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والزراعة  
للأمم المتحدة

联合国  
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Organización  
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para la  
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y la  
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## TWENTY-NINTH FAO REGIONAL CONFERENCE FOR LATIN AMERICA AND THE CARIBBEAN

Caracas, Venezuela, 24 to 28 April 2006

### ROUND TABLE: INSTITUTIONAL CHALLENGES FOR NATIONAL, SUBREGIONAL AND REGIONAL TECHNOLOGICAL INNOVATION

#### I. Agriculture in Latin America and the Caribbean in the regional and global context

1. Agriculture continues to be a fundamental activity of society despite the changes that have occurred in the world, resulting mainly from major advances in technology. The continuing growth of the world population represents a formidable challenge, especially for agriculture which has to feed an ever larger urban population of food consumers but not producers. At the same time, rural poverty continues to hamper economic and social development and has repeatedly been presented as the key challenge for overcoming poverty and identified as a target for regional and global policy, in which agriculture has to play a crucial role. Regrettably, agricultural growth is still insufficient and below the level needed to demonstrate its full potential as a key sector of the economy and society.
2. Latin America has approximately 15 million agricultural holdings and more than 100 000 small and medium agricultural industries processing food and agricultural products, or producing agricultural inputs.
3. Economic liberalization and globalization open an array of opportunities for further development. The Region therefore faces the challenge of transforming its agriculture and conserving its natural resources, which can be achieved by placing technological change and dynamic innovation firmly on the agenda. Unfortunately, the Region's structures and institutions correspond to another agriculture, another period, as conceived to introduce vertically, from the public sector, technology change directed mainly towards production and greater national food self-sufficiency in a limited number of basic items. The future calls for capacity to generate and implement technological change for the multiple objectives of agribusiness, galvanized by economic markets characterized by increasing competition and sophistication, yet also stymied by the imperfections of heavy protectionism in the more developed countries. Primary agriculture accounts for about 8 percent of the Gross Domestic Product (GDP) of Latin America and the Caribbean (LAC). Under the broader sectoral perspective of agribusiness and its upstream and

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downstream links with industry, this contribution amounts to an average of 20-25% of the total value of the economy. In terms of employment, agribusiness is the main employer in the majority of countries of the Region.

4. Aggregate agricultural production figures for the Region show an improvement in the last decade, with an annual growth of agricultural GDP of between 2 and 3%. However, from the perspective of staple food production, LAC is in a position of relative equilibrium between production and population growth, with the risk of population growth and *per capita* food supply turning negative.

5. Important are the existing differences in growth, with 13 countries growing by more than 2%, but 18 countries in stagnation or decline at less than 2%. Some 11% of the LAC population was undernourished (54.8 million people)<sup>1</sup> in the period 1998-2000. LAC could feasibly eliminate malnutrition by 2020 through achievement of the goals of improved productivity, agricultural growth and increased investment in education and health, while keeping population growth under control. This is a major challenge, as productivity has not risen on the scale needed to drive agricultural growth, and more than half the gain achieved has been due to technology from the developed countries.

6. Also to be highlighted is the role of agriculture as producer of bioenergy resources, especially biofuels such as ethanol and biodiesel. Brazil, Argentina and Ecuador have major programmes in this area, while Mexico, Peru and the countries of Central America are also developing programmes.

7. With regard to international trade, globalization has raised the flow of food and agriculture products from the Region to international markets, with a significant change in the type of food in demand. Higher world incomes and urbanization have boosted market transactions of products with high processing and added value, and reduced transactions of commodities.

8. There is a good opportunity for the development of agribusiness that adds value and quality to food and agriculture products. This will require strong innovatory capacity to help development of the rural population through more dynamic economic activity, from the multiplier effects of international market demand and the rapid expansion of supermarkets as the main suppliers of food in the Region, accounting for 50-60% of food and agriculture sales in 2004, compared to 10-20% only one decade earlier.

## **II. Institutional structures for agricultural research and development in the Region**

9. Pressure to increase food production in the Region, where the possibility of expanding cultivated area is becoming increasingly limited, also impacts on higher yields and agricultural productivity and the need for improved systems of innovation, more funds for scientific and technological research and mechanisms to better transfer results and thus motivate innovation among producers.

10. Regional institutional structures for agricultural research and development (R&D) are shaped by the disparity and complex reality of the countries of the Region. There is therefore a wide diversity and multiplicity of institution and organization and relations between them, with significant differences in activity, capacity, financial and human resources and achievements.

