SEED INFO

Official Newsletter of the WANA Seed Network

Seed Info No. 22 **January 2002**

EDITORIAL NOTE

Seed Info aims to stimulate communication and information exchange among seed staff in the West Asia and North Africa (WANA) region. The purpose is to contribute towards the development of stronger national seed programs which supply quality seed to farmers.

In this issue Jan-Peter Nap from Plant Research International, The Netherlands presents a lead article entitled the opportunities and challenges of biotechnology crops. He discusses the biotechnological tools available, the research objectives and the status and future prosects of genetic engineering. Moreover, Wynand J. Van Der Walt, from The South African National Seed Organisation describes a proposed new national biotechnology strategy for South Africa. The strategy is designed to stimulate the growth of similar industry in South Africa by the establishment of Biotechnology Advisory Council to oversee its implementation. Michael Turner of the ICARDA Seed Unit introduces some of the recent developments in Africa aimed at harmonising seed regulations and promoting regional trade in seeds. Vincent Gwarazimba from the Zimbabwe will present a detailed account of these regional initiatives in the next issue of Seed Info. There is also news on 26th ISTA Congress held in France and FAO expert consultation meeting on vegetable seed production for the Near East and North Africa region in Egypt.

The section on SEED PROGRAMS includes news from Egypt, Jordan, Morocco and Pakistan. Salah Abd El Wanis reported on recent developments in the national seed sector in Egypt and Adnan Abdel Nour on the new plant variety protection law in Jordan. Mohamed Tourkmani presents a short note on the Moroccan seed industry while news from Pakistan describes new local initiatives in production and certification of horticultural crop seed and planting material.

In the HOW TO section, your regular contributor, Abdoul Aziz Niane explains the ISTA Quality Assurance program describing the essence of Standardized Operation Procedures (SOPs).

Laboratory seed testing is a long established quality assurance program to guarantee seed quality based on sound scientific knowledge. However, the search for new, quick and reliable techniques and standardization of the procedures is in continuous development. The RESEARCH section highlights new approaches in seed and seedling evaluations. The technique using scanner and computer technology offers many advantages as reported by McDonald and colleagues from the Ohio State University.

This newsletter is meant to promote communication among the seed people and the public at large within the West Asia North Africa region and beyond. We would like to receive your views and opinions. You can send us your contributions in any format to inform us what is happening in your organization, country, region or global levels which are influencing the current issues in seed program development. Your contribution is highly appreciated. Let us keep Seed Info informative!

We wish you an enjoyable read.

Happy New Year

Zewdie Bishaw, Editor

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WANA SEED NETWORK NEWS

This section presents information about the WANA Seed Network. It regularly updates the progress of Network activities and reports on the meetings of Steering Committee and WANA Seed Council.

Network Publications

The revision of three Network publications namely; WANA Variety Catalogue, WANA Field and Seed Standards Catalogue and WANA Seed Directory is progressing very well. The catalogue of weed species is now printed and being distributed.

Focus on Seed Programs

Since 1994, 16 issues of the 'Focus' series on national seed programs of member countries were published and that leaves only Iran and Saudi Arabia to complete this important series. Cyprus, Egypt, Ethiopia, Lebanon, Oman, Turkey and Yemen have updated their 'Focuses' to reflect recent developments in national seed programs while Algeria, Iraq, Jordan and Pakistan have relatively recent contributions. It is hoped to finalize all revisions from member countries and to publish the updated version in the near future.

Change of Network Representatives

Mr Mohammed Ramadan Omar from the Agricultural Research Center has replaced Mr Ahmed Zintani who served as the Country Representative of Libya to the WANA Seed Network since 1995. We would like to thank Mr Zintani for his valuable contribution to the Network during his term as representative of Libya. We also would like to welcome Mr Ramadan as a new Country Representative and look forward to his contribution to the objectives of the Network. His contact address is: Mr Mohamed Ramadan Omar, Agricultural Research Center, P.O Box 2480-3697, Tripoli, Libya; Tel: ++218-21-3616864; Fax: ++218-21-3614993; E-mail: Mohamedramadan Omar@lycos.com.

Change of Address

The area code for telephone and fax numbers has been changed for Tunis. The old area code of 1 is now changed to 71 with other numbers remaining the same. The full address of the Country Representative of Tunisia is now as follows: Mr Aissa Bouziri, Sous-Directeur du Contrôle et Certification des Semences et Plants, Ministere de l'Agriculture, 30 Rue Alain Savary, Tunis; Tel: ++216-71-800419; Fax: ++216-71-800419.

Seed Info Available Online

The first issue of Seed Info was published over a decade ago in June 1991. With the establishment of the WANA Seed Network in 1992, it soon became the official newsletter of the Network. Since then 22 issues have been published covering a wide range of subjects focusing on policy, regulatory, technical and institutional issues affecting the national, regional and global seed industries. The newsletter attempts to be as informative as possible through regular contributions from country representatives and observers of the Network as well as interested individuals who wish to share their news and views with our readers.

In the era of information technology, online publishing becomes increasingly popular particularly for the newsletters. Through electronic publishing, news can easily be packaged and sent effectively and reliably to many interested groups who have access to the internet. This reduces the time and resources spent on keeping track of mailing lists and sending out printed materials.

To benefit our readers with access to the internet the English version of Seed Info is now available on the ICARDA website each time a new edition is ready for printing. However, we will continue publishing and distributing the printed newsletter as before and we would like your feedback to update our mailing list (see page 16). Those of you who have access to the internet and wish to be removed from our mailing list because of this new facility please let us know.

The Secretariat of the WANA Seed Network is hoping to put most of its publications on the website so that member countries and observers and the public at large could access the information.

NEWS and VIEWS

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

The Opportunities and Challenges of Biotechnology Crops

Introduction
Over the last three decades, advances in plant

biotechnology have had a significant impact on plant breeding and the plant industry. Notably over the past five years, numerous crop varieties have been marketed that used some form of plant biotechnology in their development. According to the International Seed Trade Federation estimates, the area cultivated with transgenic crops jumped from 2.8 million in 1996 to 39.9 million ha in 1999.

Plant biotechnology comprises several different technologies that are currently used in plant breeding and production. These are explained in the following sections:

In vitro Technology

In vitro technology (tissue culture) is the rapid and large-scale propagation of genetically identical plant material in glass or plastic jars that takes place in specialized laboratories. The objective is to accelerate multiplication as well as obtaining disease-free starting material. It has developed to such an extent that the tissue culture is now considered relatively 'low-tech' and routine. More advanced tissue culture methods such as anther or embryo culture, somatic hybridization, single cell regeneration and the use of somaclonal variation, expand the genetic variability useful for breeding and help to generate and select superior material.

Marker Technology

Marker technology has been successfully exploited currently in plant breeding strategies. A 'marker' is a protein or more often a short sequence of DNA, the presence of which is linked to a desired trait such as resistance to a particular pest. By using such markers as a flag for regions of genetic material (DNA), complex or difficult-to-assay traits can more easily be evaluated and selected in a process called marker-assisted breeding. This speeds up and improves the accuracy of selection. A considerable part of current plant biotechnology research is aimed at identifying suitable markers for 'traits of interest' in breeding material. There are many different kinds of DNA markers such as RAPD, RFLP and AFLP. The ideal marker is the Single Nucleotide Polymorphism (SNP), a single difference in the basic building blocks of DNA. Several novel technologies have been and are being developed that target SNPs in crops. Marker technology is also used in other fields of plant science such as in establishing genetic relationships in ecosystems.

