



PROCEEDINGS OF THE SECOND WORLD SEED CONFERENCE

Responding to the challenges of a changing world: The role of new plant varieties and high quality seed in agriculture

FAO Headquarters, Rome, September 8-10, 2009



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EXECUTIVE SUMMARY

Declaration from the Second World Seed Conference

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.

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, phytosanitary measures and laboratory testing, contributes substantially to the strong growth in international trade and development of seed markets to the benefit of farmers.

Conclusions of the Expert Forum

Session 1

The role of plant breeding in meeting the multiple challenges of a fast-changing world

- ▶ Improved varieties and high quality seeds are basic requirements for productive agriculture, which is the basis of sustainable economic development in developing economies
- ▶ Through the efforts of both the public and private sectors, plant breeding has provided an enormous contribution to global agriculture (yield, resistance to biotic stresses, tolerance to abiotic stresses, harvest security, quality traits including nutritional value, etc.)
- ▶ Plant breeding has the ability to significantly contribute in solutions to several of the challenges ahead such as food security, hunger alleviation, increasing nutritional values, and higher input costs. Plant breeding and related disciplines and technologies help in mitigating the effects of population growth, climate change and other social and physical challenges
- ▶ Intellectual property protection is crucial for a sustainable contribution of plant breeding and seed supply. There are still many tools and traits in the pipeline that will prove to be very necessary for the continued supply of high quality varieties and seeds
- ▶ Apart from genetic enhancement, other technologies, e.g. quality seed production and seed treatments, contribute substantially to improved seeds, and capacity building in all these areas is urgently needed in developing countries.

Session 2

The importance of plant genetic resources for plant breeding; access and benefit sharing

- ▶ Plant breeding and the sustainable use and conservation of genetic resources are interdependent.
- ▶ The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) is a unique and innovative legally binding instrument providing facilitated access to genetic material for plant breeding at the international level
- ▶ The Multilateral System (MLS) of the ITPGRFA provides a consistent Access and Benefit-sharing option for plant breeding activities
- ▶ The Standard Material Transfer Agreement (SMTA) of the ITPGRFA is a contract between the provider and the recipient that is simple to use and facilitates access to germplasm
- ▶ The involvement of the private sector in the design of Access and Benefit-sharing schemes is necessary for a well functioning Access and Benefit-sharing mechanism
- ▶ Material in the MLS is a source of genetic traits and characteristics of interest
- ▶ The full success of the ITPGRFA and its MLS will depend on local, national and regional implementation, as well as on the availability of funds at the local, national and regional level.

Session 3

Plant Variety Protection

- ▶ The number of new varieties increased after the introduction of plant variety protection.
- ▶ Introduction of the UPOV system of plant variety protection was associated with increased breeding activity and with the encouragement of new types of breeders, such as private breeders, researchers and farmer-breeders. The introduction of PVP was also associated with the development of partnerships, including public-private cooperation.
- ▶ Introduction of plant variety protection was associated with the development of new, protected varieties that provided improvements for farmers, growers, industry and consumers, with overall economic benefits.
- ▶ One of the benefits of plant variety protection is to encourage the development of new, improved plant varieties that lead to improved competitiveness in foreign markets and to development of the rural economy.
- ▶ Membership of UPOV was associated with an increase in the number of varieties introduced by foreign breeders, particularly in the ornamental sector.
- ▶ The breeder's exemption, whereby protected plant varieties can be freely used for further plant breeding, is an important feature of the UPOV system which advances progress in plant breeding.
- ▶ Access to foreign plant varieties is an important form of technology transfer that can also lead to enhanced domestic breeding programs.

