Frequently Asked Questions about FAO and Agricultural Biotechnology

1. What is agricultural biotechnology?

The terms 'biotechnology' or 'agricultural biotechnology' are frequently defined in different ways by different organizations and people, so definitions are important to avoid confusion and misunderstanding. FAO traditionally uses a broad definition, based on Article 2 of the Convention on Biological Diversity, which states that biotechnology is "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use". The term agricultural biotechnology (or agricultural biotechnologies) therefore covers a broad range of technologies used in food and agriculture. They are used for a number of different purposes, such as the genetic improvement of plant varieties and animal populations to increase their yields or efficiency; the characterization and conservation of genetic resources for food and agriculture; plant or animal disease diagnosis; and vaccine development. Some of these technologies may be applied to all the food and agricultural sectors, such as the use of molecular markers or genetic modification, while others are more sector-specific, such as tissue culture (in crops and forest trees), embryo transfer (livestock) or sex-reversal (fish). Note, the term agriculture includes crop, livestock, fish and forestry products, so the term 'agricultural biotechnologies' encompasses their use in any of these sectors.

2. What are GMOs?

A genetically modified organism (GMO) is an organism in which one or more genes (called transgenes) have been introduced into its genetic material from another organism using recombinant DNA technology. For example, the genes may be from a different kingdom (such as from a bacterium to a plant) or a different species within the same kingdom (e.g. from one plant species to another).

3. Are GMOs widely used in food and agriculture today?

In crops, genetic modification has had limited but real success in modifying a few simple input traits in a small number of commercial commodity crops, which have also been adopted by farmers in some developing countries. GM crops were first grown commercially in the mid 1990s. While the majority continues to be grown in developed countries, an increasing number of developing countries are reported to be cultivating them. Almost all GM crops grown commercially are soybean, maize, cotton or canola and they have been genetically modified for herbicide tolerance and/or insect resistance. No GM livestock or fish have been commercially released for food and agricultural purposes to date in the world. Commercial release of GM forest trees has been reported in one country, China. Although documentation is poor, use of GM micro-organisms in agro-industry (e.g. for production of enzymes in the food industry) and the animal feed sector (e.g. for production of feed additives such as amino acids and enzymes) is routine in developed countries and is also a reality in many developing countries.

4. What is FAO's position on GMOs?

First, despite what is sometimes said, we do not need GMOs to resolve the current world hunger problem. There is enough food for everybody, but millions of people are poor and simply do not have the money to buy food – that is why access to food is a major problem.

Second, FAO recognizes that genetic modification can help in some circumstances to increase production and productivity and thus contribute to food security. However, FAO is also aware of the concern about the potential risks that GMOs pose regarding the effects on human and animal health and the environment. FAO underlines the need to carefully evaluate the potential benefits and possible risks associated with the application of modern technologies to increase plant and animal productivity and production. However, the responsibility for formulating policies and making decisions regarding these technologies rests with the Member Governments themselves.

5. What is FAO's position on release of GMOs in any specific country?

As mentioned above, the responsibility for formulating policies and making decisions regarding GMOs lies with the individual Governments. FAO does not interfere in the policies or decisions, including those related to GMOs, of its Member Governments and so it has no position regarding the development, testing or commercial release of GMOs in any specific country. However, on their request, FAO provides advice, assistance with capacity development, information and a meeting place to its Member Governments.

6. What is the relationship between genetic modification and other agricultural biotechnologies?

The major controversy about the subject of agricultural biotechnology relates to a single biotechnology, genetic modification, and its resulting products, the GMOs. While there has been little discussion about the other biotechnologies, the debate about the advantages and disadvantages, real or perceived, of GMOs began over a decade ago and it still continues today without showing any significant signs of abating.

