SEED INFO

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EDITORIAL NOTE

Seed Info aims to stimulate information exchange among seed staff in the Central and West Asia and North Africa (CWANA) region. The purpose is to help strengthen national seed programs, and thus improve the supply of quality seed to farmers.

History was made on 18 July in Istanbul, when the formation of a new regional seed association was announced, by the 10 member countries of the Economic Cooperation Organization (Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey, Turkmenistan, Uzbekistan). The announcement followed a two-day meeting, held under a regional Technical Cooperation Project supported by FAO and implemented jointly with ICARDA.

In traditional agriculture, genetic resources management, crop improvement, production and seed supply are all integrated at farm level. In modern agriculture, however, breeding and seed production have evolved into specialized but highly integrated components. This specialization gradually gave birth to the modern seed industry, which continues to grow and evolve, with many structural changes and recently at a very fast pace. In the **NEWS AND VIEWS** section Bernard Le Buanec, former ISF Secretary General, provides insights on how regulatory change and the technology revolution have changed the seed world.

Frederick Schreurs, from ASTEC-Global, the Netherlands, presents new seed technology solutions for the industry. The need for seed technology solutions started with the beginning of agriculture particularly for cleaning seeds prior to planting. With progress in agriculture and seed technology, new techniques emerged including soaking, priming, disinfecting, and seed treatment using slurry, dusting, coating, pelleting and encrusting technology. These technologies, for example cleaning and treatment, were initially custom-applied by specialized companies, but later on handled in-house by seed companies. With the development of new and simple technologies, some of the techniques for seed treatment and quality assurance are now available for use by small seed companies or local seed producer groups. There is also news on ISF seed congress in 2008, ISTA's Green Certificate, approval of GM crops in Egypt and public-private partnership on hybrid rice technology by IRRI and partners.

The section on **SEED PROGRAMS** includes news from Iraq, Morocco and Pakistan. The news from Afghanistan focuses on a first local seed storage facility constructed for VBSEs through the support of Afghanistan Small and Medium Enterprise Development in Nangarhar province. We also report on ongoing efforts for the rehabilitation and development of the national seed industry in Iraq; the status of plant variety protection in Morocco; and on the vegetable seed project by Pakistan's Federal Seed Certification and Registration Department.

The **RESEARCH** section aims to capture information on adaptive research or issues relevant to seed program development in the region and beyond. Asrat Asfaw from the Southern Agricultural Research Institute writes about participatory 'mother-baby' trials in common bean breeding in southern Ethiopia.

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

This issue of *Seed Info* contains a questionnaire seeking your feedback on the content, ways to improve and how best you would like to receive your future copies of the newsletter. Please spare a few minutes to send us your reflections on how best we could serve your interest. For on-line survey please visit the site at: http://www.icarda.org/publications/Survey SeedInfo/ICARDA_SeedInfo_User_Survey.asp

Have a nice read

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.

New Regional Seed Association Formed

History was made on 18 July in Istanbul, Turkey when the formation of the new regional seed association was announced by 10 member countries of the Economic Cooperation Organization (ECO) region comprising of Afghanistan, Azerbaijan, Islamic Republic of Iran, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey, Turkmenistan and Uzbekistan. The decision to form this association followed an intense two-day consultative meeting amongst delegates, which was held on 17-18 July under the aegis of the ECO Secretariat as part of the intra-regional Technical Cooperation Project supported by FAO and implemented jointly with the International Center for Agricultural Research in the Dry Areas (ICARDA). Prior to that a three-day regional workshop on harmonization of seed regulations attended by more than 50 Senior Government officials and representatives of the private sector, after discussing technical and policy issues, endorsed harmonization and the need for a regional association to translate this into a reality.

The delegates after reviewing the existing opportunities for public-private partnerships had reached a consensus to embark on the formation of the new regional seed association that will represent the interests of all the member countries and contribute to the development of the seed sector in the region. In recognition of the advanced nature of the Turkish seed industry and the leadership role it could play in ensuring the visibility and viability of the association, the delegates agreed to locate the headquarters of the regional seed association in Ankara.

Also present at the meeting were international experts as well as executives of the International Seed Federation (ISF) representing the global seed industry and the Asia and Pacific Seed Association (APSA) who shared their experiences in facilitating seed security and seed trade.

ECO, FAO and ICARDA worked closely with member countries, and particularly the Government of Turkey in facilitating the meeting which lead to the formation of the regional seed association. The membership of the association will be open to all seed companies and service providers to the seed industry from ECO region and beyond.

During the opening statement Dr Metin Genckol, Director of Agriculture and Tourism of ECO, stressed that "the ECO region covers about 800 million ha with rich diversity in agro-ecology, farming systems, crops and a population of over 350 million. We are cultivating barely half of the available land (only 24%) from the potential cultivable area of 49%. Obviously there is great opportunity for expansion and diversification of agriculture in the era of soaring food prices".

Consultative meeting organized by the ECO, FAO and ICARDA in Istanbul, Turkey

Dr Zewdie Bishaw, Head of ICARDA's Seed Unit, said that "organizing the seed industry is in the best interest of farmers. "Today the winners are the farmers of the ECO region who would be served better through better organized seed industry," he added.

In his closing remarks Dr Michael Larinde of FAO said: "Today we have planted a seed which should be nurtured to develop into a productive plant that would bear fruits to meet regional food security".

ECO, FAO and ICARDA worked closely with member countries, and particularly the Government of Turkey in facilitating the meeting which lead to the formation of the regional seed association. The membership of the association will be open to all seed companies and service providers to the seed industry from ECO region and beyond.

The ECO member countries collectively represent a huge seed market worth billions of dollars. The estimated domestic annual seed market based on potential demand in the top three countries alone is close to US $1 billion.

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ICARDA Organizes Regional Workshop on Small-scale Seed Enterprise Development

Background

In the context of major policy shifts towards privatization, decentralization, and promotion of rural businesses, it is expected that the establishment of small-scale seed enterprises through farmer participation will provide an effective alternative seed delivery mechanism to serve poor farmers in marginal areas. Given the limited experiences available on small-scale enterprises in the Central West Asia and North Africa region, ICARDA organized a regional workshop from 26 to 28 February 2008 at its headquarters in Aleppo on small-scale seed enterprise development. The workshop was partially funded by the Japan International Cooperation Agency (JICA) through its overseas office in Syria and in-collaboration with the Syrian Planning Commission. This was the fourth event of series of regional workshops implemented within the Third Country Training Program (TCTP) for Afghanistan over 5-Japanese Fiscal years from April 2004 to March 2009. FAO-Afghanistan through the EU funded seed project provided financial support for additional participants from Afghanistan.

Participants of the Regional workshop on small-scale seed enterprise development

Workshop objectives

The objective of the workshop is to provide a forum for experience sharing and to formulate recommendations and action plans for improving business environment for small-scale enterprise development in the region. The objective was achieved through key presentations, case studies, experience sharing, and discussions:

- Background and approaches to small-scale seed enterprise (SSE) promotion and development
- SSE development experiences from North Africa: Algeria, Morocco, Tunisia; reflections on national perspectives
- SSE experience under USAID-RAMP & DAI projects (ICARDA) and EU projects (FAO) in Afghanistan
- Farmer-based seed production and marketing activities in Egypt and Eritrea and potential for development in Oman
- Seed production and enterprise management experiences from private entrepreneurs from Afghanistan, Algeria, Morocco, Tunisia, and Yemen
- Seed sector development in Afghanistan: challenges for effective linkages between public research and seed systems
- Public sector seed supply system, and effective linkage between crop research and seed supply in Syria

These presentations were followed by extensive discussions to generate ideas and suggestions for improving the enabling environment for small-scale seed enterprise development in the region as an alternative delivery mechanism to serve resource poor farmers. The workshop was attended by 24 participants from 10 countries: Afghanistan, Algeria, Egypt, Eritrea, Japan, Morocco, Oman, Syria, Tunisia and Yemen.

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NEWS AND VIEWS

News, views, comments, and suggestions on varieties and seeds are included in this section. It is a forum for discussion among seed sector professionals.

Evolution of the Seed Industry in the Past Three Decades[1]

During the last three decades, the seed industry and its regulatory environment have changed drastically. The paper will briefly present the evolution of plant breeding and seed regulations in general and the evolution of seed production, seed markets and seed companies in particular.

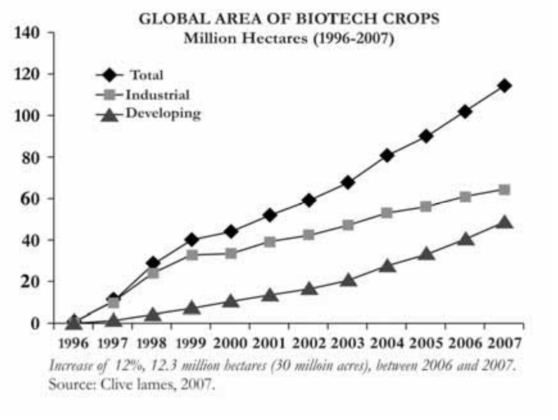
[1] This article is based on a presentation at the 2007 ISTA Congress (with few updates) and appeared in ISTA News Bulletin No 134 October 2007. It is reproduced here with permission

1. Evolution of plant breeding
Three main aspects are worth considering regarding the evolution of plant breeding

1.1 Development of F1 hybrids
In the 1960s, with noticeable exception of maize, most varieties were conventional varieties such as pure lines, synthetics or populations (often called open pollinated varieties (OPs) in maize). Today there is a long list of commercialized hybrid crops such as sunflower, sorghum, oilseed rape, rye, rice, several vegetables and lately millets, pigeon pea, alfalfa and cocksfoot. In some countries, 'OPs' are named as varieties and not the hybrids, though hybrids are also varieties. The evolution from 'OP' to hybrids has had several impacts on seed industry in terms of production and financial turnover.

