EU Discussion Forum "Towards Sustainable Agriculture for Developing Countries: Options from Life Sciences and Biotechnologies"
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"Which Road Do We Take?"
Harnessing Genetic Resources and Making Use of Life Sciences, a New Contract for Sustainable Agriculture

by

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Ladies and Gentlemen,

Once upon a time, lost at a crossroads, a little girl met a cat. The cat told her: "If you do not know where you want to go, then it does not matter which road you take". She is Alice, of course, lost in the Wonderland of Lewis Carroll's famous book.

The Cheshire cat's words have some relevance for our subject today. Like Alice, through the looking glass of fast-paced scientific progress, we are catching a glimpse of an exciting world. Like Alice, we are at a crossroads with many paths open in front of us, as new opportunities are created by tremendous technological advances. But we must carefully choose our destination, and the roads we can take to get there.

So, where do we want to go? Since the UN conferences of the 1990s, in particular the Earth Summit in Rio, and the World Food Summit, governments have publicly affirmed their commitment to an equitable world without hunger or poverty and where sustainable development guarantees the livelihoods of future generations. The Millenium Development Goals give us a common direction. However, nearly 1.2 billion people live in a state of absolute poverty, and 840 million people are undernourished. FAO estimates that by 2030 the world will have to feed an additional 2 billion mouths.

Moreover, there are additional destinations on our road beyond poverty alleviation. Agriculture in the XXIst century will not only need to produce enough food for a growing, increasingly urbanized population whose dietary patterns are shifting towards more consumption of meat, fish, milk, fruits and vegetables. It will also be the key to alleviating hunger through income and employment. It can only do so through a systematic and far-reaching intensification of the use of land and labour. Most importantly, the agricultural sector will need to respond in ways_beyond the traditional focus on higher yields, addressing protection of environmental common goods, consumer concerns for food safety and quality and the enhancement of rural livelihoods both in the South and in the North. Yet at the same time, in an increasingly urbanized society, rich consumers take cheap food for granted.

Thus, the goals set for agricultural production are bewildering. Fortunately, there are clear promises that biotechnology may contribute to meeting some of these challenges, in particular in terms of improving the quality and quantity of food, and in offering new products: iron-fortified rice; hepatitis B vaccine in bananas; vegetables fortified with compounds that lower 'bad' cholesterol - or with antioxidants that help ward off heart

disease and cancer; coffee trees that can grow decaffeinated beans; transgenic animals producing therapeutic quantities of human proteins in cows' milk; or promising transgenic animal vaccines against some tick-borne diseases or swine fever.

Notwithstanding these potentials and an overall international convergence on the basic development goals – where we want to go - something has gone terribly wrong in recent years. Biotechnology, largely because it is often reduced to GMOs, provokes profound public mistrust across continents. Governments, consumers, farmers and to a lesser extent scientists disagree fundamentally on its benefits and risks. Against a backdrop of globalization and questions about the role of nation states, biotechnology raises four types of concerns:

1. Concerns about health and environmental safety;
2. Ethical concerns, the uneasy feeling that we are "meddling with evolution";
3. Equity concerns about the access to and benefits of these technologies for poor countries, poor farmers and poor consumers;
4. Democratic concerns as to who decides "where to go" in scientific research and technology development, which emphasizes some possible futures while neglecting others.

In other words, the classical humanistic vision that science will naturally lead to social progress has been severely eroded. Many feel threatened and insufficiently consulted on the advances taking place. As a former scientist, I hasten to add that scientists themselves bear a large part of the responsibility for this.

I would like to appeal to you today to refrain from expanding theoretical possibilities, but to discuss concretely what future we need, "where we want to go", and what roads we may take in order to meet some of these concerns.

The Molecular Divide

FAO has conducted several studies on biotechnology. Our findings show that:

1. the pace of advance in developing countries varies considerably,
2. developing countries are not exploring the full range of biotechnology tools to harness genetic resources.

It is no exaggeration to say that we are witnessing a molecular divide. The gap is widening between developed and developing countries, between rich and poor farmers,

between research priorities and needs, and above all between technology development and actual technology transfer.

Let me illustrate. Today 85% of all plantings of transgenic crops globally are herbicide-resistant soybean, insect-resistant maize and genetically improved cotton varieties, designed to reduce input and labour costs in large scale production systems, not to feed the developing world or increase food quality. There are no serious investments in any of the five most important crops in the semi-arid tropics - sorghum, pearl millet, pigeon pea, chickpea and groundnut. This is largely because 70% of the agricultural biotechnology investments are by multinational private sector research, mostly in developed or advanced developing countries. These investments concentrate on GMOs and biotic stresses. Barring a few initiatives here and there, there are no major public sector programmes to tackle more critical problems of the poor and the environment or targeting crops such as cassava or small ruminants.