Gene Technology

Most of the challenges, opportunities and discussions about plant biotechnology are focused on gene technology. Genetic engineering (GE) allows the transfer of a piece of functional DNA (gene) into a host organism. There are several ways to introduce such novel genetic information in a plant. The most common method is to use the bacterium (*Agrobacterium tumefaciens*) that transfers DNA to host plant cells to modify them for its own needs. Another method is particle bombardment, a transformation method based on physical principle where DNA fragments are bound to the surface of minute metal particles and shot into plant cells using specially developed devices. There are several other approaches for gene delivery such as chemical methods ($CaCl_2$ or polyethyleneglycol) and electroporation.

The key feature of GE is that the origin of the gene-of-interest is not important. Classical plant breeding is limited to the genes that occur in related, crossable plant populations. Such relatives may not carry genes for desired traits. Using GE, the donor organism may be a plant, but can also be a bacterium or even a fish: the concept of '(wild) relative' is of little relevance for plant biotechnology. When the donor is a wild, crossable plant relative, GE can make extensive backcrossing unnecessary and speed up breeding. Therefore, GE enlarges the gene pool available for crop improvement and breeding dramatically.

Aims of Gene Technology in Plants

Nowadays, GE is important in many areas of academic research to elucidate the basic biology of plants. In its applications, GE basically aims at the same improvements of crops as conventional breeding has done and still does: improved crop varieties that appeal to farmers, industries, retailers and consumers. The aim and outcome of GE is still not so very different from hybridization, but GE widens the scope of plant breeding and (potentially) accelerates the delivery of results. GE has resulted in the introduction of genetically modified (GM) crops in farmers' fields and on the consumer markets. Notably in the USA, GM crops are planted on a large scale and the adoption rate has been remarkable. GE has seen a development from input traits to output traits and there is a trend to go from simple single genes to complex multiple gene traits.

Input traits

These affect the agronomic performance of a crop such as yield and costs of production, but they do not necessarily change the final product, hence farmer's advantage. Input traits which may be assisted by GE, comprise:

- improved weed control: herbicide tolerance
- biotic stress: resistance against pests such as fungi, bacteria, viruses, insects, nematodes
- abiotic stress: tolerance against drought, salinity, mineral deficiency, heat, cold, freezing, environmental pollution

- increased efficiency of production male sterility, seed quality (dormancy, vigor)
- reduced environmental load in crop production: less spraying, less energy use, less waste, less losses
- intrinsic yield: more efficiency of plant growth in terms of mineral uses, nitrogen fixation, photosynthesis, increased seed set

Important input traits that are currently used in GM crops are herbicide tolerance and pest resistances (virus, insect, nematode). Many improvements can be expected in the understanding and use of resistance genes in enhancing the resistance of crops notably broad spectrum resistance. Future GE of input traits may allow us to change plants in such a way that low or suboptimal environments can be used for productive agriculture.

Output traits

In contrast, these traits improve the quality or economic value of the final product, rather than the agronomic performance of the crop, hence to the consumer's advantage. Output traits to be affected by GE include:

- nutritional value: vitamin content, health promoting substances, nutraceuticals
- product quality: longer shelf life, reduced allergenicity, reduced toxicity, increased consumer appeal
- specialty chemicals: specific oil, starch or fiber components for existing or innovative industrial applications, biodegradable plastics, cosmetics
- pharmaceuticals: edible vaccines, blood proteins, expensive medicines

The goals of GE for output traits go far beyond the aims of classical breeding. GM may turn plants into chemical factories for added-value compounds: the plant as a plant. By modifying metabolic pathways, common crops could be redesigned into units that produce virtually anything, from commodity chemicals to pharmaceuticals and cosmetics. Basically it is only human capacity that is limiting the range of possibilities.

Current Status of GM Crops

The GM crops now marketed generally contain a single added gene that confers a single desired trait, such as resistance to specific pests or tolerance to a specific type of herbicide.

For some time breeders argued that most important traits such as yield or quality were essentially quantitative traits determined by complex polygenic networks that would never be amenable to GE. Results from quantitative trait mapping, however, suggest that also in complex quantitative traits, relatively few genes exert the largest part of the effect. If so, GE may also be of use in improving quantitative traits.

These more advanced applications will require the stacking of several genes. The golden rice is currently the best example of multiple GE. Rice with two genes from daffodil, and a gene from a bacterium is able to accumulate β-carotene, which the human body can convert to vitamin A. The expectation is that numerous multiple genes will be stacked in varieties of crops. Future applications will also give more attention to the precise control of introduced genes. Now often so-called constitutive expression is used, but it may be advantageous to limit the expression of a given gene to specific cells or specific phases in a plant's life.

The application of GE to plant breeding is straightforward and ambitious: for any trait desired, somewhere there will be an organism that is able to do the job. The challenge is to find that organism, identify the genes involved, and transfer those genes into a suitable crop. The identification and evaluation of properties in organisms for potential application in crops, is currently a major activity in plant GE. Botanical gardens, national parks or national plant communities may be as useful as the diversity in local farming communities. Any organism in any ecosystem may contain genes that may have value in crop improvement.

In addition, GM can create novel diversity in the laboratory that has no equivalent in nature. New genes that encode improved proteins may emerge out of random recombination of existing genes. The created gene can result in a protein that has an activity far exceeding the specifications of the parental proteins. This laboratory-based accelerated evolution can be considered as the molecular equivalent of heterosis in plant breeding.

Continuing developments in large-scale and high-throughput (and high-cost) techniques, collectively known as 'genomics', will further speed up the identification and use of novel genes. Rapidly growing databases of genes, expression patterns, proteins and metabolites will speed up breeding and further expand the possibilities of GE and of plant biotechnology.

Pandora's Box or the Philosopher's Stone?

Despite the many possibilities for improvement and innovation, the GE is looked upon with considerable distrust, concern and even fear. Notably in Western Europe, GM crops are having a difficult time and Europe is trying to set the stage for the rest of the world.

The technical concerns over GE focus on safety: for example are GM crops safe to grow and consume? What will be the impacts on ecology both on farm and for biodiversity at large, and how about the toxicological characteristics of food and feed? How to determine safety and impact? Such issues can only be assessed on a case-by-case basis. Unfortunately, in all discussions, the issue of case-by-case is often overlooked. For the GM crop products now on the market, the conclusion that they are as safe as their non-GM counterparts seems well substantiated.

There is also considerable debate on the socio-economic impact of GM crops. A key issue introduced to plant breeding is 'ownership' of GE materials. The current organization of plant biotechnology in a few multinational corporations that set goals and aim to define markets may result in the situation that too few control too much. This is a legitimate concern. It should be pointed out however, that the current load of regulation, comes with a considerable cost and delay that may only be affordable by very large companies. The (over?) regulation of GM crops may therefore favors this concentration of technology that is considered by many to be undesirable.