In the past, and still today, there has been too much emphasis on genetic modification and GMOs and too little focus on the potential merits of the other biotechnologies and the positive role that they can play for food security and sustainable development in developing countries. The polarized debate has led to these other biotechnologies being overshadowed and is likely to have hindered their development and application. They vary considerably, from biotechnologies that are relatively 'low-tech' (such as biofertilizers, biopesticides or tissue culture in crops/trees; artificial insemination in livestock; fermentation and use of bioreactors in food processing) to those that are more 'high-tech' (such as use of polymerase chain reaction (PCR) based methodologies for disease diagnosis, marker-assisted selection, genomics or *in vitro* fertilization in livestock). An important feature they all have in common is that, unlike genetic modification and GMOs, these biotechnologies, and any eventual

products arising from them, do not normally require any specific regulatory approval, meaning that they can be quickly adopted by farmers and that the costs of release are low.

7. How does FAO assist its Member countries in the area of agricultural biotechnologies?

FAO implements its overall mandate, including its mandate regarding agricultural biotechnologies, in four ways, namely by providing its Members with advice; assistance with capacity development; information; and a meeting place for nations.

On request, FAO provides legal and technical advice to governments on areas such as development of national biotechnology strategies and development of biosafety[1] frameworks. For example, FAO has assisted countries such as Bangladesh, Paraguay, Sri Lanka and Swaziland to develop their national biotechnology policies and strategies.

FAO assists its Member countries to develop their capacities in agricultural biotechnologies and related issues through technical co-operation and training, implemented at the national, sub-regional, regional and global levels. For these activities, FAO collaborates with a range of partners, including other UN agencies and the research centres of the Consultative Group on International Agricultural Research (CGIAR).

FAO has been at the forefront in recent years in providing high-quality, updated, balanced science-based information about agricultural biotechnologies to its Member countries and in providing a neutral platform for them to exchange information on this subject. This has been done using the Internet, e-mail conferences/newsletters as well as hard-copy and electronic publications.

FAO facilitates development of international standards and helps frame international conventions and agreements as well as hosting major conferences, technical meetings and expert consultations. The Secretariats of several intergovernmental bodies/treaties dealing with some biotechnology-related issues are based in FAO Headquarters, including the Commission on Genetic Resources for Food and Agriculture, the International Plant Protection Convention, the International Treaty on Plant Genetic Resources for Food and Agriculture and the Joint FAO/WHO Codex Alimentarius Commission. For example, in 2010 the Codex Alimentarius Commission adopted guidelines on methods for detection, identification and quantification of specific DNA sequences and proteins in foods.

8. Can agricultural biotechnologies help smallholder farmers in developing countries?

Yes, and this is illustrated by many case studies provided in the background documents prepared by FAO for ABDC-10[2]. For example, New Rice for Africa (NERICA) varieties have been developed using biotechnologies that enable crossing of two species of cultivated rice, African rice and Asian rice. These NERICA varieties combine the high yields from the Asian rice with the ability of the African rice to thrive in harsh environments and are grown on about 200,000 hectares of upland areas annually in sub-Saharan Africa. In the Satkhira and Chittagong districts of Bangladesh, the use of artificial insemination to raise milk yields of dairy cattle has increased incomes and employment for smallholders in community-based programmes. In India, the use of DNA-based methods to detect pathogens was a key component of better management practices that were applied for small-scale shrimp farmers in Andhra Pradesh and which led to significant improvement in profits and reduced shrimp disease risks for farmers. DNA-based tools have been applied to improve traditional fermentation-based food/drink production systems to create home-grown industries in Africa, Asia and Latin America. Biotechnologies have also played a vital role in the diagnosis and surveillance of

[1] Biosafety is a general term used to describe frameworks encompassing policy, regulation and management to control potential risks associated with the experimentation, release, use and transboundary movement of GMOs

[2] FAO. 2011. Biotechnologies for agricultural development: Proceedings of the FAO international technical conference on 'Agricultural biotechnologies in developing countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change' (ABDC-10). http://www.fao.org/docrep/014/i2300e/i2300e00.htm

rinderpest, contributing to the eradication of this infectious viral disease of cattle, buffalo, yak and numerous wildlife species that has caused devastating effects throughout history. This is only the second time that a disease has been eradicated worldwide, following smallpox in humans.