1.2 Genetic engineering
The first stable genetic transformations in plants were reported in 1983 and the first transgenic crops (GMOs) were commercialized in 1995. Since then the area planted to GMOs, mainly soybean, maize and oilseed rape, has steadily increased to reach 114.3 million ha, in 2007 (Figure 1).

Figure 1. Area planted to biotech crops, 1996-07



1.3 Molecular assisted selection
To speed up the development of new varieties, breeders have always looked for early selection markers i.e. phenotypic or biochemical, particularly for crops with long development cycle. In the mid-1980s, the development of DNA markers in plants has initiated marker assisted selection (MAS). It is used to track genes/traits of interest in the progeny of a cross. First used to track qualitative traits linked to single gene or few genes, MAS is now applicable for more complex traits using 'quantitative trait loci' (QTL). The development of MAS requires quite sophisticated and expensive laboratories without any impact on concentration of the seed industry.

2. Evolution of international regulations
Three main areas deserve specific consideration: intellectual property protection (IPR), regulation for certification and regulations in emerging new sectors.

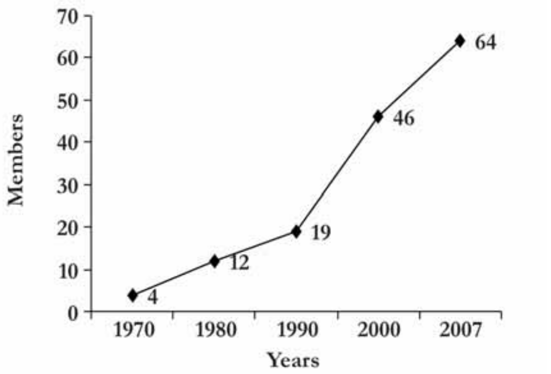
2.1 Protection of intellectual property
The protection of plant breeders' rights, with exception of Plant Patent Acts of 1930 for vegetatively propagating plants (excluding tubers) in USA and attempts in some European countries, is quite new. The milestones in protection of intellectual property in plants are as follows:

- 1961: Adoption of the UPOV Convention
- 1980: US Supreme Court decision allowing the patentability of living organisms
- 1991: Adoption of UPOV Convention granting extended rights to plant breeders and introducing the concept of 'essential derivation' to prevent 'plagiarism'
- 1994: TRIPS Agreement of the World Trade Organization

In fact, in the early 1970s only very few countries were allowing the protection of plant varieties and of biological inventions. Today a possible protection exists in most of the countries with large seed markets even if enforcement of the rights is often still difficult (Figure 2). This protection of intellectual property has encouraged large investment in agricultural research and variety development particularly in the private sector.

2.2 Regulations for seed certification
Seed certification is a process to guarantee a certain level of seed quality such as varietal identity and purity, phytosanitary status, etc and, in some countries, based on compulsory standards. In the past, certification was the responsibility of government agencies or specialized accredited agencies. To date certification is characterized by sharing tasks between the public and private sectors through 'accreditation' of private entities or seed companies, for doing some regulatory tasks under the supervision of governments.

Figure 2. UPOV member countries, 1970-07



2.2.1 Varietal certification

Varietal identity and purity is a cornerstone of varietal certification scheme. The OECD Seed Schemes for varietal certification of seed moving in international trade regulates certification at an international level whereas the Association of Official Seed Certifying Agencies (AOSCA) and EU at the regional levels. Whilst accreditation of seed companies was accepted in some European countries since the 1950s, this was not recognized at international level. In the mid-1990s, upon the request of the ISF, a derogating experiment was conducted within the OECD Seed Schemes to check the quality of results obtained by private seed companies in the certification process. The experiment started with field inspection (1995) and later on extended to seed sampling, testing and labelling (2000). After ten years of intense debate and given the results obtained by seed companies, is identical to those obtained by government agencies, the accreditation of seed companies for field inspection, seed sampling, testing and labelling was introduced to the OECD Schemes in 2005.

2.2.2 Phytosanitary certification

The International Plant Protection Convention (IPPC) regulates the phytosanitary certification of seed moving in international trade. This Convention allows accreditation of seed company employees for field inspection. The main change in the Convention that entered into force in December 2005 is the possibility to replace field inspection by laboratory checks. This opens a new era for globally accepting seed health testing methods. It is certainly a new field of activity where ISTA and ISF should be very active in collaboration with IPPC.

2.2.3 Seed quality certification

In most countries, official seed quality standards exist for certification. Commercial contracts between seed companies also often require a given level of physical and physiological quality. It was important to have at international level an agreed system of seed testing to avoid disputes. Today the most recognized document is the ISTA orange certificate which was established in the early 1930s at the request of ISF. Until recently, only governmental laboratories had the right to become ISTA member and to issue the orange certificate. In 1995, private laboratories were allowed to join ISTA but still without the authorization to issue orange certificates. Here again, as for OECD certification, after intense debate an experiment was put in place in 1999. Given the accuracy and quality of their results, the private ISTA member laboratories were allowed to issue orange certificates in 2005. The immediate impact is an increasing number of private laboratories becoming ISTA members (Table 1).

Table 1. Number of seed testing laboratories with membership of ISTA, 1997-07

ISTA members	1997	2002	2007
Public laboratories	132	121	121
Private laboratories	13	32	47
Total	145	153	168

2.3 Regulations for new sectors

2.3.1 Organic seed

According to the International Federation of Organic Agriculture Movements (IFOAM), the area under organic agriculture (i.e. field crops and vegetables) has increased steadily during the past 20 years, reaching about 20 million ha in 2006. This has had an impact on the seed industry. First seed treated with synthetic chemical compounds not allowed for organic agriculture. More recently, in most countries, organic farmers have, subject to some exceptions, to use seed produced organically ('organic seed'). This has an impact on international trade, as standards for organic agriculture differs among countries, leading to technical trade barriers. A next logical step, the compulsory use of 'organic varieties', will make even more difficult both the development of new varieties and the seed trade.

2.3.2 GM varieties

The development of GM varieties has been significant during the past 10 years. In 2000, this has led to the adoption of a new binding international instrument, the Cartagena Protocol on Biosafety to the Convention on Biological Diversity. The protocol, now ratified by 141 countries, affects the seed industry mainly in two areas: (i) registration of new GM varieties regarding their possible impact on the environment, and (ii) transboundary movement of GM seeds.

The environmental safety assessment, besides the food and feed safety assessment is very cumbersome and costly. The main consequence is that today only large multinational companies can afford to market new transgenic traits, with a *de facto* exclusion of small and medium companies and public research institutions. The transboundary movement is subject to prior informed consent of the receiving party where handling, transport, packaging and identification are regulated.

3. Evolution of seed production

In the broadest sense, seed production includes all activities from planting basic seed to sale of certified seed to farmers. During the last 30 years some technical practices (e.g. isolation distances) have remained the same whereas some have followed the general evolution of mechanization and globalization but specific to the seed industry. Four areas deserve attention in the evolution of seed production: seed quality during production, seed testing, geographic specialization, and seed treatments.

3.1 Field seed production

It is not possible to give details on the complex issues of seed quality during field seed production.

- The process to maintain varietal identity and purity, as stated above, remained stable based on the OECD Seed Schemes at international level
- Progress in managing physical purity particularly control of other seeds and weeds through better use of herbicides and effective cropping systems
- A better understanding of mechanisms in determining germination potential, such as impact of weather on dormancy, maturity, water stress, seed position, and harvesting time to enhance seed producers knowledge
- Significant progresses made in diagnostic methods, epidemiology and pest management improving seed health. The emphasis mainly on fungi in the 1960s, were it is extended to bacteria, viruses and nematodes in the 1980s and 1990s.

3.2 Seed testing

A wide range of physiological tests has been perfected for routine germination and vigor tests. More recently, image analysis provide size classification of seed lots and determining the mechanics of germination. There are now sensitive tests to detect pathogens in seeds using immuno-fluorescence and PCR techniques.

