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V.3 MA. Pugliese UPP

Final Press Release

Second World Seed Conference, Rome September 8-10 2009

World food security: urgent measures on seed needed

September 10 2009, Rome – Urgent government measures and increased public and private investment in the seed sector are required for the long term if agriculture is to meet the challenge of food security in the context of population growth and climate change. This was the declaration of the Second World Seed Conference held at the FAO Headquarters in Rome, September 8-10, 2009.

Governments are strongly encouraged to implement a predictable, reliable, user friendly and affordable regulatory environment to ensure that farmers have access to high quality seed at a fair price.

In particular, FAO member countries are urged to participate in the internationally harmonized systems of the Organization for Economic Cooperation and Development (OECD), the International Union for the Protection of New Varieties of Plants (UPOV), the International Treaty on Plant and Genetic Resources for Food and Agriculture (ITPGRFA) and the International Seed Testing Association (ISTA).

Participation in those systems will facilitate the availability of germplasm, new plant varieties and high quality seed for the benefit of their farmers, without which their ability to respond to the challenges ahead will be substantially impaired.

The Conference emphasized the important role of both the public and the private sectors to meet the challenges ahead and the benefits when the two work together.

The Second World Seed Conference emphasized that agriculture needs to provide sustainable food security and economic development in the context of current and future global challenges.

The Conference highlighted the critical role of new plant varieties and high quality seed in providing a dynamic and sustainable agriculture that can meet those challenges. It concluded that governments need to develop and maintain an enabling environment to encourage plant breeding and the production and distribution of high quality seed.

The global seed market has grown rapidly in recent years and is currently worth around US$37 billion. Cross border seed trade was estimated to be worth around US$6.4 billion in 2007.

The Second World Seed Conference was held at FAO headquarters from September 8-10 and organized in collaboration with the OECD, UPOV, ITPGRFA, ISTA, ISF.

Conference conclusions:

- Plant breeding has significantly contributed and will continue to be a major contributor to increased food security whilst reducing input costs, greenhouse gas emissions and deforestation. With that, plant breeding significantly mitigates the effects of population growth, climate change and other social and physical challenges.

- ITPGRFA is an innovative instrument that aims at providing food security through conservation, as well as facilitated access to genetic resources under its multilateral system of access and benefit-sharing. The multilateral system represents a reservoir of genetic traits, and therefore constitutes a central element for the achievement of global food security.

- Intellectual property protection is crucial for a sustainable contribution of plant breeding and seed supply. An effective system of plant variety protection is a key enabler for investment in breeding and the development of new varieties of plants. A country's membership of UPOV is an important global signal for breeders to have the confidence to introduce their new varieties in that country.

- Seed quality determination, as established by ISTA, on seed to be supplied to farmers is an important measure for achieving successful agricultural production. The establishment or maintenance of an appropriate infrastructure on the scientific as well as technical level in developed and developing countries is highly recommended.

- The development of reliable and internationally acceptable certificates, through close collaboration between all stakeholders along the supply chain for varietal certification, phyto-sanitary measures and laboratory testing, contributes substantially to the strong growth in international trade and development of seed markets to the benefit of farmers.

ISTA www.seedtest.org

ISF www.worldseed.org

OECD www.oecd.org/tad/seed

UPOV www.upov.int

2nd WORLD SEED CONFERENCE
Rome, Italy - September 8-10

CONCLUSIONS OF THE FORUM OF EXPERTS

Session 1
The role of breeding in response to the many challenges of a rapidly changing world

• Have improved varieties and quality seed is a prerequisite for productive agriculture, which in turn is the basis for sustainable economic growth in countries with developing economies.

• Thanks to the efforts of public and private sectors, plant breeding has made an enormous contribution to world agriculture (eg in terms of yield, resistance to biotic stresses, tolerance to abiotic stresses, crop safety, and features quality including nutritional value)

• The Plant breeding can contribute greatly to solving many of the challenges arising in the future, such as those related to food security, hunger reduction, increased nutritional values and the higher cost of inputs.

• Breeding and disciplines and related technologies can help mitigate the effects of population growth, climate change and other challenges, both social and physical.

• The protection of intellectual property is essential to ensure the sustainable contribution of plant breeding and seed supply.

• There are still many tools and features under development that will prove critical to the continued supply of seed varieties and high quality.

• Besides the breeding, other technologies, such as those used in the production of quality seeds and seed treatment, contribute significantly to the achievement of improved seeds and there is a pressing need to strengthen the capacity of countries development in all these areas.

Session 2:
Importance of plant genetic resources for breeding, access and benefit sharing
• Plant breeding and the conservation and sustainable use of genetic resources are interdependent.

• International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) is a legally binding instrument, unique and innovative nature, which facilitates access to genetic material for breeding worldwide.

• The Treaty's multilateral system offers a systematic alternative access and benefit sharing of breeding activities.

• The agreement standard Material Transfer (MTA) of the Treaty is a contract between the provider and receiver, easy to use, to facilitate access to germplasm.

• In the development of systems for access and benefit sharing requires the participation of the private sector to establish for this purpose, mechanisms to function properly.

• The material included in the multilateral system is a source of genetic characteristics and traits of interest.

• The full effectiveness of the Treaty and its Multilateral System will depend on its implementation at the local, national and regional as well as availability of funds in these three areas.

Session 3

Plant Variety Protection
• With the introduction of plant variety protection has increased the number of new varieties

• The introduction of the International Union for the Protection of New Varieties of Plants (UPOV) to protect plant varieties was associated with an intensification of breeding activity and a stimulus for new types of breeders who are, for example, private breeders , researchers and farmers. Also, the plant variety protection is linked to the establishment of partnerships, in particular for cooperation between public and private sectors.

• With the introduction of plant variety protection, new varieties were developed which involved protected improvements for farmers, growers, industry and consumers, with overall economic benefits.

• One of the benefits of plant variety protection is that it encourages the development of new and improved varieties that allow for greater competitiveness in foreign markets and promote the development of the rural economy.

• Participation in the UPOV was associated with an increased number of varieties introduced by foreign breeders, especially in the ornamental sector.

• The access of foreign plant varieties is an important form of technology transfer, which also can translate into national breeding programs more appropriate.

Session 4:

The importance of seed quality in agriculture
• This session demonstrated the importance of quality seed for crop productivity and agricultural production. He stressed that lack of information on seed quality could lead to crop failures, as well as pose a potential threat to food security of whole countries.

• Determination of quality parameters of seed should be based on a comprehensive understanding of the philosophy of plants and seeds as well as taxonomy and botany, and requires intensive research and studies.

• For the purposes of the evaluations of the quality of seed you need a detailed knowledge of production and trade of seeds, the legislation on the matter and the seed sector.

• Since 1924 the International Seed Testing (ISTA) is an impartial and objective platform ja prominent technologists and researchers met to discuss relevant scientific developments and make the necessary definitions concerning the quality of seeds and how to measure it .

• In developing countries there are currently no appropriate infrastructure to ensure seed quality through ongoing analysis, such infrastructure is necessary to increase agricultural productivity and enhance food security in the countries concerned.

• Determination of seed quality is still evolving; interesting developments are being prepared, taking into account changing market needs. This will allow the analysis and its applications seem more relevant, effective and robust, and faster and cheaper.

• The breeder's exemption, whereby it is allowed free use of protected plant variety for further breeding activities, is an important feature of the UPOV system that promotes the progress of plant breeding.

• The substantial cutbacks in scientific research and education have reduced the likelihood of young scholars to gain competence in the field of seed technology.

• In the field of seed technology, transparency of research and scientific exchange their most recent result is critically important for continued progress.

• uncompetitive salaries they receive seed analysts in developed countries makes the prospect of a career in quality control in seed unattractive for young people.

Session 5:

Trade facilitation and market development

• In recent years the seed market has expanded rapidly, its volume is currently estimated at 37,000 million USD. Europe, North America and Asia can achieve almost four fifths of world trade in seeds. The volume of international seed trade in 2007 was estimated at 6,400 million USD.

• Using international licenses for the varietal certification and phytosanitary measures and laboratory analysis have greatly facilitated the development of international trade in seeds.

• Production of marketing of certified seeds of all crops is largely regulated both nationally and internationally. A system of transparent and effective regulation is essential to ensure that farmers have access to high quality seeds at reasonable prices.

• The international regulatory framework includes: the certification based on the varietal identity and purity of the varieties that give the Organization for Economic Cooperation and Development (OECD) and the Association of Official Agencies Seed Certification (AOSC), measures phytosanitary measures as those set by the International Plant Protection Convention (IPPC) - Agreement on the Application of Sanitary and Phytosanitary Measures of the World Trade Organization (WTO SPS Agreement) and the national plant protection organizations (ONPG); measures Plant Variety Protection (UPOV) and analysis of seeds as the filmmakers by ISTA, AOSA and others.

• Have been developed and harmonized regional regulatory frameworks in the field of seeds to facilitate regional trade, for example in Central America, MERCOSUR, the East African Community, the Community for the Southern African Development Community and the Economy West African States. Regional standards, eg European Union, are remarkably uniform with international standards including the OECD and clearly establish the conditions of registration and certification for seed marketing.

• The increasing use of harmonized procedures for international certification of identity and varietal purity helps to facilitate the import and export of high quality seeds, to ensure consumer confidence and reduce technical barriers to trade.

• The good cooperation between stakeholders from public and private sectors in developing and establishing internationally acceptable standards to facilitate the issuance of certificates which has in turn contributed to the growth of trade.

• Implementation of measures to prevent the introduction and spread of pests is essential to ensure the development of a global seed market viable and sustainable. International standards for phytosanitary measures (ISPM) provides useful guidance on the plant media applications in international trade.

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CONCLUSIONES DEL FORO DE EXPERTOS

Sesión 1:

El papel del fitomejoramiento en la respuesta a los numerosos desafíos de un mundo que cambia con rapidez

- Contar con variedades mejoradas y con semillas de alta calidad es un requisito indispensable para una agricultura productiva, que a su vez es la base de un crecimiento económico sostenible en los países de economías en desarrollo.

- Gracias a los esfuerzos de los sectores públicos y privado, el fitomejoramiento ha aportado una enorme contribución a la agricultura mundial (por ejemplo en términos de rendimiento, resistencia a las tensiones bióticas, tolerancia a las tensiones abióticas, seguridad de la cosecha, y rasgos cualitativos incluido el valor nutricional)

- El Fitomejoramiento es capaz de contribuir en medida importante a la solución de varios de los retos que se plantearan en el futuro, como los relacionados con la seguridad alimentaria, la reducción del hambre, el aumento de los valores nutricionales y el mayor costo de los insumos.

- El fitomejoramiento y las disciplinas y tecnologías conexas pueden ayudar a mitigar los efectos del crecimiento demográfico, el cambio climático y otros retos, tanto sociales como físicos.

- La protección de la propiedad intelectual es fundamental para asegurar la contribución sostenible del fitomejoramiento y el suministro de semillas.

- Hay aún muchos instrumentos y rasgos en curso de elaboración que se demostraran fundamentales para el suministro continuado de variedades y semillas de alta calidad.

- Ademas del mejoramiento genético, otras tecnologías, como las empleadas en la producción de semillas de calidad y en el tratamiento de las semillas, contribuyen en medida importante a la obtención de semillas mejoradas; existe una necesidad apremiante de potenciar la capacidad de los países en desarrollo en todos estos ámbitos.

Sesión 2:

Importancia de los recursos fitogenéticos para el fitomejoramiento; acceso y distribución de beneficios

- El fitomejoramiento y la conservación y utilización sostenible de los recursos genéticos son interdependientes.

- El tratado internacional sobre los Recursos Fitogenéticos para la Alimentación y la Agricultura (TIRFAA) es un instrumento jurídicamente vinculante, de carácter único e innovador, que facilita el acceso a material genético para el fitomejoramiento a nivel internacional.

- El sistema multilateral del Tratado ofrece una opción sistemática de acceso y distribución de los beneficios de las actividades de fitomejoramiento.

- El acuerdo normalizado de transferencia de material (ATM) del Tratado es un contrato entre el proveedor y el receptor, de uso sencillo, que facilita el acceso al germoplasma.

- En la elaboración de los sistemas de acceso y distribución de beneficios se necesita la participación del sector privado para establecer, a tal efecto, mecanismos que funcionen adecuadamente.

- El material incluido en el sistema multilateral es una fuente de características y rasgos genéticos de interés.

- La plena eficacia del Tratado y de su Sistema multilateral dependerán de su implementación en el ámbito local, nacional y regional así como la disponibilidad de fondos en estos tres ámbitos.

Sesión 3

Protección de variedades vegetales

- Con la introducción de la protección de variedades vegetales se ha incrementado el numero de variedades nuevas
- La introducción del sistema de la Unión Internacional para la Protección de las Obtenciones Vegetales (UPOV) para proteger las variedades vegetales se asocio a una intensificación de la actividad de fitomejoramiento y a un estímulo para nuevos tipos de mejoradores que son, por ejemplo, obtentores privados, investigadores y agricultores. Asimismo la protección de variedades vegetales se vinculó al establecimiento de asociaciones, en particular para la cooperación entre los sectores público y privados.
- Con la introducción de la protección de variedades vegetales se desarrollaron variedades nuevas y protegidas que entrañaron mejoras para los agricultores, los cultivadores, la industria y los consumidores, con beneficios económicos generales.
- Una de las ventajas de la protección de variedades vegetales reside en que fomenta el desarrollo de variedades nuevas y mejoradas que permiten una mayor competitividad en los mercados extranjeros y favorecen el desarrollo de la economía rural.
- La participación en la UPOV se asoció a un incremento del numero de variedades introducidas por obtentores extranjeros, especialmente en el sector ornamental.
- El acceso de variedades vegetales extranjeras constituye una forma importante de transferencia de tecnología, que también puede traducirse en programas nacionales de mejoramiento más adecuados.

Sesión 4:

La importancia de la calidad de las semillas en la agricultura

- En esta sesión se demostró la importancia que reviste la calidad de las semillas para la productividad de los cultivos y la producción agrícola. Se destacó que la falta de información sobre la calidad de las semillas podría ser causa de malas cosechas, además de entrañar una amenaza potencial para la seguridad alimentaria de países enteros.
- La determinación de parámetros de calidad de las semillas debe basarse en un conocimiento amplio de la filosofía de las plantas y las semillas así como de la taxonomía y la botánica, y requiere investigaciones y estudios intensivos.
- Para la aplicación de las evaluaciones de la calidad de las semillas se necesita un conocimiento detallados de la producción y el comercio de semillas, de la reglamentación en la materia y del sector de las semillas.
- Desde 1924 la Asociación Internacional de Análisis de Semillas (ISTA) constituye una plataforma imparcial y objetiva que ja reunido prominentes tecnólogos e investigadores para examinar los progresos científicos pertinentes y formular las definiciones necesarias en relación con la calidad de las semillas y la forma de medirla.
- En los países de desarrollo no existen actualmente una infraestructura adecuada para garantizar la calidad de las semillas mediante los análisis permanentes; tal infraestructura es necesaria para incrementar la productividad agrícola y potenciar la seguridad alimentaria en los países en cuestión.
- La determinación de la calidad de las semillas aún sigue evolucionando; se están preparando novedades interesantes, que toman en cuenta las necesidades cambiantes del mercado. Esto permitirá que los análisis y sus aplicaciones resulten mas pertinente, eficaces y sólidos, así como más rápidos y económicos.
- La exención del obtentor, mediante la cual se permite libre uso de variedad vegetales protegidas para nuevas actividades de fitomejoramiento, es una característica importante del sistema de la UPOV que impulsa el progreso del fitomejoramiento.
- Los considerables recortes aplicados a la investigación científica y la educación han reducido la posibilidad de los académicos jóvenes de adquirir las competencias necesarias en materia de tecnología de semillas.
- En el ámbito de tecnología de semillas, la transparencia de la investigación y el intercambio científico de sus resultados mas recientes reviste una importancia decisiva para un progreso constante.
- Los sueldos poco competitivos que reciben los analistas de semillas en los países desarrollados hacen que la perspectiva de una carrera en el campo del control de calidad en las semillas resulte poco atractiva para los jóvenes.

Sesión 5:

Facilitación del comercio y desarrollo de los mercados

- En los últimos años del mercado de semillas se ha expandido rápidamente; su volumen se estima actualmente en 37.000 millones de USD. Europa, América del Norte y Asia desarrollan casi cuatro quintos del comercio mundial de semillas. El volumen del comercio internacional de semillas en 2007 se estimo en 6.400 millones de USD.
- El uso de certificados internacionales para la certificación de variedades, así como las medidas fitosanitarias y los análisis de laboratorio, han facilitado considerablemente el desarrollo del comercio internacional de semillas.
- La producción de comercialización de semillas certificadas de todos los cultivos agrícolas está ampliamente regulada tanto a nivel nacional como internacional. Un sistema de regulación transparente y eficaz es fundamental para garantizar que los agricultores tengan acceso a semillas de calidad elevada a un precio razonable.
- El marco de regulación internacional comprende: la certificación basada en la identidad varietal y la pureza de las variedades que otorgan la Organización para la Cooperación y el Desarrollo Económicos (OCDE) y la Asociación de Agencias Oficiales de Certificación de Semillas (AOSCA); medidas fitosanitarias como las establecidas por la Convención Internacional de Protección Fitosanitaria (CIPF)- Acuerdo sobre la

Aplicación de Medidas Sanitarias y Fitosanitarias de la Organización Mundial del Comercio (Acuerdo MSF de la OMC) y las organizaciones nacionales de protección fitosanitaria (ONPG); medidas de protección de variedades de plantas (UPOV) y análisis de las semillas como los realizadores por ISTA, AOSA y otras entidades.

- Se han elaborado y armonizado marcos regionales de regulación en materia de semillas a fin de facilitar el comercio regional, por ejemplo en América Central, el MERCOSUR, la Comunidad del África Oriental, la Comunidad para el Desarrollo de África Austral y la Comunidad Economía de los Estados del África Occidental. Las normas regionales, por ejemplo las de la Unión Europea, están considerablemente uniformadas con normas internacionales como las de la OCDE y establecen con claridad las condiciones de registro y certificación para la comercialización semillas.
- El uso cada vez mayor de procedimientos armonizados para la certificación internacional de la identidad y pureza de las variedades contribuye a facilitar la importación y exportación de semillas de alta calidad, al asegurarse la confianza del consumidor y reducir los obstáculos técnicos al comercio.
- La buena cooperación entre los interesados directos de los sectores públicos y privados en la elaboración y el establecimiento de normas internacionalmente aceptables a facilitado la emisión de certificados lo que ha su vez a contribuido al crecimiento del comercio.
- La aplicación de medidas destinadas a prevenir la introducción y difusión de plagas es esencial para asegurar el desarrollo de un mercado mundial de semillas viable y sostenible. Las normas internacionales para medidas fitosanitarias (NIMF) proporcionan una orientación útil respecto de la aplicaron de medias fitosanitarias en el comercio internacional.

Nyon, 5 / May / 09

Reference : **2nd World Seed Conference 2009**

Dear Sir/Madam

We are pleased to confirm the following for Mario SCHINDLER .

Participant Registration Fee	x 1 = EUR	125.00
Participation in Expert Forum (Tue 8-Wed9 Sep)	x 1 = EUR	0.00
Participation in Policy Forum (Thu 10 Sep)	x 1 = EUR	0.00

The amount charged to you is: **EUR** **125.00**

This is only a confirmation of receipt of your registration form and payment details.
Final registration will be subject to receipt of payment.There will be no further confirmation.

Please take note that due to security reasons a screening procedure will be implemented therefore, we kindly ask you to make sure that you have an official identification document while entering the FAO premises.

In case of any change to the bookings made above due to unforeseen circumstances, you will be informed accordingly.

Looking forward to seeing you in Rome.

With best regards,

ISF Secretariat

ISF Chemin du Reposoir 7, CH-1260 Nyon, Switzerland - Fax: +41 22 365 44 21
E-mail: register@worldseed.org

2nd World Seed Conferencce
Badge Printing List

Meeting Cod	Date	Prenom	Nom	Company	Country
2nd WsConf	8-10 - Sep	Sunday Oladimeji	ADEBOYE	CONSTRAAD NIGERIA LIMITED	NIGERIA
2nd WsConf	8-10 - Sep	Chabane	AHAMADA	A.C.P.C.S	COMOROS (THE)
2nd WsConf	8-10 - Sep	Dhoulhedj	AHAMADA	A.C.P.C.S	COMOROS (THE)
~~2nd WsConf~~	8-10 - Sep	~~Hassan~~	~~AHMED~~	~~SUDANESE AGROBUSINESS GROUP (S.A.G)~~	~~SUDAN (THE)~~
2nd WsConf	8-10 - Sep	Rebecca Fembe	AKALE	SUSTAINABLE AGRICULTURE FOUNDATION	CAMEROON
2nd WsConf	8-10 - Sep	Antonio Carlos	ALBUQUERQU	FEDERAL UNIVERSITY OF PELOTAS	BRAZIL
2nd WsConf	8-10 - Sep	Latifa	ALHUSSAINA	PRINCESS NORA BINT ABDULRAHMAN UNIVERSITY	SAUDI ARABIA
2nd WsConf	8-10 - Sep	Omar	ALSEHLI	FMS	SAUDI ARABIA
2nd WsConf	8-10 - Sep	Laurence	AMAT	ARCADIA INTERNATIONAL	BELGIUM
2nd WsConf	8-9 Sep	Silvica	AMBARUS	VEGETABLE RESEARCH AND DEVELOPMENT STATIC	ROMANIA
2nd WsConf	8-10 - Sep	Misra	ANIL KUMAR	MESSINA BEEJ PRIVATE LTD	INDIA
2nd WsConf	8-10 - Sep	Arthur Santosh	ATTAVAR	INDO AMERICAN HYBRID SEEDS(INDIA) PVT LTD	
2nd WsConf	8-10 - Sep	Manmoham	ATTAVAR	INDO AMERICAN HYBRID SEEDS(INDIA) PVT LTD	
2nd WsConf	8-10 - Sep	Glenn	AUSTIN	MONSANTO COMPANY	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Daniela	AVIANI	MINISTRY OF AGRICULTURE,LIVESTOCK AND FOOD	BRAZIL
2nd WsConf	8-10 - Sep	Patricio Alejadnro	AVILA FIGUEI	SERVICIO AGRICOLA Y GANADERO - DIVISION DE S	CHILE
2nd WsConf	8-10 - Sep	Manuel	BACIGALUPO	ALLIANCE SEMILLAS S.A.	CHILE
2nd WsConf	8-10 - Sep	Mohamed Jelor	BAH	CHILDRE´S AGENDA INTERNATIONAL	SIERRA LEONE
2nd WsConf	8-10 - Sep	Chris	BARNABY	NEW ZELAND PLANT VARIETY RIGHTS OFFICE	NEW ZEALAND
2nd WsConf	8-10 - Sep	Gerard	BARRY	INTERNATIONAL RICE RESEARCH INSTITUTE	PHILIPPINES (THE)
2nd WsConf	8-10 - Sep	Marcin	BEHNKE	RESERACH CENTRE FOR VARIETY TESTING (NATIOI	POLAND
2nd WsConf	8-10 - Sep	Marilyn	BELARMINO	AVRDC - THE WORLD VEGETABLE CENTER (RCA)	UNITED REPUBLIC OF TANZANIA (THE)
2nd WsConf	10-Sep	Xavier	BEULIN	SOFIPROTEOL	FRANCE
2nd WsConf	8-10 - Sep	Hanumanth Rao	BHANDARI	ICRISAT	INDIA
2nd WsConf	8-10 - Sep	Shakeel	BHATTI	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Pier Giacomo	BIANCHI	ENTE NAZIONALE DELLE SEMENTI ELETTE	ITALY
2nd WsConf	8-10 - Sep	Zewdie	BISHAW	ICARDA	SYRIAN ARAB REPUBLIC
2nd WsConf	8-10 - Sep	Magni	BJARNASON	VIBHA AGROTECH LTD.	GERMANY
2nd WsConf	8-10 - Sep	Peter	BLOCH	CGIAR CAS-IP	ITALY
2nd WsConf	8-10 - Sep	Ricardo	BOCCI	ASSOCIAZIONE ITALIANA PER L´AGRICOLTURA BIC	ITALY
2nd WsConf	8-9 Sep	Constanze	BOEHMEL	KWS SAAT AG	GERMANY
2nd WsConf	8-10 - Sep	Birte	BOELT	AARHUS UNIVERSITY, FACULTY OF AGRICULTURAL	DENMARK
2nd WsConf	8-10 - Sep	Perry	BOHN	USDA, AMS,LS SRTB	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Nathaline	BONSA NZEK	SUSTAINABLE AGRICULTURE FOUNDATION	CAMEROON
2nd WsConf	8-10 - Sep	Julia	BORYS	RESERACH CENTRE FOR VARIETY TESTING (NATIOI	POLAND
2nd WsConf	8-10 - Sep	Franz	BRANDL	SYNGENTA CROP PROTECTION AG	SWITZERLAND