11. The institutional building blocks for agricultural research in the Region are the National Agricultural Research Institutes (NARIs) which have a similar origin and history. These were mainly created in the 1960s, essentially to conduct adaptive research on using the advances made

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<sup>1</sup> Inter-American Institute for Cooperation on Agriculture - IICA (2004), Situación y perspectivas de la vida rural en las Américas, pp. 10, 14.

in the developed countries or in the international research centres of the Consultative Group on International Agricultural Research (CGIAR). All the NARIs of the Region have been public bodies and worked on the research of public goods. Some received financial and technical support from the Rockefeller Foundation in their earlier period; such support was significant in developing Chile's seed industry, which has been consolidating over the years to the point where the country is now the leading producer of seeds in the southern hemisphere and sixth in the world.

12. In the mid-1980s, the NARIs acquired varying degrees of autonomy, depending on the agricultural policies implemented in the countries of the Region, where the main operating model was import substitution and thus research on staple foods, often producing significant increases in productivity through technological change (seeds, fertilizer, irrigation technology, new cropping practices, pesticides).

13. The accelerated transformation of the production structure in most countries towards products that are tradable on international markets has not been matched by a refocusing of agricultural research on products of greater importance such as foods and vegetables, which is still in its early small-scale stages in some countries of the Region.

14. Dividing the Region into four subregions gives us a degree of local uniformity, albeit still with significant differences between more and less developed countries: the southern cone of South America and Brazil; the Andean subregion; Mesoamerica which includes Central America and Mexico; and the Caribbean subregion.

15. Virtually all the countries of these subregions have NARIs that have been in operation for a number of years and that all depend to a varying extent on contributions from the State for their existence and operation. Budgets vary according to the importance that the government authorities attach to agriculture and to strengthening research and development. There are countries that only carry out adaptive research, while others also engage in highly innovative scientific and technological research projects (e.g. EMBRAPA<sup>2</sup> in Brazil, INIFAP<sup>3</sup> in Mexico, INIA in Chile and INTA<sup>4</sup> in Argentina).

16. In recent years, agricultural research and development institutions have been bolstered by the creation of the Global Forum on Agricultural Research (GFAR), whose executive secretariat is located at FAO Headquarters in Rome and which has promoted analysis of agricultural R&D policy in the world through regional and subregional forums for Asia, Africa, Europe and America. The Forum of the Americas for Agricultural Research and Technological Development (FORAGRO), a body set up collectively by the NARIs with the participation of the private sector and regional NGOs and coordinated by a technical secretariat, has drawn the attention of many national sectoral authorities and policymakers to the importance of strengthening research, development and innovation programmes in Latin America and the Caribbean.

17. FORAGRO has also served as a platform to identify the steps needed to promote knowledge-based agriculture, which is the current reality facing countries as they introduce new thematic areas into their agricultural activity: biotechnology, agroecology, information technology, intellectual property and food safety.

18. National interest in seeking mechanisms of integration and coordination has encouraged the participation of manifold institutions with differing interests and mandates, and with very different structures and capacities. The search for coordination to improve effectiveness and share experiences was directed towards an institutional framework that could accommodate functional specialization and geographical distinction. This led to the Cooperative Programmes of Technology Research and Transfer (PROCISs) which have been in operation for several years and which have successfully advanced major programmes agreed by their constituent countries.

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<sup>2</sup> Brazilian Corporation for Agricultural Research (EMBRAPA)

<sup>3</sup> National Institute of Forestry, Crop and Livestock Research (INIFAP)

<sup>4</sup> National Institute of Agricultural Technology (INTA)

19. The PROCISs represent the most advanced model of cooperation in agricultural research and constitute an international projection of the NARIs, encouraging these to exchange experiences and jointly examine common issues and possible solutions.
20. The Regional Fund of Agricultural Research and Technological Development (FONTAGRO) is another regional institution that serves to fund common projects for the Region, through the competitive allocation of funding.
21. The development and operation of the chapters of the Technological Cooperation Network on Plant Biotechnology for Latin America and the Caribbean (REDBIO) in most countries has been useful in furthering understanding of the opportunities of biotechnology to LAC and should become increasingly important as progress is made in this area.
22. Noteworthy in the field of education for agricultural development is the support given by the Rockefeller and Ford Foundations to different initiatives, especially for the postgraduate education of public and university professionals. The Ford Foundation, for example, has strongly supported education in agricultural economics and other specialist fields in Argentina and the training of experts in fruit cultivation and other disciplines in Chile, through postgraduate courses mainly at universities in the United States.
23. To conclude this section, the Latin America and Caribbean region has a varied institutional structure for research and development programmes that needs to adjust to the new challenges of knowledge-based agriculture and to compete on the global markets. The institutions also need to satisfy growing domestic demand in most countries and must therefore strengthen their technology innovation mechanisms to achieve the competitiveness demanded by the new conditions.