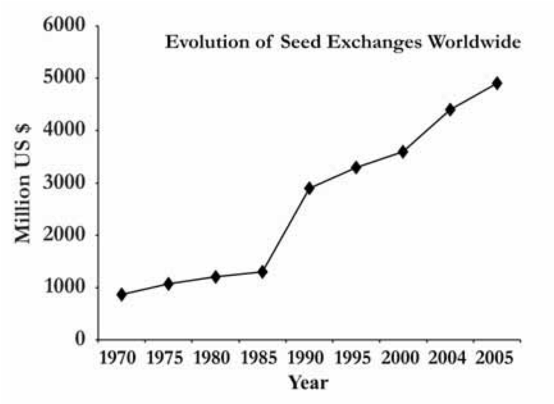
3.3 Geographic specialization

International seed trade is not new and the International Seed Trade Federation was established in 1924. However, seed import/export was low compared to domestic markets and almost all countries, with few exceptions, was able to produce their own seeds. This has changed during the past three decades for several reasons:

- The development of cheap and fast transportation providing advantage for favorable climatic zones such as East African highlands and Idaho for beans and Central America for flowers
- A more recent regional specialization in production of hybrids because of specific conditions and needs for skilled labor and agro-climatic conditions. For example, the difference in flowering time between male and female maize hybrids require specific climatic conditions, and the production of hybrid vegetables requires skilled labor at reasonable price. Thus, hybrid maize production in Europe is mainly located in Austria, France and Hungary; and hybrid vegetables in south east Asia; and mono-germ sugar beet in France, Italy and USA (Oregon).
- Accelerating all breeding and commercial processes leading to the development of counter-season cropping in the southern hemisphere by companies of the northern hemisphere. For example, seed exports from Chile have increased from US$ 10 million in 1985, to $ 70 million in 1995 to $195 million in 2006.

The evolution is also illustrated by the development of international seed trade (Figure 3). In 1985, the international seed trade, represented about 7% of the total seed market and in 2006, it reached around 15%.

Figure 3. Evolution of international seed trade, 1975-05



3.4 Seed treatment

Seed treatment comprises different aspects:

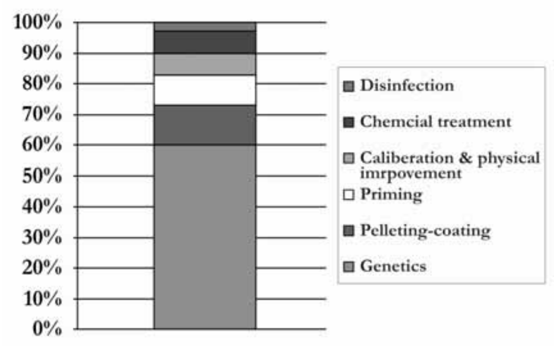
- Physiological treatment or 'priming'
- Coating and pelleting
- Phytosanitary treatment
- Microbial inoculation

According to an ISF survey, to date almost 95% of all commercialized seed are treated. This evolution is well illustrated in lettuce (Figure 5).

In addition to the genetic, the seed is now a concentrate of technology, with a significant impact on seed price (Figure 4).

Table 2 illustrates the evolution of the global seed treatment sales.

Figure 4. Elements of seed prices *(Source: Pierre Ferraton)*



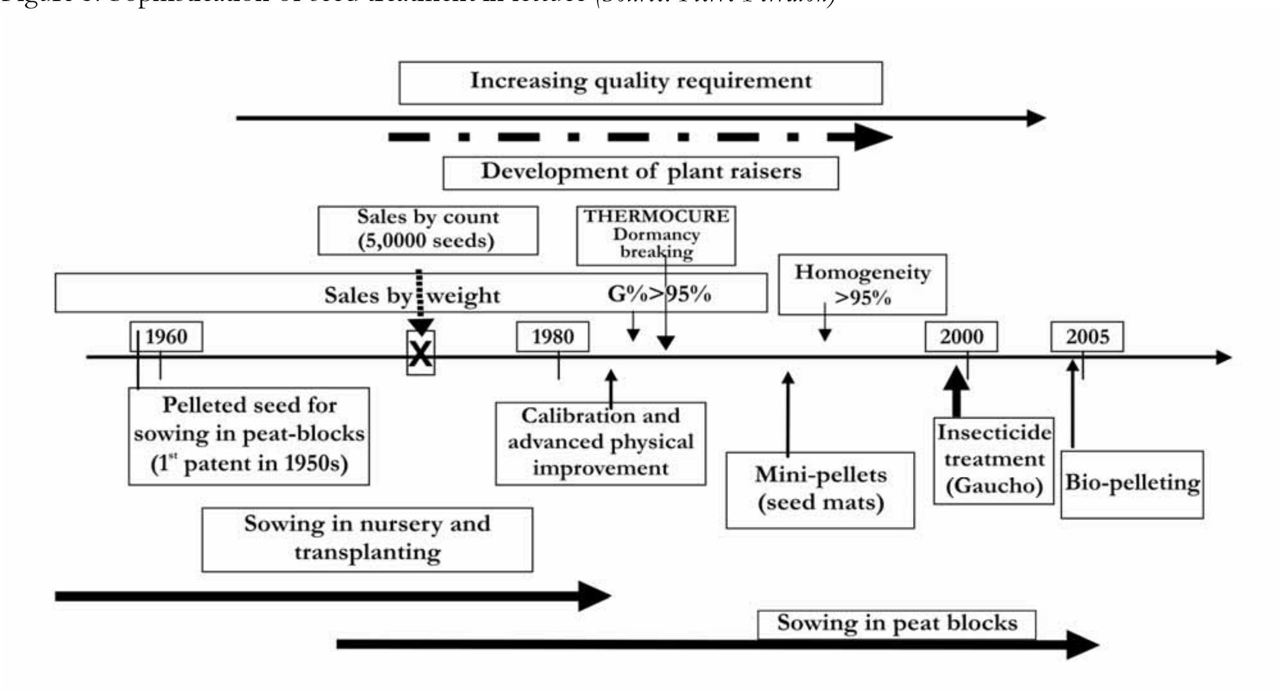
4. Seed markets and seed companies

4.1 Seed markets

The global seed market has almost tripled during the past three decades from US$ 12 billion in 1975 to US$ 34 billion in 2006 (Table 3). If we include non-commercial seed, the total value of seed used at global level may reach about US$ 50 billion. This increase is due to several factors:

- Development of hybrids
- Increase of seed treatment
- Development of transgenic varieties (Table 4)
- Development of new markets, in particular in developing countries.

Figure 5. Sophistication of seed treatment in lettuce *(Source: Pierre Ferraton)*



4.2 Seed companies

The key word illustrating the evolution of seed companies certainly is 'concentration'. That concentration started in the 1970s with the arrival of pharmaceutical and oil companies.

A new wave of acquisitions took place in the 1980s and the process is still continuing actively with new deals every month. This evolution may be illustrated by the turnover of major seed companies from 1985 to 2006. Today the top five companies represent 31.3% of the total seed market compared to 8% in 1985 (Tables 7, 8) and huge investment in research and development (Figure 6).

Table 2. Evolution of global seed treatment sales (million US$), 1997-07

1997	**2002**	**2007** (estimates*)
700	920	1550

Table 3. Global seed markets (billion US$), 1975-06

1975	**1985**	**1996**	**2006**
12	18	30	34

Table 4. GM seed markets (million US$), 1996-07

1996	**2000**	**2004**	**2006**	**2007**
115	2703	4663	6150	6900

Table 5. Domestic seed markets (million US$)

Country	Value	**Country**	**Value**
USA	7080	Italy	670
China	4000	Canada	550
France	1915	Russia	500
Japan	1500	Korea	400
Brazil	1500	Australia	400
India	1300	Mexico	350
Germany	1000	Taiwan	300
Argentina	850	Spain	300

Table 6. First wave of concentration, 1966-76

1968	Purchase of Asgrow by Upjohn
1970	Purchase of Nickerson by Shell
1974	Purchase of Funk by Ciba-Geigy
1974	Purchase of Rogers Brothers by Sandoz
1976	Purchase of Northrup King by Sandoz
1976	Purchase of Zaadunie by Sandoz

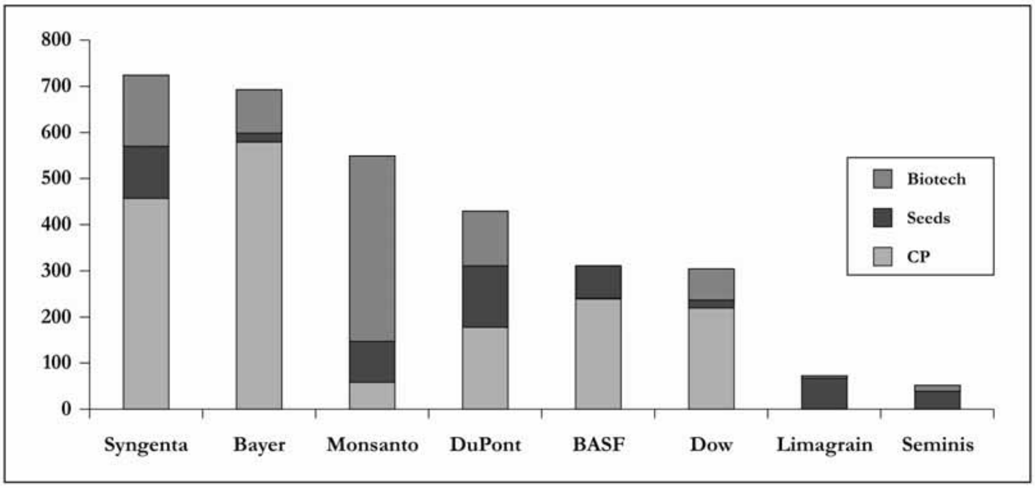
Table 7. Level of market concentration (%), 1985-06