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2nd WsConf	8-10 - Sep	Ivan	BRANZOVSKY	MINISTRY OF AGRICULTURE	CZECH REPUBLIC (THE)
2nd WsConf	8-10 - Sep	Romana	BRAVI	ENTE NAZIONALE DELLE SEMENTI ELETTE	ITALY
2nd WsConf	8-10 - Sep	Marcel	BRUINS	INTERNATIONAL SEED FEDERATION(ISF)	SWITZERLAND
2nd WsConf	8-10 - Sep	Francois	BURGAUD	G.N.I.S	FRANCE
2nd WsConf	8-10 - Sep	henry	BURGER	STARKE AYRES	SOUTH AFRICA
2nd WsConf	8-9 Sep	Sean	BUTLER	CGIAR CAS-IP	ITALY
2nd WsConf	8-10 - Sep	Peter	BUTTON	UPOV	SWITZERLAND
2nd WsConf	8-10 - Sep	Merete	BUUS	MINISTRY OF FOOD, AGRICULTURE AND FISHERIES	DENMARK
2nd WsConf	8-9 Sep	Maria Laene	CARVALHO	ABRATES-BRAZILIAN ASSOCIATION OF SEED TECH	BRAZIL
2nd WsConf	8-10 - Sep	Jose Ernesto	CERVANTES-I	UNIVERSIDAD AUTONOMA DE TAMAULIPAS	MEXICO
2nd WsConf	8-10 - Sep	kay	CHAPMAN	CGIAR CAS-IP	ITALY
2nd WsConf	10-Sep	Somchai	CHARNNAROI	DEPARTMENT OF AGRICULTURE	THAILAND
2nd WsConf	8-10 - Sep	Juanita	CHAVES	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Upma	CHAWDHRY	DEPARTEMENT OF AGRICULTURE AND COOPERATI	INDIA
2nd WsConf	8-10 - Sep	Fatma	CHIHA BELGA	TUNUSIAN MINISTRY OF AGRICULTURE	TUNISIA
2nd WsConf	8-10 - Sep	Sergii	CHMYR	UKRAINIAN STATE SEED INSPECTORATE	UKRAINE(THE)
2nd WsConf	8-10 - Sep	Jaroslav	CHOBOT	OSEVA PRO S.R.O	CZECH REPUBLIC (THE)
2nd WsConf	8-9 Sep	Mei Hua	CHUNG	MORALBURG TRADING CORPORATION	CHINA
2nd WsConf	8-10 - Sep	Isabelle	CLEMENT-NIS	G.N.I.S	FRANCE
2nd WsConf	8-10 - Sep	Caroline	COLLIN	COORDINATION NATIONALE POUR LA DEFENSE DE	FRANCE
2nd WsConf	8-10 - Sep	Mariana	CORREA	MINISTRY OF AGRICULTURE, LIVESTOCK AND FOO	BRAZIL
2nd WsConf	8-10 - Sep	Joseph E.	CORTES	SEED SCIENCE CENTER IOWA STATE UNIVERSITY	UNITED STATES OF AMERICA(THE)
2nd WsConf	8-10 - Sep	Maria Francisca	COSTA	MINISTRY OF AGRICULTURE (NATIONAL SEED SER	ANGOLA
2nd WsConf	8-10 - Sep	Alicia	CREPO PAZO	MINISTERIO DE MEDIO AMBIENTE, MEDIO RURAL Y	SPAIN
2nd WsConf	8-10 - Sep	Eva	DAHLBERG	SWEDISH BOARD OF AGRICULTURE	SWEDEN LITHUANUA
2nd WsConf	8-10 - Sep	Rimantas	DAPKUS	DOTNUVOS PROTEKTAI UAB	LITHUANIA
2nd WsConf	8-10 - Sep	Walter	DE BACKER	EUROPEAN COMMISSION	BELGIUM
2nd WsConf	8-10 - Sep	Orlando	DE PONTI	NUNHEMS B.V.	NETHERLANDS
2nd WsConf	8-10 - Sep	Mia	DEFRANQ	FLEMISH AUTHORITY/PRODUCT QUALITY MANAGEM	BELGIUM
2nd WsConf	8-10 - Sep	Oleksandr	DEMYDOV	MINISTRY OF AGRARIAN POLICY OF UKRAINE, DEP	UKRAINE(THE)
2nd WsConf	8-10 - Sep	Sebastian	DERWISCH	CGIAR CAS-IP	GERMANY
2nd WsConf	8-10 - Sep	Rajaram	DESHMUKH	MAHATMA PHULE AGRICULTURAL UNIVERSITY	UKRAINE(THE)
2nd WsConf	8-10 - Sep	Dominique	DESSAUW	CIRAD	INDIA
2nd WsConf	8-10 - Sep	Katarina	DJERMANOVI	OECD	FRANCE
2nd WsConf	8-10 - Sep	Ivan	DJURKIC	INSTITUTE FOR SEED AND SEEDLINGS	FRANCE
2nd WsConf	8-10 - Sep	Barbora	DOBIASOVA	CENTRAL INSTITUTE FOR SUPERVISING AND TESTI	CROATIA
2nd WsConf	8-10 - Sep	Nick	DOWNEY	NATIONAL ASSOCIATION OF AGRICULTURAL CONT	UNITED KINGDOM

2nd World Seed Conferencce
Badge Printing List

2nd WsConf	8-10 - Sep	Karol	DUCZMAL	POLISH SEED TRADE ASSOCIATION	POLAND
2nd WsConf	8-10 - Sep	Vojtech	DUKAT	VARIETY OWNERS COOPERATE	CZECH REPUBLIC (THE)
2nd WsConf	8-9 Sep	Carolyne	DURR	INRA UMR SEED MOLECULAR PHYSIOLOGY	FRANCE
2nd WsConf	8-10 - Sep	Sylvie	DUTARTRE	GEVES	FRANCE
2nd WsConf	8-10 - Sep	Jean-Louis	DUVAL	JLDUVAL CONSULTING SARL	FRANCE
2nd WsConf	8-10 - Sep	Ngake Luma	EFIKE	CAMEROON ANIMAL & FARMERS HUSBANDRY ASSC	CAMEROON
2nd WsConf	8-10 - Sep	Astrid	EIKELAND	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Mubarak	EL AHEIKH	ARAB SUDANESE SEED COMPANY	SUDAN (THE)
2nd WsConf	8-10 - Sep	Dave	ELLIS	USDA, ARS, NATIONAL CENTER FOR GENETIC RESC	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Ismahane	ELOUAFI	CANADIAN FOOD INSPECTION AGENCY	CANADA
2nd WsConf	8-10 - Sep	Katalin	ERTSEY	CENTRAL AGRICULTURAL OFFICE	HUNGARY
2nd WsConf	8-10 - Sep	Dariush	F.TALEGHANI	SUGAR BEET SEED INSTITUTE (SBSI)	IRAN(ISLAMIC REPUBLIC OF)
2nd WsConf	8-10 - Sep	Kader	FATMI	EUROFINS SCIENTIFIC	FRANCE
2nd WsConf	8-10 - Sep	Sergey	FEOFILOV	UKRAGROCONSULT	UKRAINE(THE)
2nd WsConf	8-10 - Sep	Stephen	FLACK	NIAB	UNITED KINGDOM
2nd WsConf	8-10 - Sep	Karl-Hermann	FREUDENSTE	BUNDESSORTENAMT (FEDERAL PLANT VARIETY OF	GERMANY
2nd WsConf	8-10 - Sep	Jacques	GENNATAS	EUROPEAN COMMISSION	BELGIUM
2nd WsConf	8-10 - Sep	Raouf	GHARIANI	BADDAR AGRICOLE	TUNISIA
2nd WsConf	8-10 - Sep	Kakoli	GHOSH	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Carlos	GODINHO	COMMUNITY PLANT VARIETY OFFICE	FRANCE
2nd WsConf	8-10 - Sep	Simon	GOERTZ	NPZ-LEMBKE	GERMANY
2nd WsConf	8-10 - Sep	Christine	GOULD	SYNGENTA	SWITZERLAND
2nd WsConf	8-10 - Sep	Britt	GRANQUIST	BRIAGRI APS	DENMARK
2nd WsConf	8-9 Sep	Chritopher	GREEN	SENOVA LTD	UNITED KINGDOM (THE)
2nd WsConf	8-10 - Sep	Gouantoueu	GUEI	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Joel	GUIARD	GEVES	FRANCE
2nd WsConf	8-10 - Sep	Elcio	GUIMARAES	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Filiz	GUREL	INSTANBUL UNIVERSITY	TURKEY
2nd WsConf	8-10 - Sep	Anita	HALL	SOCIETY OF COMMERCIAL SEED TECHNOLOGISTS,	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Gerry	HALL	SASA	UNITED KINGDOM (THE)
2nd WsConf	8-9 Sep	Brigitte	HAMMAN	SYNGENTA CROP PROTECTION AG	SWITZERLAND
2nd WsConf	8-10 - Sep	John	HAMPTON	BIO-PROTECTION RESEARCH CENTRE	NEW ZEALAND
2nd WsConf	8-10 - Sep	Christopher	HANSEN	INTER AMERICAN INSTITUTE FOR COOPERATION O	COSTA RICA
2nd WsConf	8-10 - Sep	Adelaida	HARRIES	SEED SCIENCE CENTER IOWA STATE UNIVERSITY	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Richard	HARRIS	FOOD AND ENVIRONMENT RESEARCH AGENCY	UNITED KINGDOM
2nd WsConf	8-10 - Sep	Arne	HEDE	SIDA SEED INDUSTRY DEVELOPMENT PROJECT	TAJIKISTAN
2nd WsConf	8-10 - Sep	Kirsi	HEINONEN	MINISTRY OF AGRICULTURE AND FORESTRY	FINLAND

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2nd WsConf	8-10 - Sep	Victoria	HENSON-APO	CGIAR CAS-IP	ITALY
2nd WsConf	8-10 - Sep	Christoph	HERRLINGER	BUNDESVERBAND DEUTSCHER PFLANZENZUECHTE	GERMANY
2nd WsConf	8-10 - Sep	Peter	HILLERY	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Lr	HINDARWATI	CENTER FOR PLANT VARIETY PROTECTION	INDONESIA
2nd WsConf	8-10 - Sep	Jan Willem	HOOPMAN	ATLAS SRL	ITALY
2nd WsConf	8-10 - Sep	Vlasta	HORKA	CZECH SEED TRADE ASSOCIATION	CZECH REPUBLIC (THE)
2nd WsConf	8-9 Sep	Cosima	HUEFLER	MINISTRY OS AGRICULTURE, FORESTRY, ENVIRONI	AUSTRIA
2nd WsConf	8-10 - Sep	John	HUTCHINS	NIAM	UNITED KINGDOM (THE)
2nd WsConf	8-10 - Sep	Carlo Fiorindo	INVERNIZZI	APSOVSEMENTI SPA	ITALY
2nd WsConf	8-10 - Sep	Okasana	IVASHCHENK	STATE SERVICE ON RIGHT PROTECTION FOR PLANT	UKRAINE(THE)
2nd WsConf	8-10 - Sep	Narayan Dhondi	JAMBHALE	INDIAN COUNCIL OF AGRICULTURAL RESEARCH	INDIA
2nd WsConf	8-10 - Sep	Ling	JIANG	HI-TECH SEED CO., LTD	CHINA
2nd WsConf	8-10 - Sep	Lldefonso	JIMENEZ	INTERNATIONAL RICE RESEARCH INSTITUTE	PHILIPPINES (THE)
2nd WsConf	8-10 - Sep	Rolf	JOERDENS	UPOV	SWITZERLAND
2nd WsConf	8-10 - Sep	Timothy	JOHNSON	AMERICAN SEED TRADE ASSOCIATION	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Jeffrey E.	JONES	IPPC SECRETAIAT/PALNT PROD. AND PROTEC. DIVI	ITALY
2nd WsConf	10-Sep	Wayne	JONES	OECD	FRANCE
2nd WsConf	8-9 Sep	Andrea	JONITZ DR	LITZ AUGUSTENBERGER	GERMANY
2nd WsConf	8-10 - Sep	Daniel	JURECKA	UKZUZ	CZECH REPUBLIC (THE)
2nd WsConf	8-10 - Sep	Kassaim Father	KAMARA	AFRICAN YOUTH UNITE FOR CHANGE	SIERRA LEONE
2nd WsConf	8-10 - Sep	Sulaiman	KAMARA	CHILDREN´S AGENDA INTERNATIONAL	SIERRA LEONE
2nd WsConf	8-10 - Sep	Geofferey	KANANJI	MINISTRY OF AGRICULTURE AND FOOD SECURITY	MALAWI
2nd WsConf	8-10 - Sep	Marcel	KANUNGWE	AFRICAN SEED TRADE ASSOCIATION (AFSTA)	KENYA
2nd WsConf	8-10 - Sep	Guy	KASTLER	CONFEDERATION PAYSANNE	FRANCE
2nd WsConf	8-10 - Sep	Chagema John	KEDERA	KENYA PLANT HEALTH INSPECTORATE SERVICE(KE	KENYA
2nd WsConf	8-10 - Sep	Peter	KENMORE	FOOD AND AGRICULTURE ORGANIZATION OF THE U	ITALY
2nd WsConf	8-10 - Sep	Valeriy	KHADZHYMA	STATE SERVICE ON RIGHT PROTECTION FOR PLANT	UKRAINE(THE)
2nd WsConf	8-10 - Sep	Abdalla	KHALAFALLA	AGRIBUSINESS SUDAN CO	SUDAN (THE)
2nd WsConf	8-10 - Sep	Bart	KIEWIET	COMMUNITY PLANT VARIETY OFFICE	FRANCE
2nd WsConf	8-10 - Sep	Chan Huyn	KIM	KOREA SEED AND VARIETY SERVICE (KSVS)	REPUBLIC OF KOREA (THE)
2nd WsConf	8-10 - Sep	Kyusick	KIM	KOREA FOREST SEED&VARIETY CENTER	REPUBLIC OF KOREA (THE)
2nd WsConf	8-10 - Sep	Minwook	KIM	UPOV	SWITZERLAND
2nd WsConf	8-10 - Sep	Tae Hoon	KIM	KOREA FOREST SEED&VARIETY CENTER	REPUBLIC OF KOREA (THE)
2nd WsConf	8-9 Sep	Mark	KIMBLE	STRATEGIC DIAGNOSTICS	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	A. Kadir	KIRAN	PAMUKKALE SEED COMPANY	TURKEY
2nd WsConf	8-10 - Sep	Valery	KISTANOVA	RUSSIAN AGRICULTURAL CENTRE	RUSSIAN FEDERATION (THE)
2nd WsConf	8-9 Sep	Matthias	KLEMM	KWS MAIS GMBH	GERMANY

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2nd WsConf	8-10 - Sep	Carina	KNORPP	MINISTRY OS AGRICULTURE OF SWEDEN	SWEDEN
2nd WsConf	8-10 - Sep	Rachel	KOBLA	ACTION CENTRE FOR RURAL COMMUNITY DEVELOP	CAMEROON
2nd WsConf	8-9 Sep	Gwen	KONING	SYNGENTA CROP PROTECTION AG	SWITZERLAND
2nd WsConf	8-10 - Sep	Hanna	KORTEMAA	FINNIFH FOOD SAFETY AUTHORITY,EVIRA	FINLAND
2nd WsConf	8-10 - Sep	Francisco Carlos	KRZYZANOW	BRAZILIAN ASSOCIATION OF SEED TECHNOLOGY (	BRAZIL
2nd WsConf	8-10 - Sep	Eric	KUENEMAN	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-9 Sep	Lior	KUSHNIR	ZERAIM GEREDA	ISRAEL
2nd WsConf	8-10 - Sep	Olga	KUZNETSOVA	RUSSIAN AGRICULTURAL CENTRE	RUSSIAN FEDERATION (THE)
2nd WsConf	8-10 - Sep	Angelos	KYRATZIS	AGRICULTURAL RESEARCH INSTITUTE	CYPRUS
2nd WsConf	8-10 - Sep	Tapio	LAHTI	FINNIFH FOOD SAFETY AUTHORITY,EVIRA	FINLAND
2nd WsConf	8-9 Sep	Joep	LAMBALK	ENZA ZADEN	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Michael Abimbola	LARINDE	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Peter	LATUS	FEDERAL OFFICE FOR AGRICULTURE	SWITZERLAND
2nd WsConf	8-10 - Sep	Andy	LAVIGNE	AMERICAN SEED TRADE ASSOCIATION	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Raimundo	LAVIGNOLLE	UPOV	SWITZERLAND
2nd WsConf	8-10 - Sep	Jorge Alejandro	LAVIN CONTR	SERVICIO AGRICOLA Y GANADERO - DIVISION DE	CHILE
2nd WsConf	8-10 - Sep	Bernard	LE BUANEC	ORGANIZING COMMITTEE	FRANCE
2nd WsConf	8-10 - Sep	Joel	LECHAPPE	GEVES	FRANCE
2nd WsConf	8-10 - Sep	Philippe	LE CONENT	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Joongku	LEE	KOREA RESEARCH INSTITUTE OF BIOSCIENCIE AN	REPUBLIC OF KOREA (THE)
2nd WsConf	8-10 - Sep	Robert	LEGRO	INCOTEC HOLDING B.V.	NETHERLANDS (THE)
2nd WsConf	8-9 Sep	Tais	LEITE FERREI	USP/ESALQ	BRAZIL
2nd WsConf	8-10 - Sep	Mogens	LEMONIUS	BETTERSEED	DENMARK
2nd WsConf	8-10 - Sep	Charlotte	LEONHARDT	AGES AUSTRIAN AGENCY FOR HEALTH AND FOOD	AUSTRIA
2nd WsConf	8-10 - Sep	Sen Yin	LI	SCIENCE AND TECHNOLOGY CENTER	CHINA
2nd WsConf	8-9 Sep	En- Shiang	LIN	MORALBURG TRADING CORPORATION	CHINA
2nd WsConf	8-10 - Sep	Francisco	LOPEZ	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Selim	LOUAFI	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Irina	LUNYAKA	FSI KRANSNODAR REFERENCE CENTRE OF ROSSEL	RUSSIAN FEDERATION (THE)
2nd WsConf	8-10 - Sep	Mohammed Selam	MADOM	MALAYSIAN AGRICULTURAL RESEARCH AND DVLPT	MALAYSIA
2nd WsConf	8-10 - Sep	Helena	MAJDEKOVA	UKSUP BRATISLAVA	SLOVAKIA
2nd WsConf	8-10 - Sep	Karine	MALGRAND	CGIAR CAS-IP	ITALY
2nd WsConf	8-10 - Sep	Alexander	MALKO	RUSSIAN AGRICULTURAL CENTRE	RUSSIAN FEDERATION (THE)
2nd WsConf	8-10 - Sep	Maruti	MANJARE	MAHATMA PHULE AGRICULTURAL UNIVERSITY	INDIA
2nd WsConf	8-10 - Sep	Paivi	MANNERKOR	EUROPEAN COMMISSION - DG FOR HEALTH AND C	BELGIUM
2nd WsConf	8-10 - Sep	Daniele	MANZELLA	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Karol	MARCINIAK	DANKO	POLAND

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2nd WsConf	8-10 - Sep	Mario	MARINO	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Luis	MARTINEZ VA	INIA	SPAIN
2nd WsConf	8-10 - Sep	Katia	MARZALL	MINISTRY OF AGRICULTURE, LIVESTOCK AND FOO	BRAZIL
2nd WsConf	8-9 Sep	Mark	MASSOUDI	AG BIOTECH INC.	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Naomie	MATSIDA	CAMEROON ANIMAL & FARMERS HUSBANDRY ASS	CAMEROON
2nd WsConf	8-10 - Sep	Byakombe	MAZAMBI	SERVICE NATIONAL DE SEMENCES(SENASEM)	CONGO, DEMOCRATIC REPUBLIC OF THE
2nd WsConf	8-10 - Sep	Jim	MCCULLAGH	CANADIAN SEED INSTITUTE	CANADA
2nd WsConf	8-9 Sep	Leo	MELCHERS	SYNGENTA SEEDS BV	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Giuseppe	MERISIO	ENTE NAZIONALE DELLE SEMENTI ELETTE	ITALY
2nd WsConf	8-9 Sep	Enrico	MIATELLO	SUMERAN HANDELS SRL	ITALY
2nd WsConf	8-9 Sep	Simone	MIATELLO	SUMERAN HANDELS SRL	ITALY
~~2nd WsConf~~	~~8-10 - Sep~~	~~Julie~~	~~MILANESI~~	~~CREMAQ INRA~~	~~FRANCE~~
2nd WsConf	8-10 - Sep	Doug	MILLER	SOCIETY OF COMMERCIAL SEED TECHNOLOGISTS,	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Patrick	MINK	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Francisco	MITI	SEED CONTROL AND CERTIFICATION INSTITUTE(S	ZAMBIA
2nd WsConf	8-10 - Sep	Firmin	MIZAMBWA	AGRICULTURAL SEED AGENCY	UNITED REPUBLIC OF TANZANIA (THE)
2nd WsConf	8-10 - Sep	Bacar	MOINDJIE	A.C.P.C.S	COMODOROS(THE)
2nd WsConf	8-10 - Sep	Mathias	MONDY	BAYER CROPSCIENCE	FRANCE
2nd WsConf	8-10 - Sep	Flora	MPANJU	ARIPO	ZIMBABWE
~~2nd WsConf~~	8-10 - Sep	~~Saleem~~	~~MUHAMMAD~~	~~AGROMAN CHEMICALS AND SEEDS~~	~~PAKISTAN~~
2nd WsConf	8-10 - Sep	Bahati	MUKUNDE	SERVICE NATIONAL DE SEMENCES(SENASEM)	CONGO, DEMOCRATIC REPUBLIC OF THE
2nd WsConf	8-10 - Sep	Hafiz	MUMINJANOV	SEED ASSOCIATION OF TAJIKISTAN	TAJIKISTAN
2nd WsConf	8-10 - Sep	Peter	MUNYI	CGIAR CAS-IP	KENYA
2nd WsConf	8-10 - Sep	Michael	MUSCHICK	INERNATIONAL SEED TESTING ASSOCIATION(ISTA	SWITZERLAND
2nd WsConf	8-10 - Sep	Marco	NARDI	ASSOCIAZIONE ITALIANA SEMENTI(AIS)	ITALY
2nd WsConf	8-10 - Sep	Francis	NDAMBUKI	KENYA SEED COMPANY LTD	KENYA
2nd WsConf	8-9 Sep	Gabriele	NEUHAUS	BAYER AG	SWITZERLAND
2nd WsConf	8-10 - Sep	Nelson Mauke Etut	NGALE	ESUKE COMMON INITIATIVE GROUP	CAMEROON
2nd WsConf	8-10 - Sep	Patrick	NGWEDIAGI	MINISTRY OF AGRICULTURE FOOD SECURITY AND	UNITED REPUBLIC OF TANZANIA (THE)
2nd WsConf	8-9 Sep	William	NIEBUR	PIONNER HI-BRED INT´L INC	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Pavla	NIKOLOVA	EXECUTIVE AGENCY FOR VARIETY TESTING, FIELD	BULGARIA
2nd WsConf	8-10 - Sep	Kent	NNADOZIE	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Abdul Qatdir	NOOR	NOOR AGRICULTURAL SEEDS COMPANY	AFGHANISTAN
2nd WsConf	8-10 - Sep	Francis Obongo	NYACHAE	SEED TRADE ASSOCIATION OF KENYA	KENYA
2nd WsConf	8-10 - Sep	Tobias	OLSSON	SWEDISH BOARD OF AGRICULTURE	SWEDEN
2nd WsConf	8-10 - Sep	Eunice	OMBACHI	KENYA SEED COMPANY LTD	KENYA
2nd WsConf	8-10 - Sep	Linda	OPATI	INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE	KENYA