### **III. Technology transfer to the production sector**

24. Because the NARIs focused primarily on research in their early years, mechanisms for the transfer of technology tended to be neglected and were handled by the agricultural extension services, which have disappeared from virtually all the countries. The actual transfer of research results to the production sector was therefore extremely deficient, with NARI terms of reference normally failing to specify any transfer of technology to producers, who were consequently left to their own devices, especially the smaller producers.
25. This has had a two-pronged impact: as producers have not received the benefits of research, they have not applied pressure for increased funding of research, which has further widened the technology divide and prevented the attainment of competitiveness to deal with globalization. Important initiatives in the advanced countries have left most LAC countries behind; for example, biotechnology has only recently been included in research programmes, largely thanks to REDBIO.
26. Technology has little real value unless actually deployed by innovators to create wealth or improve quality of life. The way technological advance is perceived and applied depends not so much on the budget as on the aptitude of individuals for change, especially individuals involved in the production processes. This is particularly true of agriculture, a sector with deep-seated traditions.
27. The private sector has sometimes been a strong mover of technology transfer, in some cases in close collaboration with the NARIs, as exemplified by the activities of the Regional Consortia for Experimental Agriculture (CREA) in Uruguay and Argentina, the Mexican Foundation for Development and more recently Mexico's Produce Foundations.
28. Chile's Technology Transfer Groups, which were set up in 1982 by the INIA, began a process of gradually involving producers in the adoption of new technologies. These were initially funded by the INIA, before being managed and financed by the member producers themselves,

and coordinated through the private-sector National Agricultural Society. Various private specialist commodity bodies have been very active in modernizing agriculture in Colombia, including the National Sugar Cane Centre of Colombia (CENICAÑA), the National Coffee Research Centre (CENICAFE) and the National Centre for Oil Palm Research (CENIPALMA), whose contributions have had a greater impact than those of the public bodies. A similar situation has occurred in other countries of the Region.

#### **IV. Conceptualization of innovation**

29. The concept of innovation is closely linked to two other concepts of major relevance to economic and social activity in recent decades: management and entrepreneurship. Innovation must involve the producers, who take the decisions and assume the risks, if it is to exist, but the true concept of entrepreneurship has often been undermined by equating it more with a social group than with the functions it fulfils, which include decision-making, risk-taking and assuming the consequences. Peasant farmers and small producers stand out as entrepreneurs, given their ability to take decisions that have enabled them to survive for years, despite difficulties in accessing major economic and financial resources.

30. Innovation is the introduction of new ideas that change or modify an existing situation; a creative process that adapts products, services, processes and structures to the opportunities opened up by domestic and external market demands and requirements. New ideas are realized when they enter the production stage and, being intrinsically risky, require commensurate returns. There are various types of innovation – technological, scientific and social – all of which have had a major impact on the evolution of society and countries.

31. One of the most recent innovations, which did not originate from technology, was the use of containers to transport goods to international markets. This innovation arose from concern to streamline the management of ports, optimizing their use and reducing costs by shortening ship loading and unloading times.

32. A fundamental element of dynamic innovation is entrepreneurial ability. Innovation occurs when economically attractive and convenient to the person willing to take the risk of attempting something new. Innovation always adds value and is thus essential for agriculture seeking to enhance competitiveness and profitability and to generate employment and wealth for the rural population.

#### **V. Inadequacies of the current institutional structure**

33. For many years, the emphasis in LAC agricultural research promoted by governments and NARIs was on primary products, such as subsistence crops, and selected export crops, such as sugar and coffee, which generally received the support of producer organizations. Priority was placed on crops that enabled countries to avoid imports to achieve food security, and the output from research was usually handled by agricultural extension systems. The disappearance of these systems left a vacuum in the transfer of technology from public research, reducing agricultural growth in many countries.

