and for the entry of agricultural and vegetable varieties on the Dutch National List.

Application for admission under your own funding is made directly to Wageningen UR Centre for Development Innovation. The deadline is 18 May 2012.

Short course on Seed Business 101

The Seed Biotechnology Center expands the Seed Business 101 course by offering sessions with the curriculum focused on field crops. The first session of Seed Business 101 Field Crops is scheduled for 11-15 June 2012, in Minneapolis, USA. It is one-week course designed to expose the participants to the five functional areas of a seed company (R&D, production, operations, sales and marketing, and administration). By creating a virtual seed company and case studies for each functional area, the course content is delivered in a very interactive way. During each of the four case studies, participants assume a different functional responsibility within the company. The course gives employees new to the seed industry a broad understanding of the major aspects of a seed company's operations and cross-departmental

knowledge of best practices for profitability. The course is taught by widely respected industry executives with additional help from industry experts participating as guest speakers.

For registration fees, additional dates, and other details please visit www.sbc.ucdavis.edu or contact Jeannette Martins at jmartins@ucdavis.edu.

LITERATURE

Books, journal articles, and other literature of interest to readers are presented here. Please send information on seed and other agriculture related publications – policy, regulation, and technology – to the Editor for inclusion in Seed Info.

Books

Scoones, I. and J. Thompson (eds). 2011. The Politics of Seed in Africa's Green Revolution. Significant amounts of money have been invested in crop breeding, market development, and input subsidies in an attempt to deliver an African Green Revolution. Directed at development professionals and academics, this Institute of Development Studies' bulletin focuses on the political dimensions that have hindered the emergence of lasting improvements in agricultural productivity by highlighting experiences from Ethiopia, Ghana, Kenya, Malawi, and Zimbabwe.

Within a more diverse vision of Africa's Green Revolution, and the role of seeds within it, there is a need to open up the innovation process, making use of new information technologies and networking opportunities to link high-end genomics with local adaptive research with farmers. It was emphasized that there is no 'one size fits all', especially in settings as diverse as those found across Africa.' Published by the Institute of Development Studies, ISSN 0265 5012; Price: £14.95; 120pp; Website: www.ids.ac.uk

Budlender, D. and E. Alma. 2011. Women and Land: Securing Rights for Better Lives. In developing countries, women tend to be more concentrated in rural areas and more dependent on the land. Using research findings from 14 sub-Saharan countries, the book provides detailed information on the complex relationship of women with the land as a step towards achieving real change.

The relationship between customary and statutory law, the interplay of marital and land laws, national land policies and reform, and promotion and protection of inheritance rights are some of the topics covered. In addition to highlighting the diversity and complexity of women's experiences, the book also highlights a number of lessons for those working to secure women's rights to land. Other lessons include: consulting and involving women when designing reforms and monitoring their implementation; using varied approaches to streamline and consolidate numerous land laws to address land injustice; using participation-oriented research methods; and providing the necessary resources to implement legislation, such as informing and educating relevant actors about the legislation and providing sanctions if implementation fails.

For a variety of resources on women and land rights, including videos, case studies, research reports, and books, visit IDRC. Published by International Development Research Centre, ISBN 978 1 55250 522 9 (Pb); 110pp; Price: free to download; Website: www.idrc.ca

Wilson, D., K. Wilson, and C. Harvey (eds). 2011. Small Farmers, Big Change: Scaling up Impact in Smallholder Agriculture. Taking agricultural projects from the research or pilot phase to the next level, to achieve substantial gains for a large number of people, is an exciting and often complex challenge. The eight case studies in this collection, compiled through a partnership between Practical Action and Oxfam, demonstrate the central importance of bottom up processes in influencing policy and investment decisions.

For example, until five years ago, the region of Western Honduras was the most isolated and least supported in the country, with no civil society representation at the national level. But a ten year program of building civil society institutions, as well as training and credit support to small-scale farmers, has enabled the area to develop its own Poverty Reduction Strategy, and successfully bid for millions of dollars to implement it. As a result, the contribution of women to household income has doubled and, in five years, the percentage of women in the region engaged in agricultural businesses has risen from 1% to 31%.

Other studies in the collection include joint action by fishing communities in India to regain control over pond resources, strengthened links between farmers and city markets in Colombia,

and new systems of cooperation by cotton producer groups in Mali. Each study is concisely and clearly presented, pulling out key lessons from the scaling up of activities. They offer considerable food for thought for development practitioners and policymakers. Published by Practical Action publishing, ISBN 978 1 85339 712 7 (Pb); Price: £14.95; 140pp; Website: www.developmentbookshop.com

Yadav, S.S., R. Redden, J.L. Hatfield, H. Lotze-Campen, and A. Hall. (eds) 2011. Crop Adaptation to Climate Change. This book addresses these critical issues by presenting the science needed not only to understand climate change effects on crops, but also to adapt current agricultural systems particularly, with regard to genetics, to the changing conditions. The book covers a spectrum of issues related to both crops and climatic conditions. The first two sections provide a foundation on the factors involved in climate stress, assessing current climate change by region, and covering crop physiological responses to these changes. The third and final section contains chapters focused on specific crops and the current research to improve their genetic adaptation to climate change.