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2nd WsConf	8-10 - Sep	Ad	ORDELMAN	AGRI INFORMATION PARTNERS	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Michelle	ORFEI	CROPLIFE INTERNATIONAL	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Thomas	OSBORN	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Ryudai	OSHIMA	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Asmahani	OUMOURI AL	A.C.P.C.S	COMOROS (THE)
2nd WsConf	8-10 - Sep	Shivaji	PANDEY	FOOD AND AGRICULTURE ORGANIZATION OF THE	ITALY
2nd WsConf	8-10 - Sep	Jagganath	PATIL	MAHATMA PHULE AGRICULTURAL UNIVERSITY	INDIA
2nd WsConf	8-10 - Sep	Kameliya	PAVLOVA	EXECUTIVE AGENCY FOR VARIETY TESTING, FIELD	BULGARIA
2nd WsConf	8-10 - Sep	Anna	PERETTI	UNIDAD INTEGRADA BALCARCE (FCA-EEA INTA)	ARGENTINA
2nd WsConf	8-10 - Sep	Rutger	PERSSON	SVALOF CONSULTING AB	SW
2nd WsConf	8-10 - Sep	Leena	PIETILA	FINNIFH FOOD SAFETY AUTHORITY,EVIRA	FINLAND
2nd WsConf	8-10 - Sep	Sebastian	POEHLMANN	CGIAR CAS-IP	ITALY
2nd WsConf	8-10 - Sep	Jean Pierre	POSA	CHILEAN SEED TRADE ASSOCIATION(ANPROS)	CHILE
2nd WsConf	8-10 - Sep	Alison	POWELL	UNIVERSITY OF ABERDEEN	UNITED KINGDOM (THE)
2nd WsConf	8-10 - Sep	Cecilio	PRIETO	INIA	SPAIN
2nd WsConf	8-10 - Sep	Elzbieta	RADOMSKA	RESEARCH CENTRE FOR VARIETY TESTING (NATIO	POLAND
2nd WsConf	8-10 - Sep	Salah	RAHAMA	AGRO NECTAR GROUP	SUDAN (THE)
2nd WsConf	8-10 - Sep	Justin	RAKOTOARIS	AFRICAN SEED TRADE ASSOCIATION (AFSTA)	KENYA
2nd WsConf	8-10 - Sep	Patricia	RAUBO	INTERNATIONAL SEED TESTING ASSOCIATION (IST	SWITZERLAND
2nd WsConf	8-10 - Sep	Francesca	RE MANNING	CGIAR CAS-IP	UNITED KINGDOM (THE)
2nd WsConf	8-10 - Sep	Gretchen	RECTOR	SYNGENTA	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Craig	RICKARD	CROPLIFE INTERNATIONAL	UNITED STATES OF AMERICA (THE)
2nd WsConf	8-10 - Sep	Diego	RISSO	SEED ASSOCIATION OF THE AMERICAS(SAA)	URUGUAY
2nd WsConf	8-10 - Sep	Ladislav	ROSENBERG	CZECH SEED TRADE ASSOCIATION	CZECH REPUBLIC (THE)
2nd WsConf	8-10 - Sep	Monika	RUBESOVA	CENTRAL INSTITUTE FOR SUPERVISING AND TESTI	CZECH REPUBLIC (THE)
2nd WsConf	8-10 - Sep	Michael	RYAN	OECD	FRANCE
2nd WsConf	8-10 - Sep	Radmila	SAFARIKOVA	UKZUZ	CZECH REPUBLIC (THE)
2nd WsConf	8-10 - Sep	Sanjeev	SAGAR	OSAW AGRO INDUSTRIES PVT LTDA	INDIA
2nd WsConf	8-10 - Sep	Luis	SALAICES	MINISTERIO DE MEDIO AMBIENTE, MEDIO RURAL Y	SPAIN
2nd WsConf	8-10 - Sep	Abbdelrahman	SALANTOUT	ZAS AGRICULTURAL PRODUCTION CO	SUDAN (THE)
2nd WsConf	8-10 - Sep	Silvia	SALAZAR	NATIONAL SEEDS OFFICE COSTA RICA	COSTA RICA
2nd WsConf	8-10 - Sep	Jean Francois	SARRAZIN	BAYER BIOSCIENCE NV	BELGIUM
2nd WsConf	8-10 - Sep	Marja	SAVONMAKI	MINISTRY OF AGRICULTURE AND FORESTRY	FINLAND
2nd WsConf	8-10 - Sep	Mario	SCHINDLER	CHILEAN SEED TRADE ASSOCIATION(ANPROS)	CHILE
2nd WsConf	8-10 - Sep	Marie	SCHLOEN	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Ferdinand	SCHMITZ	BUNDESVERBAND DEUTSCHER PFLANZENZUECHTE	GERMANY
2nd WsConf	8-10 - Sep	Elizabeth	SCOTT	NIAB	UNITED KINGDOM (THE)

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2nd WsConf	8-10 - Sep	Irina	SEMERYAZHK	FSI KRANSNODAR REFERENCE CENTRE OF ROSSEL	RUSSIAN FEDERATION (THE)
2nd WsConf	8-10 - Sep	Jitu	SHAH	SEED TRADE ASSOCIATION OF KENYA	KENYA
2nd WsConf	8-10 - Sep	Anzar	SHAMSIE	IT-PGRFA	ITALY
2nd WsConf	8-10 - Sep	Hillel	SHIFMAN	ZERAIM GEREDA	ISRAEL
2nd WsConf	8-10 - Sep	Eugenio	SIBONI	SOCIERA PRODUTTORI SEMENTI SPA	ITALY
2nd WsConf	8-10 - Sep	Jamil	SIDDIQUE	SIDDIQUIS SEEDS	BANGLADESH
2nd WsConf	8-10 - Sep	Serge	SIEWE	ACTION CENTRE FOR RURAL COMMUNITY DEVELOP	CAMEROON
2nd WsConf	8-10 - Sep	Evans	SIKINYI	KEPHIS	KENYA
2nd WsConf	8-10 - Sep	Luisa Benilde Dos	SILVA CADET	MINISTRY OF AGRICULTURE(NATIONAL SEED SERV	ANGOLA
2nd WsConf	8-10 - Sep	Jai	SINGH	ASIA AND PACIFIC SEED ASSOCIATION (APSA)	THAILAND
2nd WsConf	8-10 - Sep	Hosea	SIRMA	KENYA SEED COMPANY LTD	KENYA
2nd WsConf	8-10 - Sep	Piero	SISMONDO	INTERNATIONAL SEED FEDERATION(ISF)	SWITZERLAND
2nd WsConf	8-10 - Sep	Hosea	SITIENEI	KENYA SEED COMPANY LTD	KENYA
2nd WsConf	10-Sep	Khanrithykun	SO	MINISTRY OF AGRICULTURE, FORESTRY AND FISHE	CAMBODIA
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2nd WsConf	10-Sep	Khin	SOE	MINISTRY OF AGRICULTURE AND IRRIGATION	MYANMAR
2nd WsConf	8-10 - Sep	Max	SOEPBOER	NAK (DUTCH GENERAL INSPECTION SERVICE FOR A	NETHERLANDS(THE)
2nd WsConf	8-10 - Sep	George	SPIROU	SPIROU GROUP OF COMPANIES	GREECE
2nd WsConf	8-10 - Sep	Manoj	SRIVASTAVA	PPV AND FR AUTHORITY MINISTRY OF AGRICULTUR	INDIA
2nd WsConf	8-10 - Sep	Michael	STAHR	ASSOCIATION OF OFFICIAL SEED ANALYSTS, INC.	UNITED STATES OF AMERICA(THE)
2nd WsConf	8-10 - Sep	Jaroslav	STANA	UKZUZ	CZECH REPUBLIC (THE)
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2nd WsConf	8-9 Sep	Assane	TOURE	AGRIPRO	SENEGAL
2nd WsConf	8-10 - Sep	Ad	TOUSSAINT	NAK(DUTCH GENERAL INSPECTION SERVICE FOR A	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Daniel	TRAON	ARCADIA INTERNATIONAL	BELGIUM
2nd WsConf	8-10 - Sep	Modibo	TRAORE	FOOD AND AGRICULTURE ORGANIZATION OF THE U	ITALY
2nd WsConf	8-10 - Sep	Alfonso	TRAUB	OFICINA DE ESTUDIOS Y POLITICAS AGRARIAS OD	CHILE

2nd World Seed Conferencce
Badge Printing List

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2nd WsConf	8-9 Sep	Erik	VAN BOCKST	ILVO	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Anke	VAN DEN HUF	PLANTUM NL	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	W. Joost	VAN DER BUF	PLANT RESEARCH INTERNATIONAL	NETHERLANDS (THE)
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2nd WsConf	8-10 - Sep	Aad	VAN ELSEN	PLANTUN NL	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Kees	VAN ETTEKO\	NAKTUINBOUW	NETHERLANDS (THE)
2nd WsConf	8-9 Sep	Jan	VAN ROMPAE	BAYER BIOSCIENCE NV	BELGIUM
2nd WsConf	8-10 - Sep	John	VAN RUITEN	NAKTUINBOUW	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Arndjan	VAN WIJK	NAKTUINBOUW	NETHERLANDS (THE)
2nd WsConf	8-10 - Sep	Bhola Nath	VERMA	ZAMBIA SEED COMPANY LIMITED	ZAMBIA
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2nd WsConf	8-10 - Sep	Garlich	VON ESEN	EUROPEAN SEED ASSOCIATION)ESA)	BELGIUM
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2nd WsConf	8-10 - Sep	Andrea	WAMBACH	EUREGIO ANALYTIC BIO CHEM GMBH	GERMANY
2nd WsConf	8-10 - Sep	Cristoph	WAMBACH	EUREGIO ANALYTIC BIO CHEM GMBH	GERMANY
2nd WsConf	8-10 - Sep	Doug	WATERHOUSI	PLANT BREEDER´S RIGHTS OFFICE, IP AUSTRALIA	AUSTRALIA
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2nd WsConf	8-10 - Sep	Mi Hee	YANG	KOREA SEED AND VARIETY SERVICE (KSVS)	REPUBLIC OF KOREA (THE)
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2nd WsConf	8-10 - Sep	Rita	ZECCHINELLI	ENTE NAZIONALE DELLE SEMENTI ELETTE	ITALY
2nd WsConf	8-10 - Sep	Usha	ZEHR	MAHARASDTRA HYBRID SEEDS COMPANY LIMITED	INDIA
2nd WsConf	8-10 - Sep	Liu	ZHEN	MANAGEMENT STUDIES, WAGENINGEN UNIVERSIT	NETHERLANDS (THE)

Barwale Zehr

Ms Barwale Zehr graduated with a B.Sc. in 1981 from Wilson College at the University of Bombay, India. After that she was awarded an M.S. and later on a Ph.D. in 1985 in Agronomy at the University of Illinois, USA.

Since 1991 she is the Director of the Barwale Foundation, and has worked as a geneticist in sorghum and millet at the Purdue University, Indiana, USA. From 1997 till 2006 she has been a trustee of the M.S. Swaminathan Research Foundation, in Chennai, India.

She has occupied and is still occupying many positions of which the most notable are a member of the board at the Donald Danforth Plant Science Centre, member of the board at IRRI and CIMMYT. Since 2000 she is whole-time Director of Maharashtra Hybrid Seeds Co. Ltd., Jalna, India.

With advances in plant biotechnology in the recent years, Usha's research interests are in the area of application of these tools to improve agricultural productivity. With use of genetically enhanced crops and genomics, many opportunities are presented for enhancing productivity in a sustainable manner. Use of Molecular tools to enhance breeding activity, use of genomics to gain better understanding about crops, deploying new tools to enhance nutritional value of food grain are just a few of the possibilities. The objective is to look at possible technologies and work to bring appropriate technologies for the farmers.

William Niebur

As DuPont Vice President for Crop Genetics Research and Development at Pioneer Hi-Bred International, Bill drives worldwide crop genetics research strategies to create new value for our seed and agricultural value chain customers through advanced plant genetics.

Niebur has extensive global experience in plant genetics and biotechnology, having served in research director positions in both the U.S. and Europe.

In his current role, he has been instrumental in integrating two new and proprietary technologies, gene shuffling and marker assisted selection, into DuPont plant genetics product development. During his 25-year career with Pioneer, Bill has been granted several patents that led to the commercialization of more than 30 Pioneer® brand products. He has been instrumental in negotiating international research collaborations as well as the 2004 acquisition of Verdia.

Bill holds Bachelor of Science and Master of Science degrees from Iowa State University and earned his doctorate in plant breeding and cytogenetics from the University of Minnesota. In 2006, Bill was appointed chair of the Private Sector Committee of the Consultative Group on International Agricultural Research, an organization that works to achieve sustainable food security and reduce poverty in developing countries through scientific research.

Elcio Guimarães

Elcio Perpétuo Guimarães received his BSc degree in Agronomy from the "Escola Superior de Agricultura Luiz de Queiroz" in Brazil. His MSc is on Genetics and Plant Breeding from the same University in Brazil. In 1976 he began working as a rice breeder at EMBRAPA. He obtained a PhD degree in 1985 from Iowa State University in USA, also on Genetics and Plant Breeding. From 1989 to 1996 he worked as rice breeder at the International Center for Tropical Agriculture (CIAT), in Colombia. In 1996 he returned to EMBRAPA where he remained until the end of 2001 when he became a senior officer at FAO. In his career he has been responsible for releasing several rice varieties in Latin America and has published and edited several books and technical articles.

Anke van den Hurk

Ms. Van den Hurk is senior adviser at Plantum NL, the Dutch association for breeding, tissue culture, production and trade of seeds and young plants, since 2001. Among others, she is specialized in the field of biodiversity, in particular access and benefit sharing (ABS). Therefore, she participates in the various meetings of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Convention on Biological Diversity (CBD) as representative of the breeding sector. To represent the sector she is active in the various industry fora dealing with ABS, such as the International Seed Federation, the European Seed Association, CIOPORA, the International Chamber of Commerce. Wihtin ISF she chairs the working group dealing with biodiversity.

Before joining Plantum NL, Ms. Van den Hurk worked from 1996-2001 at the International Plant Genetic Resources Institute (IPGRI, now known as Bioversity International) in Rome and Cali, Colombia as Associate expert on training in plant genetic resources and on complementary conservation strategies. From 1995-1996 she worked at Mekelle University College in Ethiopia as teacher in various agricultural subjects, among which plant breeding. From 1992 to 1995 Ms Van den Hurk worked as vegetable breeder at Nunhems Zaden in the Netherlands.

Ms. Van den Hurk has an MSc degree in plant breeding from the Wageningen University. She worked on taxonomy, plant breeding in Ethiopian barley landraces and growth models.

Cosima Hufler

Ms. Cosima Hufler is the Chair of the Bureau of the 4th session of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). She is senior advisor in the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, in charge of international environmental affairs. Her particular focus are matters related to access to genetic resources and the fair and equitable benefit-sharing arising out of their use in the context of the ITPGRFA, as well as of the Convention on Biological Diversity (CBD). In addition, she is in charge of international sustainable development issues as related to the UN Commission on Sustainable Development (CSD) and the United Nations Environment Programme (UNEP).

After completion of her university studies at the Universities of Innsbruck and Vienna, Ms. Cosima Hufler worked as a translator. She is a graduate of the Diplomatic Academy of Vienna (with particular focus on international environmental law and institutions).

Shakeel Bhatti

Dr. Shakeel Bhatti was appointed as Secretary of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) by the Director-General of FAO on 29 January 2007.

Before joining FAO, Dr. Bhatti headed the Genetic Resources, Biotechnology and Associated Traditional Knowledge Section of WIPO. He was instrumental in the creation of the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC), and served in the Secretariat of this Committee.

Before establishing the IGC, he worked in the Development Cooperation (and Copyright Law) Division. Before joining WIPO, Dr Bhatti worked on his doctorate at Duke University, USA, regarding the scope of patentable subject matter under Article 27 of the TRIPS Agreement in relation to genetic resources and biotechnological inventions. He is currently completing a second PhD on bioethics, biotechnology patenting and the right to food.

Joep Lambalk

Joep Lambalk holds a degree in Plant Biochemistry and Plant Molecular Biology from the Free University of Amsterdam.
Directly after graduation, he started in 1987 within Enza Zaden as (actually the first) plant biotechnology researcher.
After a career of more than 22 years within the company his current position is Managing Director Research & Development.

Bert Visser

Bert Visser was born in the Netherlands in 1951. He obtained an MSc degree in Molecular Sciences at Wageningen University in 1976 and in 1982 obtained a PhD at the University of Utrecht in the Netherlands in the area of medical virology.

He then worked in the Agricultural Research Department of the Ministry of Agriculture, Nature and Food Quality as a plant biotechnologist. In 1992 he joined the Ministry of Foreign Affairs as a senior officer in the Special Programme Biotechnology and Development Cooperation, in particular responsible for capacity building.

Since 1997 he is the director of the Centre for Genetic Resources the Netherlands (CGN) which under its own mandate is part of Wageningen University and Research Centre. As the director of CGN he fulfils an advisory role for the Ministry of Agriculture, Nature and Food Quality on policies regarding (agro-)biodiversity. In this capacity he has been a regular member of the delegations to FAO (International Treaty) and CBD. Furthermore he functions as the national focal point for the implementation of the Global Plan of Action on PGRFA, and has been appointed as the National Focal Point on Access and Benefit Sharing of the CBD.

His interests and activities concern genetic resources management and policy development, international collaboration in the area of genetic resources management, on-farm conservation of genetic resources, and the interface of agrobiodiversity and biotechnology.

Doug Waterhouse

Doug is a graduate in botany and forestry from the Australian National University where he specialised in quantitative genetics. His research career began in the Research School of Biological Sciences, where he worked on the forerunner to "Climate Change".

In 1978 Doug moved to the Department of Agriculture as part of the Lucerne Breeding Team and released the widely acclaimed series of varieties starting with 'Nova', 'Aurora' and 'Aquarius'. In the 1990's he turned his attention to conservation issues and joined the then Department of Conservation and Land Management to direct their programs related to revegetation and salinity control including work on developing more than 100 native and introduced species for land and water reclamation.

After a stint as the senior examiner, Doug has, for the last 15 years, been Chief of the Australian Plant Breeder's Rights scheme and the chairman of the Plant Breeder's Rights Advisory Committee. He has been a regular participant of UPOV's Technical Committee and is current President of the UPOV Council.

What do we want from our seeds?



Uniform, successful establishment

Session 4 – The importance of quality seed in agriculture

What is seed quality and how to measure it?

Alison A Powell
University of Aberdeen, UK



Outline

- What is seed quality?
  - What do we want from our seeds?
- Specific aspects of quality
  - Detail
  - How to measure different aspect of quality
- Concluding comments

Seed quality

- Required variety
- Analytical purity – freedom from weeds, other seed and inert matter
- Good plant establishment
- Freedom from disease

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www.seedtest.org

What we do not want to see

Weedy crops

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- How can we measure seed quality?
- ISTA seed testing methods
  - Specific aspects of quality
    - Detail
    - How to measure different aspects

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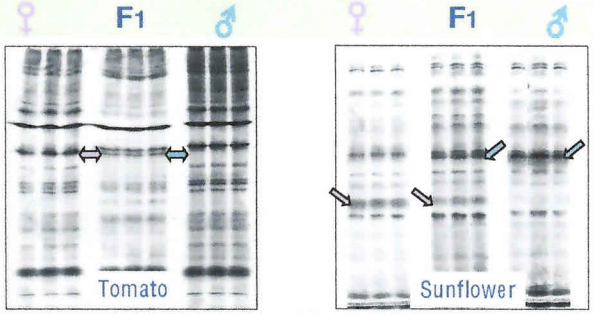
Diseased crops

Uneven maturity

Modern methods

- Protein reserves; electrophoresis



- Molecular markers: DNA extraction; PCR
- Microsatellites: Simple Sequence Repeats (SSR)

Required variety: Variety testing

Two aspects:

1. Identity of the variety: Is the sample the required species or variety?

2. Varietal purity
   - Open pollinated, F1 hybrids
   - Presence of GM in conventional lots and *vice versa*

Methods for GMO detection

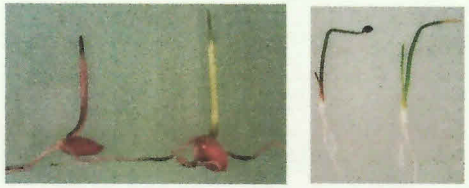
- Bioassays
- Biochemical analyses e.g. protein-based
- Molecular methods e.g. DNA-based

Traditional methods of variety testing

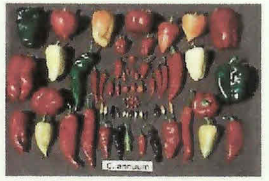
Morphological methods

Seeds

In laboratory and glasshouse



In the field



Good establishment

Influenced by 2 aspects of seed quality

Most important: Germination

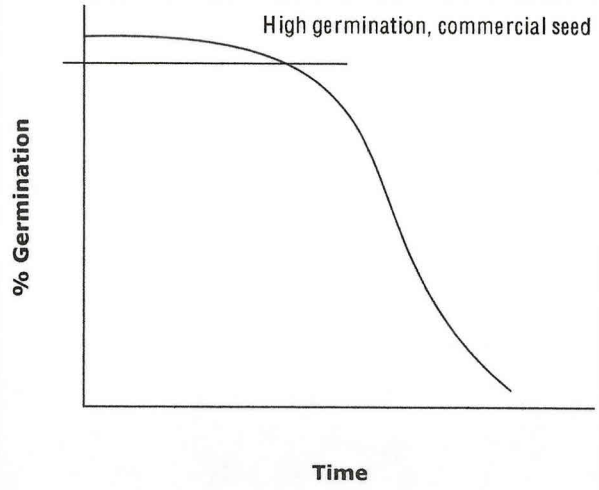
Can a seed produce a normal seedling?