34. Another failing of the transfer process was the limited participation of the private sector, which had played a key role in the developed countries. This was partly due to the strong focus on public research and the concentration of research management and dissemination in government institutions, with little involvement of the private sector. In the developed countries, on the other hand, the private sector was a principal key conveyor of knowledge and research outputs to entrepreneurs and producers.

35. The present system has produced considerable disparity between countries. Analysis of the possible local impact and the effect of new technologies in the countries of the Region shows that the economic benefits of greater productivity generated by public research and development on eight crops<sup>5</sup> of regional importance will be unequally distributed. The Southern Cone countries will benefit most for six of the eight commodities. Mesoamerica will capture the benefits of greater sorghum yields, while the Andean countries will benefit most from higher potato yields. This necessarily entails compensations and economies of scale, so some research activities are best left to national bodies while others should be given over to collective action by countries, which requires stronger horizontal technical cooperation and coordination of public and private activities for dissemination of the new technologies.

36. Fluctuating policy in NARI funding and the general allocation of resources to research and development has restricted the scope of public research, which has concentrated on selected adaptive research, mainly on the validation of varieties from the developed countries.

37. LAC universities have considerable potential for developing as-yet largely unexplored R&D programmes, especially regarding ties with the production sector and agribusiness in general. An effort was made in the late 1960s and early 1970s to provide postgraduate training to upgrade teaching in the agricultural faculties of certain countries, but this waned in and after the 1970s. The situation has now begun to change in some countries.

38. The absence or weakness of intellectual property protection is another institutional limitation that has undermined research and, especially, innovation. Until recently, there was no specific legislation for the seed industry in LAC, and although such legislation now exists in most countries, the laws have loopholes that virtually nullify the protection provided. Also lacking is the rigorous enforcement of existing legislation.

## **VI. Urgent need for decentralization**

39. One of the characteristics of research and development has been its strong centralization in NARIs or similar public bodies. For many years, there were no links with other actors, such as universities or private agribusinesses.

40. Mechanisms are now being sought to involve universities, the private sector, producer associations and NGOs in building and consolidating networks to strengthen agricultural R&D initiatives at national, subregional and regional level.

41. This will mean promoting broader dialogue in identifying priorities and defining lines of action and funding mechanisms. PROCIS, FORAGRO, FONTAGRO, REDBIO and other initiatives mentioned above have already made progress in these areas. Because of its variety of institutions and its abundance of natural resources, Latin America and the Caribbean is conducive to the development of national and international strategic alliances between the public, private and academic sectors.

42. Most countries of the LAC subregions have NARIs that have been operating for various years, all depending to a greater or lesser extent on State contributions for their existence and function. The budgets vary according to the importance that the government authorities attach to agriculture and to the need to strengthen research and development. Implementation of more effective decentralization and coordination through the subregions would help strengthen existing research and development networks and would provide an enabling institutional framework for innovation, thus bolstering forestry and agriculture production and productivity in the Region.

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<sup>5</sup> The eight crops of regional importance are: cassava, dry beans, maize, potato, rice, sorghum, soybean and wheat. Hertford, Pardey and Word, in *Documentos de la mesa redonda sobre competitividad rural*, March, 2004. Special Report N°6 of FONTAGRO, December 2004.

## VII. Roles of the public and private sectors in innovation

43. It is a fallacy to believe that the interest of the private sector will replace the public support required in R&D activities. The roles of the public and private sectors are often complementary and countries with strong private sector research also have vigorous science and technology public sectors and incentive policies for the private sector, as in the developed countries. Intellectual property regimes that fuel private motivation to innovate and regulate decisions affecting trade and local use of agricultural technology have a strong impact on the direction of R&D policy, on the scale of public financing and on the willingness of the private sector to assume the risks inherent in innovation.

44. Meaningful economic incentives will encourage the private sector to participate actively in research and innovation programmes, achieving useful results in the short and medium term. This is evidenced by diversification of exports from several countries of the Region. Chile's rising exports of fresh fruits, wine, seeds and processed agroindustrial products are an example of what the private sector can accomplish, taking the country towards its objective of becoming a major agricultural player in the next years. Some companies have set up their own R&D departments with this in mind and are working with recognized national or international experts in their respective fields. The systematic process of innovation that has been developed by producers has led to the introduction of new fruit species for the export market and to constant updating to always have the best varieties of the major species in demand on international markets. The same is happening in the cereal, oil crop and vegetable seed market.