Session 4

The importance of quality seed in agriculture

- ▶ The session demonstrated the importance of seed quality for crop productivity and agricultural production. It has underlined, that a lack of information on seed quality could result in crop failures and has the potential to threaten food security for whole countries
- ▶ The determination of seed quality parameters requires a broad knowledge of plant and seed physiology, taxonomy and botany and requires intensive scientific studies and research
- ▶ The application of seed quality evaluations requires a detailed knowledge regarding seed production, seed marketing, seed regulations and the seed sector
- ▶ Since 1924 the International Seed Testing Association (ISTA) has been the impartial and objective platform where leading seed technologists and researchers have come together to discuss relevant scientific progress and make the necessary definitions regarding seed quality and how to measure it
- ▶ Currently in developing countries there is not an adequate seed quality assurance infrastructure with respect to seed testing and this is required to increase crop productivity and provide enhanced food security in these countries
- ▶ The evolution of seed quality determination has not reached an end point and there are interesting developments in the pipeline that take account of the changing needs of the market. These will make tests and their applications more relevant, effective, robust, quicker and cheaper
- ▶ Significant cuts in scientific research and education has reduced the possibility for young academics to acquire the necessary seed technology skills
- ▶ In the seed technology area transparency in and scientific exchange of the latest research results remain of crucial importance for continued progress
- ▶ Uncompetitive salaries for seed analysts in developed countries make a career in seed quality control unattractive for young people.

Session 5

Facilitation of trade and market development

- ▶ Global seed market has grown rapidly in recent years and is currently estimated at about US\$37bn. Europe, North America and Asia account for almost four-fifths of the global seed trade. For 2007, the international seed trade was estimated at US\$ 6.4bn
- ▶ The use of international certificates for varietal certification, phytosanitary measures and laboratory testing has greatly facilitated the development of the international seed trade
- ▶ Production and marketing of certified seed of all agricultural crops is highly regulated at both the national and international level. A transparent and efficient regulatory system is crucial to ensure that farmers have access to high quality seed at a reasonable price
- ▶ The international regulatory framework consists of certification based on varietal identity and varietal purity (OECD, AOSCA), phytosanitary measures (IPPC, WTO-SPS, NPPO), plant variety protection (UPOV) and seed testing (ISTA, AOSA, etc.)
- ▶ Regional seed regulatory frameworks have been developed and harmonised to facilitate regional trade e.g. Central America, Mercosur, EAC, SADC, ECOWAS, etc. Regional standards, such as those of the EU, are closely aligned with international standards such as those of the OECD and clearly set out the registration and certification conditions for the marketing of seed
- ▶ The increasing use of harmonised international certification procedures on varietal identity and varietal purity helps to facilitate the import and export of high quality seed by assuring consumer confidence and reducing technical barriers to trade
- ▶ Good cooperation between the public and private stakeholders in developing and setting standards that are internationally acceptable has facilitated the issuing of certificates which, in turn, has contributed to the growth in trade
- ▶ Implementation of measures to prevent the introduction and spread of plant pests is critical to ensuring the development of a viable and sustainable global seed market. The International Standards for Phytosanitary Measures (ISPMs) provide useful guidance on the application of phytosanitary measures to the international seed trade.

WELCOME ADDRESS

Mr. MODIBO T. TRAORÉ*

Mr. Chair
Distinguished delegates
Ladies and gentlemen,

It is an honor for me to welcome you to the Food and Agriculture Organization for the second World Seed Conference and I also take this opportunity to welcome our partners for this conference – the Organisation for Economic Co-Operation and Development (OECD) Seed Scheme, the International Union for the Protection of New Varieties of Plants (UPOV), the International Seed Association (ISTA) and the International Seed Federation (ISF) and I commend them for their role in organizing a very important and timely conference.

I am very pleased with the theme you have chosen for the Conference. Indeed, the whole agricultural community is facing many daunting challenges, with over one billion hungry people in the world, a growing threat to food production from climate change, increasing drought, pests and decreasing gains in productivity. No doubt we will have to respond to these challenges urgently and decisively and ensure that food production can double without depleting or destroying natural resources.

Mr. Chair,

As you know, seeds and plant genetic resources are central to the biological basis of agriculture. A strong seed system with linkages between all stakeholders is essential for delivering quality seeds and improved crop varieties which in turn are crucial for global food security and the survival of rural communities. Farmers also play a key role in this process.