Normal seedling: can establish in the field

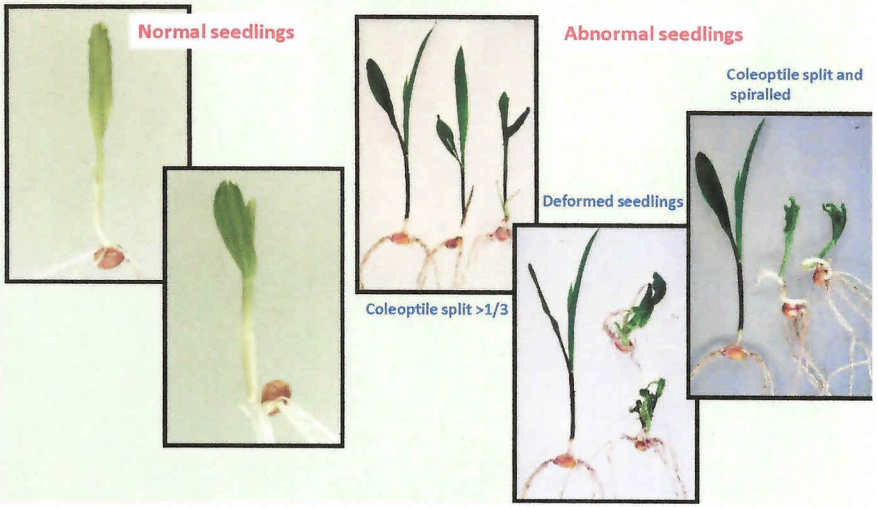
Analytical purity

- Avoids weeds and other species
- Methods:
  - Lenses, microscopes, sieves
  - Blowers (light material: chaff, empty florets)

Seed survival curve



Germination assessment: Maize



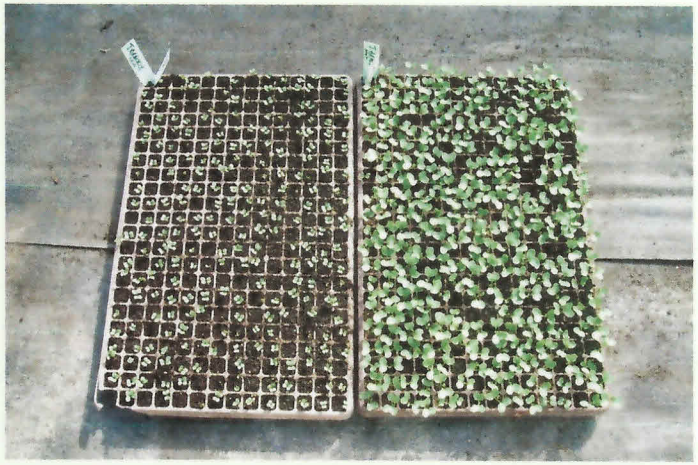
Germination tests

Range of media

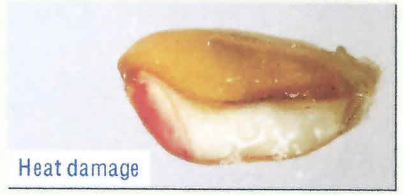
Rapid assessment of viability:

- Tetrazolium chloride staining:
  - Living tissues stain red

Emergence in transplant modules: cabbage



Viable seeds show staining in tissues that must be alive for normal seedling development

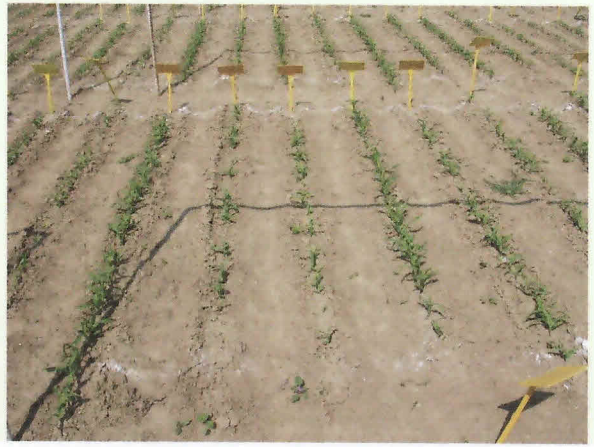


Good establishment

1. Germination
   - high percentage of normal seedlings
2. Vigour

- But – emergence differences in field conditions
- highly germinable seed lots

Maize



Avoid disease

Seed health tests

- Why are these important?
  - Seed borne inoculum may
    - Cause disease in the crop
    - Introduce disease to new regions
    - Reduce germination and % normal seedlings
  - Testing may indicate need for seed treatments

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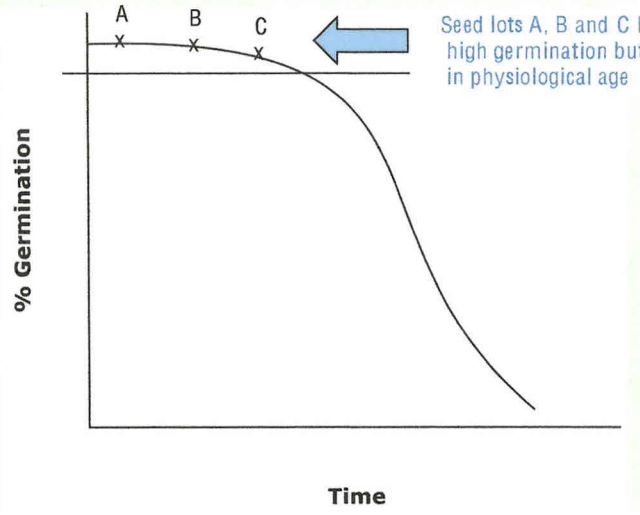
Seed survival curve



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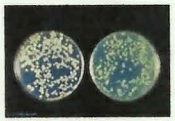
The test used depends on the organism being tested for and the purpose of the test.

- fungi, bacteria, virus, nematode, insect
- location of inoculum
- sensitivity required









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Seed vigour tests

Conductivity test (36 hours):
Peas, *Phaseolus* beans

Accelerated ageing test
(72 hours + 8 days germination):
Soyabean

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ISTA: Uniformity in seed testing

- ISTA International Rules for Seed Testing
- ISTA Handbooks
- Workshops
- Seminars
- Accreditation
- Proficiency testing

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Moisture content

- Seed value set by moisture content
- High moisture content, poor storage potential
- Important in other tests – germination, vigour

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ISTA: Test development

- Technical Committees e.g Germination,
  – Working groups
- Task Forces e.g GM
- Method validation
- Seed science research
  – Technical Committees
  – Triennial Seed Symposium
  – Seed Science and Technology (ISTA journal)

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Grind → Heat to remove water

Moisture meters

Concluding comments

Seed quality: Multiple components

- Most important components
  - Cultivar purity
  - Analytical purity
  - Germination
- Other significant components
  - Vigour
  - Seed borne pathogens
  - Moisture content

Measurement of seed quality

- Range of laboratory and field tests
- Uniformity
- Test development is continuous

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www.seedtest.org

Acknowledgements

ISTA Colleagues

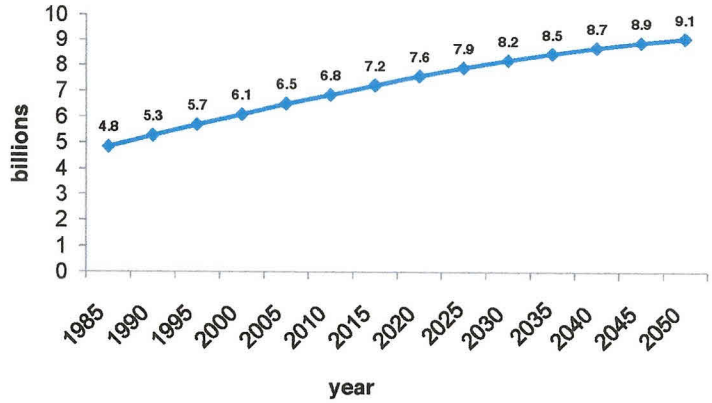
- Valerie Cockerell: OSTS, Scotland
- Ronnie Don: OSTS, Scotland
- Jose Franca Neto: EMBRAPA, Brazil
- Gillian McLaren: OSTS, Scotland
- Carmen Mortenson: Denmark
- Enrico Noli: LaRAS, Italy
- Giovanni Urso: LaRAS, Italy

Second World Seed Conference
Rome. September 8-10. 2009

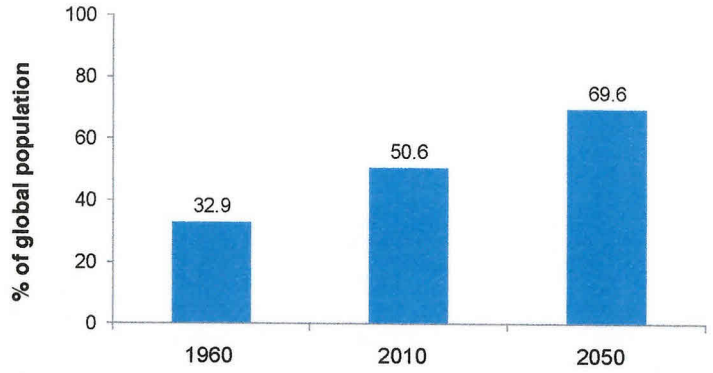
Opening Address

Bernard Le Buanec.

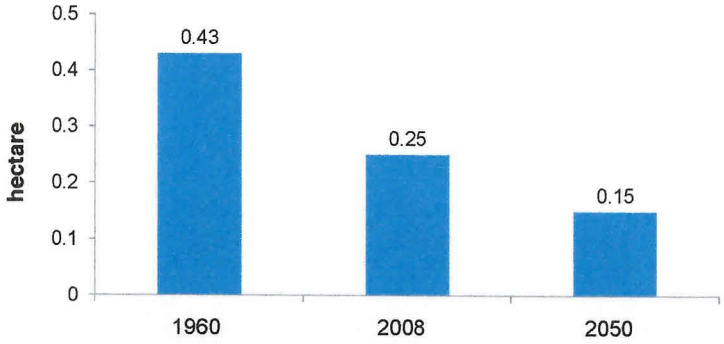
Evolution of the World Population



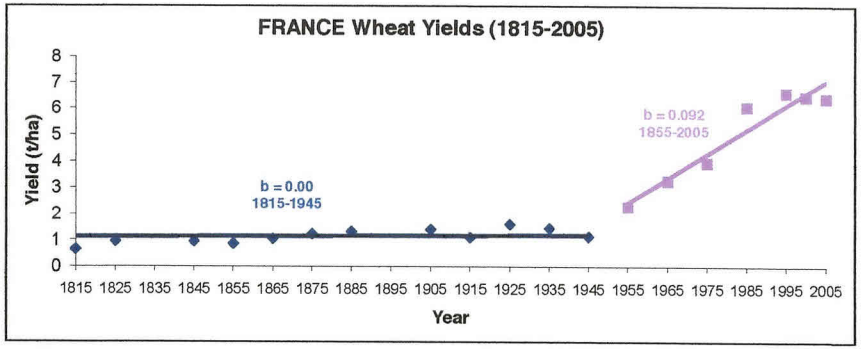
Evolution of Urbanization Level



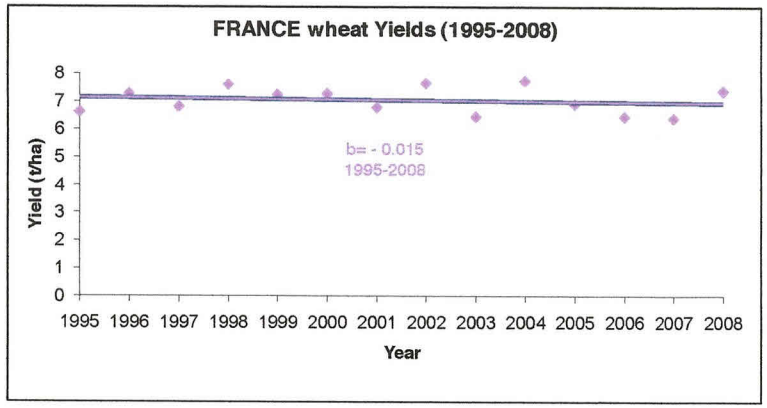
Arable Land per Inhabitant



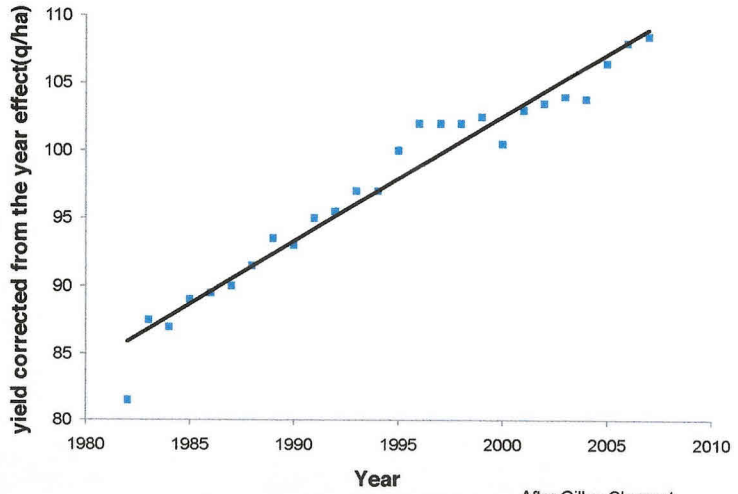
Evolution of Wheat yield in France



Evolution of Wheat yield in France

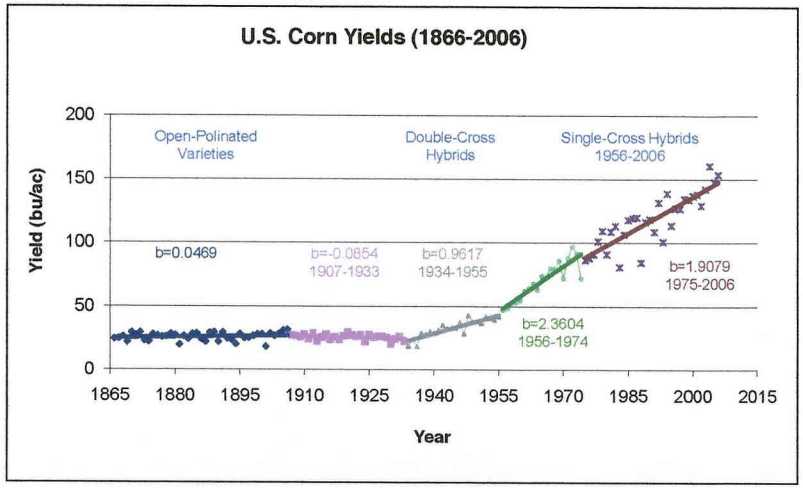


Wheat Yield increase due to genetic progress

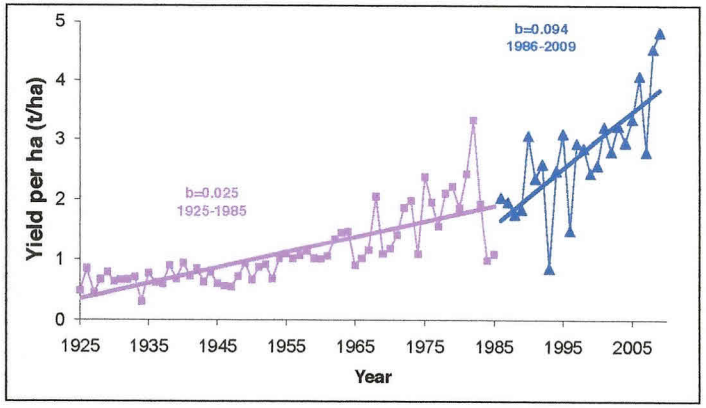


After Gilles Charmet

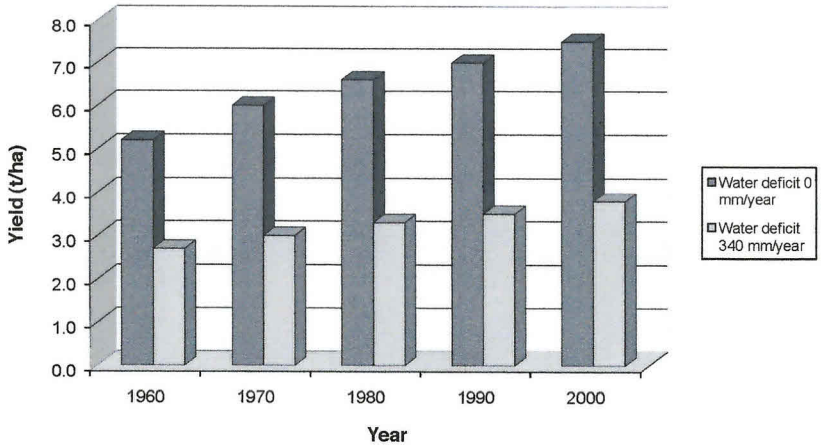
Evolution of Maize Yield in USA



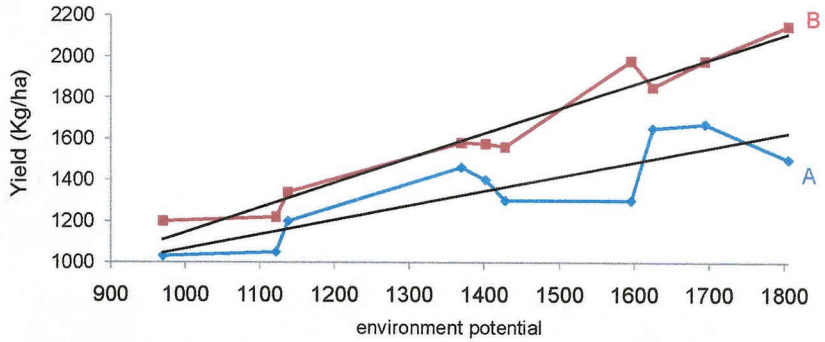
Evolution of Maize Yield in South Africa



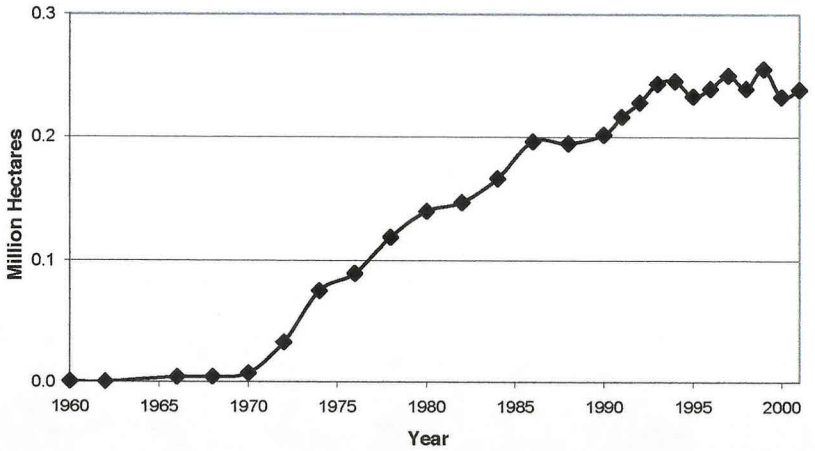
Evolution of Oil Palm Yield in Ivory Coast



Comparison of local (A) and modern (B) rice varieties



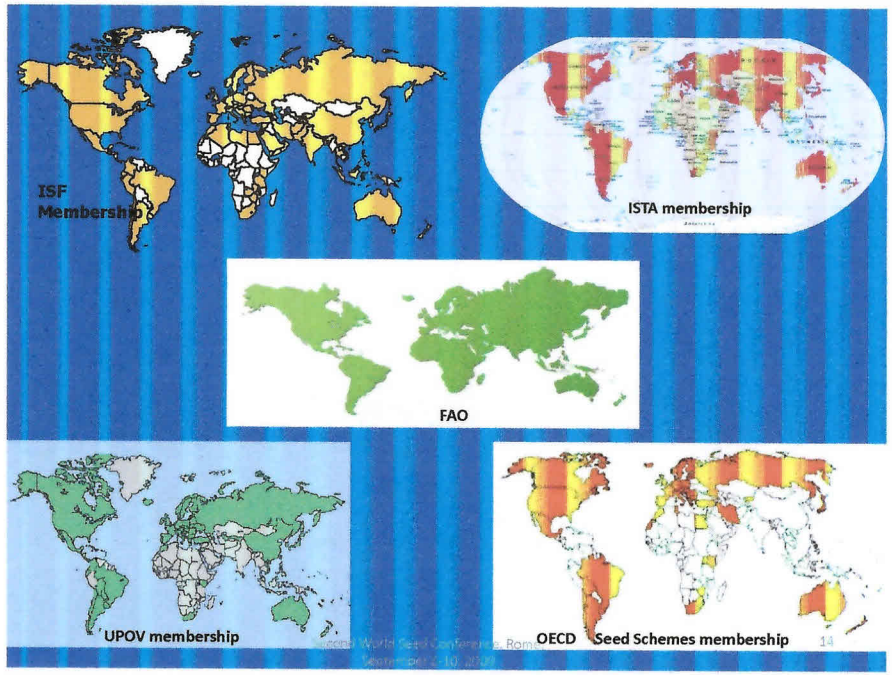
Adaptation of Maize to Temperate Climate: the case of the Netherlands



Source: Dutch Recommended List 2002)

Adaptation of Sugar Beet to Tropical Climate

- Sugar beet originates from temperate climate.
- After 10 years of breeding and experiment varieties adapted to tropical climates have been developed ans are under scaling up testing in India.
- Compared to sugar cane tropical sugar beet has several advantages:
  - less water consumption.
  - more drought and salt tolerant.
  - shorter growing cycle.



Program of the Expert Forum

- Session 1: The Role of Plant Breeding
- Session 2: the importance of Plant Genetic Resources.
- Session 3: Plant Variety Protection.
- Session 4: Importance of Quality Seed.
- Session 5: Facilitation of Trade and Market Development.