Number of companies	**1985**	**1996**	**2006**
Five top companies	8.0	12.9	31.3
Ten top companies	11.9	14.2	37.7
Fifteen top companies	14.7	20.2	41.3

Table 8. Changes in company turnovers from 1985 to 2006 (million US$)

1985	**US $**	**1996**	**US $**	**2006**	**US $**
Pioneer	735	Pioneer	1500	Monsanto	4028
Sandoz	290	Novartis	900	DuPont-Pioneer	2781
Dekalb	201	Limagrain	650	Syngenta	1743
Upjohn-Asgrow	200	Advanta	460	Limagrain	1475
Limagrain	180	Seminis	375	KWS Saat	615
Shell Nickerson	175	Takii	320	Land O'Lakes	550
Takii	175	Sakata	300	Bayer BioScience	465
Ciba Geigy	152	KWS	255	Delta PineLand	417
VanderHave	150	Dekalb	250	Sakata	410
CACBA	130	Cargill	250	DLF Trifolium	365
Sakata	120	Pau Euralis	175	Takii	342
Orsan	115	Monsanto	170	Dow Mycogen	302
Cargill	115	Sigma	160	Barenbrug	197
Lubrizol	110	Saaten Union	155	Saaten Union	187
Volvo	97	RAGT	140	Desprez	186
ICT	90	Svalöf Weibull	140	RAGT	149
Royal Sluis	80	Cebeco	140	Svalöf Weibull	137
Cebeco	80	DLF	135	InVivo	116
KWS	75	Barenbrug	133		
Total	3270		6608		14,465

Figure 6. Investment strategies for R&D *(Source: Phillips McDougall; Syngenta, 2003)*



The concentration trend is clear, but it must be noted that the seed industry is still relatively fragmented, compared to some other agriculture input providers, such as crop protection industry where the top five companies represent more than 90% of the market. The concentration has several reasons:

- The evolution of technologies increasingly sophisticated requiring high investments in research/development and production.
- An increasing need of speed in all business sectors leading to loss of specialization in some activities and a vertical integration
- Multiple pressures linked to an increasing competition due to globalization

Conclusions

During the past three decades, the seed industry has made tremendous progress in terms of technology, markets and regulations. Thirty years ago seed companies, mainly of small and medium size, were selling seed mainly of lines, synthetics and populations. Today an increasing number of multinational companies are selling mainly seed of hybrids that are not only of genetics but also carrier of many technologies depending on various and increasingly stringent regulations. At present, the international seed trade is increasing and stands at around US$ 5 billion where as the global seed market is close to US$ 35 billion.

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New Technology Solutions for Seed Industry

The search for seed technology solutions started since the beginning of agriculture, for example, for cleaning seeds prior to planting. With progress in agriculture and seed technology, new techniques emerged including soaking, priming, disinfecting, and treatment using slurry, dusting, coating, pelleting and encrusting technology. These technologies, for example cleaning and treatment, were initially custom-applied by specialized companies, but later on handled in-house by big seed companies. With the development of new and simple technologies, some of the techniques for quality testing and seed treatment are now available for use by small seed companies or local seed producer groups.

Barriers to technology

The major constraint in introducing many beneficial new technology products in the seed industry is the cost especially for small-scale farmers. Moreover, the knowledge of applying the technology remains problematic particularly the choice of technology and its large-scale application. The other barrier is the traditional attitude of farmers towards new technology. Introducing a new product is not very simple, the benefits of technology on yield and quality must be demonstrated locally. All these factors make it difficult to make new seed technology become available and accessible in many areas, which theoretically could benefit many farmers.

Quality assurance technology

Apart from traditional views of farmers, practical research in seed technology is focusing on conventional solutions and applications. Identifying, testing and using new technologies applied in other industries could give quicker and easier breakthrough for new developments. One of the best examples is the development of the Q2 technology from the food industry. The Q2 technology measures oxygen consumption in a non-invasive way and is objective and reproducible. Seed germination goes with energy consumption involving water and oxygen uptake. Oxygen consumption can be used as a parameter to evaluate seed quality (for details visit www.astec-global.com). Different seed lots could be compared for tolerance to extreme conditions such as heat, cold or wet. The measurement is non-invasive and is on individual seed basis not on a result of 400 seeds as in germination tests. You can also get an individual reading which can be used to evaluate all 400 seeds.

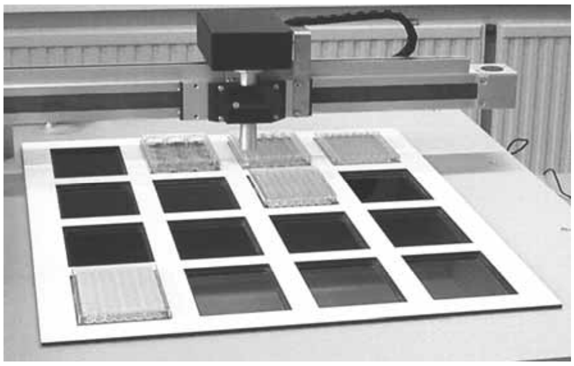
The Q2 equipment costs €35,500 including data analysis program. Standard Elisa plates including a specially developed seal can be used for the Q2 tests (see Q2 machine with ELISA plates). A re-usable container is under development for the test and the cost of each container will be roughly €0.2 to €0.3. There is no test method available which will give as much information per individual seed as the Q2.

Seed treatment technology

Another breakthrough is the wider application of rotary technology in seed treatment. It can be used for seed applied crop protection, coating, pelleting and encrusting. Rotary coating equipment is much cheaper than side vented pans originally from the pharmaceutical industry for very accurate rate of applications. It is available in different sizes and types on the market.

Basic versions of rotary coaters from China and India costs between €2,500 to €5000 while more advanced models from the US and Europe are sold between €5,000 to €10,000. With the correct protocols, both types of rotary coaters can replace expensive vented pan equipment from the pharmaceutical technology which costs about tenfold.

Another good example is pelleting as traditional planting devices were size limited. However, modern planting machines are pneumatic without any limitation by seed size. A small increase in seed size could be sufficient; and can be achieved by encrusting. The weight increase of up to 10 times is possible or otherwise calibration of the encrusted seeds will be needed which will increase costs for equipment, material, energy and labor. A basic cost comparison will demonstrate this. A kilo of onions would cost roughly around €300 for pelleting while encrusting with a weight increase of up to five times, would cost between €25 to €57.5. A lot of cost but much cheaper than pelleting and probably as effective in properly spacing seeds in the field. This principle is applicable in many types of seeds (see lettuce pellets and encrusted buffel grass).

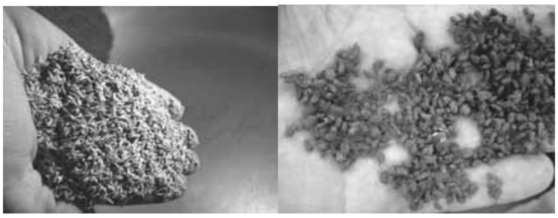


Q2 equipment with Elisa plates (top) and MarQ testing maize seedlings

New systemic molecules (fungicides and insecticides) are being increasingly used in seed applied crop protection replacing traditional slurry or dusting treatments. This is better for the environment, the users and the applicators. You do not need a high-tech seed technology factory anymore to apply it. With the right protocols and equipment this could be done locally.

Information Technology

There is an increasing trend using IT in seed technology. To date there are several relatively cheap equipment to monitor certain quality parameters per unit of seed.



Pelleted cabbage (left) and encrusted buffel (right) seeds

For example, simple and small data loggers can monitor the temperature and RH of seed during transport. Once the seed arrives at destination, the information could be uploaded on a computer or internet using a small reading device. You can directly read the exact conditions under which the seed was transported. Previously this was expensive, time consuming and monitored with big data loggers.

The MarQ is an inexpensive device used to protect your IP. You can detect if the seeds or varieties planted in the field are yours. This is a very good protection against incorrect claims or theft from your genetics. Readings can be made directly on seeds and up to eight weeks after planting (see eight-week corn plant and MarQ reader)

The Writetech is a small device used in laboratories or for companies handling large data sets from different locations. All data written with the pen are stored through a cradle in a computer. Written field data are automatically transferred into a database and the information is available centrally and accessible directly.

New technologies are required in the coming years as the demand for food supply is increasing with a growing world population. Unfortunately, there are fewer natural resources available: land, water and energy. Only new developments and technologies can increase the efficiency of agricultural and horticultural production worldwide.

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World Seed Congress 2008

The annual ISF World Seed Congress was held from 26–28 May 2008 in the Czech Republic, the home country of Gregor Mendel, the founder of modern genetics. Members of the seed industry from 59 countries, including a good number from Central and Eastern Europe, totaling 1480 persons attended the congress. International organizations such as FAO, ISTA and UPOV, and the regional associations AFSTA, APSA, ESA and SAA participated in the debates. Numerous presentations on interesting topics such as drought tolerance in maize, hybrid cereals, the International Plant Protection Convention (IPPC) and the Clean Seed program were made.

