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## **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)**

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### *Issue paper*

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### **Agricultural biotechnologies in Europe and Central Asia: new challenges and opportunities in a view of recent crises and climate change**

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### *Introduction*

Climate change is a complex global issue with regional implications and location specificity, whose impact on agriculture and related sectors, coupled with recent food and economic crises is likely to aggravate its chronic problems and negatively affect the sustainability of the sector. Biotechnology, which includes tissue culturing, gene transfer, immunological techniques, molecular genetics, recombinant DNA methods and currently, functional genomics, proteomics and metabolomics combined with bioinformatics, is recognized as a powerful tool in a broad range of agriculture related areas. If properly focused, biotechnologies, often combined with traditional knowledge, can offer solutions for a number of both novel and old challenges and thus, significantly contribute to the sustainable development of agriculture, livestock, fisheries, forestry and food industry, while adding value to the food safety and improved health.

Notwithstanding the great potential for benefits that this technology could bring to the environment and society, there is a common understanding within the community at large that a balanced, science-based approach of biosafety and biosecurity is needed for evaluating the possible adverse effects from the environmental release and human and animal diets implications of one of the biotechnological branches: genetically modified organisms (GMOs).

While recognizing several positive developments and good heritage, particularly in the agricultural and food science and research area, the countries in Central and Eastern Europe (CEE) and Central Asian (CA) region are still experiencing substantial reforms in different agrarian sectors that severely impacted all food and agriculture related aspects. Current economic and food crises largely affected millions of livelihoods, thus rapidly leading them beneath the poverty line. According to the latest climatologic data, the countries in Europe and Central Asia (ECA), with exception of Northern Russia, are furthermore expected to bear the burden of severe climate change CC (long term effects associated with the dramatic increase of the greenhouse gases (GHGs) as a consequence of human activities). The negative impacts of the CC will increasingly rise, provoking frequent climate variability with progressive enhancement

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of magnitude in the course of the next 20-100 years, when wider and massive effects are to be expected.

Despite of the fact that biotechnologies in food and agriculture have the potential to improve the quality of life and to drive economic opportunity, they already play a key role in reducing GHG emissions and help addressing today's challenges of climate change as water scarcity, malnutrition, reduced availability of agricultural land, producing clean, renewable alternatives to petroleum-based fuels, thus greatly reducing the energy consumption and GHG emissions from a wide range of agricultural practices and processes, creating millions of jobs over the world. In order to provide the countries with developing and transition economies in ECA region with an access to biotechnology innovations and products and to insure that they become an integral part of the countries' agricultural systems, proper mechanisms and incentives should be identified and promoted.

The internationally agreed move towards mitigation of and adaptation to climate change implies a holistic approach at all levels (human & institutional, public & private resources and capacities; policies and strategies, addressed nationally, regionally and internationally) that considers the agricultural systems in their integrity, thus ensuring sustainable development. Similar approach to address agricultural biotechnologies as a part of solutions for sustainable development would be used for this paper, which aims at over-viewing and analysing the strengths, weaknesses, opportunities and threats for the generation, adaptation and adoption of appropriate biotechnologies for food and agriculture in Europe and Central Asia by addressing policy and strategy options, human resources and institutional capacities in the region and intends to provoke discussions and facilitate regional priority setting during the FAO ABDC-10 conference.

### ***Strategies and policy options***

Although having experienced a similar historical past under the former centralised political system, the countries of the Eastern European and Central Asian region are now facing considerable divergence with regard to development and implementation of their national biotechnology and biosafety strategies, policies and, when necessary, regulatory frameworks. It is mostly due to their different approach towards relevant international instruments and policy orientation. The Cartagena protocol on biosafety (CPB) under the Convention of Biological Diversity (CBD) and EU accession process of some CEE countries acted so far as powerful triggers for the ECA countries to develop biosafety frameworks, particularly in the field of modern GM technologies since GEF and EC donor support was provided. Some countries in the region however, mostly the newly formed states, still lack behind in adhering and adopting international treaties and therefore, respective domestic legislations in this field.