The widening molecular divide which generates a gap between promise and reality of the impact of biotechnology is a cause for concern. Will biotechnology *aggravate* current inequalities in the world? And if this is not were we want to go, what roads can we take?

Life sciences and society: a new contract

Biotech is everybody's business. No consumer, no farmer, no government can remain indifferent in the face of its promises and its concerns. Let me again quote Alice, who wisely points out to the Duchess, "if everybody minded their own business, the world would go round a deal faster than it does. Which would *not* be an advantage". The misunderstandings and deadlock on biotechnology can only be solved through access to information, dialogue and transparency in decision making. There is no shortcut to building the credibility and public acceptance of agricultural biotechnology, and making sure it contributes to pressing social needs. I believe a new contract, remotely inspired by the famous *Contrat Social* launched by J.J. Rousseau, is required between all stakeholders. Three principles would govern such a Contract:

1. ensure an open, objective dialogue on the benefits and risks of biotechnologies promoting diversity rather than a limited range of options

2. direct public and private research to respond to key challenges

3. ensure access of poor countries and poor farmers to genetic resources, and to the technologies and means to use them.

1. Facilitate an open dialogue on the benefits and risks of biotechnology

In the current environment of polarized opinions, a wide-ranging dialogue is needed to decide how to arbitrate between risks and opportunities. Objective, unbiased information should guide this dialogue. But border lines between research, marketing, public relations and activism are becoming increasingly blurred. Objective brokers are needed, and multilateral organizations, like FAO, can play key roles in this respect.

In the case of GMOs (the cause for much of the public alarm), there is so far no evidence of negative effects on human health (though lack of evidence of adverse effects is not the same as knowing that genetic modification is safe). However, there may be evidence on the potential risks for biodiversity and the environment. As our scientific knowledge of possible risks lags behind our technological capacities, FAO supports science-based evaluation procedures that objectively determine the benefits and risks of each individual GMO on a case-by-case basis prior to its release, and, where possible, agreement on common standards depending on the type of crop or animal, the gene construct, the agro-ecological location of introduction, and the purpose of the introduction. Well-functioning regulatory systems are the only way to regain public confidence in food safety (and the continuing work of Codex Alimentarius is essential here). Regional and global harmonization in relation to environmental risk analysis will also be crucial.

In June 2003, we plan to hold an expert consultation at FAO to assess the current state of knowledge on the environmental impact of transgenic crops on agro-ecosystems, including the evolutionary impacts of GMO introductions on above ground and below ground food webs, as well as good agricultural practices which should accompany them.

2. Direct public and private research to respond to key challenges

Since current research does not address some of the most pressing needs to increase food quality and quantity, we need to consider priority setting in biotechnology research and in agronomic research as a whole.`

To bridge the molecular divide, the key word will be diversity of options and transparency of choice. There are many roads to sustainable intensification, and biotechnology is just one of them. Which options will be best suited to address specific production bottle necks in developing countries needs to be determined on a case-by-case basis, taking into

account economic, technical, social, trade and safety considerations. For instance, for pest control - by using practices such as crop rotation, soil fertility improvement, biological control and traditional selection techniques. The Integrated Pest Management approach has provided a very successful model for integrating local knowledge with new technologies to tackle local problems. Biotechnology may add new dimensions to the existing integrated approaches, but not replace them. Perhaps the greatest potential of biotechnologies does not come from GMOs but from genetic markers, genomics and proteomics which can complement conventional breeding strategies and enhance their efficiency. Vaccines and virus-free plant materials hold great potential. Biotechnology-based diagnostic tools can be of great help to quickly identify many viral, fungal, and bacterial pathogens. Research priorities in biotechnology should also put the emphasis on key challenges facing developing countries such as abiotic stresses like drought, soil erosion and salinity. The point is harnessing genetic resources through biotechnology, and not just manipulating them . Biotechnology tools must also contribute to the conservation, characterization and utilization of biodiversity. Techniques such as *in vitro* culture are very useful in maintaining *ex situ* germplasm collections of plant species that have asexual propagation and species that are hard to keep as seeds or in field gene banks. Similarly, embryo rescue and artificial insemination are important for breeding and preserving rare animal breeds.