Production of biotechnology crops in USA

Crops	Total US Crops acreage (millions)	Biotechnology crops acreage (millions)	Biotechnology crops (%)
Corn	79.6	19.9	25
Soybean	74.5	40.2	54
Cotton	15.6	9.5	61

Source: Seed Trade News, September 2000

Another important issue in all discussions is 'freedom of choice'. Consumers in Europe expect the choice between GM and non-GM food. In countries where food supply is less secure, this is sometimes looked upon with surprise and annoyance. As a result of perceived consumer demands, there are now strict GM crops labeling requirements in Europe. For example, oil coming from herbicide tolerant GM corn must be labeled as 'GM', although the oil itself in no way differs from its non-GM counterpart. Therefore, the method of production is more important than the properties of the product. For many, this labeling feeds the notion that there must be something risky with GM crops or their products. In addition, attempts to establish exclusive non-GMO production chains are being put in place. Such chains, if feasible and viable, try to make 'non-GMO' a selling point for products and producers.

Do GM Crops Have a Future?

Overall, it would seem unrealistic to assume that GM crops, or any related technology that is perceived to have value, will not be put into practice. For seed producers, the balance between benefits and perceived risks of GM crops is of vital importance. Higher seed quality (dormancy, vigor), possibly combined with novel output traits, can create new markets for seeds. However, as long as Europe in particular puts very strong restrictions on the import of GM seed and GM-derived products, the potential of markets for GM seed may be limited. Seed producers will have to develop own policies towards GM crops and GM crop research, taking into account also the newly developing variety registration and release procedures. Rules and regulations to control GM crops and seeds should satisfy the interests and concerns of both agriculture and society as a whole. The biggest challenge of GE is therefore to overcome the public's distrust of this new technology. It would be most unwise to discard the tremendous potential of GE and GM crops on the basis of largely hypothetical dangers. Current problems in world agriculture are serious enough to at least consider all the potential inputs for problem solving. *Jan-Peter Nap, BU Genomics, Plant Research International, P.O Box 16, NL-6700 AA Wageningen, The Netherlands; Fax: ++31-317-418094; E-mail: J.P.H.Nap@plant.wag-ur.nl*

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A Proposed National Biotechnology Strategy for South Africa

South Africa has a strong background in agricultural based industries and has developed many new crop varieties, some of which are used commercially throughput the world. However, South Africa has failed to exploit the more recent advances in biotechnology, particularly over the last 25 years with the emergence of genomic sciences (the so-called 3rd generation). Already many private companies and public institutions elsewhere in the world are offering products and services that have arisen from the new biotechnology. In the USA alone, there are 300 public biotechnology companies with an investment of $353 billion and an annual turnover of $22 billion. Moreover, the growth of biotechnology industries is not restricted to the most developed countries. Brazil, China and Cuba have quickly identified the potential benefits of the technology and have taken measures both to develop such industries and to extract value where possible.

The proposed new strategy is designed to stimulate the growth of similar activities in South Africa. Biotechnology can make an important contribution to national priorities, particularly in human health, food security and environmental sustainability. To achieve success, a country requires a government agency to support biotechnology, to build human resources, and to develop scientific and technological capacity. In addition, successful commercialisation of public sector-supported research and development requires strong linkages between institutions and a vibrant culture of innovation and entrepreneurship, assisted by incubators, supply-side measures and other supporting programs and institutions.

Some of these components of a successful biotechnology sector are already in place in South Africa. However, a number of gaps are identified in this document and certain interventions are suggested to address these problems. The recommendations are divided into two categories, namely new institutional arrangements and specific actions for Government departments. For the former, the Panel has recommended the establishment of a Biotechnology Advisory Committee (BAC), under the auspices of the Cabinet's Economics Cluster, the responsibilities of which will include the implementation of this strategy, coordination of biotechnology research and development and alignment with national priorities.

A key component of the strategy is the creation of several Regional Innovation Centers to act as nuclei for the development of biotechnology platforms, from which a range of businesses offering new products and services can be developed. The Regional Innovation Centers will work in close collaboration with academia and business to become active nodes for the growth of the biotechnology sector. Using both existing funds and new allocations specifically designated for biotechnology, and employing well-trained scientists, engineers and technologists in a multi-disciplinary environment, the centers will stimulate the creation of new intellectual property. The successful protection and exploitation of this will be made possible by a new venture capital fund and an array of new and existing support structures. It is emphasized that the main focus of the Regional Innovation Centers will be the creation of economic growth and employment through innovation.

A number of recommendations are made to Government, both financial and policy support, for the formation of the Biotechnology Advisory Committee, which will be responsible for the implementation of this strategy. The proposed actions will require an annual budget of $22 million, of which $16 million is required for the funding of the Regional Innovation Centers and the associated research and development programs, $2.4 million for the venture capital fund, $3 million for additional funding to strengthen the link between academia and industry and $0.24 million to run the Biotechnology Advisory Committee, plus a once-off establishment cost of $5.5 million for the Regional Innovation Centers. This document also urges the Government to complete regulatory reforms including the extension of the activities of the Bio-ethics Committee and the revision of the Patents Act for the strategy to be successful.

Finally, careful attention must be given to the development of the appropriate human resources and to the public understanding of biotechnology. It is Government's responsibility to ensure that new biotechnology products or services do not threaten the environment or human life, or undermine ethics and human rights. Several actions to meet these responsibilities are also proposed in this document.
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Regional Seed Initiatives in Africa

In the past three years there has been considerable interest in regional initiatives to assist seed sector development, and particularly so in Africa. The reason for this can be traced to the increasing emphasis being given to the role of the private sector in national seed programs. In the past when governments were the major players in seed supply, they naturally concentrated all their efforts on the national seed requirement in which seed security and self-sufficiency were major concerns. With economic liberalisation and policy reform, governments are withdrawing from production in many countries and the private sector is becoming more active in the commercial functions of production and marketing. However company operations are seldom defined by national boundaries, they seek to maximise the market for their products wherever opportunities exist.

Unfortunately, the regulations developed by each country independently in the past often do not help this process. National variety release systems often took no account of results from an adjoining country with similar climatic conditions. Similarly, seed regulations were often incompatible causing bureaucratic delays in the preparation or movement of consignments. These experiences have prompted moves to facilitate the movement of seeds and varieties across national borders, thus allowing a growth in regional trade. In regions prone to climatic instability, there is a strong seed security dimension in this for it is clearly helpful if seed can be moved quickly into areas where there has been a crop failure.

The key word in this process is harmonisation of regulations to minimise these barriers and there are two main targets in view. For variety registration, the ultimate goal would be a regional variety list, composed of the lists of all the contributing countries, an approach which was adopted by the European Union many years ago by means of the 'Common Catalogue'. For seed movement, a regional seed certification scheme with common standards and procedures would be very beneficial. A third area is phytosanitary regulations and this is potentially the most difficult, but there is a general trend to revise these regulations now in order to reflect a real 'risk assessment'.

