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The CGIAR Research Programs: Gearing Up for New Challenges

The CGIAR and Biotechnology: Can the Renewal Keep the Promise of a Research Agenda for the Rural Poor?

Please find attached a paper by the NGO Committee Chair on biotechnology in the CGIAR. This paper was considered at the stakeholder consultation on the role of biotechnology in the CGIAR and is background for discussion of Agenda Item 5 - Biotechnology in the CGIAR.

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The CGIAR and Biotechnology: Can the Renewal Keep the Promise of a Research Agenda for the Rural Poor?*

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Since the launching of the renewal, the CGIAR has emphasized a new research agenda aimed at promoting a sustainable agriculture for food security and poverty alleviation in the developing world (LDCs). In various declarations and published materials there is constant mention of new technological breakthroughs developed by the IARCs that will have a more positive impact on the poor of the LDCs. In his various policy statements at the 1996 International Centers Week, CGIAR Chairman called for an agricultural agenda aimed at poverty reduction, food security and sustainable natural resource management. He also spoke of the need to intensify complex agricultural production systems sustainably, of respecting and tapping indigenous knowledge and about the importance of recognizing farmers organizations, community organizations and NGOs as potential research partners and as sources of knowledge on societal transformations. The Chairman also spoke about the great opportunities in the area of biotechnology and its potential to contribute to the sustainability of agricultural production systems. To many NGOs and other critics of the past Green Revolution, however, there is concern that by engaging in biotechnology, the CGIAR's underlying goals remain the same as in the past, emphasizing yield increases through intensive agriculture, but this time aided by biotechnology (narrowly conceived as genetic engineering). By strongly endorsing biotechnology as the main strategy for agricultural production enhancement, the CGIAR will alienate much of the NGO community (and also many farmers organizations) who will consider that the CGIAR's real intentions are that of a Green Revolution replay by spearheading research into genetic engineering of crops.

Although many NGOs share a widespread recognition of the potential value of biotechnology in LDC agriculture, the central concern of NGOs is the context in which biotechnology is presently being developed. At the moment the technology is being heavily privatized, mainly by large TNCs, and the direction of the research is biased towards a "high-tech" type of agriculture of no relevance to problems of LDC small and peasant farmers. Up to this point one of the principal priorities of private-sector biotechnology is that of developing herbicide resistant varieties which would stimulate rather than substitute for herbicide usage. In addition to its high cost for poor farmers, genes inserted into such crops are capable of rapidly moving to weeds, thus potentially creating "super weeds." Another priority is the development of Bt transgenic crops for insect control, but again cost and the

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potential development of pest resistance makes the technology socio-economically and ecologically unfit for LDC agriculture. Private biotechnology R and D toward LDC agriculture is likely to emphasize a limited range of agricultural technologies for which there are large and secure markets, targeted to relatively capital-intensive production systems. Under such conditions, it is extremely difficult to conceive how such biotechnology will be introduced to less-favored areas for adoption of masses of peasants thus "offering undreamt of opportunities to the poor" as the Chairman suggests.

As it happened with northern universities, many NGOs fear that private biotechnology companies are now reaching into the CGIAR to draw knowledge out and into the corporate labs. Such firms will continually depend upon fundamental and applied nonproprietary knowledge developed in the IARCs. The CGIAR will have to carefully monitor and control the provision of knowledge to the private sector so as to protect that such knowledge will continue in the public domain for the benefit of the rural poor and society at large. As the Chairman suggests, the CGIAR will have to "reach special arrangements with the private sector on the use of the new technologies for the poorest parts of the world". A key question however is how to reach such an agreement given the precarious economic condition (and therefore leverage) of the CGIAR with respect to the billion dollar biotechnology research budgets of MTCs?