Notwithstanding with the donor assistance received for drafting their biosafety policies and national legislations that cover the safe use of products resulting of genetic modification, almost all ECA countries failed in developing or enforcing functional frameworks that allow taking advantage of a wide range of biotechnologies and particularly to bring locally developed biotechnology inventions in the farms and on the market. These biosafety policies, drafted or officially adopted, existing often only on paper but not implemented, are hardly embedded in a larger context of a sustainable biotechnology strategy.

In the absence of a long term commitment over a holistic biotechnology framework (strategy), the Governments in the ECA countries were urged to adopt legislative acts addressing the safety of one of the modern biotechnology branches- the genetic modification technology. Even those countries (mainly CEE), which already have drafted or adopted their primary biosafety legislation (laws), did not fully enforced it yet. Among the main reasons are: (i) scientific

complexity of the issue and insufficient administrative capacities at different levels to address it properly, which led often to overregulation; (ii) overregulation, that led to loss of framework operability; (iii) very high cost of regulation, increased additionally by overregulation; (iv) lack of wider public acceptance and participation.

As a consequence, almost two decades after the adoption of the Agenda 21 at the Earth Summit 1992, which paved the way of the safe use of the products of modern biotechnology, although largely used in food industry, the issue of the application of certain GM technologies in crops is still ongoing and has even gained in controversy in the public debate in ECA countries. Moreover, the insufficiency of capacities and lack of wide communication strategy actually influenced negatively also the biotechnology research, which is not based on GM technologies, including very promising novel technologies, functional genomics *inter alia*. A high concern is present further that the delay in implementing relevant communication strategies and education campaigns in biotechnology and biosafety may challenge governmental decisions in this area, including co-existence, and compromise both the implementations of domestic laws and international obligations under the CBD and World Trade Organisation (WTO), due to possible misperceptions in the general public and related unjustified pressure from civil organisations.

Lessons learned from the ECA regions suggest that a biotechnology strategy, agreed on a large basis in a long term commitment, should be developed prior other derivative policies and legislative frameworks, and it should:

- Allow for generation and adoption of science-based know how that copes with traditional approaches and innovative biotechnologies;
- Encompass all sectors: agricultural, livestock, fisheries and aquaculture, forestry and food biotechnologies;
- Promote strengthening the functional linkages among all stakeholders of the NAARs: researchers, academia, private and public extension, farmers, retailers, SMEs to allow fast adopting of adequate to farmers needs biotechnology innovations and their market implications;
- Address technology transfer, coupled with enhanced intellectual property rights protection capacities;
- Set specific priorities in the development and adoption of agricultural biotechnologies at national level when lack of funding to cover all aspects exists;
- Facilitate the public-private partnerships in biotechnology research and innovations in agriculture;
- Provide for channelled mechanisms to bring biotechnology innovations to the poor and insure access and relevance of those high technologies for poor farmers' needs;
- Make use of local germplasm, breeds and varieties developed through biotechnologies from the region (subregion);
- Use participatory and transparent approach.

In line with the national biotechnology strategy, biosafety policies and regulatory frameworks should be developed and enforced and which should be, among others:

- science-based
- flexible to allow inclusion of new knowledge and evidences
- functional and efficient
- based possibly on existing and workable structures (biosecurity approach).

Being widely discussed issue in EU and EU trade partners, the co-existence<sup>4</sup> of conventional, organic and GM crops is a part of the agenda of many CEE countries and considered at policy and legislative level in the near future by the governments in the whole ECA region.

### ***Human resources***

Human resources in the area of agricultural biotechnologies in crops, forestry, livestock, fisheries and food in ECA region can be regarded in three different aspects: general; issue-specific (professional trainings and education); cross-cutting issues, which further add societal value over the professional skills. For the purpose this paper, they will be discussed jointly.