I wish you a very fruitful World Seed Conference

The Seed Industry - a Time Line (1)

- 1740 – 1850: First companies specialising in horticultural crops established
- 1850 – 1900: Modern Plant Breeding begins

  - Public sector involvement in plant breeding and protection of farmer & consumer interests
  - New companies established for numerous crops
  - First National Seed Associations established
- 1900-1970s: Transition and Modernization
  - Growth of the seed sector, private and public
  - Forerunners of ISF established (FIS: 1924 / Assinsel: 1938)
  - International regulations affecting seed in force

The evolution and contribution of plant breeding to global agriculture

Marcel Bruins
International Seed Federation

2nd World Seed Conference, Sept. 8-10, 2009, Rome

The Seed Industry – a Time Line (2)

- 1970s - First wave of consolidation
  - Chemical & oil industry acquire seed companies
- 1980s - Biotechnology in plant breeding
  - DNA marker assisted selection, genetic engineering
- 1990s - Second wave of consolidation
  - Birth of 'life-science' companies
- International Treaties and Conventions with impact on the seed industry

  (UPOV, CBD, CPB, IT-PGRFA)

Plant Breeding

Changing genetic make-up of plants
for the benefit of humankind

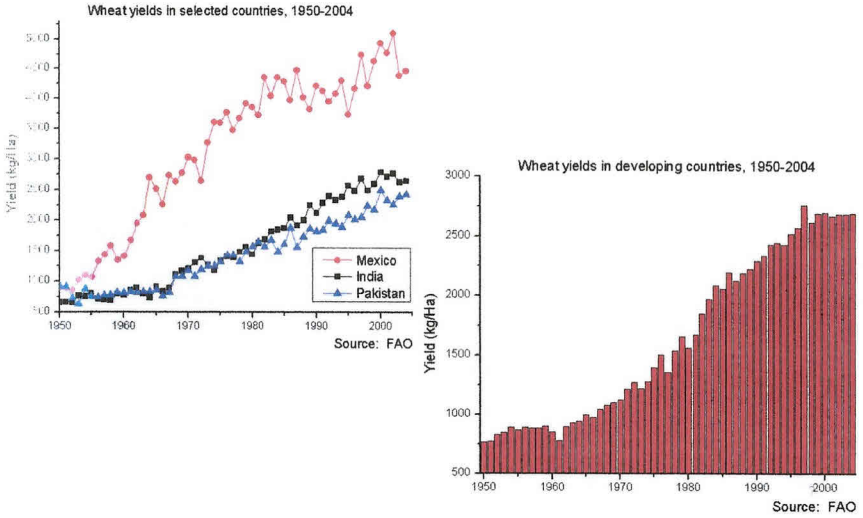
Developing new varieties
→through creation of new genetic diversity
→by reassembling existing diversity
→aid of special techniques & technologies

Precursor:
9.000-11.000 yrs ago
(domestication)

Source: Crispeels, 2008

Contributions of Plant Breeding

Yield



The Seed Industry Today

1. Increasing global seed market
2. Growing use of hybrid seed with several technological components (e.g. seed coatings)
3. Growing international seed trade
4. Increasing number of regulations
5. Increasing number of multinational companies

Contributions of Plant Breeding

Yield

- ❑ Winter wheat yields: trebled over the past 60 years
  - ➢2.5 tonnes/ha (mid-1940s) to 8 tonnes/ha today.
- ❑ NIAB study 2008: wheat, barley, oats
  - ➢300 varieties (>3 yrs), 3600 trials, 53.000 data points
- ❑ 1947-1986: 50% of increase in yield attributed to plant breeding.
  - ➢Rest to fertilizers, crop protection products, crop husbandry and machinery (Silvey, 1986)
- ❑ Since 1982: 90% of all yield increase due to introduction of new varieties (yield : 5t/ha =>8t/ha)

Contributions of Plant Breeding

- Yield
- Resistance to biotic stress
- Tolerance to abiotic stress
- Earliness
- Taste
- Size
- Quality
- Firmness
- Shelf-Life
- Plant type
- Labour cost
- Harvestability
- Dwarfness

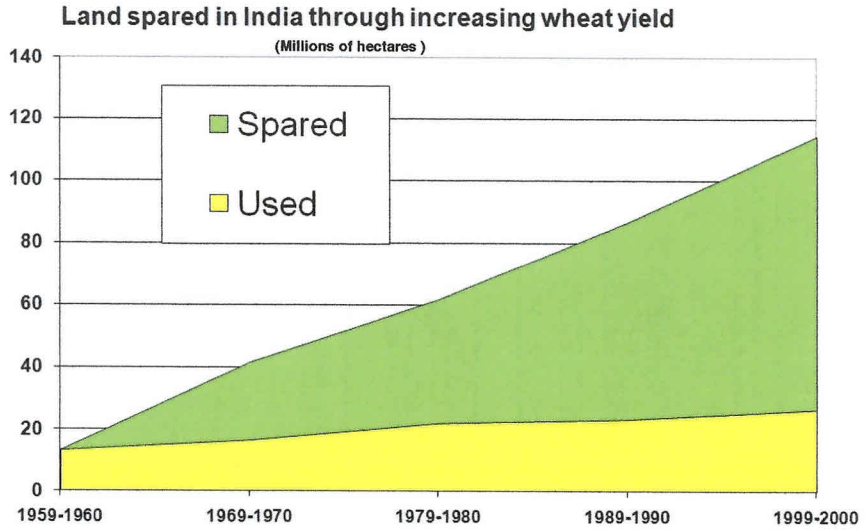
Annual global level of lost food production

5 billion caused by pathogens
5 billion caused by insects

Source: FAO, Aug. 2009

: disease resistance alone saves 100
lion GBP/yr in crop protection products

Contributions of Plant Breeding



Geminiviruses in tomato

omato Yellow Leaf Curl Virus

990s: Destroyed 95% of tomato harvest in

om. Rep.

1991/1992: 140 million USD damage in

lorida.

low resistant varieties

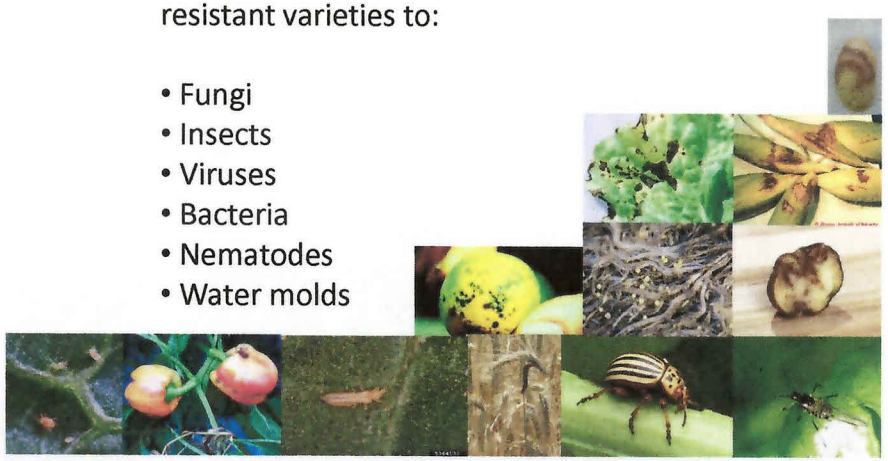
M. Bruins

Contributions of Plant Breeding

Biotic stress resistance

Plant Breeding has provided 10.000s of resistant varieties to:

- Fungi
- Insects
- Viruses
- Bacteria
- Nematodes
- Water molds



Contributions of Plant Breeding

Nutritional quality

124 million people / yr in 118 countries affected

/ Vit. A deficiency (1-2 million deaths)

Rice: staple crop for half of mankind

Rice varieties developed with higher levels of

rotenoids => 'Golden rice'

Market release 2011?

70 IP rights from 32 companies relinquished

Still work to do

- Fusarium Head Blight , Ergot or Stem rust in cereals and grasses
  - All Fungi, potentially fatal
  - FHB: Yearly 1 billion losses in wheat yield and grain quality
  - Ergot: In North Dakota, as much as 10 percent loss has been reported in wheat, while losses of 5 percent are common in rye.
  - Ug 99: up to 100% crop loss reported
  - Aim: Resistant varieties

Improving crop quality

Machine harvestable Brussels sprouts

Sugar beet: Sugar production/ha doubled in 50 years

- Monogerm varieties: fully mechanized cultivation

Malting quality in barley improved

- 1950: 2000 ltr/tonne => Now 8000 ltr/tonne

Taste in many vegetables greatly improved

Broccoli with higher levels of cancer fighting glucosinolate

Contributions of Plant Breeding

Abiotic stress tolerance

Plant Breeders focus on tolerance for:

- Herbicides (95 billion USD / yr lost on weeds
  - 380 million tonnes of wheat)
- Drought (90 million people affected/yr)
- Flood (106 million people affected /yr)
- Salt (900 million ha affected)
- Better nutrient uptake

Barley genotypes grown under normal and saline conditions on hydroponics.

Cowpea drought field trial (Kano, Nigeria) Source: WUR, NL

Potato plants grown without watering for 3 weeks

Contributions of Plant Breeding

Responding to the challenges

- Food security & Hunger alleviation
- Increase nutritional values
- Reduction of pesticides / fossil fuels
- Reduction GHG emissions
- Land saving / Decrease deforestation
- Conserve biodiversity
- Increase carbon sequestration

The Green Revolution

Combined use of High Yielding Varieties, fertilizer, irrigation and crop protection products in wheat, rice and other cereals

1943: MX imported half of its wheat
1956: MX is self-sufficient
1964: MX exports 0,5 million tons of wheat

1961: IN on brink of famine
Introduction of semi dwarf IR8 rice
Since 1973 self sufficient
By 1990s rice yield risen from 2 tons to 6 tons /ha

Contributions of Plant Breeding

Conclusion:

⇨ Enormous contribution so far

➡ Tremendous potential

New Rice for Africa (NERICA)

- Africa imports 1 billion USD of rice
  - African rice: resistant to drought & pests, but lodges & grain shattering
  - Asian rice: high yielding but poorly adapted
- Interspecific cultivar: African X Asian rice
- Developed by West Africa Rice Dev. Assoc.
- Combines best of both types:
  - 2,5 x yield, 2% more protein, resistant & tolerant

Thank you for your attention

SEED IS LIFE
ISF
International Seed Federation

www.worldseed.org

SEED IS LIFE
ISF
International Seed Federation

Introduction

The selection of plants to give higher yields and produce of higher quality has formed the basis of plant breeding.

Faced with evolving constraints such as climate change and the need to significantly improve crop yields in a relatively short time to feed the fast growing needs, the seed industry and governments have to embark on the use of new plant breeding technologies with set targets or goals.

Anticipated Demands and Challenges to plant Breeding and related Technologies into the Future.

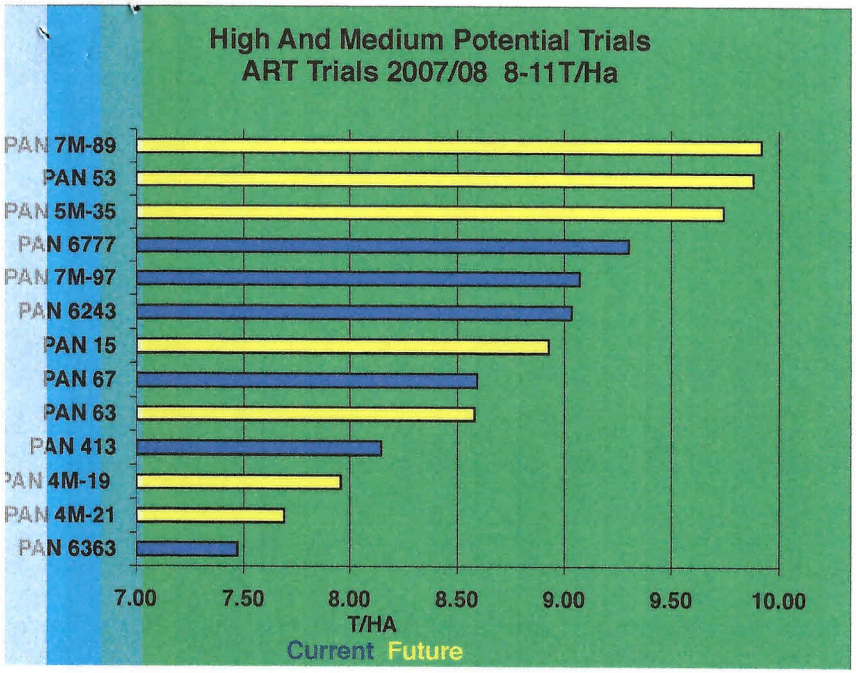
By Marcel.B.Kanungwe

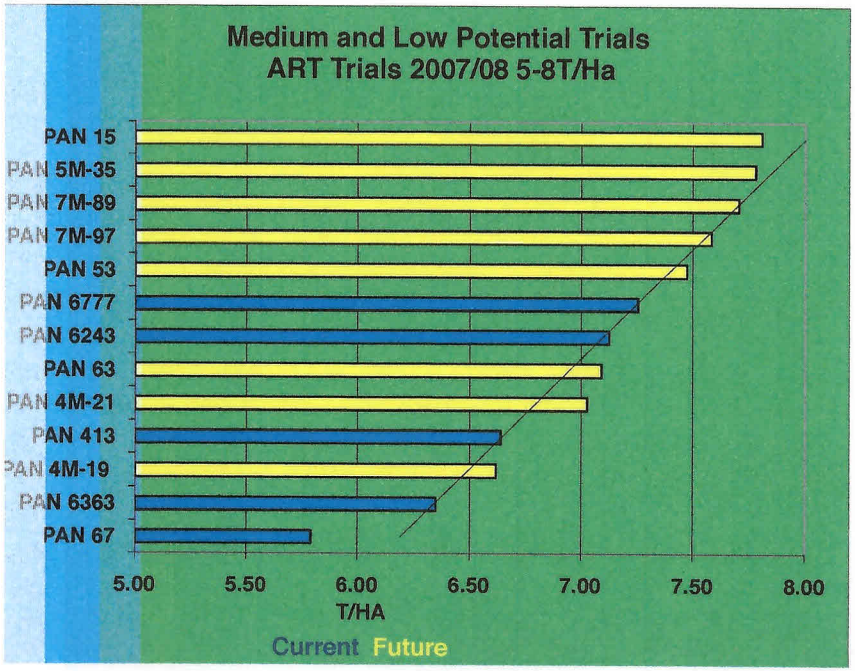
Director Pannar Seed (Z) LTD

CORPORATE BREEDING GOALS

ULTRA EARLY/DROUGHT TOLERANT	
EARLY/DROUGHT TOLERANT	PAN 4M-19
EARLY	PAN 6363
MEDIUM	PAN 67,53
LATE HIPO	PAN 61,6777
VERY LATE	PAN 69,7M-89
ULTRA LATE	PAN 691,683

Anticipated Demands and Challenges to plant Breeding





PANNAR 50 Years of Quality Seed

Robynne M. Anderson in "Putting Farming First" and the article "A call to Action on global agriculture" put it very candidly saying "the approach starts by focusing on farmers, the tools and information they need to steward land, grow corps, bring in their harvest and then get it to the market". She went further and said "New investments, incentives and innovations are needed to achieve greater sustainability while delivering increased agricultural production".

The above quotes and the corporate breeding goals by seed companies sum up the demands, challenges and opportunities of the past, the present and the future for global agriculture and plant breeding in particular.

PANNAR 50 Years of Quality Seed

2.0 ANTICIPATED DEMANDS

2.1 CHANGING FARMERS' NEEDS

Farmers at large are becoming more specific in their demands and meeting their needs will require well planned breeding with well established goals.

Such breeding corporate goals (fig 2 and 3) will aim to :

3.0 CHALLENGES

3.1 POPULATION GROWTH

➢The World Population now at 6.8 billion will by 2050 reach 9.2 billion.

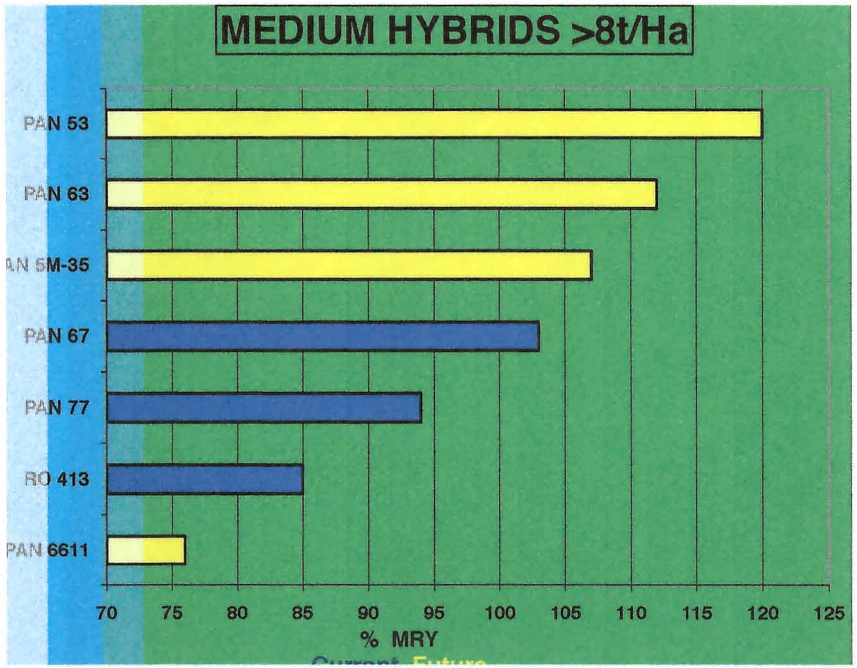
➢In a more and more hostile environment, plant breeding and supporting technologies will be required to produce more food. Figures No.4a and 4b show development of high yielding maize hybrids at all levels of maturities.

➢Develop hybrids of all maturities (very early to very late).

➢Provide varieties for all localities, seasons and circumstances (erratic rainfall, heavy / late rains and high altitude)

➢Develop varieties with sound agronomic traits (cob, leaf and stem disease resistance, standability and hardness of grain for small scale farmers)

➢Pay particular attention to small scale farmers' needs (provision of very early flowering and maturing varieties with improved storability)



2.2 INFRASTRUCTURE DEVELOPMENT

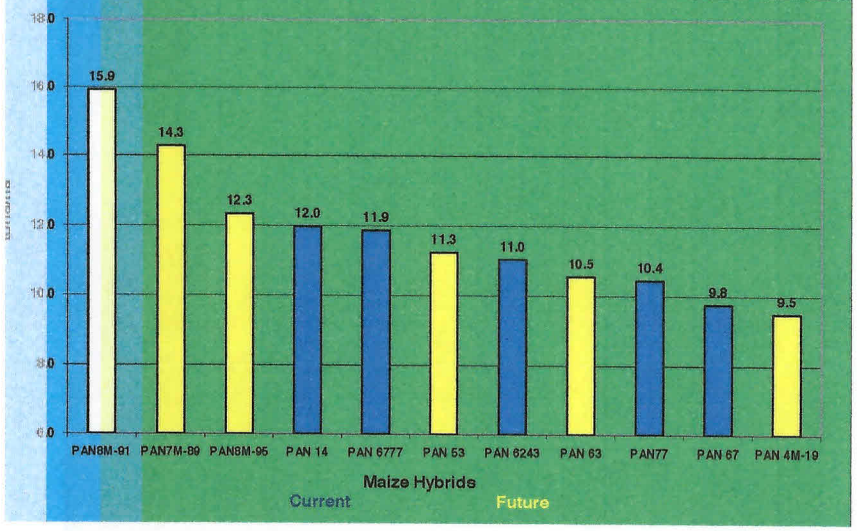
➢Infrastructure development such as roads, bridges, electricity are top priorities, especially for developing countries because they form the basis for the exploitation of technologies.

➢The expansion of irrigated land in Indonesia to empower small scale farmers in the production of rice will maximize output resulting from advances in plant breeding.

➢Sub-Sahara Africa with vast lands and abundant water resource (rivers and lakes) could produce record yields taking advantage of improved varieties.

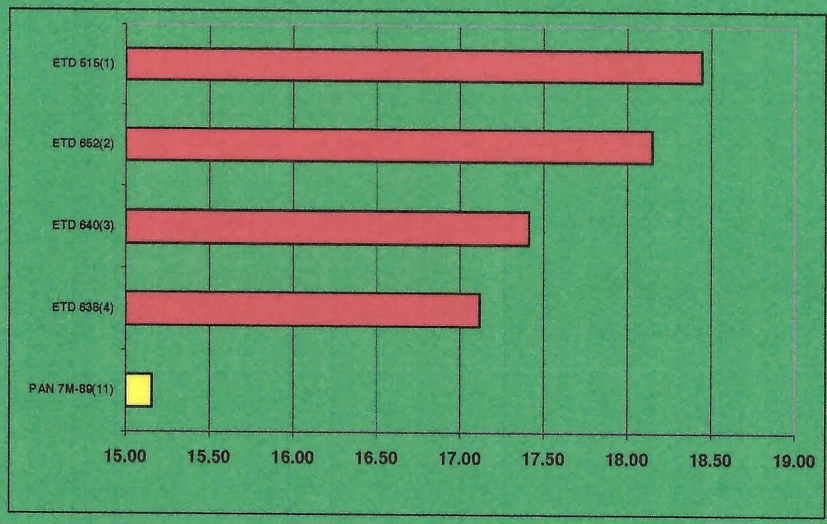
➢The Common Wealth Market of East and Southern Africa (COMESA) and SADC countries continue to commit less than 10% of their annual budgets contrary to their resolution. Only adequate finance can unlock the agronomic potential of high yielding varieties.

High Rainfall – Commercial Hybrids

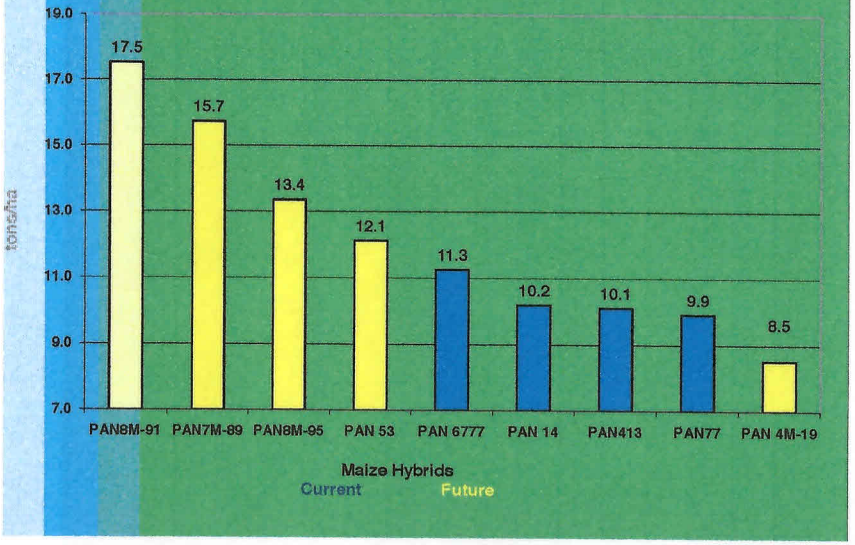


Future vs Experimental

Hybrid Trial tons/ha Pannar seed 2008



Medium Rainfall-Commercial Hybrids

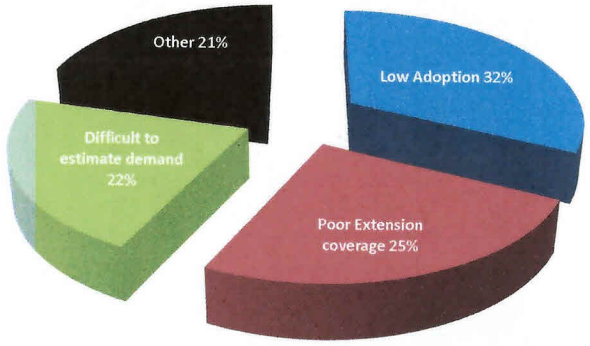


PANNAR 50 Years of Quality Seed

3.2 ACCESS TO SUITABLE GERMPLASM

- Plant breeding has to cope with the changing environment by constantly breeding superior varieties to address specific needs.
- Economically important traits are top priority in breeding programs as they impact positively on productivity (figures No.5 and 6 breeding for specific environment)

Fig no.7 Bottlenecks Influencing Farm Level seed Demand



LIVING THE PANNAR EXPERIENCE

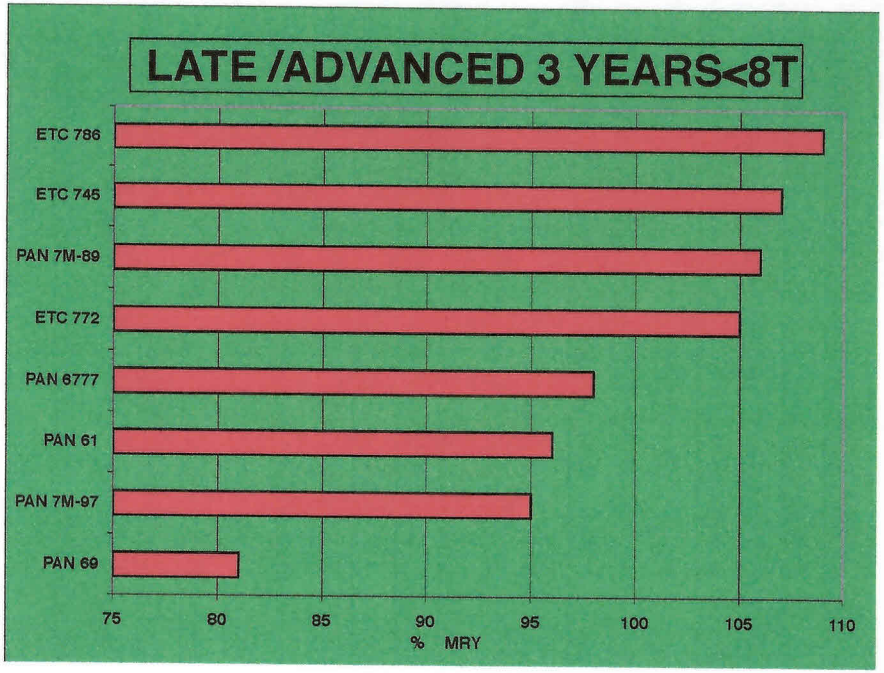


Fig no 7 Bottlenecks influencing farm level seed demand in Eastern and Southern Africa
DTMA Seed sector survey (2007-08)

- Poor extension coverage not delivering up to date information on varieties and services.
- Farmers unaware of availability of improved varieties that can improve productivity.
- Farmers make decisions without awareness of varietal characteristics.
- Seed houses are unable to forecast seed demand

LIVING THE PANNAR EXPERIENCE

3.3 LOW SEED DEMAND AT FARM LEVEL

- Farmers are not readily adopting new improved varieties thus being deprived of the benefits of improved products.