In order to guarantee access to the quantity and quality of seeds needed, systems must be put in place to safeguard plant genetic resource management, national varietal development programs and linkages with regional and international research Facilities. National seed services must also be strengthened and seed rules and regulations harmonized at the sub-regional and regional levels to facilitate the trade in seeds. Policies should be developed and strengthened through the involvement of relevant stakeholders, both public and private, to ensure the development of entrepreneurial capacity in the seed industry enterprises.

Throughout these two days, your focus will be on how new plant varieties and high-quality seed could help in mitigating the consequences of global change and meet the need for food security. I note that you have a range of sessions on a variety of themes from the role of plant breeding; the importance of plant genetic resources for plant breeding and benefit sharing; the importance of quality seed in agriculture, to the facilitation of trade and market development. In all these discussions, you will need to offer guidance on a way forward that will be mutually beneficial to both the developed and developing countries as well as to both private and public sectors.

The FAO is heavily engaged in seed sector development and emergency initiatives to improve the food security of vulnerable households and we are also increasing our efforts to promote plant breeding capacity building. We look forward to your advice on how to further strengthen seed systems at the national, sub-regional and regional levels to ensure continued food security and provide an effective response to the challenges facing us, including those related to climate change.

Mr. Chair, distinguished delegates, ladies and gentlemen, I wish you a successful and productive meeting and I look forward to the results of your deliberations,

* Assistant Director-General, Agriculture and Consumer Protection Department

OPENING ADDRESS

Mr. BERNARD LE BUANEC

During the first World Seed Conference held in Cambridge in 1999 it was seen how new plant varieties and quality seed were important to meet the challenges humankind was facing. Ten years later, our changing world continues to provide many challenges for agriculture.

The global population continues to grow and, according to revised UN statistics, should increase from 6.8 billion today to just over 9 billion in 2050. Demand for food will also increase dramatically due to quantitative but also qualitative needs. It is generally considered that crop production will have to increase by more than 50 per cent in the next 25 years to meet the demand.

The level of urbanization will reach almost 70 per cent in 2050, up from 50 per cent this year, putting more pressure on each farmer to feed the urban population. Meanwhile the area per inhabitant will continue to decrease from 0.25 hectares today to 0.15 hectares in 2050. In addition, the decision by many governments to encourage the production of first generation biofuels means that more land will be necessary for crop production. The only way to meet these challenges is to increase significantly the productivity of each hectare of cultivated land.

As shown in the following examples based on national statistical data, yields in various crops and countries have increased regularly during the past decades.

Fig. 1 Evolution of Wheat Yields in France (1805-2005)

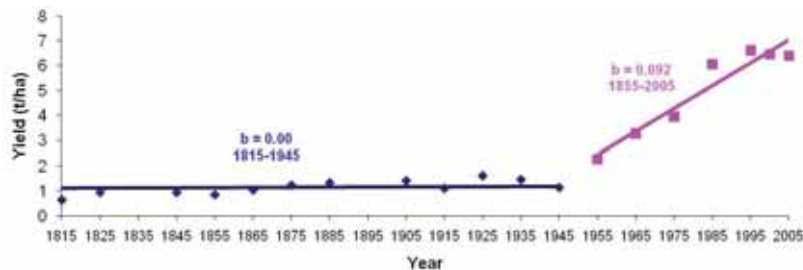


Fig. 2 Evolution of Maize Yields in the US (1866-2006)