The countries from ECA have traditionally good secondary and high education systems, which address different aspects in biotechnology research: in crops, forestry, livestock, fisheries and food. The educational systems in ECA usually have the capacities to deliver sufficient experts in traditional and modern biotechnology applications through university curricula, post graduate programmes and specialised secondary schools and farmer colleges. The transition period in their economies however, severely influenced the process of depletion or loss of intellectual and technical personnel, especially in the young generation, mostly known as “brain drain” to developed countries. The disinclination of the policy-makers to implement adequate strategies prioritising biotechnology research, or adopting too restrictive, overregulated biosafety legislations caused additional reflux of highly qualified young experts from biotechnology vocation. In addition, in most of the ECA countries the insufficient monthly stimuli in public research resulted in sexual inequity and high prevalence of women in this area.

There is a common understanding and interest, expressed in several international fora that human resources, specifically trained through biosafety curricula (not only training courses) that include biosafety research; risk analysis; legal; socio-economic issues and science and risk communication skills should be developed and put into practice, which currently is not the case any of the ECA countries. Since the demand of biosafety experts in each country is not expected to require annual supply of, e.g. bachelor graduated students, it would be most appropriate to start with master or postgraduate programmes. To this end, regional approach and, where appropriate e-learning programmes would be the most appropriate mechanism, ensuring development of adequate human resources and sustainable employment at proper cost.

The lack of awareness and practical experience with regard of the issues related to protection of intellectual property rights of researchers and breeders in all the countries in the region is considered as a serious constraint in bringing local inventions to farmers and to reach the market. This gap should be addressed at national level, starting from inclusion in the university curricula and designing and implementing masters and postgraduate programmes.

In order to facilitate the access of the stakeholders and particularly the poor farmers to the biotechnology innovations, special attention should be paid to the development of specific

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<sup>4</sup> Co-existence refers to the economic consequences resulting from adventitious presence of material from one crop in another and is related to the principle that farmers should be able to cultivate freely the crops of their choice using the production system they prefer (GM, conventional or organic). It arises logically after the decision-making process has taken place, when a given GM crop has obtained the permit for release into the environment and its safety does not pose concerns anymore. Co-existence of the three types of agriculture is not, consequently, a biosafety issue. It rather relates to the management measures that have to be taken in order to prevent the adventitious presence of GMOs into other production systems such as organic farming, which production according to the EU regulatory documents should be GMO-free or into conventional crops, which in should meet respective threshold of purity (0.9%).

extension programmes, addressing biotechnology and biosafety issues. Capacity-building for extension experts in this area should be thoroughly considered.

Biotechnology is a complex scientific discipline that requires a certain specific knowledge and high awareness. This is also relevant for biosafety, even in a greater extend, given the fact that biosafety is a rapidly developing multidisciplinary approach that encompass science, ethics and societal issues, policy and regulatory frameworks, therefore there is a considerable risk that the processes, achievements and benefits of modern biotechnologies (GM and non-GM) may not be fully recognised, adequately evaluated and perceived among the general public. A common experience so far in the ECA countries shows that the insufficient transparency and the lack of a broad, multilevel communication strategy left room for the large spread of factoids and misperceptions. Hence, it is of primarily importance to consider the development of communication skills and to envisage establishment of a new career of science- (biotechnology-) communicators.

### ***Institutional capacities***

During the past centralised economy system, which was in place in the most of the developing and transition countries in the ECA region, many research centres, institutes and laboratory facilities were built and equipped, among which some dedicated to agricultural biotechnology research. As up today, these centres are at different level of development: some showed considerable advancement so that they regularly enter in partnerships, e.g under EC frameworks programmes as Centres of Excellence and others, often the major part, face very poor infrastructure, facilities and old equipment. The situation differs from country to country but more often inside the country. It would be wise in this line, if a consolidation and concentration of efforts and resources would be foreseen around the successful structures. An example that could illustrate this approach is the core issue of GMO detection, identification and quantification, which involves high cost sophisticated lab equipment and expertise and additional efforts and cost associated with the laboratory accreditation. Countries, which have adopted biosafety regulatory frameworks, bear legal obligation to perform GMO analysis but often GMOs are regulated by more that one authority under the umbrella of different ministries. The experience so far shows that very often the government states that the country lacks of capacities for GMO detection, and ministries use donor funds to build new GMO laboratories and train the personnel under each authority, even though the country's inspection plans (if in place) and emergency cases would not fulfil the capacity of a single laboratory. Moreover, in many cases, governments are unwilling to use already fully operational laboratories with highly qualified experts with the reasoning that the laboratory is a part of a public research centre or university and not ministry, thus provoking unnecessary waste of resources and considerable delay in enforcing the legislation.