One obvious problem with such efforts is to define the geographical scope of the region and the participating countries. It should naturally start with a grouping which have similar agro-ecology and traditional commercial or transport links. Two such initiatives have been unfolding in Africa over the past two years. One is based in East Africa under the aegis of ASARECA – the Association for Strengthening Agricultural Research in East and Central Africa. It currently involves Kenya, Tanzania and Uganda, who are currently rebuilding the economic partnership of the former East African Community, but expansion to other neighbouring countries is already being discussed. The other is in Southern Africa with Malawi, Mozambique, Zambia and Zimbabwe as the first participants under the umbrella of SADC – the Southern Africa Development Council. This is a product of the Sub-Saharan Seed Initiative (SSASI) of the World Bank. A detailed account of both these regional initiatives will appear in the next issue of Seed Info.

Two other Africa-wide developments should also be noted here. One is the establishment of the African Seed Trade Association (AFSTA) whose first Annual Congress in Cairo in March 2001 was reported in the last Seed Info. This Association represents the commercial sector which will actively support the harmonisation agenda. The other is the African Seed Network, which was established at the first FAO regional seed meeting in Abidjan in November 1998. This has a defined coordinating structure and a large framework program of activities for all of Sub-Saharan Africa, but to date little funding has been secured to implement them. However, in the summer of 2001, the Government of France has committed a sum of $250,000 to supporting one component of the Network, again concerned with harmonisation of seed regulations.

It is clear from all these activities that harmonisation is now high on the seed agenda. It is not an easy topic, having both technical and political dimensions, but it is one new front to which donor funds are being directed, with both commercial and seed security objectives in view. This reflects yet again the increasing role of policies as a tool to shape seed program development, now that the era of major capital projects is past. We look forward to further activities of this kind in the WANA region also.
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Expert Consultation Meeting on Vegetable Seed Production in the Near East and North Africa

Vegetable production is a major activity in many countries of the Near East Region. Despite significant progresses in vegetable seed industry elsewhere particularly in hybrids, the Near East and North Africa (NENA) region is lagging behind due to several constraints. These include:

- limited research in vegetable crop production and lack of necessary germplasm and breeding materials
- under developed and poor physical resources and infrastructure
- shortage of technical and skilled manpower in the sector
- limited financial resources and lack of private sector investments
- lack of cooperation and linkages among regional and international agencies and seed programs at sub- or regional levels

In view of these constraints, the FAO Regional Office for the Near East (FAO-RNE) organized an Expert Consultation Meeting on the Status of Seed Production of Vegetable Crops in the Near East and North Africa Region from 11-13 November 2001 in Cairo, Egypt. The meeting was organized jointly with Central Laboratory of Agriculture Climate and Agricultural Research Center in Egypt.

The main objectives of the meeting were:

- review the status of vegetable seed production with reference to policy, regulatory, technical, institutional and economic issues
- identify major constraints for investment in vegetable seed industry and set the priorities
- identify national policy options to encourage vegetable seed production (model policy)
- discuss options to strengthen and develop cooperative programs for sustainable vegetable seed industry at national and regional levels
- discuss ways of developing database of organizations and facilities available for vegetable seed production (seed directory)
- identify the means and resources needed to develop and maintain proper database on research, seed needs and availability and production of horticultural crops
- discuss ways to create avenues for the dissemination of information through an interactive homepage on the worldwide web

The meeting discussed policy, regulatory, technical and institutional issues related to vegetable seed production in the region within the context of globalisation of world economy. Technical issues covered breeding activities (genetic engineering, hybrid seed production), seed marketing, investment opportunities and role of international seed companies. The meeting also reviewed the roles and partnerships of governments, private sector and NGO's in vegetable seed industry.

The meeting recommended that Governments in the region be encouraged to: (i) adopt open regulations (voluntary certification, minimum standards) to allow farmers, seed companies and researchers to access better varieties, remove obstacles to seed export, reduce seed production costs and establish variety protection; (ii) design and implement policies and programs to facilitate and assist local private breeding and seed production including regulatory reforms, public research, public-private collaboration, licensing of public varieties and tax incentives; (iii) promote regional cooperation for seed industry development, focusing on reducing phytosaniatry barriers, promoting germplasm exchange, encouraging harmonization of seed regulations; (iv) enforce truthful labeling and assist farmers through demonstrations and extension advice; and (v) plan for manpower development through national and regional programs for degree and in-service training. The vegetable seed companies should be encouraged to take full advantage of opportunities that may exist for joint ventures, contract production for export, licensing foreign varieties, and possible linkages with foreign vegetable seed companies and global seed trade. The international and regional organizations and funding agencies are also requested to look for available opportunities to assist the development of private sector vegetable seed industries in the region.

Thirty seven participants from Egypt, Jordan, Lebanon, Libya, Morocco, Syria, Tunisia and Turkey as well as international organizations such as AOAD, GTZ, GNIS and FIS attended the meeting. *Salah Abd El Wanis, Egyptian-German Cotton Sector Promotion Program, c/o GTZ Office, 4 D, El Gezira Street, Zamalek, Cairo 11211, Egypt; Fax: ++20-2-3365415; E-mail: cspp@idsc.gov.eg*

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Report from the 26th ISTA Congress

The 26th Congress of the International Seed Testing Association took place in Angers, France from 14-22 June 2001. It was held in the excellent facilities of the Angers Congress Center and attracted over 500 participants from some 83 countries. As usual, the meeting had two distinct parts, the first three days being devoted to the 'Seed Symposium' followed by the Ordinary Meeting of the Association on the last two days.

In addition, three specialist Workshops were held and the 17 technical committees met to discuss and prepare the reports of their work over the past three years since the last Congress in Pretoria, South Africa in 1998. Technical visits were arranged to several institutions in the vicinity, Angers now being a major center for plant science work in France. For the ISTA fraternity, the visit to the national seed laboratory of GEVES was a high point, this being probably one of the largest and best equipped official laboratories in the world.

The Symposium provided an opportunity to present papers on a wide range of topics in seed science and technology. These were grouped into 6 sessions covering the following subjects: (i) producing quality seed, (ii) post-harvest seed technology, (iii) assessing seed quality, (iv) seed lot hygiene, (v) seed development and germination, and (vi) mechanisms of seed damage and repair. The oral presentations were supplemented by a large poster display of 130 contributions.

The Ordinary Meeting is the main decision making body of the Association at which the important business is discussed. In recent years, this meeting has had to consider some major changes in the structure and operation of ISTA, such as the introduction of new accreditation procedures and the admission of private laboratories. This process of adjustment to the changing global environment continues and this year a discussion paper entitled 'Strategic Directions for ISTA' was presented to the Executive Committee, as a synthesis of these challenges and possible responses.

This paper sets out ISTA's vision to be *'an international seed science and technology based association, non-political and not-for-profit, legally independent from both governments and commerce, for seed technology, development and validation of seed sampling and testing methods, accreditation of laboratories and issuance of certificates'*. This vision statement is followed by a list of objectives, clients and partners, and principle activities. To accelerate the implementation of change, there will be annual meetings of the association from now on, although the Congress including Seed Symposium will continue to be held every three years. Also discussion was started among the ISTA membership to review the link between ISTA and the governments.

