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Constraints to biotechnology introduction for poverty alleviation

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Poverty in developing countries is usually linked to low agricultural productivity. Inadequate quantity and quality of food impacts human development potential, physically and mentally. Reduced immunity to disease due to poor nutrition increases the burden and kills. Current technologies (fertiliser, improved seed, irrigation, pesticides) correctly applied can sustainably and safely increase crop yields. Purchase cost and infrastructural issues (lack of roads, credit, market access and market-affecting-trade-distortions), however, severely limit small scale farmers' ability to adopt these life sustaining and life saving technologies.

Plant Biotechnology has great potential to improve the situation. Delivery of the technology in the seed largely overcomes the logistical problems of distribution involved with packaged products: farmers can pass seed to each other. Once the initial research is completed the 'cost of goods' (that is of a biotechnologically delivered trait delivered in a seed) is zero. Total time to market is comparable between biotechnology products and conventionally bred seed. For some traits conventional breeding is not an option: the only way to introduce such a trait is by genetic engineering. Even for traits that can be improved by traditional breeding, genetic engineering may facilitate and speed up the process. Intellectual property issues are usually not a constraint in developing countries and in pro-poor agriculture.

It is notable that agricultural biotechnology uptake for commercially introduced traits has been extremely rapid, including in developing countries. However, for public good products from the public sector, despite much research in developing countries, this potential has not materialised. The politicisation of the regulatory process is an extremely significant impediment to use of biotechnology by public institutions for public goods. Costs, time and complexity of product introduction are severely and negatively affected (without such political impediment the technology is very appropriate for adoption by developing country scientists and farmers: it does not require intensive capitalisation). The regulatory process in place is bureaucratic and unwarranted by the science: despite rigorous investigation over more than a decade of the commercial use of genetically engineered (GE) plants, no substantiated environmental or health risks have been noted. Opposition to biotechnology in agriculture is usually ideological.

The huge potential of plant biotechnology to produce more, and more nutritive, food for the poor will be lost, if GE-regulation is not changed from being driven by 'extreme precaution' principles to being driven by 'science-based' principles. Changing societal attitudes, including the regulatory processes involved, is extremely important if we are to save biotechnology, in its broadest applications, for the poor, so that public institutions in developing as well as industrialised countries, can harness its power for good.

Against this background the programme of the study week was organised into the following sections. The *Introduction to the Study Week* presents the problem of increasing food insecurity in developing countries, the need for continued improvement of crop plants and agricultural productivity to address the problem, the track record and perspective of genetic engineering (GE) technology, and the roadblock to efficient use by the established concept of 'extreme precautionary regulation'. *Contributions From Transgenic Plants* will highlight what important contributions in the areas of tolerance to abiotic stress, resistance to biological stress, improved water use efficiency, improved nutritional quality, inactivation of allergens and reduction of toxins, are already in use or in the R&D pipeline. Following an account of the state-of-the-art of the technology and the world-wide, radical opposition on the use of the technology in agriculture, this session continues with the question of whether or not GE-plants diminish or promote biodiversity and describe what is necessary to achieve sustainable yield, including the contributions from the private sector.

In the section on the *State of Application of the Technology* concrete examples from Argentina show which products have made it over the hurdles of the regulatory regimes. This session concludes with a paper on the problems of and possible solutions

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in regard to intellectual property rights, and with a discourse on the ethics of the use and non-use of transgenic plants in the context of development. The session on the *Potential Impact on Development* will highlight what an important role transgenic plants could play if released from excessive regulation. The question of whether or not there is any scientific basis for an extreme precautionary attitude is analysed in the session on *Putative Risk and Risk Management*. A comparison of the molecular alterations to the genome by natural genetic variation and genetic engineering shows that there is *a priori* little reason to be concerned with genetic engineering of plants. In detailed case studies putative risks to the environment and the consumer are analysed, to explore whether in the history of use there was any case of real concern. This is followed by the lessons from 25 years of use, biosafety studies and regulatory oversight, and by an overview comparing GMO myths with reality.

A brief section on *Biofuels Must Not Compete With Food* indicates novel problems arising from the concept of biofuel production from agricultural land, already seriously affecting food security and concepts under study aiming at biofuel production from biological materials that will not compete with food sources. *Hurdles Against Effective Use For The Poor* describes which hurdles under the presently established regulatory regime prevent use of the technology for public good. The analysis focuses on (a) the political climate around GEs having been spread from Europe around the world; (b) the legal and trade consequences connected to regulation and political climate; (c) GMO over-regulation making use of GEs for the public sector inaccessible for cost and time reasons; (d) the financial support to professional anti-GE-lobby groups and (e) poor support for agricultural research in general.

The programme of the study week was designed (a) to present the potential of plant genetic engineering to contribute to food security, (b) to analyse the causes for the obvious exclusion of the public sector and projects from the delivery of public goods and (c) to develop concepts how to improve the situation to the benefit of the poor. The participants represented a wide and interdisciplinary range of scientific disciplines including philosophy, theology, political science, economy, agricultural law, agricultural economics, development economics, intellectual property rights, botany, ecology, plant pathology, evolution, botany, microbiology, agriculture, crop science, biochemistry, molecular biology, biotechnology, food safety, biosafety, and regulation. The participants jointly formulated and agreed unanimously to the following summary of the results of the study week in form of a 'STATEMENT' which summarises the scientific conclusions and recommendations following from those conclusions.

This STATEMENT is presented in five languages in print (English, Arabic, Chinese, Hindu, and Swahili) and in further 11 languages (Indonesia, Filippines, France, Germany, Italy, Japan, Korea, Portugal, Russia, Spain, and Turkey) in form of links to the internet. The English version is the authorised original, in case of inconsistencies in one of the translations, which have, however been carefully checked by Klaus Ammann.

The editors are very grateful to those who took care of the translations (English: Drafted and endorsed by all participants of the Conference, synthesized mainly by Ingo Potrykus, Peter Raven, Albert Weale, Chris Leaver

Arabic: Ismail Serageldin, Hanan Mounir

Chinese: Clive James, Mariechel Navarro,

Hindi: Kameswara Rao, Shantu Shantaram, Prof. Vimala, Geetha Singh

Swahili: Clive James, Margareth Karembu

11 languages as links:

Bahasa: Clive James, Clement Dionglay

Filipino: Clive James, Clement Dionglay

Français: Marc van Montagu, Nathalie Verbruggen

German: Ingo Potrykus, Klaus Ammann, Nikolaus Amrhein

Italian:. Piero Morandini, Marcelo Sánchez Sorondo

Japanese: facilitated by Peter Raven

Korean: facilitated by Clive James

Portugese: Alda Lerayer, Debora Marques

Russian: Peter Raven, Konstantin Skryabin, Nikolay Burdeyniy, Tatyana Shulkina, Biljana Papazov Ammann and Natalia Margulis,

Spanish: Marcelo Sánchez Sorondo, Wayne Parrott, Rafael Vicuña, Moisés Burachik

Turkish: Selim Cetiner, Nadir Fayazoff). For more details see the translations.

Powerpoint presentations of the conference in pdf format are also available as hyperlink in the sequence of the original program.