However, it must be underlined that no biotechnology or biotechnology product is a silver bullet that can ensure success on its own. The ability of agricultural biotechnologies to help smallholder farmers also depends on a range of other factors such as government policies and access of the farmers to extension services, agricultural inputs, credit and markets.

9. Can agricultural biotechnologies benefit biodiversity?

A number of agricultural biotechnologies can help to characterize, conserve and utilize crop, animal, forestry, aquatic and microbial genetic resources and they are being used for this purpose in both developed and developing countries. Characterization is needed to identify and prioritize genetic resources for food and agriculture to be conserved. In addition to features such as their phenotypes, population size and geographical distribution, genetic resources can be characterized using biotechnologies such as molecular markers that reveal differences at the DNA level that are not influenced by the environment. Agricultural biodiversity can be conserved using biotechnologies such as cryopreservation (i.e. that preserve genetic material, such as seeds, sperm or embryos, at ultra-low temperatures) and *in vitro* slow growth storage (where sterile tissue/plantlets of crops or trees are grown on nutrient gels).

Genetic resources are the raw material for agricultural development and their sustainable use is crucial for global food security. Biotechnologies are increasingly being utilized to enhance genetic resources, such as by the use of immunological and molecular methods for pathogen screening and disease diagnostics to improve plant and animal disease control or the use of micropropagation, the laboratory practice of rapidly multiplying disease-free stock plant material to produce a large number of progeny plants using plant tissue culture methods.

10. What is ABDC-10?

ABDC-10 is the acronym for the FAO international technical conference on "Agricultural biotechnologies in developing countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change" (ABDC-10, www.fao.org/biotech/abdc) which took place in Guadalajara, Mexico on 1-4 March 2010. The conference was hosted by the Government of Mexico and co-sponsored by the International Fund for Agricultural Development (IFAD). The Consultative Group on International Agricultural Research (CGIAR), the Global Forum on Agricultural Research (GFAR), the International Centre for Genetic Engineering and Biotechnology (ICGEB) and the World Bank were major partners in this initiative. A major objective of the Conference was to take stock of the application of biotechnologies across the different food and agricultural sectors in developing countries, in order to learn from the past and to identify options for the future to face the challenges of food insecurity, climate change and natural resource degradation.

The Conference was attended by about 300 policy-makers, scientists and representatives of intergovernmental and international non-governmental organizations, including delegations from 42 FAO member countries. A key feature of ABDC-10 was the involvement of a broad range of different stakeholders, including several intergovernmental and non-governmental organizations and regional fora, which organized and supported a comprehensive series of parallel sessions that were sector-specific, regional or of cross-sectoral interest.

11. What were the main conclusions of ABDC-10?

At the end of the conference, the Member States reached a number of key conclusions. They acknowledged that agricultural biotechnologies can help to alleviate hunger and poverty, assist in

adaptation to climate change and maintain the natural resource base; that agricultural biotechnologies have not been widely used in many developing countries, and have not sufficiently benefited smallholder farmers and producers and consumers; and that more research & development should be focused on the needs of smallholder farmers and producers. They also acknowledged that governments need to develop their own national vision and policy for the role of biotechnologies; that effective communication and participation strategies with the public are necessary; and that stronger partnerships among and within countries will facilitate the development and use of biotechnologies.

The Member States also agreed that effective and enabling national biotechnology policies and regulatory frameworks can facilitate the development and use of appropriate biotechnologies in developing countries and that developing countries should significantly increase investments in capacity building and the development and use of biotechnologies to support, in particular, smallholders, producers and small biotechnology based enterprises.

Finally, the countries also agreed that FAO and other relevant international organizations and donors should significantly increase their efforts to support the strengthening of national capacities in the development and appropriate use of pro-poor agricultural biotechnologies.

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For more information, see http://www.fao.org/biotech