One change agreed at this meeting was the creation of the new post of 'Secretary General' to replace the Executive Officer and we congratulate Dr Michael Muschick on his elevation to this new position. The Secretary General manages ISTA under the authority and the control of the Executive Committee. This coincides with the departure of Prof. Attilio Lovato from the position of Honorary Secretary Treasurer which he has held since 1989. The Meeting took the opportunity to honour his remarkable service to ISTA, which spans nearly 40 years, for which he received the title of Honorary President of ISTA.

Another key decision of the Ordinary Meeting concerned the accreditation of seed testing laboratories, including company laboratories and seed lot samplers. As a result of this decision including the governance of the Association, the Constitution of ISTA was revised to take account of these changes.

A definitive position paper was presented concerning the maximum size of seed lots – an item which has been the subject of discussions with the commercial seed trade for many years. A comprehensive review of the literature on the heterogeneity of seed lots has been made and ISTA concluded that it cannot actively promote a change of the ISTA Rules towards increasing the maximum size of seed lots (detailed information on 'ISTA Position Paper concerning the increase or repeal of ISTA maximum seed lot size' will be published in the next issue of Seed Info in July 2002).

Despite the rapid pace of change in the global seed industry, the ISTA Congress remains the major international event for those involved in seed research, testing and regulatory matters to meet for both formal and informal discussions. In many countries, there are now fewer staff and much less time available to devote to work for ISTA in governmental seed testing stations, which has traditionally relied heavily on those 'voluntary contributions'. On the other hand, it was reassuring to see so many countries, from the developing world, and from the transitional economies. Seed Info readers should note that the membership of countries and laboratories in ISTA is open and any interested person is most welcome to participate in the vital technical work of ISTA. This is undertaken through the medium of the various technical committees which remains the heart of the organisation, however, the voting rights are held by the governments.

Further information about ISTA, including contact persons for these committees, can be found at the website: http://www. seedtest.org. *Michael Turner, Seed Unit, ICARDA, P.O. Box 5466, Aleppo, Syria; E-mail: M.Turner.cgiar.org*

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FAO Conference Approved Treaty on Plant Genetic Resources

According to the press release of the Food and Agriculture Organization (FAO), the 31st Session of the Governing Conference of the United Nations Food and Agriculture Organization consisting of the Ministers of Agriculture and senior officials of member countries approved an International Treaty on Plant Genetic Resources for Food and Agriculture intended to ensure access to plant genetic diversity while taking into consideration the needs of farmers and plant breeders. The Treaty is considered a major step towards guaranteeing the future availability of the diversity of plant genetic resources for food and agriculture on which farmers and breeders depend, as well as a fair and equitable sharing of benefits. For more information on the treaty please contact FAO or visit the website at http://www.fao.org

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New Director Appointed for Asia and Pacific Seed Association

The Asia and Pacific Seed Association (APSA) announced the appointment of a new Director, Dr. J. S. Sindhu. Dr. Sindhu holds a PhD in genetics and plant breeding and has published over 100 research papers in international journals.

He has been involved in the seed industry for the last 30 years, most recently as Director of International Business Development at Proagro Seed (Aventis) in New Delhi, India. Having been actively involved in seed industry development in Africa and Asia for the last 10 years, Dr. Sindhu is eminently qualified to continue the work of developing Asia's seed industry through the APSA Directorship.

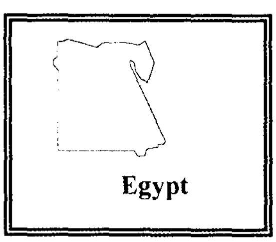
Dr. Sindhu took office in Bangkok on 15 October 2001 and can be reached at director@apsaseed.com. For further details please contact: APSA, P.O. Box 1030, Kasetsart Post Office Bangkok 10903, Thailand; Tel: ++ 66 2 940 5464; Fax: ++ 66 2 940 5467; E-mail: apsa@apsaseed.com; Website: http://www.apsaseed.com.

CONTRIBUTIONS from SEED PROGRAMS and PROJECTS

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

News from the National Seed Program of Egypt

New Director for Central Adminstration for Seed Certification



Mr Ahmed Mohamed Hussein became the Director General of the Central Administration for Seed Certification and Testing (CASC) from January 2002 after the retirement of Mr Fawzy Shaheen at the end of 2001. CASC is an independent organization responsible for seed quality control, certification and law enforcement. It has five general directorates: (1) Field Inspection, Testing and Retesting, (2) Seed Testing Affairs in the Governorates, (3) Seed Certification; (4) Gins and Oil Mills; and (5) Seed Measures and Development. The main responsibilities are implementing variety registration and plant variety protection; seed certification; seed market control and law enforcement; licensing of seed producers, processors, traders and dealers; and seed industry support, training and promotion. CASC also serves as a technical secretariat for variety registration, crop seed and other specialized councils and their sub-committees (Seed Council, Cotton Council).

CASC administers seed certification and law enforcement units through 22 regional seed certification directorates and 12 seed testing stations. Control plot testing is carried out in two locations to ensure quality of seed lots used for further multiplication and to monitor the efficiency of seed certification.

Ministerial Decree for Testing Vegetable Varieties

The Ministry of Agriculture and Agrarian Reform issued a Ministerial Decree No 1648 of 2001 for testing new vegetable varieties imported from the OECD countries.

The Ministry after reviewing: (a) Agriculture Law No 52 of 1966 and its amendments, (b) Ministerial Decree No 52 of 1998 for registration of agricultural crop varieties; and (c) Ministerial Decree No 1064 of 1995, has decreed to:

1. Exempt vegetable crop varieties imported from OECD member countries from the Ministerial Decree No 1064 of 1995 which determines agricultural crops on which clause No 10 of chapter 2 of the Agriculture Law No 52 of 1966 applies
2. Test vegetable crop varieties imported from OECD member countries for adaptation and pest resistance for the following periods:
   (a) One year for hybrid varieties grown in greenhouses
   (b) Two similar and consecutive seasons for varieties grown in open fields

The decree is expected to facilitate registration and commercialization of varieties and promote the vegetable seed industry. This decree enters into force on the date it has been published. *Salah Abd El Wanis, Consultant, Egyptian-German Cotton Sector Promotion Program (CSPP), c/o GTZ office, 4 D, El Gezira Street, Zamalek, Cairo 11211, Egypt; Fax: ++20-2-3365415; E-mail: cspp@idsc.gov.eg*

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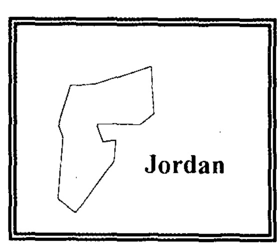
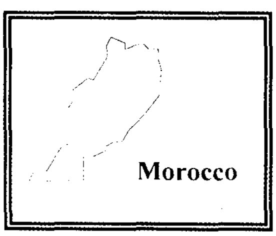
Jordan Enacted Plant Variety Protection Law



In 2000, the Government of Jordan enacted the law for the protection of new plant varieties. The Law No. 24 of 2000 was published in the official gazette on the second of July 2000 and became legal thirty days from the day of its official publication. A technical committee formed by the Ministry of Agriculture worked for over a year in preparing the law until it was officially released. The United States Agency for International Development (USAID) provided assistance through the AMIR (Access to Micro Finance and Improved Implementation of Policy Reform) program where a number of visiting experts and national lawyers were consulted. The related conventions and agreements of WTO and UPOV were taken into consideration in preparing the document. The law deals with the conditions, requirements and procedures for granting the protection for new plant varieties and other related legal issues such as right of priority, provisional protection, publication, licensing, ownership, cancellation of the registration, general rules and variety denomination. Under this law the four essential conditions for granting the protection to a variety are d*istinctness, uniformity, stability and novelty*.