Topics on the agenda included overviews from the Czech seed industry on the different crop groups, GM vegetables, royalty collection, adventitious presence, essential derivation and seed health testing, just to name a few. A proposed position paper on Essential Derivation was discussed at great length before deciding that further input was required of the relevant Working Group. The ISF Trade and Arbitration Rules Committee (TARC) proposed numerous amendments to the ISF Rules and Usages for the Trade in Seeds for Sowing Purposes as part of the regular review process. ISF Members approved the adoption of most of the changes and the remaining few will be on the TARC's agenda in preparation for the next congress.

The General Assembly voted in favor of merging of the Cereal & Pulse, the Maize and Sorghum and the Industrial Crops Sections into a new Field Crops Section. In the past, there was a great deal of overlap between meeting participation and agenda topics, and this merger will streamline the working of the Federation.

The General Assembly approved the presidency of Mr. Orlando de Ponti, who will take over from Mr. Deon van Rooyen. The new ISF President expressed his content that agriculture and food were back at the top of the world agenda. He spoke of the role the seed industry can and will play in alleviating the current food crisis. He reminded the audience of the words 'Seed is Life' on the ISF logo.

In his keynote address to the congress participants, Mr. Bernard Le Buanec, Senior Advisor to ISF spoke of the "Evolution of the Seed Industry during the Past 40 years" and emphasized once again the importance of a good national seed association.

In conjunction with the congress, a Seed Treatment Seminar was organized on 29 May in Prague. It drew 120 participants and saw interesting presentations on seed treatment processes, stewardship in seed treatment and commercial aspects of seed treatment.

The next annual World Seed Congress will be in Antalya, Turkey from 25-27 May 2009. The post congress seminar on phytosanitary matters will be on 28 May 2009.

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ISTA Discontinues Green Certificate

ISTA issues three types of certificates for seed moving in international seed trade: orange, blue and green. ISTA is pleased to announce that the proposal to discontinue the ISTA Green International Seed Lot Certificate was adopted by voting delegates on behalf of their respective Governments at the ISTA Congress in Iguaçu Falls, Brazil in 2007. The new version of Chapter 17 on ISTA Seed Analysis Certificates came into force on 1 January 2008.

From here on, seed testing results will be reported on ISTA Blue and ISTA Orange Certificates only. The results of tests reported on ISTA Blue Seed Sample Certificates will refer to the quality of the sample as submitted, whereas the results of ISTA Orange Seed Lot Certificates refer to the quality of a whole seed lot since sampling and testing are conducted in accordance with the ISTA Rules by an accredited laboratories.

In the past where a Green Certificate was required i.e. for sampling and testing performed by two different laboratories in two different countries, it will now exclusively be covered using the Orange Certificate. Full traceability is ensured since the name and address of both laboratories will be reported on the ISTA Certificate. With this change, ISTA is confident that international seed trade is facilitated with greater transparency and reliability of test results. For more information contact: *ISTA, Zürichstrasse 50, P.O. Box 308, 8303 Bassersdorf, Switzerland; E-mail ista.office@ista.ch; Website: www.seedtest.org*

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Egypt Approves First Genetically Modified Crop

In Egypt, the Agricultural Genetic Engineering Research Institute has been working on biotech crops for quite some time. In 2008, Egypt has approved the cultivation and commercialization of Bt maize variety, marking the first legal introduction of genetically modified (GM) crops into the country and become the second country on the African continent approving the commercialization of GM crops. The Ministry of Agriculture and Land Reclamation has approved decisions made by the National Biosafety Committee and Seed Registration Committee. The decision was based on a series of field trials conducted for several seasons during 2002-2007.

The variety, Ajeeb-YG, is a cross between MON 810 and an Egyptian maize variety with resistance to three corn borer pests, developed by Monsanto scientists in South Africa — currently the only African country planting commercial GM crops. Initially, Fine Seeds International Company is partnering with Monsanto to distribute the variety in Egypt; and the seed will be made available to farmers in 10 governorates. Egypt, from next year, will locally produce the seed.

Egypt currently has no official biosafety legislation, though a regulatory framework exists. which follows the Cartagena Protocol on Biosafety and encompasses ministerial decrees regulating the registration of GM seeds. To read more visit the SciDev web site at
http://www.scidev.net/en/news/egypt-approves-commercialisation-of-first-gm-crop.html

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Public-Private Partnership in Hybrid Rice

Successful deployment of hybrid rice in Asia requires more effective cooperation between public research institutions and the private sector A new international research initiative, linking the private and public sectors for the first time and launched on November 9 at the 2007 Asian Seed Congress, aims to boost the research and development of hybrid rice for the tropics. The Hybrid Rice Research and Development Consortium (HRDC), established by the International Rice Research Institute (IRRI), will strengthen public–private sector partnership in hybrid rice, a technology that can raise the yield of rice and thus overall rice productivity and profitability in Asia. Hybrid rice takes advantage of hybrid vigor known as 'heterosis' to achieve yields 15–20% higher than conventional varieties. Over the past three decades, the technology has helped China achieve food security, but has not yet reached its potential in the tropics.

IRRI and its partners in the public and private sector have led research on development and use of hybrid rice technology in the tropics for almost 30 years. The HRDC will be hosted by IRRI and will have three major objectives:

- Support research on developing new hybrids with enhanced yield heterosis, improved seed production, multiple resistances to stresses, and grain quality
- Support research on best management practices for rice hybrids.-Improve information sharing, public awareness, and capacity building

Public and private sector organizations and companies with interest in hybrid rice development are invited to become members of the HRDC. For private-sector members, annual financial contributions under the consortium structure will take into account the status of seed companies at different stages of development. HRDC members will have access to improved parents, hybrids, and breeding lines, including seeds and associated information.

The HRDC will have a public–private sector advisory committee and will meet annually to provide information to its members on new plant genetic resources available or under development, review research on hybrid rice management, discuss new research priorities, and make decisions on other consortium activities such as capacity building for both the public and private sectors.

The HRDC will significantly enhance the capacity for hybrid rice research and product delivery, while providing services and support to the private sector in its product development and delivery in order to benefit the general public.

National agricultural research and extension systems and other public sector organizations engaged in hybrid rice research and development will be among the primary beneficiaries of funds generated by the HRDC. Rice farmers in Asia will benefit from accelerated access to hybrid rice-based technologies such as more and better hybrids, good-quality seed, knowledge, and services provided by the private and public sectors.

IRRI is the world's leading rice research and training center; and is one of 15 centers funded through the Consultative Group on International Agricultural Research (CGIAR), an association of public and private donor agencies.

Source: Plant Breeding News, Edition 185 17 December 2007

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.

ASMED Construct First Seed Storage Facility for VBSEs in Afghanistan

ICARDA has established 17 Village-based Seed Enterprises (VBSEs) in three provinces in Eastern Afghanistan: Kunar, Laghman and Nangarhar through RAMP and ADP/E programs of USAID. Almost all VBSEs are engaged in seed production and marketing of wheat, rice and mung bean. In 2008, the 17 VBSEs have collectively planted 669 ha and expected to produce about 2500 tonnes of wheat, rice, mung bean and potato seed for marketing.

However, lack of centrally located proper storage facilities remain a major constraint for VBSEs. ICARDA negotiated with Afghanistan Small and Medium Enterprise Development to provide support for constructing a seed storage facility. Behsood VBSE was the first beneficiary where the storage facility was constructed on land provided by one of its members. The model storage facility (15 m x 10 m x 5 m) at a cost of around $13,000 has the capacity of more than 200 MT. The facility will help in maintaining seed quality and seed marketing. Each VBSE will require such facility for its promotion and seed marketing purposes.

Mr. Abdul Latif Babakarkhil, District Administrator and H. E. Haji Fazal Rahim, member of provincial assembly chaired the inaugural ceremony in the presence of farmers from three adjoining districts, and representatives of ASMED, MAIL, ACBAR and ICARDA. H.E Fazal Rahim member of provincial assembly and Behsood VBSE highly acclaimed ICARDA and ADP/E for their excellent contribution for the development of the agricultural sector in eastern Afghanistan. Farmers were very satisfied with the support provided by MAIL, ADP-E and ICARDA particularly in adaptive research, technology

The model local seed storage facility built for Behsood VBSE, Behsood district, Nangarhar, Afghanistan

transfer and seed provisions through VBSEs and are committed to increase agricultural production and productivity in the face of global challenges in food security.

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ICARDA Organizes Variety Maintenance and Breeder Seed Production Course for Iraq

FAO has been implementing a project on 'Rehabilitation and Development of the National Seed Industry in Iraq'. The objective of the project is to improve food security and nutrition through rehabilitation and improvement of the national seed industry. Capacity development is one of the major objectives where a series of training courses are conducted abroad to enhance and strengthen the seed sector. FAO and ICARDA have formally signed an agreement to organize two month training program on 'Variety Maintenance and Breeder Seed Production' for 5 Iraqi staff from the State Board of Agricultural Research and the State Board of Seed Certification and Testing of the Ministry of Agriculture.