- Low adoption rate of improved maize varieties in Eastern and Southern Africa (figure No.7) is mainly due to:

LIVING THE PANNAR EXPERIENCE

➢Many countries have not established accreditation to important international organizations such as Organization of Economic Co-operation and Development (OECD), International Seed Testing Association (ISTA) etc. These countries find it difficult to access international markets. (Table 1 gives the position in Eastern and Southern Africa while table 2 shows the time lag to release a new variety on the market).

3.4 SEED CONTROL AND CERTIFICATION LEGISLATION

➢Seed policy or the absence of it has in many instances impacted negatively on the development of the seed industry. Figure 8 illustrates the principal bottlenecks limiting the production and distribution of seed in Africa.

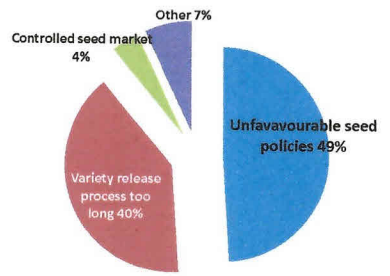
Table no.1 Status of seed control legislation in Eastern and Southern Africa

DTMA Seed sector survey 2007/8

		Plant Variety	Variety	ISTA	OECD
	Seed Act	Protection	Registration	Accreditation	Accreditation
n Africa					
Ethiopia	No	Yes	Yes	No	No
Kenya	Yes	Yes	Yes	Yes	Yes
Tanzania	Yes	Yes	Yes	No	No
Uganda	No	No	Yes	No	No
ern Africa					
Angola	Yes	No	Yes	No	No
Malawi	Yes	No	Yes	Yes	Yes
Mozambique	Yes	Yes	Yes	No	No
South Africa	Yes	Yes	Yes	Yes	Yes
Zambia	Yes	Yes	Yes	Yes	Yes
Zimbabwe	Yes	Yes	Yes	Yes	Yes

Fig no.8 Major Seed Policy Related Bottlenecks Hindering the production and distribution of seed in Africa

DTMA Seed sector survey 2007/8



4.0 CONCLUSION

- It is gratifying that the seed stakeholders have mobilized themselves to anticipate the demands and challenges for plant breeding and are trying to find global response through the exchange of ideas like this 2nd World Seed Conference.

- Developing countries should register a change in the mindset and elect on developing agriculture and adopt current and new technologies.

- The adoption of progressive seed laws and regulations with effective harmonization of seed trade will improve farmers' access to improved seed.

- Public-private partnership is not only critical but essential for the seed sector. The Indian Sub-Continent and South East Asia have experienced a higher growth rate in agriculture mainly because of the good cooperation between the public and private sectors.

Table no.2 Length of seed release process in selected countries

DTMA Seed sector survey 2007/8

	Actual time to seed release (years)			Time from release to time significant quantities of seed is available (years)		
Country	Mean	Minimum	Maximum	Mean	Minimum	Maximum
Kenya	3.1	1.5	6.0	2.4	0.0	9.0
Malawi	3.0	2.0	7.0	1.9	0.5	3.0
Tanzania	2.2	1.0	3.0	2.0	1.0	3.5
Uganda	2.2	1.0	4.0	2.1	1.0	4.0
Zambia	2.1	1.0	3.5	2.5	2.0	3.0
Zimbabwe	2.2	1.0	3.0	2.4	1.5	4.0
South Africa	2.0	2.0	2.0	2.5	2.0	3.0

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3.5 GOVERNMENT AND DONOR MINDEST

- The mindset of many governments in developing countries is nonresponsive to market demands resulting in poor exploitation and investment in new technologies.
- Many donor agencies are not development oriented. Valuable funds are spent on short term relief which does not add much value to local economies in the long term and in a sustainable manner.
- Governments and donors should focus on increasing adoption rates of new products in order to increase productivity at farm level.
- Investment should be committed to ensure farmers use the right tools and equipment combined with sound agricultural practices to increase production efficiency (figure 7 clearly illustrated the failure of reaching out to the farmer with correctly packaged information.)

LIVING THE PANNAR EXPERIENCE

Effective use of modern biotechnology and molecular breeding and associated methods as breeding tools

Usha Barwale Zehr
mahyco

Prehistoric selection for visible phenotypes that facilitated harvest and increased productivity led to the domestication of the first crop varieties - the earliest examples of biotechnology

Breeding progress

- Improved varieties
- High Yielding Varieties
- Green revolution
- Hybrids

mahyco

- 1980s- The plant biotechnology era begins - transgenic plants using Agrobacterium produced in 1983
- Molecular marker systems for crop plants soon follow to create high-resolution genetic maps

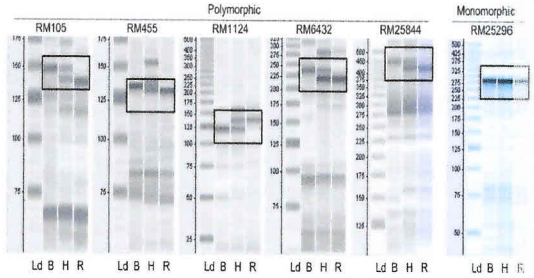
Application of Molecular tools to breeding procedures

- Molecular Plant Breeding Expands Useful Genetic Diversity for Crop Improvement
- Molecular Plant Breeding Increases Favorable Gene Action
- Molecular Plant Breeding Increases the efficiency of Selection –improved Year-on-year gains

mahyco

Molecular breeding

- Backcrossing program
- MAS
- Genome recovery
- Genetic diversity/heterotic grouping
- Fingerprinting
- .....



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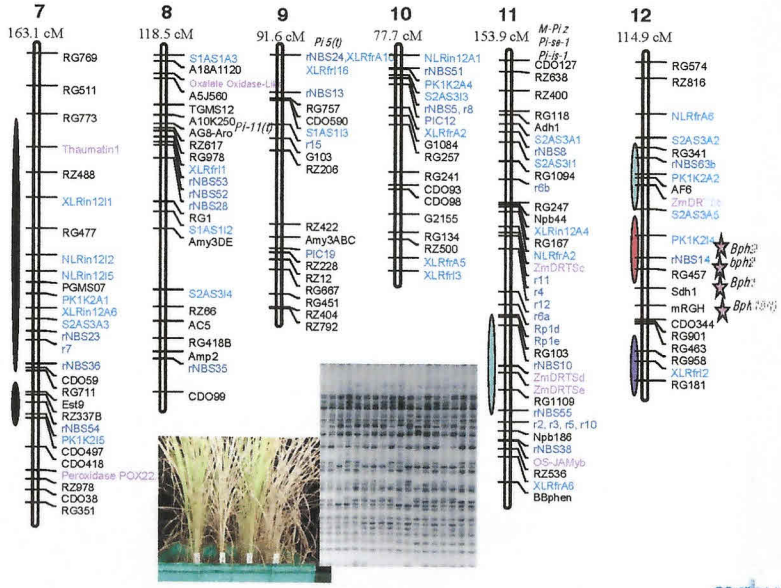
Host Plant Resistance to BPH in Rice Germplasm

(IRRI)



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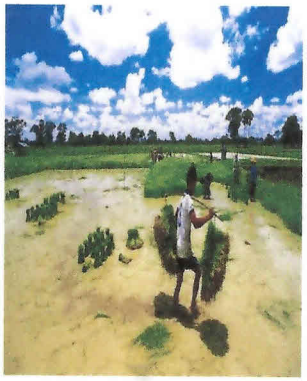
Drought tolerance in rice

Field evaluation - Phenotyping

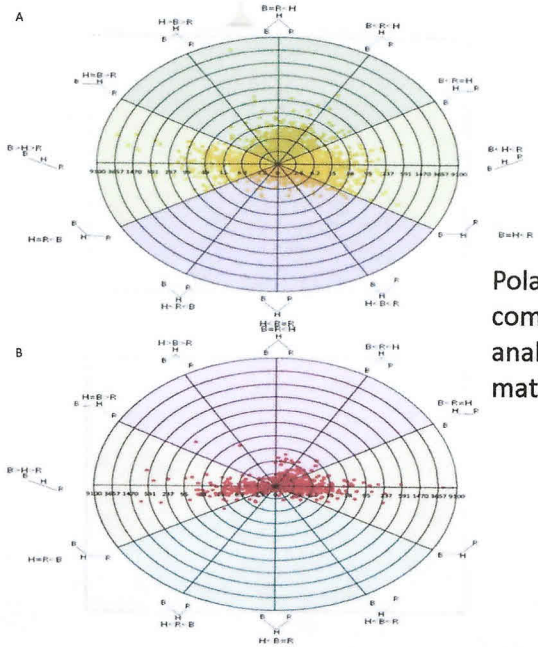


Sources of germplasm

Drought

Molecular markers

Transgenics



Polar graphs representing comparative transcriptome analysis of young (A) and mature (B) leaves

Why transgenic technology?

No known sources of tolerance

Conventional approaches not successful

- First generation traits
  - Insect tolerant crops
  - Herbicide tolerant crops
  - Disease resistant crops
- Looking ahead
  - Drought
  - Salinity
  - Fertilizer use
  - Yield per se

Insect tolerance

Virus tolerant crops

mahyco

- Losses caused by the fruit and shoot borer alone is 50 to 70%
- 25-80 pesticide sprays per season

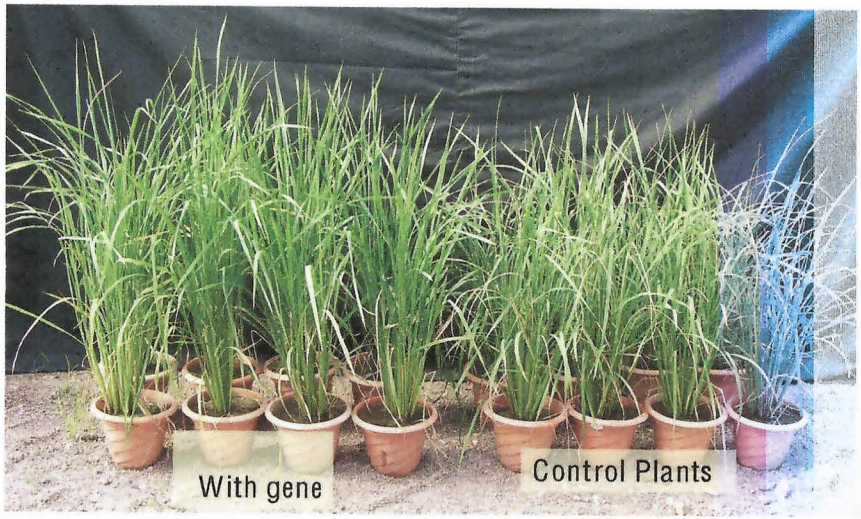
mahyc

Salinity tolerance

- 900 m hectares of land affected by salt worldwide
- 33% of the world's irrigated land is affected by high salt
- 50% of the arable land will be salt-affected by 2050

mahyco

NHX Salt tolerant plants



16 days of 50mM Nacl stress

mahyc

- Biotechnology is providing unprecedented options for enhancing plant breeding
- Molecular breeding and transgenic crops for improving productivity in a sustainable manner

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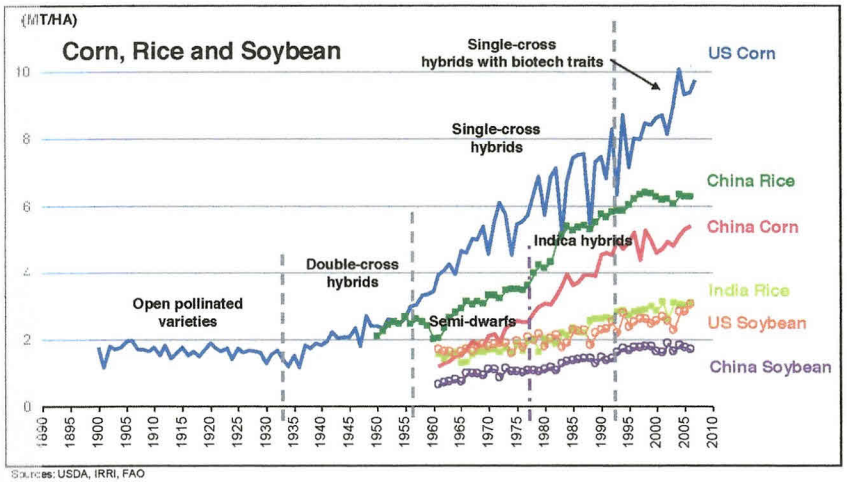
Strong Productivity Gains Achieved through Plant Breeding



Sources: USDA, IRRI, FAO

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The Opportunities Presented by Modern Biotechnology to Enhance Plant Breeding:

What's in the Pipeline?

World Seed Conference
September 8, 2009

Bill Niebur
DuPont Vice President
Crop Genetics Research & Development

What will Define the Future?

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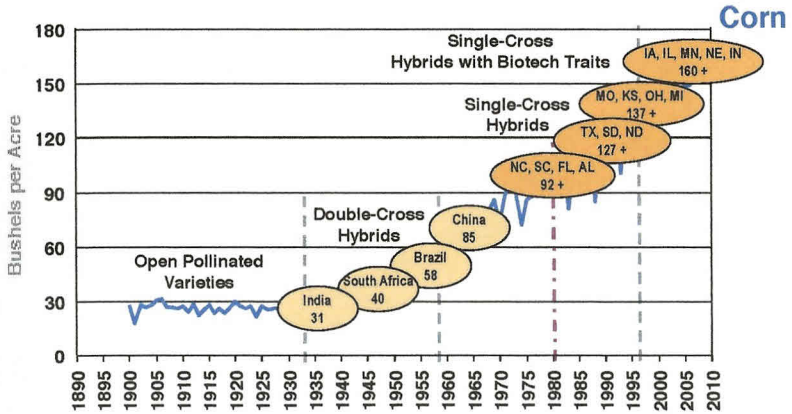
Corn Yield Trends in Global Context



Source: USDA, IRRI and FAO

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Enhancing Plant Breeding through Biotech: What's Next?

- Modern biotechnology provides powerful tools
  - Expand breeding programs
  - Accelerate rate of genetic gain
  - Fully exploit native genes
  - Bring new attributes to crop species
- Development and deployment of technology to enhance plant breeding on global basis to increase productivity
  - Future pipeline
  - Breaking down barriers

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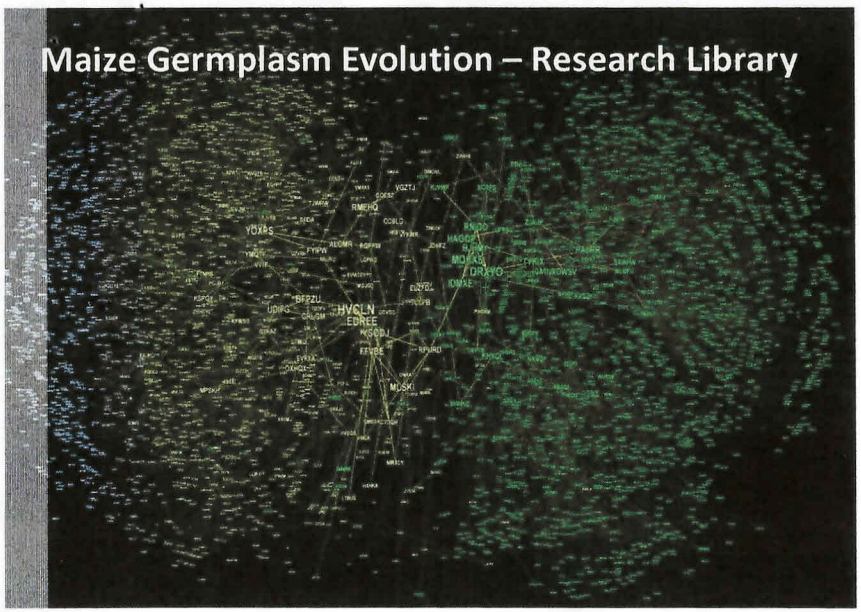
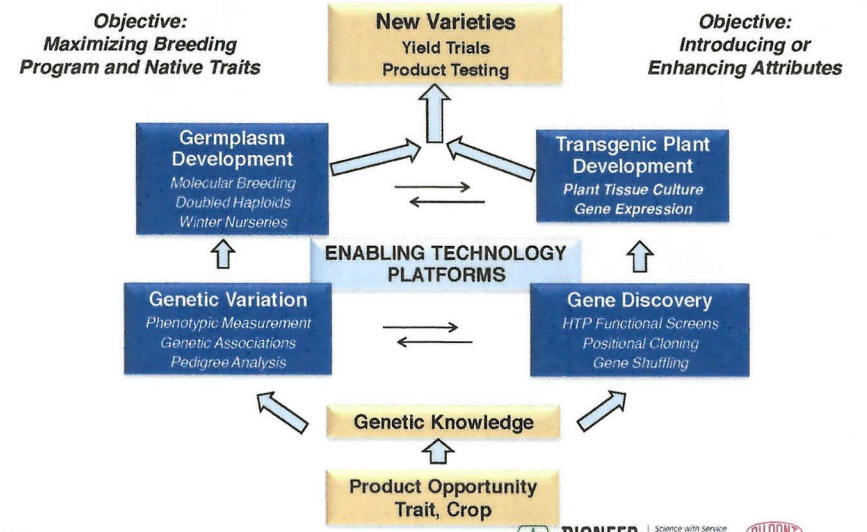
Genetic Variation



The Tools of Modern Plant Breeding



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Exploiting Native Genes

Corn


Southern Rust


Fusarium Ear Mold


Gray Leaf Spot


Brittle Snap


Northern Leaf Blight


Stalk Rots

Soybeans


Charcoal Rot


Chinese Soybean Aphid


Asian Soybean Rust


Soybean Cyst Nematode


Iron-Deficiency Chlorosis


Sudden Death Syndrome

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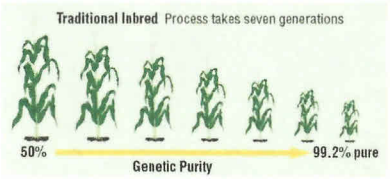
Germplasm Development

- Molecular Markers
- Laser Assisted Seed Selection
- Doubled Haploids
- Winter Nurseries



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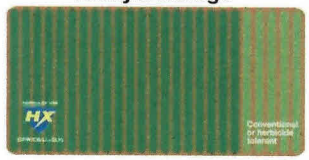
lext Generation Insect Control – Reduced Refuge, Multiple lodes of Action

- **Refuge reduction**, increased productivity, higher farm yields
- **Multiple modes of action**
- **New concepts** that leverage both existing and new modes of action
- **Integrated refuge** for grower convenience – promotes IRM compliance
- **Trait durability**

Today's Refuge



Optimum AcreMax System Concept

and AcreMax™ are trademarks of Pioneer Hi-Bred. Optimum® AcreMax™ insect protection is not available for sale or use. Products, benefits and concepts described are subject to full regulatory approval. Herculex® XTRA Insect Protection technology by Dow AgroSciences and Pioneer Hi-Bred. ® and the HX logo are registered trademarks of Dow AgroSciences LLC

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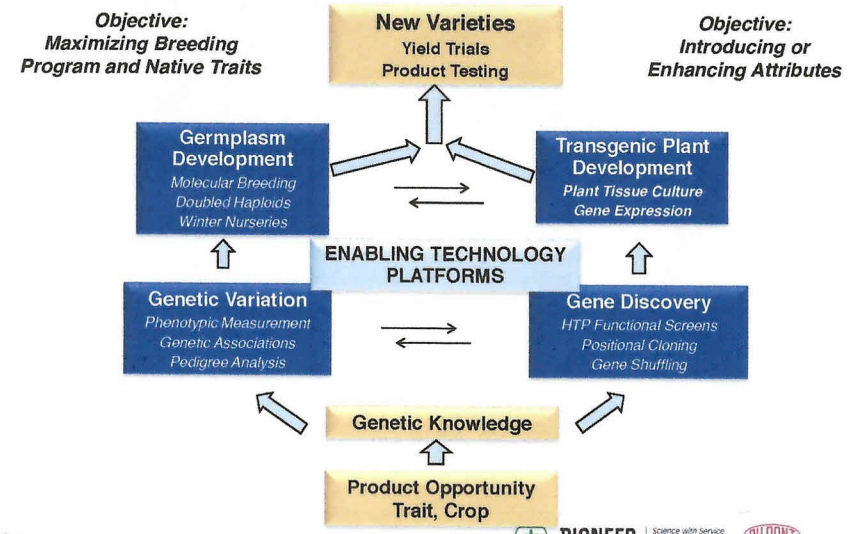
The Tools of Modern Plant Breeding



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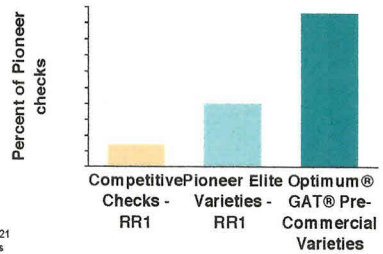
Multiple Modes of Glyphosate Tolerance & Glyphosate-Tolerant Weed Control

- Improved crop performance / Water-use efficiency / Nutrients
- Combinational technology approach
- Additional modes of action
- Platform for future innovation

Optimum® GAT® Soybean 2008 Research Trials, Champaign, IL

Optimum® GAT® Soybeans Yield Advantage + 6%



between Optimum GAT/RR experimental lines and Pioneer RR varieties summarized over 21 replicated multi-replication experiments from 27 locations and between Pioneer RR and Competitor RR lines from 9,475 comparisons in 2008 on-farm strip trials.
and GAT® are registered trademarks of Pioneer Hi-Bred. Optimum® GAT® products are not yet available for sale or use. Products, benefits and concepts described are subject to full regulatory approval. Roundup Ready is a registered trademark used under license from Monsanto Company.