In this regard, the CGIAR must be well advised by NGOs and farmers organizations in biotechnology matters, as such alliance has the potential to be one of the few international mechanisms that could reverse the privatization of biotechnology and challenge the direction of current privately led research. The critical question is then how to position the CGIAR to assume the historic and ethical responsibility in the development and deployment of socioeconomically and environmentally desirable biotechnologies. IARCs cannot be confined to basic research, collection, conservation and evaluation of germplasm, while the private sector leads the bio-revolution as determined by markets and transnational capital. The real challenge for the IARCs in engaging in the biorevolution is to gear biotechnological research towards the specific problems of the rural poor, and this may well prove to be a research agenda in which "appropriate biotechnology" is part of a much broader technological approach to sustainable agriculture.

The first step in defining the role of the CGIAR in biotechnology, will be to identify the types of biotechnology most appropriate to the needs and circumstances of the resource poor farmers.

Potential examples include:

- development of bioengineered crop varieties responsive to low levels of soil fertility or tolerant of saline or drought conditions and other stresses in marginal lands

- design of improved varieties which are not dependent on agrochemical inputs for increased yields, excluding transgenic crops which are likely to increase agrochemical input use

- development of apomictic crop varieties (that is that they have the ability to develop seeds through asexual reproduction) allowing farmers to propagate and maintain superior cultures through seed

- *fermentation technologies for massive production of microbial* insecticides, fungal antagonists, and biofertilizers

- tissue and meristem culture techniques for production of resistant varieties or virus free varieties and clonal propagation for fostering new cultivar development, cautious of the problems arising from genetic uniformity

- development of molecular markers to identify genes of interest in a variety that may be transferred to another for improvement purposes

The second step will be to build strategic partnerships with other organizations that are also involved in the development of biotechnology adaptable to the needs of developing countries in order to share tasks, knowledge and human, material and financial resources. Some of these potential partners include UNIDO's International Center for Genetic Engineering and Biotechnology (ICGEB), UNESCO-UNEP sponsored Microbiological Research Centers (MIRCENs), and the Center for the Application of Molecular Biology to International Agriculture (CAMBIA) in Canberra, among others. Collaborative linkages with national research centers in developing countries such as India, Argentina, Brazil, China, and the Philippines, where indigenous capabilities are well developed and in some cases directly applicable to local agricultural problems, should also be encouraged. The case of Cuba's remarkable biotechnological advances in artesanal massive production of biopesticides and biofertilizers may be of most relevance to LDC low input agricultural systems and should be capitalized through special solidarity agreements by the CGIAR so as to make them widely available to small farmers of the developing world.

The third and perhaps most relevant step is to recognize that appropriate biotechnology is one of the many approaches for agricultural transformation, and should be regarded as a tool that can complement the landscape of alternative agricultural technologies developed by farmers and hundreds of NGOs in Latin America, Asia and Africa. On the one hand, the peasant farmers of traditional agriculture are less vulnerable to catastrophic loss because they grow a wide variety of plants under diversified farming. Many of these plants are landraces grown from seed passed down from generation to generation and selected over the years to produce desired production characteristics. Landraces are genetically more heterogeneous than modern cultivars and can offer a variety of defenses against vulnerability. By contrast, a pest or pathogen has a much less difficult barrier to breach when it encounters a genetically uniform modern cultivar grown under continuous monoculture over wide areas. Consequently, today entire crops are at times attacked and seriously damaged or even destroyed. Crop vulnerability due to genetic homogenization of once diverse agroecosystems is not a problem that once addressed is no longer a concern. The failure and continuous replacement of IRRI's

rice varieties (IR-8, IR-20, IR-26, IR-36, IR-56) illustrate the transient nature of breeding success, be it conventional or biotechnological in nature.