ICARDA had organized the course at its headquarters from 1 April to 29 May 2008. The course aimed at developing the participants' knowledge and skills through theoretical lectures and hand-on practical training. The main objective is to train subject matter specialists who will subsequently be in charge of variety maintenance in Iraq and conduct in-country training courses to technical staff involved in the seed sector. The course focused on major cereals (wheat, barley) with highlights on legumes (faba bean, chickpea, lentil) and forages (vetch) and include various topics among others: (i) Morphological variety description and data analysis; (ii) Concepts and principles of variety maintenance and breeder seed production; (iii) Seed production of subsequent generations and causes of varietal contaminations.

A practical training session in variety maintenance plots at ICARDA headquarters, Aleppo, Syria

Field trips were organized to visit the facilities (basic seed farm, variety maintenance plots, seed processing center, tissue culture laboratory, seed testing laboratory) and commercial seed production, and quality assurance activities of the General Organization for Seed Multiplication in Syria.

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Plant Variety Protection in Morocco

In Morocco, the Plant Variety Protection (PVP) Law 9/94 was promulgated in 1997 in order to enhance plant breeding research and to encourage foreign breeders to introduce well adapted and high performing varieties. This law conforms to 1991 UPOV convention to which Morocco is a member since October 2006. The law has entered into force on 28 October 2002 and to date. two decrees and seven ministerial orders have been published in the official gazette. About 76 species can be protected in Morocco and the list will be updated accordingly. The duration of protection is

20 years for annual species, 25 years for trees and grapevine and 30 years for palm dates.

The Seeds and Propagating Material Certification Service is responsible for the protection of plant breeder's rights. Therefore, the same facilities and competence used for variety registration in the Moroccan catalogue are also used for variety protection; mainly for conducting tests of distinctness, uniformity and stability (DUS). For varieties already protected in other countries, the results can be transferred from the official services of the country of origin and the applicant is accounted for the charges.

Crop species	Number of varieties under examination	Number of protected varieties
Field crops	5	55
Potato	21	34
Strawberry	5	5
Trees	15	27
Vine	21	2
Rose	2	1
Total	69	124

A gazette 'Bulletin de la protection des obtentions végétales' is published twice a year, in April and September to inform the public, and mainly the claimants/owners, about the variety presented for protection and the varieties being protected under the law. Since October 2002, enforcement date of PVP law, 124 certificates were issued, 55 belongs to the National Institute of Agronomic Research (INRA); and 69 applications are under examination, 5 belongs to INRA (see table below). The applicants for protection are from Morocco, Europe, South Africa, and USA.

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Pakistan Launches Seed Production Program for Vegetables

Pakistan requires around 6000 t of vegetable seed annually. About 713 t of seed was produced locally under the supervision of FSCRD in 2005/06; and continue depending on seed import. In 2006/07, the country has imported 5805 tonnes of vegetable seed and spent PKR 862,495,862 (USD 1 = 66.8 PKR) importing vegetable seed, 27% of the value of all seed imports. The government launched a new project 'Establishment of Facilitation Unit for Participatory Vegetable Seed and Seedling Production Program' and called for collaboration with domestic and foreign companies.

The main objective of the program is to acquire elite vegetable genetic resources from external sources; collect, , characterize, purify and multiply seed of indigenous vegetables; acquire seed drying, cleaning, coating, pelleting and packaging equipment; and employing international experts to train technical staff, seed producers and vegetable growers. Within this context seed companies are encouraged for direct investments or joint ventures to extend cooperation for provision of genetic resources, seed conditioning plants and licensing agreements for local production and marketing.

The project will establish 10 units across Pakistan where such arrangements would be provided. These units will be comprised of private seed companies which will enter into agreement to abide by IPR issue, royalties and investment in technical staff and use of genetic resources. The project will facilitate the participatory units for commercial hybrid seed production. The project has inbuilt fund provision to pay for materials and consultants. It also envisages introducing vegetable nursery production by acquiring controlled environment facility through the project.

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RESEARCH NOTES

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

Participatory 'Mother-Baby' Trials in Common Bean Breeding in Southern Ethiopia

Asrat Asfaw and Fistum Alemayehu [2]

Introduction

Common bean (*Phaseolus vulgaris* L.) domesticated in Andean South and Middle America, is believed to have been introduced together with maize into the east coast of Africa by Portuguese and

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Spanish traders in the 16th and 17th century. However, according to some reports beans were introduced into Ethiopia as early as 1520 (Habtu, 1994) or later in the 16th century (Assefa, 1985). Since then farmers have developed ecotypes adapted to local conditions by conserving and exploiting useful alleles which have resulted into a wide range of morphologically diverse landraces. Moreover, under the national bean-breeding programs, new germplasm is continually added from different parts of the world.

In developing countries, nearly 80% of dry bean is produced by smallholder farms with endemic poverty. Beans are the most important food legume for direct human consumption in the world, and are a traditional staple in many parts of East Africa (Wortman *et al.*, 1998). In Eastern and Southern Africa, beans are the second most important protein sources and the third most important caloric source after cassava and maize (Pachico, 1993). While traditionally a food security crop throughout the region, intra-regional trade of common beans is gaining in importance.

Ethiopia is among the top ten common bean producers in sub-Saharan Africa (Hillocks *et al.*, 2006) where the crop occupies considerable area, providing food and cash for millions of farmers. At present, it is evolving as an important source of foreign currency for the country in general and cash income for smallholder farmers in particular (Asrat *et al.*, 2007). Among pulses, common bean covered about 4.8% of export earnings in 2001. This makes the crop strategic in alleviating malnutrition and ensuring food security.

Common bean is mainly produced in the low to medium altitude areas (1000-2200masl) for both home consumption and local/export markets. Its production is very diverse in terms of agro-ecology and cropping system, often cultivated as sole or in association with other crops mainly with low external input where landraces and informal seed sources are predominant (Asrat et al., 2007). It is produced twice a year i.e. in '*Belg*' (February to April) and '*Meher*' (June to October) season depending on the rainfall pattern of the area. In the '*Belg*' season, beans are intercropped with maize, sorghum and coffee while in the '*Meher*' season, beans are often planted as sole or relay crop with maize, sorghum, etc. In central rift valley, '*Meher*' is the main production season whereas in southern region, large share of production comes from '*Belg*' season planting.

Why participatory mother-baby trials?

In the southern Ethiopia, production largely depends on farmer's varieties which are believed to be of narrow genetic base compared to other bean growing countries in Africa. Farmers' bean varieties that have passed through many generations of natural and human selection for end-use quality are found to be low yielding and susceptible to angular leaf spot, bacterial blight and bean fly.

The national conventional common bean breeding program has developed many productive varieties that perhaps can increase yield per unit area. However, in the southern region, there has been a very limited adoption of improved bean varieties by smallholder farmers, especially the women. This could be attributed to:

- Less targeting of farmers production environments: the selection environments in conventional bean breeding program are generally fertilized, well weeded, sole crop and the land is flat, mostly fertile and uniform. In contrary, the farmers' bean production environments in the region are mostly non-fertilized, sole/relay/inter cropping system, and the land is sloppy, less fertile and heterogeneous. There is a mismatch between the selection and farmers production environments.
- Less effectiveness in addressing need of clients: since there is no participation of farmers and other stakeholders in the variety development process, most conventionally bred bean varieties are less acceptable because of non-attractive seed color, seed size, cooking time and taste and inadequate diversity to meet local preferences of bean farmers and consumers.

The efficiency of bean breeding program can be improved by matching the selection environment with target farmers' environment and ensuring participation of farmers and end users in the breeding process. Farmer participation in the breeding process helps to fit the crop to specific needs and uses of farming communities (Ceccarelli *et al.*, 2000), increases client orientation and gains in plant breeding efficiency (Witcombe *et al.*, 2005), and improve cultivar adoption (Horne and Stur, 1997). Mother-baby trial is one of the techniques for integration of clients or end-users need and addressing actual production environment in the crop improvement process.

Stages of breeding and mother-baby trials

Plant breeding usually comprises three stages, namely generating variability, fixation of created variability and testing of the fixed variation (Schnell, 1982). Witcombe *et al.*, (2005) further elaborated additional breeding stages such as goal setting, seed supply and outcome assessment. Mother-baby trial is one of the techniques for participatory varietal evaluation (PVE) and best applicable at varietal evaluation/testing stage of the breeding process.

Different models in mother-baby trials

Different researchers are employing different mother-baby trial design models (Witcombe *et al.*, 2005) as follows:

- Replicated mother trial (12 entries) and baby trial (4 entries) in an incomplete block lattice evaluated as practiced by CIMMYT and its national program partners on maize in South Africa (Banziger and Cooper, 2001; Witcombe *et al.*, 2005)
- Single replicate mother trial of about 60 entries in year one and baby trials in following year based on entries selected from mother trial practiced by West Africa Rice Development Association and its national program partners in rice trials (Gridley *et al.*, 2002; Witcombe *et al.*, 2005).
- Single replicate mother trial under a single management regime (the farmer's own) and baby trials where usually each farmer grows only one test entry alongside his/her local control used by CAZ and its collaborating NGOs and GOs in Asia (Witcombe, 2002; Witcombe *et al.*, 2005)
- Replicated mother trials at communal plots and non-replicated baby trials based on farmers selection in individual farmer plot model practiced by SARI in common bean breeding in southern Ethiopia (Asrat *et al.*, 2004).