The Ministry of Agriculture will prepare related regulations and directions of the law. It is expected that the Ministry will start implementing the law during the second half of the year 2002. *Adnan Abdel Nour, Plant Production Department, Ministry of Agriculture, P.O. Box 408, Amman 11953, Jordan; Fax: 962-06-5686310; E-mail: adnanabdel_nour@hotmail.Com*

A Short Note on the Moroccan Seed Industry



In Morocco the formal seed sector has a relatively long history, having started in the early 1920s. The first regulations on seed were issued in the 1940s. However, the current law dates back to 1969 when the regulation for production and marketing of seed and planting material was issued.

Annual certified seed production varies from 45,000 tonnes to over 100,000 tonnes, with an average of 70,000 tonnes, mostly of cereal crops (wheat and barley), which account for almost 98% of the total production. About 12% of seed of these crops are imported while the rest is locally produced. For crops such as vegetables, fodder and sugar beet, almost all seed is imported from Europe, Unites States of America and especially Australia. The private companies play a major role in seed import. Morocco exports faba bean and pea seed.

Before 1988, the Societé Nationale de Commercialisation de Semences (SONACOS) enjoyed a monopoly in cereal seed production. The seed sector has been opening up progressively since that time, although the contribution of the private sector in cereal seed production still remains low (< 5%). Measures are now being taken to increase the contribution of the private sector. Maize, sorghum, legumes, fodder and vegetables are mostly marketed by the private sector.

The Service de Contrôle des Semences et Plantes is responsible for seed quality control and certification. The agency is represented by 14 regional inspection offices which are responsible for field inspection and sampling, labeling and sealing of seed. The organization has a central seed testing laboratory in Rabat, which has been a member of ISTA since 1964. The laboratory tests about 7,000 samples annually and has a storage capacity for 12,000 seed samples. There is staff of 80, of which 60 are located in regional offices.

To achieve the goal of the National Seed Plan of 200,000 tonnes per year by 2008, the establishment of an additional laboratory in Meknès is foreseen to control seed production in the eastern region of the country. In the coming years, the establishment of private laboratories is also anticipated due to the increasing role of the private sector.

The current regulations require imported seed to be accompanied by an ISTA Orange Certificate from the Designated Authority of the issuing country, regardless of the nature of the laboratory having undertaken the tests. Nevertheless, imported seed is subjected to further control in order to check the quality, without, however, affecting international seed trade. *Mohamed Tourkmani, Service de Contrôl des Semences et des Plants, P.O. Box 1308, Rabat. Fax: ++212-3-7779852; E-mail: Tourkmani@francite.com.* ***Source: ISTA News Bulletin 121, December 2000***

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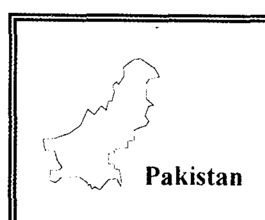
Pakistan to Boost Horticultural Seed Production



The Pakistan seed industry has made significant progress in commercialization of seed of wheat, rice, maize, sunflower and cotton over the last 25 years. However, the horticulture seed industry, especially for vegetable seed continues to depend on imports. The government has established a Horticultural Export Board to devise and implement an export-oriented marketing strategy to increase horticultural exports from $119 million to over $600 million by 2003-4.

Such a strategy can only be achieved by providing good quality planting material to increase production and product quality to compete in the international market.

Despite suitable climatic conditions to produce various vegetable seed, imports remain at a high level. During 1999-2000, the country imported 3,553.5 tonnes of vegetable seed valued at over Rs 347 million. Although national seed companies have been trying to produce okra and pea seed locally, they face serious competition in marketing their seed from indiscriminate import by traders.

In North West Frontier Province (NWFP), the Project for Horticulture Promotion (PHP) is collaborating with the regional office of the Federal Seed Certification and Registration Department (FSCRD) to organize certified vegetable seed production with smallholders' associations in the province. The project aimed also at improving the livelihood of these small farmers through increased production and income adding value to their product. PHP and NWFP Seed Council approved one variety each of okra, onion, radish and pea to facilitate seed production and supply. Moreover, there are efforts by Federal Seed Certification and Registration Department in conducting variety registration of fruit crops. The organization of formal variety registration and quality control is expected to improve fruit production resulting in increased income of farmers and better quality fruits on the market.

In another development, the Agribusiness Conference held in April 2001 in Islamabad has recommended the introduction of a Biodiversity Law and Plant Breeder's Rights Act to take advantage of biotechnology, protect the breeder's rights and stimulate the seed industry. (*Editor's Note: This information is extracted from The Seed News, April- June 2001*)

HOW TO

In this section we provide technical/practical information that seed sector staff may find useful in issues related to seed production and quality control.

How to No 24: Developing Standard Operating Procedures (SOPs) for Seed Testing Laboratory

In the last three issues of Seed Info, calibration of analytical balances, germination cabinets and germination media were discussed. In this issue of Seed Info the focus is on operating procedures for seed testing.

In seed testing, the quality assurance program is based on establishing and applying rigorous and demonstrable process control. This can be achieved through use of good quality equipment, regular calibration of equipment and well organized working procedures.

Under the new ISTA accreditation system, preparation of detailed Standard Operating Procedures (SOPs) for each of the tests performed in a seed testing laboratory is one of the major criteria for accreditation. These Standard Operating Procedures should be:

- prepared in the same sequence that the job is executed in a descriptive or flow chart format
- simple and user friendly, preferably prepared by those who do the job themselves using their own working language
- laboratory and seed analyst specific, explaining exactly how a seed analyst uses the equipment in this particular laboratory

The Standard Operating Procedures for each test include:

- the purpose of the test to be carried
- the scope of the test i.e. for which crops
- a detailed procedure including all the steps for the test to be carried (processes)
- responsibilities (who does what)
- the equipment to be used
- references (documents to refer)

After preparing the SOPs in writing or as flow chart, these instructions are printed and clearly displayed in the working place or kept in a folder which is known and easily accessible to all users.
Abdoul Aziz Niane, Seed Unit, ICARDA, P.O. Box 5466, Aleppo, Syria; E-mail: a.niane@cgiar.org

RESEARCH NOTES

Short communications of practical oriented research/information in agriculture or seed science and technology are presented in this section

Using Scanners to Improve Seed and Seedling Evaluations

Introduction

Seed analysis is a subjective skill relying on the knowledge and expertise of the analyst. As a result, seed testing organizations regularly conduct referee and ring testing programs by which seed analysts evaluate the same seed samples to assure themselves that results are consistent between laboratories. This uniformity of seed testing is vital to ensure the orderly marketing of seeds. To assist standardization, seed analysts have traditionally relied on educational media such as reference texts, handbooks, manuals, and herbaria. A major limitation of these current identification systems is the inability to share actual seed and seedling specimens with those more skilled in their evaluation. Advances in computer technology offer the promise of (i) easily and cheaply digitizing seed and seedling images using scanners and (ii) rapidly conveying digitized images of seeds and seedlings via e-mail attachments or visits to websites where specimen libraries are maintained. The objective of this study was to develop an imaging platform that could be adapted in a routine seed testing laboratory at little cost to enhance the standardization of purity and germination testing.