45. In recognition of the importance of collective action, many organizations associated with agribusiness are becoming increasingly involved in the promotion and support of Chile's research initiatives, through universities and public and private institutions.

46. All national and international bodies active in social and economic development are aware of the importance of forging closer ties with the private sector to achieve set objectives. However, there have been few initiatives of mechanisms to achieve broader benefits.

47. The integration of private organizations with academic institutions and national and international public sector agencies in the Region and the respective subregions will give added impetus to research and especially to innovation, which is what is currently needed to improve productivity and bring about more efficient agriculture.

48. The importance of the private sector was recognized – among other occasions – at the Global Forum on Agricultural Research (GFAR Dakar, 2003): "...successful agricultural development in most countries has been spearheaded by the private sector, and a stronger indigenous private sector is vital to development, especially with the liberalizing of most developing countries' economies and increasing globalization".

## VIII. Proposals for real integration

49. Given the importance and urgency of improving production and income-generating capacity in LAC agriculture, the institutional mechanisms that make this possible need to be prioritized, thus giving the Region a dynamic for sectoral innovation that can help reduce the broad disparity that exists between countries. The following proposals are made to this end:

- a. A change in mentality needs to be fostered towards building a culture of innovation supported by national, subregional and regional R&D policies.
- b. Ways need to be found to increase broad-based farmer participation in defining research priorities, with recognition that there will be actions for short-term solutions and other initiatives requiring long-term actions.

- c. Research, development and innovation activities should take place in national scenarios relevant to the context and reality of each country, and in international scenarios with elements common to several countries of the Region.
- d. Globalization is generating many opportunities for countries, which need to adjust their institutional structures and harmonize selected policies so that these can be implemented in similar fashion according to respective possibilities.
- e. The dynamic of scientific and technological advance in the developed countries offers multiple options for the LAC countries to harness some of the advance and narrow the technology gap in the shortest possible time.
- f. The scientific and technological evolution that has been observed in certain countries of the Region in recent decades, in particular the growing supply of qualified human resources, presents an opportunity for South-South cooperation that is still not sufficiently tapped by the Governments.
- g. Countries will advance towards growth and development to the extent that all their actors work together to achieve the common good. While the private sector is recognized as the driving force of the economy and development, it is also essential to recognize that the public sector provides the institutional framework in which the activities of society unfold within countries and at the international level.

50. The above considerations suggest a number of proposals for action, using FAO's experience and its presence with offices in all the countries of the Region, to introduce the changes that are needed to facilitate the process of innovation in forestry and agriculture. The proposals consider the existence of two sectors responsible for technological innovation: a) the national systems of innovation that exist at country level; and b) the subregional, regional and international organizations promoting technologies, services and products that exist in the Region. Some of these suggestions are as follows:

- At national level and through the FAO Representations, studies need to be coordinated to appraise the state of national research systems in each country, evaluating their real possibilities of increasing sectoral productivity.
- The level of integration and potential for complementarity that exist among supranational agencies of innovation located in the Region needs to be evaluated, including international agricultural research centres, PROCIS, CATIE<sup>6</sup> and others, as well as regional and international organizations (FAO, IICA, FORAGRO, FONTAGRO) equipped to promote, in an integrated manner, the exchange of successful experiences between countries and subregions, and to introduce new concepts and technologies available outside the Region.
- There should be national and international efforts to help develop mechanisms that will bring the public, private and NGO sectors closer together in jointly analysing how better to contribute to the economic and social development of agriculture and the rural sector. This means having national institutional structures configuring as a genuine national system of innovation.
- The use made of Good Innovation Practices should be analysed at regional and subregional level, evaluating the possibility of harmonizing such practices among countries of the Region to exploit the opportunities of the global markets.
- Assistance is needed to strengthen the information technology systems that facilitate the dissemination of research results and the institutional mechanisms of promotion and development that support innovation. This can be done by working together rural schools and producer organizations.

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<sup>6</sup> Tropical Agriculture Research and Higher Education Centre (CATIE).

- National and regional initiatives to strengthen the legal and institutional framework for the protection of intellectual property need to be supported as a requisite for the strengthening of innovation.
- A regional forum should be convened to examine options to facilitate and accelerate innovation in LAC forestry and agriculture in order to increase productivity.