Methodological approach of mother-baby trial at SARI

Experimental sites: The trials were conducted in two rural communities, Remeda and Korangoge near Awassa in Sidama zone of the South Regional State of Ethiopia from 1999 to 2003. Remeda (1900 masl) represents the tepid to cool moist and humid mid-highland whereas Korangoge (1600 masl) represents the hot to warm sub-moist lowland areas of bean production.

Research design: It involves participatory communal plot selection (mother trial) on station followed by on-farm performance and diffusion of selected materials (baby trials). Forty-four farmers, including 10 women and 34 men representing different user groups, selected from the two villages were participated in selection process.

In the first year (1999 *belg* season) the farmer selectors were invited to attempt selection from 147 diverse genotypes planted at Remeda on-station mother trial for sowing in their individual on-farm plots (baby trials) in succeeding years. All the lines retained by individual farmer selections from the baby trials per cropping season, were pooled and planted on communal plot of mother trial for group evaluation and selection. The selection was made at physiological maturity and grains of each line from previous year harvest were presented in transparent plastic bags at time of evaluation to give farmers options of selection for seed characteristics. The farmers used their own judgment based on their own selection criteria to retain or reject the materials without any interference from the researchers.

Results of mother-baby trials

The number of lines selected by a farmer ranged from five to 51 and on average, a farmer selected 15 lines at first selection cycle from mother trial in *belg* 1999. At the final section cycle in baby trials i.e., in 2002, the number of lines selected by a farmer ranged from one to four and on average, a farmer selected two lines. This indicated that the range and average number of lines selected by a farmer decreased from first to final selection. At the final selection, the 27 farmer-selectors from two villages retained 17 large and 17 small-medium seeded beans i.e., 34 lines from the original 147 diverse lines they were exposed to in 1999 mother trial.

The farmers retained large numbers of lines for production in the two villages. This is because farmers need diversity for different purposes in the villages: varieties performing well with (responsive) or without fertilizers, beans preferred in local market and/or home consumption (women), beans suitable for sole or intercropping, etc. These diverse user preferences are positive values contributing to on-farm conservation of bean genetic diversity. Participating farmers in breeding process created access for the communities to improved bean germplasm (new genes) and increased intra-varietal diversity on-farm and at the experimental sites where there has been low level of bean agro-biodiversity. Sperling *et al* (2001) stated that PPB has a biodiversity enhancement role as it gives the community a chance of getting wider access to germplasm, information/related knowledge, and targeting of more micro-niches.

Farmers applied diverse selection criteria for maintaining bean varieties on their own field. The presence of diverse selection criteria in the bean production system indicates the complexity of the user's need and production conditions (Table 1). The more diverse the selection criteria, the better a chance of maintaining large diversity on-farm as all positive traits of beans can't be found in a single variety. The selection process and subsequent interviews with farmers revealed that seed color and seed yield were the main criteria to retain or reject a line. This was followed by large seed size, tall plant height, early maturity, high pod load, long pod, high number of seed per pod (>5 seeds/pod), strong stem (non lodging), erect growth habit, pod clearance from the ground, good taste, fast cooking, etc being descriptor to select a good line.

Table 1. Farmers' selection criteria for common bean varieties

Positive criteria	Negative criteria
• High yield • Red & red mottled seed color • Large seed size • Tall plant height • Early maturity • High pod load • Long pod • High number of seed pod^{-1} (> 5 seeds pod^{-1}) • Strong stem (non lodging) • Erect growth habit • Pod clearance from ground • Good taste • Fast cooking • Swelling during cooking • Reduced flatulence	• Low yield • Non-red seed color (black, brown, yellow, etc not preferred) • Late maturity • Short pod length • Low pod load (few pods/plant) • Weak stem • Prostrate growth habit • Pod reaching ground • Shattering • Bad taste • Slow cooking • Causing flatulence • No market demand

A farmer attempting single plant selection on segregating populations

The on-farm performance of the lines on baby trials is presented in Table 2. The new farmer's selections with small and medium seed size were better than that of the local farmer variety. The best yielding new small and medium seed size selections on average gave 19 to 100% yield advantage over local farmer variety. This indicated that the new bean genotypes injected in the farmers' production system out performed the local farmer variety.

In 2001 and 2002, among the new farmer selections evaluated under different management, DICTA-109 in mother trial and AFR-702 in baby trial recorded the highest yield of 1566 and 1660 kg ha^{-1}, respectively (Table 3). Table 3 also revealed that some of the better preferred variety like CAL-170 with mean preference rating of 3.9 yielded lower and the high yielding variety DICTA-109 rated with medium preference of 2.6. This indicated that for adoption of a new bean variety not only grain yield but also farmer's qualitative traits/assessments are vital. In general, the overall selection process with farmers in both mother and baby trials revealed that farmers are capable of selecting varieties that give superior yield in their own field. This is in line with Ceccarelli *et al* (2000) who stated that farmers can handle and select among a large number of segregating lines and it is possible to transfer the responsibility of selection to farmers in their field.

Table 2. Average grain yield (kg ha^{-1}) and yield advantage of farmers selections (baby trial) over local variety in 2000

Varieties	Range		Mean	
	Korangoge	Remeda	Korangoge	Remeda
LSB	312-2440	620-2350	1353	1344
SMB	770-3230	690-3240	1778	1965
Local	290-3109	430-1920	1837	1072
LSB[1]	630-3130	880-3610	1826[1]	1830
SMB[1]	240-3810	920-3720	2191	2173
Average of LSB vs local[2]			73.6	125.4
Average of SMB vs local[2]			96.8	183.3
Best yielding LSB vs local[2]			99.4	170.7
Best yielding SMB vs local[2]			119.3	202.7

Note: LSB= large seed bean; SMB= small and medium seed bean; [1]Best yielding line at each farmer field; [2]Yield advantage (%) of farmers selection over local variety

Table 3. Mean grain yield (kg ha^{-1}) and farmer preference of bean lines in mother and baby trials in 2001 and 2002 at two locations (average of two years and two locations)

Variety	Mean grain yield		Mean preference rating [1]
	Mother trial	Baby trial	
CAL-170	999	728	3.9
AFR-697	949	1,086	2.9
AFR-702	1,324	1,660	3.5
AFR-708	1,070	809	3.1
DICTA-109	1,566	1,530	2.6
OBA-4	1,113	1,341	3.2
Roba-1	1,415	1,144	3.6
RAB-585	1,201	1,245	3.8
Red Wolayta (local)	1,117	839	2.9

[1]Variety preference rating where 5 = most preferred and 1 = less preferred

Participatory variety diffusion

The varieties that got wider acceptance were placed in participatory variety diffusion scheme similar to that for PVS and PPB through individual farmers and cooperative based initiatives. Two common bean varieties identified through mother-baby trials were included in the program: Ibado and Omo-95. With individual seed producer scheme, farmers were given initial seed of preferred varieties in revolving seed system in which a farmer receive initial seed of a variety on free and payback in kind the amount he/she received from the research at harvest time. In the process, research, university and respective area office of agriculture and rural development were involved. The research provided training on bean seed production and post handling to development agents and initial seeds of preferred varieties. The development agents in turn provided on-farm training to farmers. Research, development practitioners and farmers monitored the entire operation jointly.

At the harvest, those better managed fields that fulfilled minimum seed production requirements, purchased back by research for redistribution to other farmers in the area and sold as seed directly by producer farmers to NGOs operating at distant locations. For example, one farmer at Boricha produced 1600 kg of Ibado seed and from that 500 kg seed sold to NGO operating in another zone. Moreover, 3000 kg seed was collected in a revolving seed scheme for redistribution to other farmers for next cropping season. In Boditi, an NGO Inter-aid France provided initial seed of Ibado and Omo-95 varieties to farmers in revolving seed scheme, where it established a community seed bank for farmers to keep seed for next planting. The farmer who put seed in bank has access to seed credit, double the amount of seed he/she saved in the bank. With this scheme, nearly 5000 kg seed of two varieties saved in the seed bank in 2007 cropping season. This made seed easily available to farmers in their vicinities and quickly reach many farmers with new varieties.

Field day on cooperative based seed production scheme

In cooperative based scheme, varieties with high market demand are targeted and farmers, research, NGOs, BoARD, farmer's unions (FU) and exporters were involved. Seed production was initiated along with market oriented bean production in order to supply seed to producers continuously. FU provides inputs (seeds and fertilizers) with down payment and collects seed back from seed growers for next season distribution. A joint task force from seed chain partners monitored seed production. Field days were organized on seed multiplication plots before harvesting (see photo) for farmers, researchers, development practitioners, seed processors, grain traders and policy makers for joint evaluation and scaling-up. Farmers involved in seed production are organized into seed producers' cooperatives through the support of an NGO, Self-help International. The present effort of organizing farmers into seed producers' union will be the first of its kind for the country.