Materials and Methods

Seeds: Seeds were placed directly on a flat bed scanner (Hewlett Packard ScanJet 6300C), covered with a green cellophane paper to provide uniform contrast, and captured at maximum resolution (1200 dpi).

Seedlings: Seeds of lettuce (*Lactuca sativa* L.) and cucumber (*Cucumis sativus* L.) were germinated on two saturated blue blotters (Anchor Paper Co.) in the lids of 15 x 23 mm plastic boxes. The seeds were vacuum planted in two horizontal rows of 25 seeds each for lettuce, 5 cm each from the top and the bottom of the blotters, and one horizontal row of 15 seeds for cucumber. After planting, the plastic boxes containing the seeds were placed at an angle of 85° from horizontal in a germinator set at 20°C for lettuce and 20-30°C for cucumber. After 3 days, the plastic lid containing the seedlings was placed on a drawer that was closed under a scanner (UMAX Astra 2000) attached upside-down to the top of a metal box and the images captured at 1200 dpi for photographic reproduction (Fig 1).

Computer: The computer used in this study was a Dell Dimension XPST, 700 MHz, Pentium III with 256 MB SDRAM memory and a 20.4 GB hard drive.

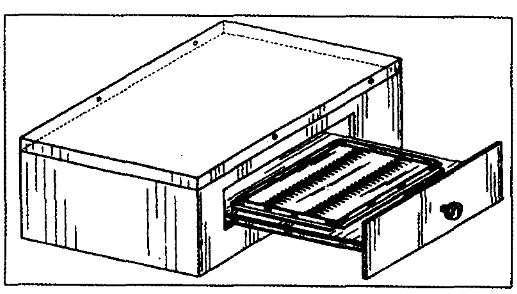


Fig 1. Diagrammatic representation of metal box containing an enclosed scanner fixed upside-down to the lid of the box

Results and Discussion

Images of seeds (Fig 2) could be captured in less than one minute. For seedling images, seeds were germinated in a near vertical position (85°) on standard blue blotters. This approach provided visibility of the entire shoot and root on a uniform plane against a contrasting color. Germinated seedlings are placed on the drawer of the box, the drawer closed, and the scanner images the seedlings.

Not all scanners examined functioned upside-down, so it is important to select a scanner that can operate in this position. This approach is superior to inverting seedlings on a traditional flat bed because the seedlings sometimes fall from the blotter or move so that features become obscured. A further advantage is that root hairs and other delicate structures are not disturbed. It should be emphasized that this scanner possessed a depth of field of at least one centimeter ensuring that all seedling structures remained in focus.

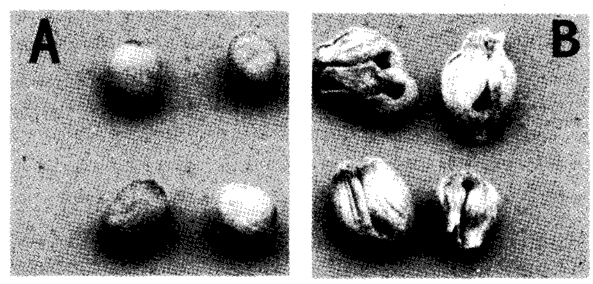


Fig 2. Seeds scanned by HP Scan Jet 6300C flat bed scanner: (A) Radish and (B) Buffalo grass

Once the seedlings are scanned and digitized into high definition files (1200 dpi), they can be cut and pasted for direct comparison(s) with normal and abnormal seedlings, labeled for structure identification, or saved as compressed JPEG file e-mail attachments for confirmation of normal/abnormal categorization by other seed analysts (Fig 3).

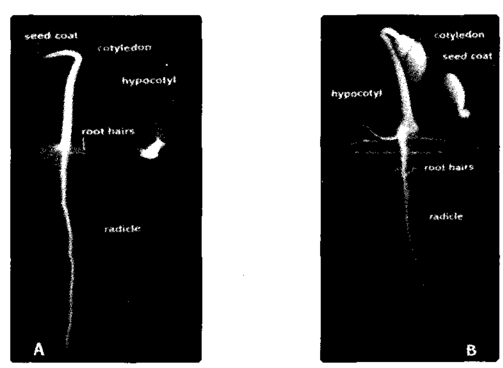


Figure 3. Normal and abnormal lettuce (A) and cucumber (B) seedlings cut and pasted from a germination blotter

Conclusions

This study has demonstrated that flat bed scanners in conjunction with commonly available software to manipulate the digitized seed/seedling images can serve as useful additional tool in a seed testing laboratory. They possess the following advantages:

- Low cost – each scanner costs less than $300
- Simple operation by the seed analyst
- Rapid production of digitized images with good depth of field and without lighting
- Once captured, the seed and seedling images can be magnified, cut and pasted or sent electronically

This study has demonstrated that (i) scanners permit an economical and high quality digitization of seed and seedling images, (ii) captured images can be stored to develop a comprehensive library of seeds and/or seedlings for future training of seed analysts, and (iii) compressed images can be promptly sent via the internet to others for comparison. *M.B. McDonald, A.F. Evans and M.A. Bennett, Department of Horticulture and Crop Science, The Ohio State University, Columbus, OH 43210-1086, USA; E-mail: mcdonald.2@osu.edu: Source: Reports July 2000 (Editor: For more information on image of seeds visit the website: http://www.ag.ohio-state.edu/˜seedbio/seed_id)*

MEETINGS and COURSES

Announcements of meetings, seminars, workshops and training courses are made. Please send us announcements for national, regional and international training courses, seminars and workshops for inclusion in the next issue.

Conferences

FIS/ASSINSEL, World Seed Congress, 27-30 May 2002, Chicago, USA. The meeting will announce the official merger of the International Seed Trade Federation (FIS) and the International Association of Plant Breeders for the Protection of Plant Varieties (ASSINSEL), to form the new organization called the International Seed Federation (ISF). Please contact Mary O'Connor & Company for further information: 335 North River Street, Suite 203 Batavia, IL 60510, 630-482-3253; E-mail: info@worldseed2002.com. You may also contact FIS Secretariat or visit the website at http:// www.worldseed.org

18th Pan American Seed Seminar, 1-3 July 2002, Santa Cruz de La Sierra, Bolivia. The seminar will be organized by FELAS (The Latin America Seed Producers Federation) under the theme 'World Forum: Impact of GMO Products Use on International Trade'. The Pan American Seed Seminar is the major technical, business and discussion forum where Latin American countries deliberate and analyze policies in the seed industry with participants from other parts of the world. For more information visit the webiste: http://www.panamericanodesemillas.com.