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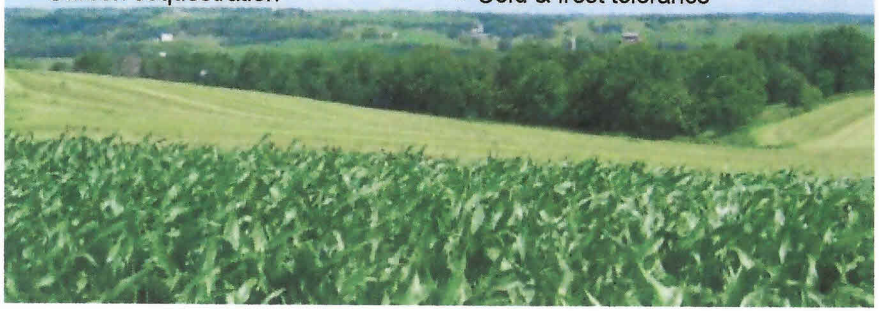
Enhancing Productivity

- Insect protection on more acres
- Multiple modes of glyphosate tol.
- Pollen fertility control, hybrid prod.
- Improved fuel, food & feed value
- Drought tol. – native & transgenic
- Carbon sequestration
- Nutrient use efficiency
- Disease resistance
- Transgenic yield enhancement
- Salinity tolerance
- Plant density, plant architecture
- Cold & frost tolerance



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Next Generation Biotech Traits

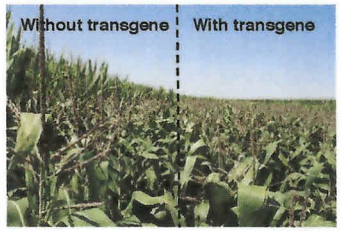
Increasing **cold** and **frost** tolerance

Without transgene With transgene

Increasing the number of **floral units** per hectare

Without transgene With transgene

Changing **plant architecture** to increase yield/expand geography



Greater **productivity per unit** of input/land area

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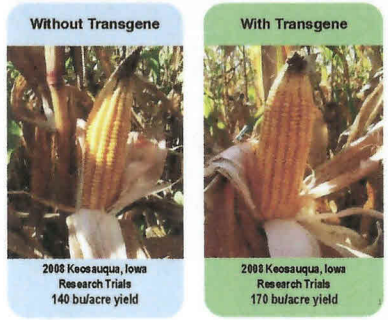
Improving Yields in Water-Limited Environments

- Drought Tolerance I:
  - Native solution leveraging Accelerated Yield Technology (AYT™ system) and germplasm
- Drought Tolerance II:
  - Transgenic and native combination approach with lead events demonstrating up to 16% yield advantage
- No yield penalty under optimal conditions



Source: 2008 Pioneer research data
Products, benefits and concepts described above are subject to full regulatory approval.

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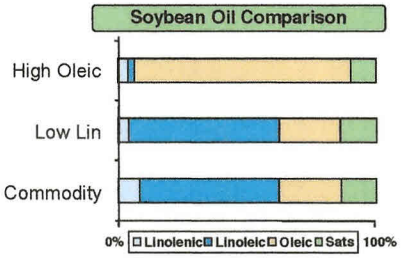
Improved Nutrition & Industrial Use Oils

High Oleic Example

- Excellent yield performance
- Improved nutritional profile
- Enhanced frying performance
- Industrial applications
- Renewable resource
- Ready for U.S. launch*
- Measured ramp up planned to allow for food industry testing and evaluation



*Pioneer 2008 research data – 14 locations
High oleic products are not yet available for sale or use. Products, benefits and concepts described are subject to full regulatory approval and field testing.
Pioneer® brand varieties with transgenic traits will not be offered for sale or distribution until conclusion of field testing and approval by regulatory authorities.

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Using Nutrients More Efficiently

Focus on

- Uptake of nitrogen, phosphorous, potassium
- Storage and remobilization
- Root architecture
- Water quality
- Energy balance

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Deploying Tools on a Global Basis: Breaking Down Barriers

Regulatory

- A transparent and science-based regulatory environment has been critical in achieving current yield increases

Biotech Acceptance

- Must remain a global effort

Intellectual Property

- Enables those who hold it to make it commercially available, benefitting society as a whole

Education and Training

- Breeders must be trained in new technologies; able to integrate molecular information, field test results and large computer data sets

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Enhancing Plant Breeding through Biotech

Modern biotechnology provides plant breeders with powerful tools to increase productivity for the world's farmers on a truly global scale.

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Plant Breeding

- Science responsible for the creation of new varieties
  - Productivity increase
  - Resistance to biotic stresses
  - Tolerance to abiotic stresses
  - Adaptation & Mitigation climate change effects
  - Response to new market demands

food security – sustainable economic development

http://km.fao.org/gipb

GIPB GLOBAL PARTNERSHIP INITIATIVE FOR PLANT BREEDING CAPACITY BUILDING
harnessing plant genetic resources for development

Building capacity for plant breeding in developing countries

Elcio P. Guimarães; Clair Hershey; Eric Kueneman; Michela Paganini

http://km.fao.org/gipb

Examples of GIPB Outputs (1/5)

- Plant breeding and associated biotechnology capacity assessment (PBBC)

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http://km.fao.org/gipb/pbbc

Content

National plant breeding capacity

http://km.fao.org/gipb

Content

National plant breeding capacity

GIPB

Regional consultations

Federal funding increase

Strategies to build national capacity

Conclusions

Examples of GIPB Outputs (1/5)

- **Plant breeding and associated biotechnology capacity assessment (PBBC)**

http://km.fao.org/gipb/pbbc

Creating a Foundation for GIPB

- **FAO Survey to assess the plant breeding and related biotechnology capacity in developing countries**
  - Plant breeding capacity is inadequate
- **The International Treaty on Plant Genetic Resources for Food and Agriculture and its Global Plan of Action**

Plant Breeding Capacity

- **Word-wide assessment (>80 developing countries)**
  - **Decreasing or stable**
  - **Limited education level**
  - **Focus on major crops**
  - **Efforts of private sector concentrated on economic crops**

GIPB Objectives

- Policy dialogue and development
- Education and training
- Access to technology
- Exchange of PGR
- Sharing information

http://km.fao.org/gipb

Global Partnership Initiative for Plant Breeding Capacity Building (GIPB)

- **A global partnership platform dedicated to increasing plant breeding capacity building, mainly in developing countries**

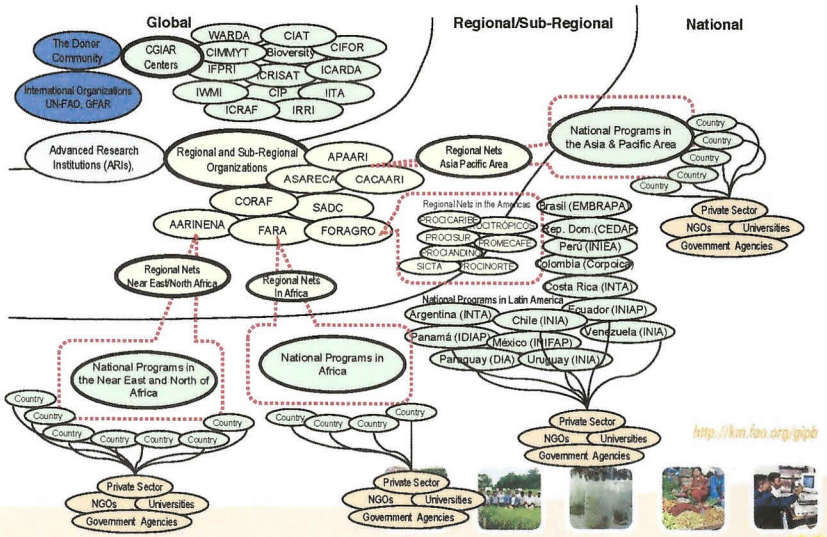
http://km.fao.org/gipb

Content

Regional consultations

http://km.fao.org/gipb

GIPB international partnership platform



Content

National plant breeding capacity
GIPB
Regional consultations
Factors limiting success
Strategies to build national capacity
Conclusions

Regional Consultations

South and Southeast Asia
Sub-Saharan Africa
Western Asia and North Africa
Latin America and the Caribbean

Factors limiting success

- Inadequate experimental fields conditions
- Inadequate # breeders/crop
- Inadequate access to the literature
- Inadequate knowledge of the plant breeding strategies
- Limited access to genetic resources
- Inadequate investment-friendly legislation and lack of public/private partnership

Regional Consultations

- Decline in plant breeding capacity
- Integrate molecular tools into PB
- Train plant breeders
- Facilitate cooperation among institutes
- Long-term investments
- Rewarding system
- Motivate participation of the private sector

Content

Conclusions

Content

Strategies to build national capacity

Conclusions

- Capacities in PB in most developing countries are not sufficient
- The lack of long-term support for national breeding strategies
- Trained personnel and institutional weaknesses, within the PB sector and in its links with seed systems, are key elements that prevent the potential contribution of PB

Strategies to build national capacity

- National PGR strategy
- Public awareness about the importance of PGR
- Harmony among the goals of PB and biotechnology tools
- Link PGR, PB and seed delivery systems
- Instruments to stimulate private investments and public/private partnerships

Conclusions

- **Lack of mechanisms to promote public and private partnerships**
- **This leads to under-developed seed systems and to poor transfer of improved germplasm to rural producers**

http://km.fao.org/gipb

GIPB GLOBAL PARTNERSHIP INITIATIVE FOR PLANT BREEDING CAPACITY BUILDING
harnessing plant genetic resources for development

A global platform dedicated to mobilize education, policy, technology and information resources to help unlock the value of plant genetic resources for all

http://km.fao.org/gipb

Plant breeding (definitions)

- **Plant breeding** is the art and science of changing the genetics of plants for the benefit of humankind
- **Plant breeding** is the use of techniques involving crossing plants to produce varieties with particular characteristics (traits), which are carried in the genes of the plants and passed on to future plant generations.
- **Plant breeding** is the purposeful manipulation of plant species in order to create desired genotypes and phenotypes for specific purposes, such as food production, forestry, and horticulture.

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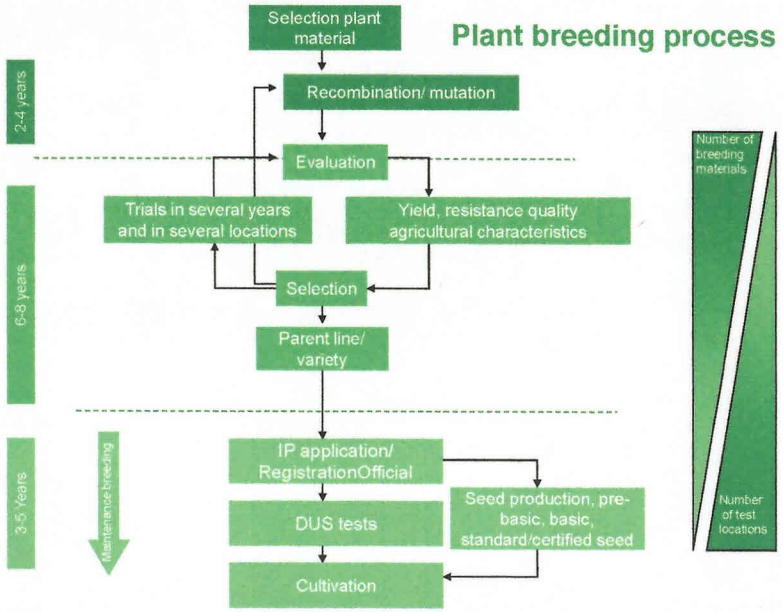
Genetic resources in/and plant breeding

-8 September 2009 Anke van den Hurk-

Plantum NL

Plant breeding process



Content

- Plant breeding
- Genetic resources in the plant breeding process
  - Use
  - Maintenance
  - Availability
- Consequences of the CBD and IT PGRFA
- Conclusions

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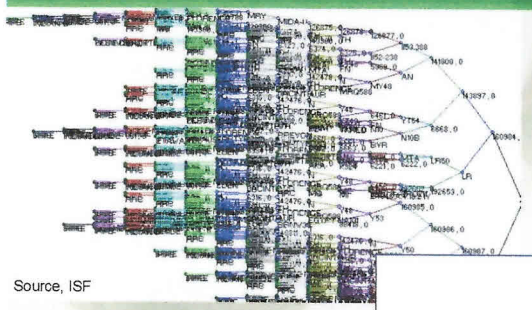
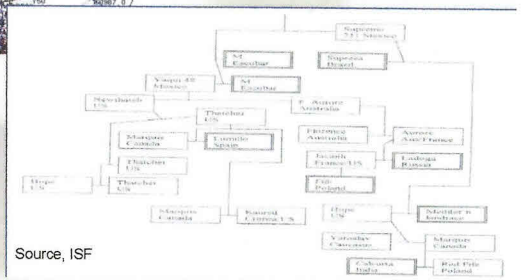
Recombination; Ancestry wheat variety Sonalika



Source, ISF



Source, ISF

Use of genetic resources

Direct use

- Recombination
  - Modern varieties
  - Research materials
  - Landraces
  - Wild relatives
- Gene selection
  - Modern varieties
  - Research materials
  - Landraces
  - Wild relatives
  - Microbials
  - Pathogens

Indirect use

- Plants/Varieties as test plants for comparison
- Pathogens to check for resistances
- Pollinators for seed production

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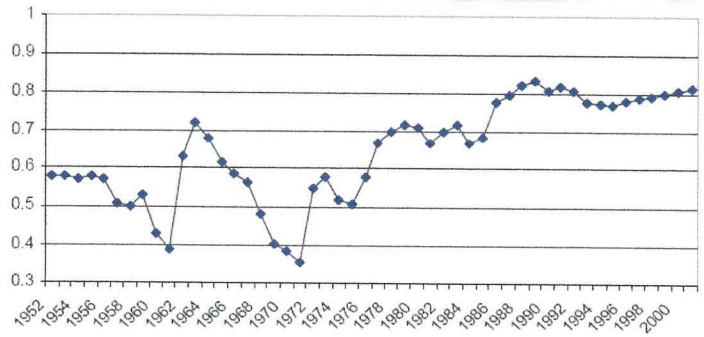
Wheat diversity in Hungary



Weighted diversity in the Hungarian wheat production
(calculated from COP, number of varieties and market share of varieties; range 0 to 1)

Source, ISF

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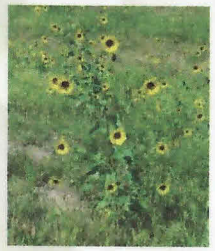
Direct use; Creation of genetic resources

- New gene combinations
  - Within species
  - Between species
- Domestication of species
  - New species
  - New uses



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Levels of Dependency for Countries in the Asia-Pacific Region

Country	Dependency (%)	Main source of energy supply	Primary region of diversity of crops
China Japan Republic of Korea	46 - 55 43 - 61 30 - 54	Non-native - wheat, sugar, maize, potato Native - rice and soybean	East Asia - rice, soybean, orange, Brassica, millet, tea, onion
Bangladesh India Nepal	14 - 21 35 - 47 47 - 57	Non-native - wheat, maize Native - rice, sugarcane, millet	South Asia - rice, banana, sugarcane, sesame, millet, *Brassica rapa, B juncea*
Kenya South Africa Ethiopia	89 - 98 90 - 98 28 - 56	Non-native - *Phaseolus*, maize, sweet potato, potato, cassava, banana, plantain, wheat, rice Native (for Ethiopia) - tef, *Avena Abyssinian, Brassica carinata*	East and Southern Africa - sorghum, millet, yam
Brazil Andean Region Argentina Colombia	81 - 94 89 - 95 84 - 94	Non-native - wheat, sugar, rice, maize, soybean, plantain, banana Native - potato, *Phaseolus* (for Andean Region); cassava (Brazil)	Andean region – pineapple groundnut, sweet potato, tomato, cocoa, Phaseolus, potato, cassava,
US Canada	77 - 100 84 - 99	Non-local - wheat, sugar, soybean, potato, maize, barley, rice, groundnut	North America - sunflower

Source: Palacios (1998)

Domestication; The spread of sugarcane

- Centre of origin believed to be Papua New Guinea and around
- Secondary centre: Northern India
- Spread through the world
- Current top producer: Brazil
- New uses for old crops: top bioethanol crop

Source, Willy Degreef

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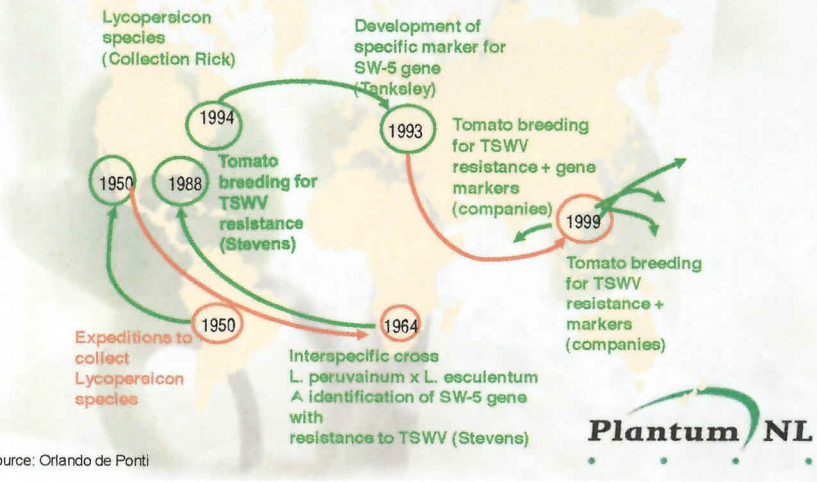
Indirect use

Flow of tomato TSWV resistance germplasm around the world



Source: Orlando de Ponti

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Maintenance of genetic resources

Without maintenance of genetic resources -
no availability of genetic resources
no plant breeding

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Use of genetic resources

Plant breeding equals to a continuous flow of genetic resources
From anywhere to everywhere

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Availability of genetic resources

Places where to obtain genetic resources
- Gene banks
- Botanical gardens
- Farmers
- Markets
- *In situ*

Benefit sharing
- Breeders' exemption
  - Varieties under PVP can be used without consent of the owner for further breeding and commercialization of the new product
- Conservation activities
- Capacity building
- Research projects

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Maintenance of genetic resources

- Private collections
  - Breeding materials
  - Modern varieties
  - Landraces and wild relatives
- Support gene banks/botanical gardens
  - Multiplication accessions
  - Characterization and evaluation
  - Financial support
- Support collection missions
  - Participation in collection missions
  - Financial support

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CBD and IT PGRFA

- Development CBD
  - International regime for access and benefit sharing
- Development IT PGRFA
  - Standard Material Transfer Agreement (SMTA)
- Consequences of the CBD and IT PGRFA for plant breeding sector

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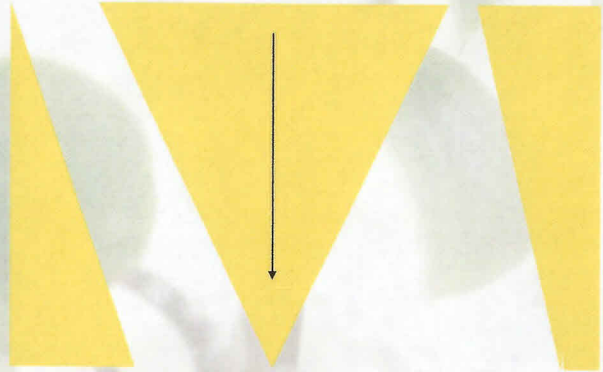
Value of genetic resources in breeding process



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Development CBD

- From common heritage to national sovereignty
- Objectives CBD
  - Conservation of genetic resources
  - Sustainable use of genetic resources
  - Access and Benefit Sharing (ABS)
- International regime on ABS
  - Prior informed consent
  - Mutually agreed terms

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Availability of genetic resources

Availability of genetic resources leads to benefit sharing

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Consequences CBD and IT PGRFA on the plant breeding sector

- Interruptions in the continuous flow of genetic resources
- New/different process on availability and benefit sharing
- Risk on burdensome administrative procedures and lack of transparency on exchange of genetic resources
- Risk of loss in biodiversity
- Slowing down the plant breeding process
- Multilateral system may make availability easier and more transparent for Annex 1 crops
- SMTA takes care of level playing field
- Relatively clear recognition of intellectual property and in particular the value of the value of the breeders' exemption in SMTA is important

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Conclusions

- Plant breeding and genetic resources cannot be seen separately
- Plant breeding and genetic resources strengthen each other; the one cannot exist without the other
- Multilateral system of IT PGRFA is most consistent with plant breeding activities and therefore best option for ABS

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Development IT PGRFA

- From International Undertaking to International Treaty on Plant Genetic Resources for Food and Agriculture (IT PGRFA)
- Objectives
  - Conservation of plant genetic resources for food and agriculture
  - Sustainable use of plant genetic resources fro food and agriculture
  - Access and Benefit Sharing (ABS)
- Multilateral system
  - Standard Material Transfer Agreement

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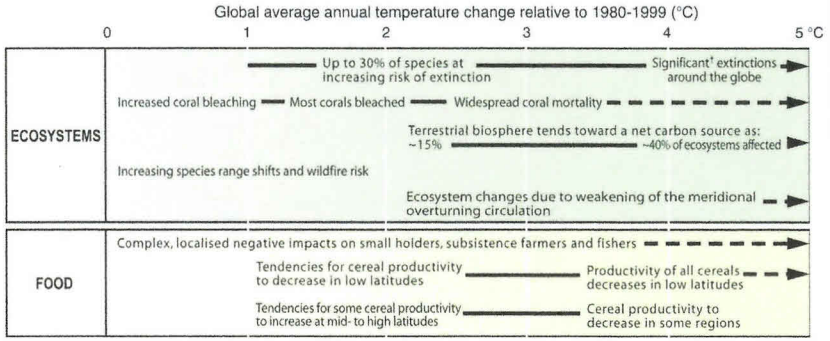
In future: Increased inter-dependence



The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Facilitating Access and Ensuring Benefit-Sharing

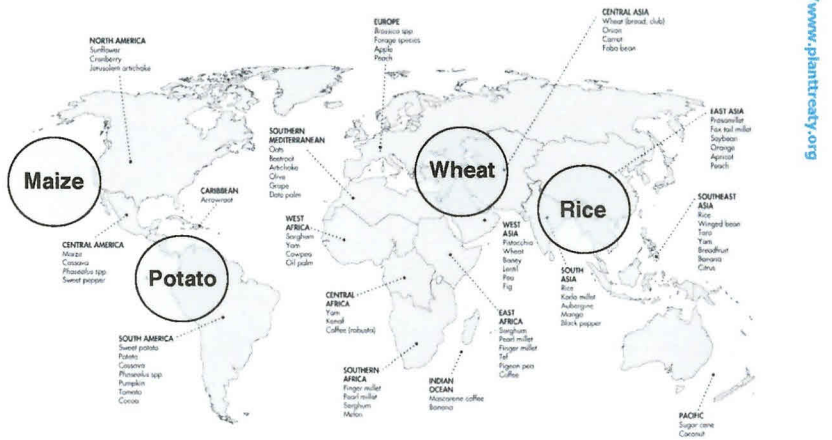
The Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture

(Draft, 25 June 2009)

Global Response: International Treaty for PGRFA

- In force since 2004
- Access and Benefit-sharing system
- In support of sustainable agriculture and global food security
  - Genetic resource pool
  - Benefit sharing
- To enhance food crops
- To recognize contribution by local farmers

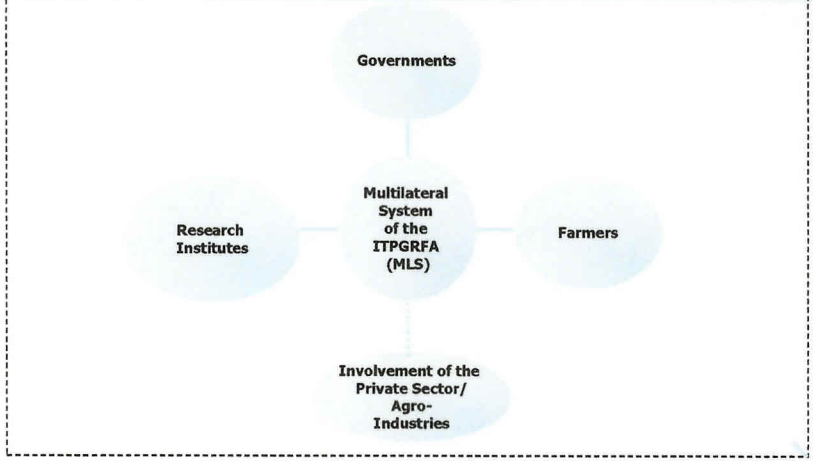
At present: 60 percent out of 4



Monetary Benefits

MLS → Product → Payment of share of commercial benefits → Funding Strategy

Access and Benefit-sharing: Plant Genetic Resources



Non-monetary Benefits

- Information exchange
- Technology Transfer
- Capacity Building
- On Farm Management and Conservation
- Sustainable use of PGRFA

Access

MLS is a global pool of genetic resources

Pool comprises 64 of our most important crops

Crops represent 80 % of the food derived from plants

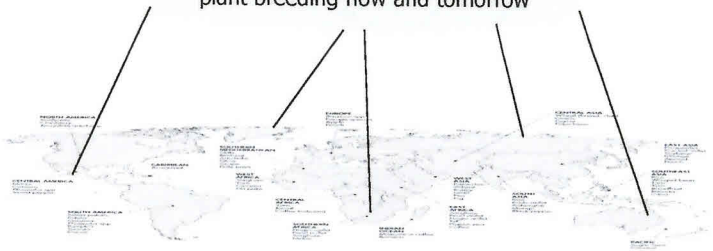
More than 600,000 varieties to date

Terms and conditions of the Standard Material Transfer Agreement

Major Steps in Benefit for All

MLS: gain access and share the benefits for

plant breeding now and tomorrow



Facts and Figures

- MLS comprises 64 crops
- Represent 600,000 unique varieties
- 100,000 accessions per year

- Exchange mostly from IARCs and gene banks in OECD countries

Further measures to strenghten the system required

The International Treaty

ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Thanks for your kind attention.