Moving beyond biotechnology, the entire discipline of life sciences can and must be harnessed for natural resources management and for designing sustainable agricultural production systems. I am most concerned that agronomic research is becoming increasingly specialized and exclusively focused on the plant or cellular levels. We must find ways to facilitate multidisciplinary research and investment. Pressures on research institutes to obtain external funding may lead to over-emphasizing biotech-related research. Already, the perceived profit potential of GMOs has changed the direction of investment away from systems-based approaches to pest management and towards a greater reliance on monocultures: the possible long-term environmental and economic costs of such strategies should not be overlooked. Hence, the key to reorienting research for the benefit of developing countries is a funding issue. We need to acknowledge and better exploit the comparative advantages of public and private research. Research in this field is an international public good. I would like to call urgently for reversing the decline in funding to public research, and creating incentives to harness private/public sector partnerships while protecting public interest.

3. Ensuring access and benefit-sharing

As many new technologies are held by the private sector, there are concerns regarding fair and equitable access, as well as the sharing of benefits and the impact of current intellectual property rights (IPR) regimes. As the frontiers become blurred between discovery and invention, this trend is particularly contentious for the use of plant and animal genetic resources, developed and preserved through evolution, domestication, and civilization for millennia, largely by farmers of developing countries. The case of the "Golden Rice", in which around 40 different patented steps were called on by various industries for payment at the time of release, is a clear example of barriers to access.

On the other hand, we have to recognize that IPRs are also critical to the growth of the biotechnology industry, and that lack of patent protection in a country can limit access to the results of biotechnology originating elsewhere. All in all, IPRs are not a good in themselves, but a tool that society uses to achieve certain objectives, such as to put information in the public sector and to promote innovation. Noteworthy steps towards the development of innovative IPRs have already been taken with the Uruguay Round agreements, the Convention on Biological Diversity and more recently FAO's International Treaty on Plant Genetic Resources for Food and Agriculture adopted in 2001, which recognized Farmers' rights as a complement to the Plant Breeder's Rights.

Let me now conclude. Biotechnology must be redirected to address the pressing needs of the poor and the new requirements for food quality and quantity and new agricultural products, by complementing existing techniques and holistic agronomic approaches to sustain production and manage risks. Our three principles (promote an open dialogue, redirect research, ensure fair access and benefit-sharing) should form the basis of a new, broad-ranging social contract, between North and South, between public and private research, between scientists and citizens - to bridge the molecular divide.

To build this social contract: concrete proposals

1. Effective procedures (where possible, regionally or internationally agreed) need to be put in place to monitor where, how, when GMO products and processes have been introduced, as well as their post-release effects.
2. Support should be given to developing countries in defining and implementing effective national agricultural biotechnology policies, tailored to their particular situation and needs.
3. Developing countries urgently need to establish a capacity to assess and manage all aspects of risk throughout the food chain. In doing so, the resource limitations

of the smaller countries need to be addressed to bring them fully into the process of standard-setting and to assist them in regional cooperation.

4. A global research network is needed to broaden the use of biotechnologies for sustainable agriculture, matching the needs and demands from any part of the world with the vast expertise, technology and financial resources available. The EU could take the lead in establishing such a network and in sharing knowledge and expertise to create a fair platform for developing countries and to tackle crops of global significance.
5. Resources must continue to be directed towards public research producing public goods, even in a time of financial stringency. The balance of private and public research and of biotechnological and agronomic research requires careful monitoring.
6. FAO calls upon private sector companies to share their technologies and information with developing countries free of charge or at minimal cost, particularly when no important market is lost by facilitating such access. Partnerships to constitute a public technology bank, putting systematically at the disposal of poor farmers in developing countries the key technologies and products, merit consideration in this respect.

Conclusion

We must rise above prejudice and inertia. Biotechnology holds great promises, but involves new risks. The timing of this Conference is appropriate – 60 years after the discovery by Avery, McCloud and McCarthy of DNA as the 'hereditary principle in all living beings, and just 50 years after the structure of the famous double helix was identified. Today, in most countries, the scientific, political, economic or institutional basis is not yet in place to provide adequate safeguards for its development and application, and to reap all their potential benefits. Clearly the question is not what is technically possible, but where and how life sciences and biotechnology can contribute to meeting the challenges of sustainable agriculture and development in the XXIst century. It is up to us to decide "the roads we take", and mobilize the political will to bridge the molecular divide. This will need time and effort, but as Alice learns in the end,

"You are sure to get *somewhere*, if only you walk long enough".
But let us be aware that time is short.