OECD Annual Meeting, 24-28 June 2002, Santa Cruz de la Sierra, Bolivia. National authorities from member countries from all over the world will meet to debate topics regarding the certification systems with the purpose of facilitating the international movement of seeds. For more details visit the website: http://www.oecd.org.

ISTA Extraordinary Meeting 3-6 July 2002, Santa Cruz de la Sierra, Bolivia. This is ISTA Meeting following the Pan American Seed Seminar. For more details contact ISTA Secretariat or visit the website at http://www.seedtest.org.

Courses

Crop Choices for Mediterranean Rainfed Conditions: Technical and Socio-economic Criteria, 6-17 April 2002, Algiers, Algeria. The course will be organized by Instituto Agronómico Mediterráneo de Zaragoza (IAMZ, Spain), Institut Technique des Grandes Cultures (ITGC, Algeria) and the International Center for Agricultural Research in the Dry Areas (ICARDA, Syria) with the contribution of the European Union. The objective of the course is to provide the necessary methodological and technical elements that may assist decision making in the choice of crops for Mediterranean rainfed areas. The program includes both a macro-economic approach for the establishment of agricultural policies and a micro-economic approach to help farmers make the correct decisions when selecting crops taking into account market opportunities at local, national and international levels. Simultaneous translation into English or French will be provided during the course.

For more information please contact: IAMZ Apartado 202, 50080 Zaragoza, Spain; Tel: ++34-976-716000; Fax: ++34-976-716001 E-mail: iamz @iamz.ciheam.org Website: http://www.iamz.ciheam.org

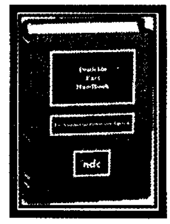
Seed Production and Seed Technology, 29 April - 5 July 2002, Wageningen, The Netherlands. The objective of the course is to provide participants with the broader knowledge and skills to effectively identify, plan and implement seed programs focusing on policy and regulatory issues (PVP); seed production agronomy, seed processing, post-harvest operations; seed quality control and assurance systems; and socio-economic aspects of seed programs. The full course runs for a period of 10 weeks, and consists of five stand-alone modules each of two weeks: (1) Seed Quality Aspects and Information Technology, 29April - 10 May; (2) Seed Enterprise Development, 13-24May, (3) Management of Seed Programs, 27 May – 7 June, (4) Plant Variety Protection 10-21 June, and (5) Seed Technology: Agronomy, Storage and Marketing 24 June - 5 July.

Fellowships are available from the Netherlands for nationals of developing countries for full courses only. Applicants for fellowships should submit their application to the Netherlands Embassy/ Consulate in their home country. Applicants should have at least a BSc degree or equivalent in agriculture, a minimum of three years experience and be competent in the English language. For more details contact: IAC, PO Box 88, 6700 AB Wageningen, The Netherlands; Fax: ++31-317-418552; Email: Training@iac-agro.nl; Website: http://www.iac-agro.nl.

Sustainable Agriculture in an Environmental Perspective from 2 September -18 October 2002, Svalöf Weibull AB, Sweden. The contents of the course are: (1) The challenge (food needs and resource availability, elements of sustainable agriculture, environmental problems etc); (2) Ecological basis of agricultural production; (3) Plant breeding and biotechnology; (4) Planning and monitoring; (5) Agriculture in a sustainable society; and (6) Policy instruments. For more information contact: Per Anderson, Director of Program, Svalöf Weibull AB, SE-26881, Svalöv, Sweden: Telefax: ++46-418-667109; E-mail: marie.hardfors@swseed.se; Website: http:// www. swseed.se.

LITERATURE

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



R. Tripp. 2001. Seed Provision and Agricultural Development: The Institutions of Rural Change. Many of the current controversies over globalisation, intellectual property protection, biotechnology and the future of farming are played out in seed provision. The book provides a detailed look at the strengths and weaknesses of seed management in traditional farming systems, reviews the history of formal plant breeding and the origins of seed trade, and examines contemporary seed systems of industrialised and developing countries. The book also describes the major types of aid interventions in developing country seed systems and explains why many of these have not been successful. Examples are drawn from original research in Asia, Africa and Latin America as well as from an extensive review of the literature. The result is a comprehensive picture of seed provision that allows the reader to go beyond the oversimplified views that dominate debates about agricultural development. Price: £14.95 and plus postage. To order: publications@odi.org.uk or website: http:// www.odi.org.uk/publications/order.html

Seed Technologists Training Manual This manual represents the most comprehensive coverage of seed testing technology with over 450 pages, 150 color photographs, and 735 drawings of seeds presented in 15 chapters and authored by the most prominent specialists in the field. The chapters include: (i)The Importance of Seed Testing. (ii) Basic Botany for Seed Testing, (iii) Seed Identification, (iv) Seed Sampling and Sub sampling, (v) Seed Moisture Testing, (vi) Seed Enhancement Technologies, (vii) Physical Purity Testing, (viii) Seed Germination Testing, (ix) Seed Dormancy, (x) Seed Viability Tests, (xi) Seed Vigor Testing, (xii) Seed Pathology (Health) Testing, (xiii) Seed Testing Tolerances, (xiv) Genetic Purity Testing, and (xv) Using Scanners to Improve Seed/Seedling Evaluations

In addition to conventional cultivar purity testing, herbicide bioassay testing, enzyme linked immunosorbent assay, electrophoresis and polymerase chain reaction technologies are included. This excellent manual will be of value to trainee and practicing seed technologists, students, researchers and government agencies. Please contact The Society of Commercial Seed Technologists, c/o Andy Evans, 2021 Coffey Rd., 202 Kottman Hall, Colombus, Ohio 43210, USA; E-mail: evans@osu.edu; Website: http://www.seed technology.net

Post Graduate Diploma or MSc
by
Attendance or Distance Learning

1. Post-Harvest Horticulture

The program examines the principles and practices fundamental to good post-harvest management applicable to perishable horticultural produce in tropical, sub-tropical and temperate climates.

2. Grain Storage Management

The program examines the principles and practices of handing cereal grains, pulses, oilseeds and other durable food commodities at all levels in the post-harvest system, applicable to tropical and sub-tropical climates.

In both courses participants are provided with the skills needed to evaluate existing commodity management systems, design and introduce improvements, and communicate effectively with policy makers and with colleagues in multi-disciplinary teams. The program also investigates operational and managerial implications of rapidly changing technologies relevant to post harvest horticulture or grain storage. Information can be obtained from: Natural Resources Institute, Training Support Unit, Medway University Campus, Chatham Maritime, Kent ME4 4TB, UK; Fax: ++44-1634-883577; E-mail: nri-training@gre.ac.uk.

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Please return to: WANA Seed Network Secretariat, Seed Unit, ICARDA, P.O. Box 5466, Aleppo, Syria; Fax: ++ 963-21-2213490, 2225105, 2551860; E-mail: Z.Bishaw@cgiar.org