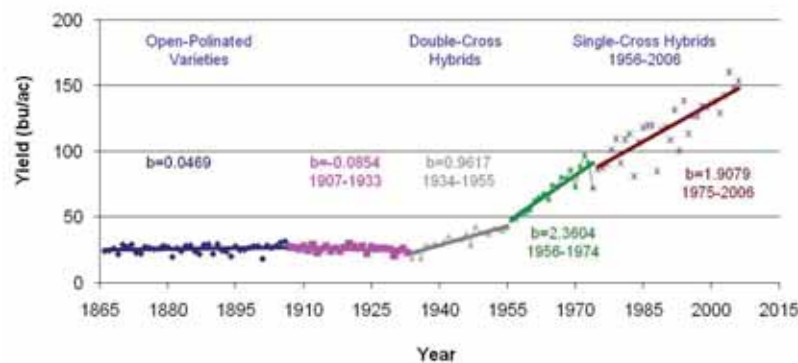
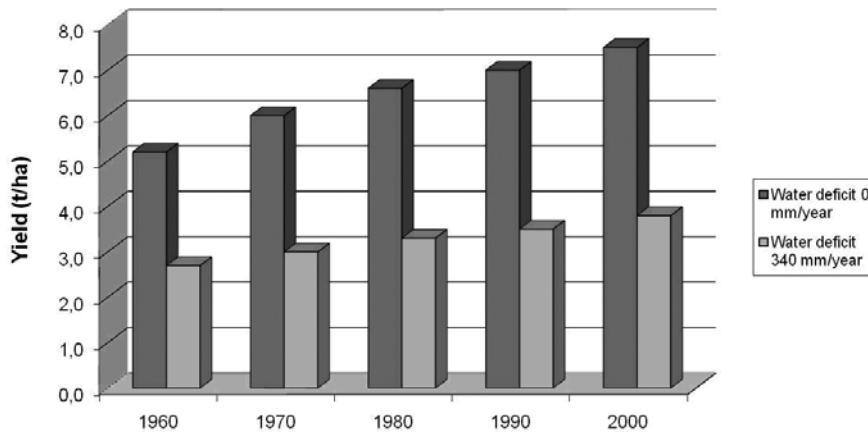
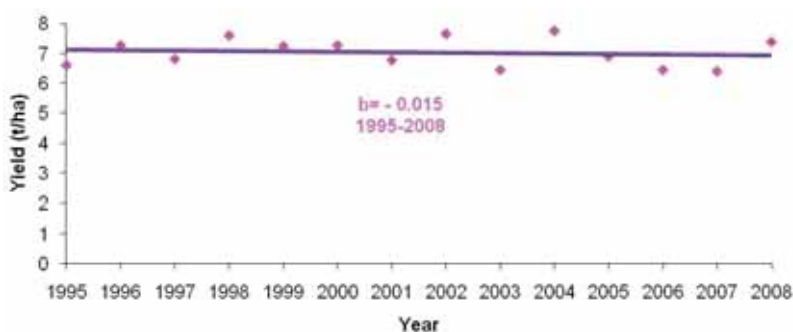


Fig. 3 Evolution of Maize Yields in South Africa.**Fig. 4 Evolution of Palm Oil Yields in Ivory Coast**

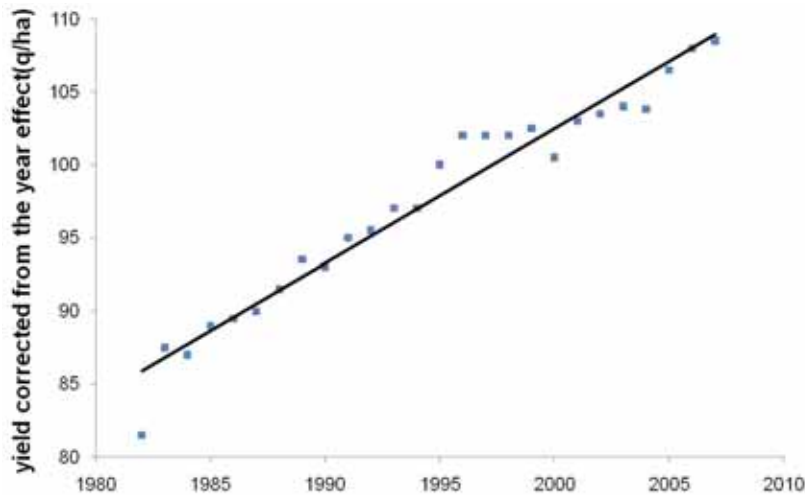
This result is a combination of improvements in plants and techniques of cultivation and the increased rate of adoption of those improvements by farmers. Several authors have shown that, in the long run, half of the yield increase of around 2 per cent per year comes from plant improvement and half from improvement of agricultural practices, in particular the use of fertilizers, crop protection products and irrigation. It is expected that these agricultural inputs will become more scarce and expensive in the future and that plant breeding will become more important.