Crop Adaptation to Climate Change is a timely look at the potentially serious consequences of climate change for our global food supply, and is an essential resource for academics, researchers and professionals in the fields of crop science, agronomy, plant physiology, and molecular biology and to crop consultants and breeders; as well as climate and food scientists. Publication by John Wiley & Sons, ISBN 978-0-8138-2016-3; Price: \$249.95; 632pp; Website: <http://eu.wiley.com>

Websites

UPOV launched its redesigned website on 1 November 2011. Some of the features of the redesigned website include:

- A freely accessible database of plant varieties (PLUTO), formerly only available in the form of a CD-ROM on subscription (UPOV-ROM Plant Variety Database)
- A multimedia presentation on UPOV
- A video on the use of plant variety protection by gentian farmers in the Ashiro region of Japan (the Ashiro Rindo story)
- A UPOV Collection of materials explaining the UPOV system

- A database of UPOV members' laws (UPOV Lex).

The Council agreed, at its 45th ordinary session held in Geneva 20 October 2011, that the documents of the Administrative and Legal Committee (CAJ), Technical Committee (TC), and Technical Working Parties (TWP), which were formerly only accessible to members and observers, would be made publicly accessible by

removal of the password requirement. The Council also agreed that removal of the password be arranged to coincide with the launching of the redesigned UPOV website on 1 November 2011.

New Journal

Meta Press has launched a new research journal in the field of agriculture. The Journal of Crops and their Management is devoted to the rapid publication of fundamental research papers on all phases of crops and their management. All contributions will be rigorously refereed and articles for publication will be selected based on the quality and originality of the work as well as the breadth of interest to readers. It will also include reviews and regular papers. The Journal will publish four issues per year. Manuscripts can be submitted now at <http://www.mehtapress.com/submit-manuscript.html>. Mehta Press (<http://www.mehtapress.com>), 126, Prasheel Park, Nr. Saurashtra University, Rajkot 360005 Gujarat, India.

Newsletter

Seed China News

Seed China News is a seed newsletter highlighting the Chinese seed industry. China, as one of the major seed producers and consumers, shows great vitality and potential in the seed market. China's total seed market value grew from \$2.42 billion in 2001 to \$8.32 billion in 2009, with a CAGR of 16.69% from 2001 to 2009. China's seed industry has maintained fast development with a rapid growth rate of over 10%, and the Chinese government has attached great importance to development of the seed industry. It has promoted the merger and acquisition of seed companies and cultivated leading competitive seed companies on the international stage. Seed China News offers you timely updates and close follow-up intelligence of the dynamics of the seed industry.

About ICARDA and the CGIAR



Established in 1977, the International Center for Agricultural Research in the Dry Areas (ICARDA) is one of 15 centers supported by the CGIAR. ICARDA's mission is to contribute to the improvement of livelihoods of the resource-poor in dry areas by enhancing food security and alleviating poverty through research and partnerships to achieve sustainable increases in agricultural productivity and income, while ensuring the efficient and more equitable use and conservation of natural resources.

ICARDA has a global mandate for the improvement of barley, lentil and faba bean, and serves the non-tropical dry areas for the improvement of on-farm water use efficiency, rangeland and small-ruminant production. In the Central and West Asia and North Africa (CWANA) region, ICARDA contributes to the improvement of bread and durum wheats, kabuli chickpea, pasture and forage legumes, and associated farming systems. It also works on improved land management, diversification of production systems, and value-added crop and livestock products. Social, economic and policy research is an integral component of ICARDA's research to better target poverty and to enhance the uptake and maximize impact of research outputs.



The Consultative Group on International Agricultural Research (CGIAR) is a strategic alliance of countries, international and regional organizations, and private foundations supporting 15 international agricultural Centers that work with national agricultural research systems and civil society organizations including the private sector. The alliance mobilizes agricultural science to reduce poverty, foster human well being, promote agricultural growth and protect the environment. The CGIAR generates global public goods that are available to all.

The World Bank, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and the International Fund for Agricultural Development (IFAD) are cosponsors of the CGIAR. The World Bank provides the CGIAR with a System Office in Washington, DC. A Science Council, with its Secretariat at FAO in Rome, assists the System in the development of its research program.

The views published in Seed Info are those of the contributors and do not necessarily imply the expression of any opinion on the part of the Editor, the WANA Seed Network, or ICARDA.