To cover all thematic aspects (crops, livestock, fisheries, forestry, food, biosafety and risk assessment, GMO analysis) and in case of insufficient in-country's capacities, regional initiatives and private partnerships could also be considered. This approach is highly recommendable when building capacities in functional genomics with agricultural and food implication.

### ***Funding for Biotechnology and Biosafety***

Although the EC framework programmes are open for partnerships for most of the countries in the region, biotechnology research in ECA countries is almost exclusively funded by the very limited pool of public sources. Moreover, the lack of prioritising strategies in biotechnology and biosafety as well as the lack of broad communication policy in this area, which led to spread of misperceptions and concerns in the general public even for non-GM techniques additionally affected the already limited funds for research and adoption of innovations.

The private sector in ECA is still under development and so far is not stimulated (by national policies) to take part in the innovation process.

The policy options, identified above, *inter alia* capacity-building, technology transfer, strengthening research and extension systems, improved communication for development in agriculture, usually require considerable efforts and funding and are fields that usually donor support is required. In biosafety, a considerable number of ECA countries received or are receiving substantial support through UNEP/GEF programmes, EU –PHARE and other bilateral agreements. None of these programmes alone were able to achieve fully operational biosafety framework.

In the situation of insufficient financing in biotechnology and biosafety, it would be important to increase the efficiency of the existing structures and capacities (nationally and regionally), while considering the biosecurity approach, and make full use of the assistance that could be provided at regional level, including relevant NGOs with appropriate mandate.

### ***Issues to be addressed at national and regional level***

In the epoch of dynamic globalization processes, food and economic crises and global environmental challenges a rapid increase of the poverty level is observed. About 30 percent of the population in Europe and Central Asia – about 145 million – are considered either poor or vulnerable but this now expected to rise throughout the Region, increasing by about 5 million people for every 1 percent decline in GDP. In 2009 alone, the Region faced the reality of an additional 13 million poor or vulnerable people, instead of the number falling from 145 to 130 million as expected before the crisis. Against this background, any sustainable solution, especially internationally recognised as it is the case of biotechnology (Agenda 21, CBD, CPB) should be used in a safe, responsible and efficient manner to contribute to alleviation of poverty and improving livelihoods, while addressing environmental issues. To reach this end, several issues in the area of biotechnology and biosafety must be addressed at national and regional level:

- Initiating inventories of the most promising genetic resources, breeds and lines, good practices, case studies and successful stories (biotechnology innovations) contributing to mitigation and adaptation to CC or improving the livelihoods from the Region to convince general public and policy-makers;
- Enhancing the administrative and institutional capacity of the governments to embrace adequate knowledge (bioechnology) - based strategies and policies for CC adaptation and mitigation, other environmental problems or improving the livelihoods;
- Adoption and implementation of longterm, transparent and widely agreed national strategies, prioritising biotechnology and biosafety, allowing flexibility to ensure consideration of a new knowledge, while facilitating public-private partnerships;
- Large scaled public awareness policy, coupled with efficient communication and relevant education programmes at all levels, with particular attention to young generation (future policy-makers, who will be facing projected environmental and economic challenges);
- Creating and facilitating linkages among all players of the national agricultural knowledge, research and extension systems;
- Technology transfer, coupled with enhanced intellectual property rights protection capacities;
- Networking and promoting institutional linkages (in the countries and at regional level);

- Consolidation and increasing the efficiency of the available capacities, making full use of well established structures, e.g. Centres of Excellence at national and regional level; consideration of biosecurity approach.

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