Cosima Hufler
Chair of the Governing Body of the
ITPGRFA

Strenghtening the MLS

Identification and documentation of material

=> faciliate further access

Priority for the coming biennium

=> Capacity building

=> Exchange of experience

=> Providing guidance

Video

www.planttreaty.org

The International Treaty
ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Exchanging Material in the Daily Business: the Operation of the Multilateral System and the Standard Material Transfer Agreement (SMTA)

Dr. Shakeel Bhatti
Secretary

International Treaty on Plant Genetic Resources
for Food and Agriculture

- 2nd World Seed Conference -

Overview

1. Introduction: Video on the International Treaty
2. **Operationalizing the Multilateral System (MLS) of the International Treaty through of the use of the SMTA**
3. Progress made in the 3rd Session of the Governing Body (Tunis, June 2009) on the MLS and Access and Benefit-sharing

Overview

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Overview

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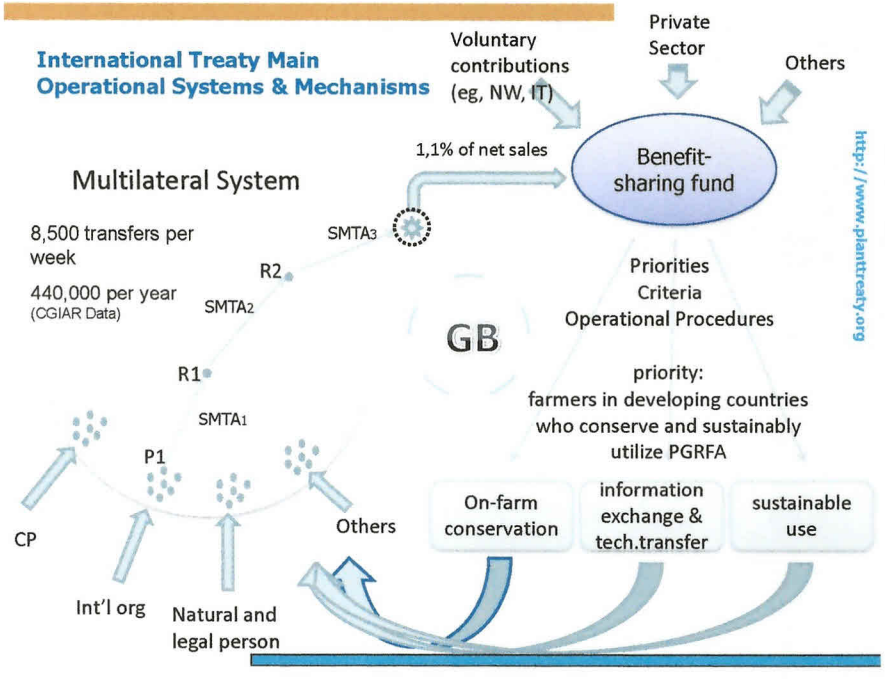
Basics about the SMTA

The SMTA

- has been adopted at the 1st Session of the Governing Body (Madrid, June 2006)
- is a standard contract that regulates Access and Benefit-sharing in exchanges of PGRFA
- provides legal certainty to users of the material of the MLS at a low transaction cost
- has allowed the International Treaty to move from text to an operational system

Implementation and Operation of the MLS and the SMTA

1. To establish policy, legal and administrative measures to provide facilitated access to PGRFA through to use the SMTA;
2. To provide appropriate assistance to developing countries:
   - capacity-building;
   - awareness-raising;
3. To promote the exchange of experiences among users of the SMTA at the national level;
4. To report on PGRFA that are in the MLS and to make information on these resources available to potential users;
5. To establish an electronic management system in order to track the PGRFA exchanged under the MLS.



Benefit-sharing Fund

- The MLS has been further operationalized through the approval of the first projects to be supported by the Benefit-sharing fund.
- 11 small-scale conservation projects receive almost 550,000 USD of funding.
- Funding strategy: a total of 116m USD to be raised by 2014 to support conservation projects.

http://www.planttreaty.org

Keyfigures Enza Zaden

- Founded in 1938
- Located in Enkhuizen, The Netherlands
- Independent / family-owned
- 1100 employees worldwide
- 19 R&D subsidiaries
- > 140 € X mio sales
- # 8 within world top 10 vegetable seed companies
- Active breeding programs in 20 vegetable crops

Working with the multilateral system - perspective of a seed company

2nd World Seed Conference Rome
8 September 2009
Enza Zaden / J.J.M. Lambalk

Vegetables and MLS / SMTA

- Only a few vegetable species in annex 1 of the international treaty / MLS

- Brassica-complex (incl. cabbage, radish, rocket, turnip)
- carrot
- eggplant
- beans
- peas
- asparagus

but

- Many EU gene banks use SMTA also for non MLS (vegetable) crops

Perspective of a **vegetable** seed company towards multilateral system

- Enza Zaden

Availability of genetic resources

- Gene banks
- Botanical gardens
- Farmers selections
- Research institutes / universities
- Private collections
- Competition (varieties)
- Own varieties and breeding lines

Availability of genetic resources

Often availability was (and still is) based upon:

- Good personal relation(s)
- Counteract: seed multiplication
- Counteract: phenotypic analysis by company breeders
- Counteract: genotypic analysis / composition core-collection
- Swopping accessions
- Sponsoring collection expeditions

With reference to conclusion of earlier presentation of Anke van den Hurk, Plantum NL:

- Access and use of genetic resources is of vital importance for continuity in vegetable variety development and improvement

But:

- (Again) in fact only applicable for a few vegetable species
- No integral use and acceptance of SMTA and MLS both by suppliers and users
- Standard MTA?
- Provider authorized?
- Synonyms of the same accession?
- Quality of delivered material?
- How to / who will check use of accession (genetics) in patent / patented variety?

Impact SMTA / MLS

Several suppliers of genetic resources in all vegetable species already have adopted the SMTA of the MLS

Advantages (in principle):

- conditions and terms for access and benefit sharing are standardized
- practical, transparant, non discriminatory
- legal certainty for both provider and user

Questionmarks?

- Current situation = (still) unclear!
- Could result in restrictions in access / availability of genetic resources
- Just a few examples of experiences!

Enza Zaden opinion / position towards

- Well organized genebanks : of utmost importance!
- SMTA : OK
- Benefit sharing : OK
- Benefit sharing / in case of 'breeders rights' : not OK
  (varieties can be used for further breeding)
- Benefit sharing / in case of patent : OK

Provider authorized?

- National Competent Authority and National Focal Point not known

No integral use and acceptance conditions SMTA / MLS

- Not all suppliers of genetic resources use SMTA (own rules prevail / no rules at all)
- No general acceptance SMTA / MLS principles within (vegetable) seed companies
- Implementation in national law of countries?

Synonyms of the same accession?

- Multiplied collections present within several gene banks in different countries. Country of origin?
- Several codes / numbers for the same original accession
- Progeny of one accession is present in gene bank as several coded / numbered accessions

Standard MTA?

- A lot of variation in conditions between suppliers
- For instance: genetic resources only available for local R&D subsidiary
- Financial issues

How to / who will check use of accession (genetics) in patent / patented variety?

- Certified labs?
- Sequence or trait based?

Plantum.NL: Biodiversity Committee

Ecuador-project: intention to acquire a set of tomato accessions

Experiences

Conclusions:

- Still many questions / uncertainties in relation to SMTA / MLS in vegetables

therefore

- risk of a standstill with respect to genetic resources availability to the (vegetable) breeding industry

and as a consequence

- a possible threat of necessary progress in (vegetable) variety development

Quality of delivered material?

- Wrong identity
- No germination
- Seed borne diseases!

Conclusions:

- It is also our hope that MLS / SMTA is a tool to facilitate access to genetic resources rather than to complicate it
- It is necessary to involve the private sector more in order to improve the MLS / SMTA / ABS set up and practical implementation

- Thank you for your attention.
- Questions?

Swedish National Programme for Diversity of Cultivated Plants (POM): Goals

- Conservation and use of plant genetic resources shall contribute to improved food security, sustainable agriculture and maintained biodiversity in Sweden.
- Make the biological cultural heritage become alive for people.
- Materials shall be well documented, and information about the materials shall be available for free.
- The programme shall promote international cooperation on conservation, utilization, access and benefit sharing.

Implementing the Treaty at the national level: What is the impact on the seed sector?

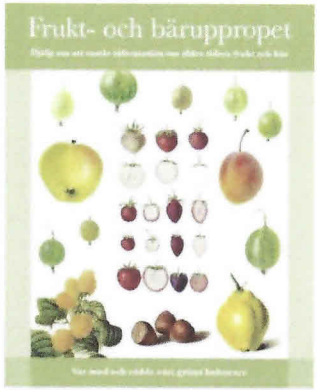
Second World Seed Conference, Rome
September 8-10 2009

Ylva Tilander, PhD
Ministry of Agriculture, Sweden

Ministry of Agriculture

REGERINGSKANSLIET
Government Offices of Sweden

POM: Call for fruit and berries material



Ministry of Agriculture

REGERINGSKANSLIET
Government Offices of Sweden

Implementing the Treaty at the national level

- The national Swedish programme
- The Nordic regional approach – NordGen
- Use of the Standard Material Transfer Agreement
- Experience in the national seed industry
- Swedish international support

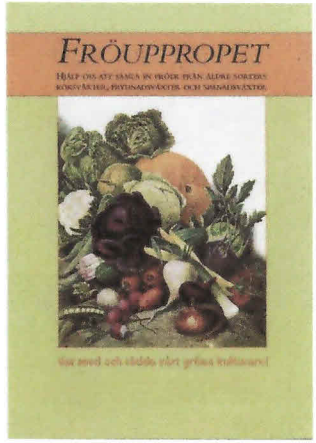
Ministry of Agriculture

REGERINGSKANSLIET
Government Offices of Sweden

Some results ...

- Morphological analyses showed that it was difficult to separate 30 of the new accessions from old landraces of pea (*Pisum sativum*) already stored at the NordGen.
- DNA analyses, using microsatellite markers, of 34 of the Fröupprop-accessions of pea and 46 accessions from NordGen collections showed that at least 21 of the Fröupprop-accessions are new unique genotypes.13 could be duplicates.

POM: Call for vegetable material



Nordic Genetic Resources Center (NordGen) Vision

- **NordGen secures the biological livelihood for the present and the future**

- **Founded in 1979**
- **A Nordic Council of Ministers Institution**
- **A regional Gene Bank for the Nordic Countries**
- **Sweden, Denmark, Norway, Finland and Iceland**

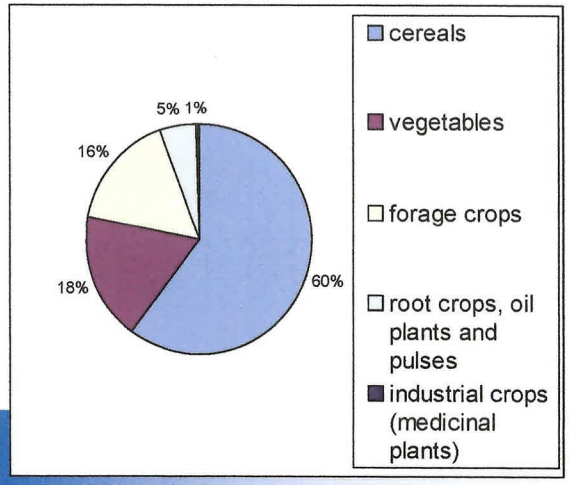
Then, what happens?

- **Registration in databases (POM, NordGen)**

  Cooperation with the NordGen:
  - **Viability tests**
  - **Descriptions/Evaluations**
  - **Analysis of molecular markers**
  - **Multiplication**
  - **Seed storage**

- **Ethnobotanical study of peas**

Nordic Genetic Resources Center
Accessions



Nordic Genetic Resources Center (NordGen)
Priorities in strategy 2008 - 2012

- **Conservation**
- **Sustainable use**
- **Information and networking**
- **International activities**

Documentation in SESTO
Our Nordic Database

- **A central online data portal developed for public access to all Nordic plant genetic resources.**
- **Staff at the Nordic Gene Bank as well as staff from the national partner institutes can access the entire system**
- **SESTO is short for seedstore and is provided free of charge as open source**

Seed Storage

- **Active Collection (Alnarp, Sweden)**
  - Distribution, characterization, multiplication, germination tests
- **Base Collection (Årslev, Denmark)**
  - Long term storage, rejuvenation
- **Safety Collection (Svalbard, Norway)**
  - Duplicate of base collection samples

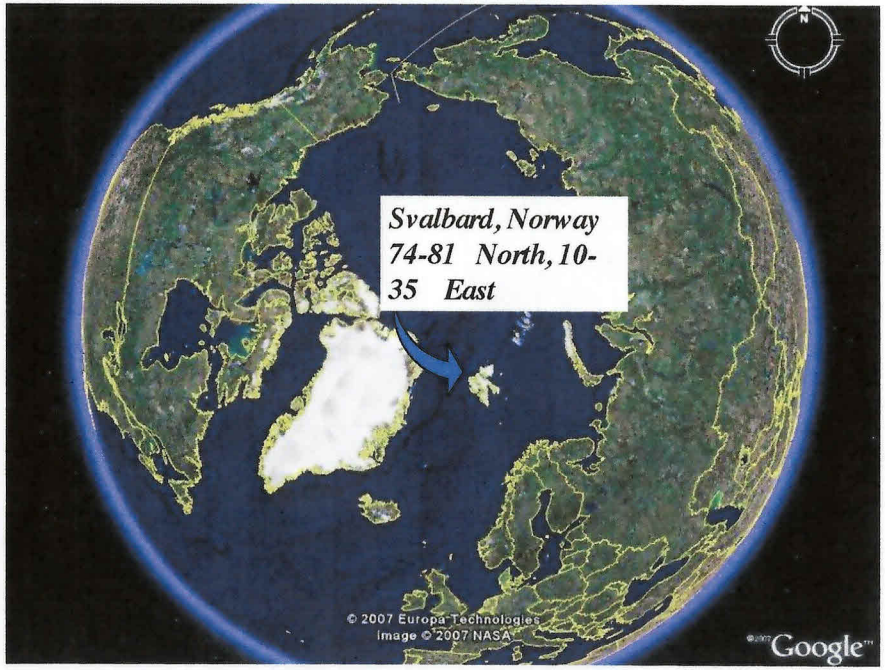


The Svalbard International Seed Vault

- Not to be an ordinary gene bank but a safety net
- A 'black box' storage
- Seed movements (in or out) only twice a year and if original accession lost
- The seed vault to be managed according to international agreements

Foto:Tom Schandy, Samfoto

Some gene bank collections presented from SESTO. SADC PGR Network (Southern Africa), ECP/GR Central Crop Forage Grasses, Plantearven (the Norwegian NI), the Latvian NI, the Estonian NI, Jogeva Plant Breeding Institute (JPBI).



International activities

NordGen

- **Expert consultation to assist partners in development of regional PGR programs**
- **Seed distributions, international**
- **Conferences, workshops, seminars**
- **Southern Africa, Eastern Africa, Baltic states, South East Europe, Russia, Central Asia**

Why?

- **The genebanks are vulnerable to a wide range of threats: civil strife, war, natural catastrophes, lack of adequate funding, equipment failures.**
- **The time is ripe: The International Treaty provides a framework for collaboration.**

Organisation

- Owned by Norway
- Managed by the Nordic Genetic Resources Centre under an international steering committee
- Partly financed by the Global Crop Diversity Trust (GCDT)

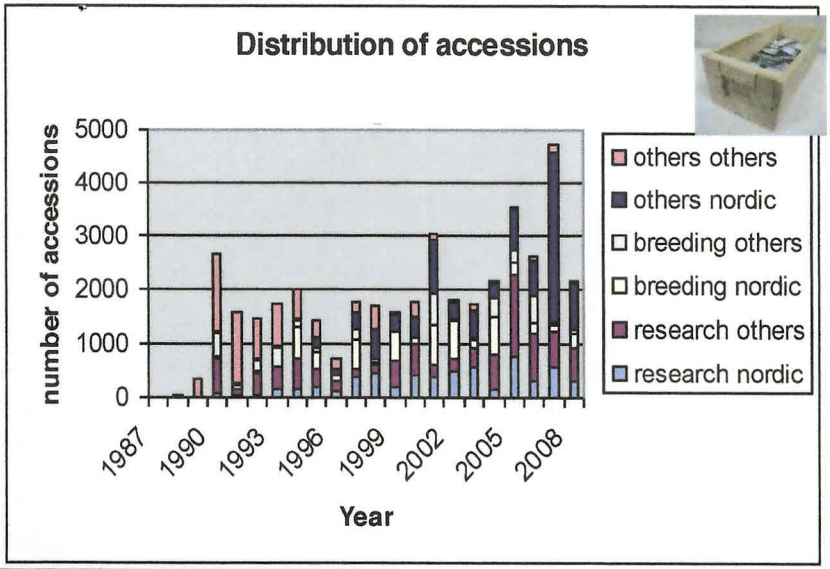
Conditions

- **Storage free of charge for public and private holders of PGRFA**
- **Black box – only donor has access**
- **Viability testing - regeneration - multiplication responsibility remains with the depositor**
- **Information access on public online dataportal**
- **Withdrawal on request**

Vision
-A global security net

- **Safeguard a complete set of the world's most important accessions of plant genetic resources for food and agriculture.**
- **SGSV will provide the securest possible safety storage for a *rational, effective, efficient and sustainable global* system for conserving crop diversity and making it available.**

Svalbard
Global Seed Vault



Experience from national seed industry

- **Little use of the sMTA as yet in seed industry**
- **Climate change gives new challenges**
- **Interest in Nordic PublicPrivatePartnership to meet this, in particular for pre-breeding**
- **Use of gene bank material and the Treaty system may be of growing relevance in this context**
- **Regional collaboration cost-efficient, also for the private sector**

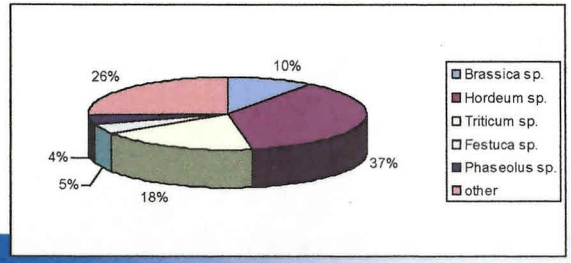
Using the sMTA

sMTAs issued since 1st of October 2007 to August 2009 by NordGen

Total: 96 sMTAs (2523 accessions)

Organisations: 90 sMTAs (2455 accessions)

Private: 6 sMTAs (68 accessions)



Treaty Capacity building workshops through Swedish support

Place	*Time*	*Partner*
Lusaka, Zambia	**Sept 2008**	**SPGRC**
Entebbe, Uganda	**March 2009**	**EAPGREN**
Cairo, Egypt	**April 2009**	**AOAD**
Kuala Lumpur, Malaysia	**May 2009**	**RECSEA-PGR**
Nadi, Fiji	**Sept 2009**	**SPC**

Swedish involvement in plant genetic resources: some examples

- Capacity building on Treaty **implementation (1 million US dollars 2008 – 2010)**
- **Hosting** meeting negotiating the Treaty Standard Transfer Agreement **2006 (ca 5 million SEK)**
- **Voluntary** contribution to the Global Crop Diversity Trust **(11,9 million US dollars 2005+2007)**
- **Election of former minister of agriculture Karl Erik Olsson as** board member in Global Crop Diversity Trust.

1 USD = approx. 7-10 SEK

Treaty assistance to national Capacity Building through Swedish support

- **Kenya**
- **Morocco**
- **Sudan**
- **Zambia**
- **Ecuador**
- **Peru**
- **Malaysia**
- **Philippines**

Swedish involvement in plant genetic resources: examples cont.

- **Regional** collaboration in Southern Africa **(SADC) (160 million SEK over 18 years from all Nordic countries including Sweden)**
- **Gene bank collaboration in** Eastern Africa **(34,5 million SEK until 2007)**
- **Gene bank collaboration in** Eastern Europe **(36,2 million SEK from 2004 and 10 years ahead)**

1 USD = approx. 7-10 SEK

Thank you!

Ylva Tilander, PhD
Deputy Director
Ministry of Agriculture, Sweden
ylva.tilander@agriculture.ministry.se