Conclusion

Participating farmers in common bean breeding and variety diffusion process created access for the communities to diverse germplasm pool (segregating populations and fixed variation) and increased intra-varietal diversity at on-farm level in the community where there were low levels of bean biodiversity. During selection, farmers retained 34 new bean lines (17 each from large and small-medium seed size) for production that will meet the need of wide range of users and adaptable to several microenvironments from the original 147 lines exposed to them. Prior to research intervention, only three cultivars were grown in the area. Thereafter the average number of varieties retained for planting increased from two to four. Number of small and medium sized bean lines retained increased from two to three and that of large seed size beans increased from zero to three. Farmers retained large number of diverse lines in participatory selection as compared to formal breeding which at the end mostly recommend few varieties. In general, farmers need diversity for different purposes: varieties performing well in no or low fertilizer or responsive to fertilizer application; varieties with preference for home consumption (women), local market or both; varieties suitable for sole cropping or intercropping. These diverse user preferences are promoting on-farm conservation of bean genetic diversity. Sperling *et al* (2001) stated that PPB has biodiversity enhancement role as it gives the community a chance of getting wider access to germplasm, information/related knowledge, and targeting of more micro-niches.

In individual as well as group selection farmers retained large proportion of large seeded lines as compared to small and medium seeded types. This demonstrated farmers' preference for newly introduced as well as reintroduced large-seeded bean types than their previously well-acquainted small seeded bean varieties. Large seeded beans are liked for their food value (good taste and swelling ability while cooked). The farmers used to grow large seeded beans before but the large seeded farmer's variety was lost because of its low yield as farmers shifted to growing productive small seeded types. However, through PPB the large seeded beans were reintroduced in to the production system.

Involving farmers in bean breeding created good insight into farmers' selection criteria/perception and their weight. Farmers applied diverse selection criteria in maintaining and rejecting bean varieties on their own field. The existence of diverse selection criteria in the bean production system indicates the complexity of the user's need and production conditions.

Exposing farmers to bean diversity resulted in identifying new variations and reintroduction of lost diversities that are more attractive to the farmers. The new as well as the re-introduction of bean diversities provided farmers more reliable seed yield under marginal environments as the newly selected lines expressed better yield advantage over existing farmer's varieties. The cultivation of new bean types by farmers and its subsequent supply to local markets created niche market for new products. The red mottled varieties introduced through PPB creating new market niche being exported to northern Kenya.

Some farmer's selections are entering the local markets and creating new demand niches for red kidney, red speckled and generally for large seeded beans. The red kidney sells extremely fast in the local markets with a 'matter of hours' and farmers complain that they cannot get the seed. The creation of new niche market for new beans in the region is encouraging for the communities who developed the varieties. Because of good price in local market some farmers are started multiplying the new beans in larger areas. The newly developed varieties are more acceptable to other farmers and consumers partly because of their higher yield potential and good seed characteristics.

In general integration of participatory approach in bean breeding and variety diffusion resulted in increased on-farm diversity, improved farmers breeding skills, identified farmers' selection criteria and preferences and introduced positive interactions, reduced research cost in relation to impact gained (acceptable varieties identified faster; fewer research dead-ends, effective in targeting users need).

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MEETINGS AND COURSES

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

Conferences

Asian Seed Congress 2008, 9-13 November 2008, Hyderabad, India. The Asian Seed Congress will be held from 9-13 November 2008 at Hyderabad International Convention Centre in Hyderabad India,. The National Seed Association of India will organize the congress in close collaboration with APSA. For information on the congress and registration please contact: APSA Secretariat, P.O. Box 1030 Kasetsart Post Office, Bangkok 10903, Thailand; E-mail: secretariat@apsaseed.org. More information is available on the APSA website www.apsa.org.

ISF 2009 World Seed Congress, 25-27 May 2009, Antalya, Turkey. The congress is organized under the auspices of the International Seed Federation and hosted by the Turkish Seed Industry Association. Antalya located in the Mediterranean cost in western Turkey is a city known for its horticultural crop seed production. For more information and registration please contact: ISF, Chemin du Reposoir 7, 1260 Nyon Switzerland; E-mail: isf@worldseed.org committe. Further information is available from Turkish Seed Industry Association, Mithapasa Caddesi Fazilet Apt. No 50/4, Yenisehir, Ankra, Turkey; E-mail: turkted@turkted.org.tr.

Seed Production and Treatment in a Changing Environment , 24 - 25 February 2009, The Belfry Hotel, Wishaw, West Midlands, UK . There have been major changes in arable and horticultural production over the last few years. There is now greater emphasis on the justification of crop protection management and more effective use of good husbandry techniques both for seed protection and production. Since the third BCPC 2001 Symposium on seed health and treatment, there has been more information available on the technology of treatment, the interpretation of seed testing, the technology of seed testing and sampling of seeds and production methods which lessen the risk of pest or pathogen attack.This Symposium will examine these developments as well as the effects of current and future legislation both in the UK and Europe. If you require further information please contact: The Program chairman Dr Anthony Biddle, Processors and Growers Research Organisation, Peterborough, UK;Tel: +44 (0) 1780 782585 Fax: +44 (0) 1780 783993; Email: anthony@pgro.org; Website: http://www.bcpc.org/seedtreatment/

Courses

Wageningen International Courses 2009

Wageningen University and Research offers continuing education in postgraduate courses, training sessions, and refresher courses. The courses vary from that of general interest to highly specialized levels, offering the chance to learn about current developments within the domain of Wageningen UR: healthy food and healthy living environment. Many institution among which is the Wageningen International (WI) organize short courses. For more information on course organized by WI and others, visit the following link http://www.courses.wur.nl

ISTA Vigour Workshop, Mashhad, Iran 18-21 April 2009: The International Seed Testing Association (ISTA) will hold a Seed Vigour Workshop at the Department of Crop Science, University of Ferdowsi, Mashhad, Iran from 18-21 April 2009. The aim of the workshop is to offer an introduction to the concept of seed vigour and seed vigour testing. It will be made up largely of lectures with some practical experience in completing vigour tests. The lecturers will be Dr Alison Powell (Chair, ISTA Vigour Committee, University of Aberdeen, UK), Dr Stan Matthews (University of Aberdeen, UK) and Dr Mohammad Khajeh Hosseini (University of Ferdowsi). The workshop will be conducted in English. Further details of the workshop and registration can be found on the ISTA website https://www.seedtest.org/en/workshopdetail---1--1113--210--66.html or from Dr Alison Powell (a.a.powell@abdn.ac.uk).

International Centre for Plant Breeding Education and Research: The University of Western Australia is to establish an International Centre for Plant Breeding Education and Research (ICPBER). The centre would play a vital role in addressing the looming global shortage in plant breeding expertise. The ICPBER will offer a four-year undergraduate science degree in genetics and breeding – the only one of its kind at an Australian university – and an undergraduate degree in agricultural science, with a component of genetics and breeding. Both degrees include training in crop agronomy, plant physiology, biometrics and related disciplines. It will also offer post-graduate study in genetics and plant breeding, as well as in-service training for practising plant breeders or seeds industry personnel.

LITERATURE

Literature, books and journal articles of interest to readers are presented here. Please send information on seed publications on policy, regulation, and technology to the Editor for inclusion in Seed Info.

Books

Bishaw, Z and A.J.G. van Gastel. 2007. Seed production of cool-season food legumes: faba bean, chickpea and lentil. This fully illustrated technical manual describes seed production methods for faba bean, chickpea and lentil. Collectively, known as cool-season food legumes, these crops are grown worldwide, and play a critical in food security in developing countries. The manual covers all stages of the seed production cycle: variety maintenance, selection of seed growers, production practices, quality control, mechanization, pest and disease control, processing and storage. The emphasis is on practical information and guidelines for producing high-quality legume seed in a developing-country context. This book is probably the first such compilation, summarizing available but hard-to-find information from many sources into a single, comprehensive reference source. It will be useful to producers, extension staff, quality assurance agencies, training programs, as well as seed relief programs. ICARDA, Aleppo, Syria; vi + 84 pp. ISBN 92-9127-194-8; Price: US$ 40.

Brescianti, F. and A. Valdes (eds). 2007. Beyond Food Production: The Role of Agriculture in Poverty Reduction. Most incidences of poverty are concentrated in rural areas and farming is a major source of income to the rural poor. Therefore, the argument goes, agricultural growth is a good way to reduce poverty. In reality, however, things are not quite so clear-cut. Produced by the FAO, Beyond Food Production takes a closer, statistic-led look at some of the issues affecting rural agricultural communities en route to development. The results from studies on three continents are intriguing, if divergent, but the analysis is aimed at readers with a firm background in econometrics. Edward Elgar Publishing, 240pp, ISBN 978 92 5 105534 2 (Hb), £59.95; Website: www.earthprint.com/fao

Useful Websites

ISTA is pleased to announce that the ISTA Statistics Committee has elaborated an updated version of Seedcalc 8 with the ability to design qualitative testing plans using a Bayesian approach. This new capability was presented at the 28th ISTA Congress 2007 under the title 'A Bayesian approach for adventitious presence (AP) semi-quantitative testing in conventional seed lots'. The program is now available for free down at https://www.seedtest.org/stream /nl-l---1--%40a3a28d620689--85.htm.