Indeed this evolution has already been confirmed by a recent study in the UK which showed that between 1947 and 1986 half of the yield increase in wheat, barley and oats could be attributed directly to new varieties, but between 1986 and 2006 the new varieties had accounted for a 90 per cent increase. A more detailed look at the evolution of wheat yields in France (Fig. 1) gives a similar result. If the global trend from the 1940s to date is a linear increase, the yield seems to have reached a plateau as shown in Fig. 5.

Fig. 5 Evolution of Wheat Yields in France, 1995-2008

This plateau exists despite a continuous genetic gain of around 90 kilos per hectare/per year during the period (Fig. 6). The stagnation in productivity may be explained by a decrease of 10 per cent in nitrogen fertilizers, 25 per cent in crop protection products and by some unusually hot and dry summers.

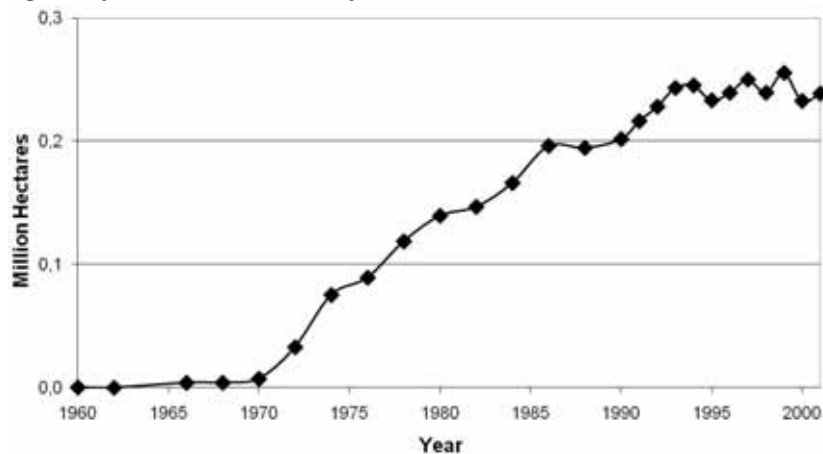
Fig. 6 Wheat Yield Genetic Gain in France, 1995-2008 (after Gilles Charmet in Philippe Gate)



Development of new varieties will be crucial to increase productivity per hectare of cultivated land in the coming years.

Plant breeding can also help crops to adapt to different climatic conditions: before the 1960s, maize was not grown in temperate climates above the 46th parallel. The development of new early maturing varieties has allowed the cultivation of maize up to the south of Sweden. The case of the Netherlands demonstrates the adaptation of a tropical crop to a temperate climate (Fig. 7).

Fig. 7 Adaptation of Maize to a Temperate Climate: the Case of the Netherlands.



It is also possible to adapt temperate crops to tropical climates: for example after 10 years of breeding and selection, varieties of sugar beet, a temperate crop, have been developed for cultivation in tropical climates. These varieties are at the moment under large scale experiment in India. Compared to sugar cane, tropical sugar beet offers several advantages such as lower water consumption, higher tolerance to drought and salinity and shorter growing cycles.

From the above examples it is possible to conclude that plant breeding will be essential to meet future challenges, i.e. to increase the productivity of cultivated land in a context of climate change.

Countries will have to put in place an enabling environment to encourage plant breeding in particular by facilitating access to plant genetic resources and by protecting intellectual property.

However, developing new plant varieties is not enough. They are useless if high quality seed of these varieties does not reach farmers or if farmers cannot afford to buy it. This is why it is necessary to establish sound seed systems allowing for improvement, maintenance and control of seed quality and, where necessary, facilitating trade and market development.

In this period of growing concern about global food security, the Food and Agriculture Organization of the United Nations (FAO), the Organisation for Economic Co-Operation and Development (OECD), the International Union for the Protection of New Varieties of Plants (UPOV), the International Seed Testing Association (ISTA) and the International Seed Federation (ISF) considered it was time to organize this 2nd World Seed Conference with the objective of identifying the key elements necessary to ensure a suitable environment for the development of new varieties, the production of high quality seeds and their delivery to farmers.