In addition to traditional farming technology and peasant knowledge, what has been almost entirely overlooked by the CGIAR is that throughout the Third World, more than 3,000 native grains, roots, fruits, and other food plants can be found. These have been feeding people for thousands of years but most are being given no attention whatsoever today. Among the 3,000 lost foods are more than 200 native cereals whose seeds are (or have been) eaten. Only a handful of cereals are currently receiving concerted research and development, disregarding the potential of native crop biodiversity. A major goal of the CGIAR should be to demonstrate the potential inherent in these overlooked traditional crops. Actions to increase the support for, and use of, the best of these native crops so as to increase food supplied, improve nutrition, and raise economic conditions should be given higher emphasis than boosting yields of a handful of cereals through biotechnology.

Traditional systems and indigenous knowledge will not yield panaceas for agricultural problems. However, traditional ways of farming refined over many generations by intelligent land users, provide insights into managing soils, water, crops, animals and pests. Research can assess the benefits of aspects of traditional systems: their structure, genetic diversity, species composition, and function as agroecosystems, as well as their social and economic characteristics and potential for wider application. The research process can have additional benefits by fostering collaborative relationships between researchers and indigenous people, and providing the groundwork for successful local development projects. Sustainable systems will have to combine traditional practices and structure with more modern, scientifically derived technologies.

On the other hand, NGOs throughout the LDCs have developed an array of both proven and promising resource-conserving technologies. These draw on a range of experiences from both farms and research and demonstration stations, where the impacts of pests, diseases and weeds have been reduced; the viability of natural predators enhanced; the efficiency of resource use improved; and nutrients, water, and soil conserved. Many of these are examples of farmers aided by NGOs already taking steps to reduce costs and the adverse environmental effect of high input technologies; others by adopting alternatives. Most have tried through farm diversification to take greater advantage of natural processes and beneficial on-farm interactions, thus reducing off-farm input use and improving the efficiency of their operations.

These technologies have various effects. They conserve existing on-farm resources, such as nutrients, biodiversity, water or soil. Or they introduce new elements into the farming system that add more of these resources, such as nitrogen-fixing crops, water harvesting structures or beneficial organisms and so substitute for some or all external resources.

There are many proven and promising resource-conserving technologies developed by NGOs and farmers organizations that can be integrated with CGIAR scientific advances to produce a more sustainable agriculture. In fact every

constraint that biotechnology has the potential to address, so does the agroecological array of technologies. Drought stress can be alleviated by using tolerant native cultivars, water harvesting, improved fallow and mulching systems. Nutrient depletion can be addressed through organic amendments, use of legumes, and enhancement of soil biology. Pest and disease problems can be suppressed through intra-field genetic or species diversity and through organic soil management. And so on. Perhaps a scientific understanding and documentation of the process of how such technologies improve agricultural sustainability is incomplete. However as IARCs scientists work in conjunction with NGO professionals, experience and observation over time will validate the agroecological methods that lead to a more sustainable agriculture. The application of agroecological methods can be accelerated along with the scientific analysis of their effectiveness. It is in this area where the CGIAR should invest at least half of what it pretends to invest in biotechnology.

IARCs in general have a poor record when it comes to participation with farmers and NGOs. If we are to be serious about the development of a sustainable agriculture, it is critical that local knowledge and skills in experimentation are brought to bear on the processes of research. The problem with international agricultural science is that it has poorly understood the nature of indigenous knowledge and farmers' and NGOs' capacity to experiment. When given the opportunity, farmers and NGOs have been innovative at adapting technologies to their own conditions, often having a significant impact on research and extension institutions in the process. Their field projects have been relatively small and isolated activities, and the CGIAR in concert with other organizations and donors (i. e., UNDP, FAO, IFAD) can do much to help scale-up such activities for wider ecoregional impact.

The wider challenge is for CGIAR organizations to become learning organizations, capable of creating partnerships that support efforts for a truly participatory sustainable agricultural development. The doors of the CGIAR will need to open wider to farmers organizations and NGOs, in order to embrace a "blend" of approaches to agricultural production (including appropriate biotechnology), instead of committing to genetic engineering as the only valid approach to solve agricultural problems. If this is not done, the possibility of working together with grassroots organizations devoted to peasant farmers may be shattered in irreversible ways.