Executive Committee

Thirty-first Regular Meeting of the Executive Committee
12 -13 July 2011

IICA/CE/Doc.574(11)
Original: Spanish
12–14 July 2011

INNOVATION TO ACHIEVE COMPETITIVE, SUSTAINABLE AND INCLUSIVE AGRICULTURE

San Jose, Costa Rica
July 2011

CONTENIDO

INNOVATION TO ACHIEVE COMPETITIVE, SUSTAINABLE AND INCLUSIVE AGRICULTURE

INTRODUCTION

The IICA 2010-2020 Strategic Plan calls for the "launching of innovation processes aimed at making agriculture more competitive and sustainable, as well as the extension of the benefits to a larger number of people," which will require a framework of well-articulated policies, and their application via policy tools designed to encourage innovation, provide support for production, attract investment, reduce uncertainty and develop new business models in agriculture. As a result, in its 2010-2014 Medium-term Plan, IICA makes direct reference to the challenge of innovation in its mission statement, and commits itself to supporting the efforts of the Member States aimed at increasing and expanding innovation in agriculture, with a view to improving productivity, competitiveness and trade and, thereby, contributing to the food security and development of rural society in the member countries.

Mission
IICA is the institution of the Inter-American System that provides technical cooperation, innovation and specialized knowledge to contribute to the competitive and sustainable development of agriculture in the Americas and to improve the lives of rural dwellers in the member countries.
Source: 2010-2014 MTP

The objective of the present document is to explain the importance and role of innovation in agriculture in the hemisphere, the reason why the Institute received a mandate to become involved in this topic, and how IICA should participate in efforts to promote innovation in the agricultural sectors and rural territories of the Member States.

SECTION I: INNOVATION IN AGRICULTURE: CONCEPTS AND ROLE

INNOVATION means to change, explore, generate value, re-invent. Worldwide, the transformation of agriculture is increasingly tangible. As a result of the "hard" and "soft" technological revolutions, the ways in which agriculture is "done," the modernization of the sector is promoted and agricultural performance is measured are changing.

We are living in the Era of Innovation. In broad terms, innovation refers to changing, exploring, inventing, re-inventing, creating, taking risks and creating opportunities. Innovation is a process of transformation that creates new possibilities for a country, production sector or business. Innovation is the force that promotes the continual growth of countries, and one of the fundamental strategies used by businesses, societies and regions to gain a competitive advantage.

From a business perspective, there are many potential areas for innovation (products, processes, business strategies and organizational design) most of which come from technological developments and markets.

The new tastes and demands of consumers, the segmentation of the demands of different groups in society, and the emergence worldwide of new sectors with greater purchasing power constantly drive innovation. Also driving innovation are new ways of doing things made possible by technological advances resulting from revolutions that have taken place in the information and communication technologies, biotechnology and nanotechnology, all of which have benefited from and been fostered by globalization. An increasingly important aspect of technologies as a source of agrifood innovation is the increasing and multiple points of convergence among the "info," "bio" and "nano" technologies, geomatics and other emerging sciences.

There is innovation, defined as the transformation of creative ideas into applications that generate value, when:

- There is social appropriation
- The knowledge reaches the market
- The new developments or changes translate into: thoughts or concepts; products or services; processes; organizations; and techniques for or ways of doing something differently.

For the purpose of bringing about positive changes that will help to meet the needs or achieve the goals of groups of people.

The full potential of innovation in agriculture aimed at transformation is best realized via the national agrifood innovation systems. It is also possible to speak of regional and hemispheric innovation systems, which are concerned with globalization and technological innovation. Simply put, such innovation systems can be defined as the set of players, interactions and policies

involved in the creation and dissemination of technologies and innovations intended to improve the productivity, competitiveness, sustainability and equity of agribusinesses and agrifood chains. This definition takes into account one of the most characteristic features of innovation, its interactive nature.

One important element of innovation in agriculture is technical-scientific research. Key players in the national agrifood innovation systems are those that conduct research, including NARIs, universities, research centers and businesses. The development of the national agrifood innovation systems is the framework in which the repositioning of agricultural research, the modernization of the NARIs and the convergence and interaction of the different stakeholders should take place.

It is important to recall that in the 1960s, 1970s and 1980s, the public sector of the countries made significant investments in infrastructure, the NARIs, to generate knowledge. Two good examples are EMBRAPA and INTA in Argentina. Parallel to this, the private sector was developing its own infrastructure to generate knowledge, especially the large agribusinesses, and making important innovations aimed at modernization, through practices such as protected, organic and hydroponic agriculture and combinations of the three, drip irrigation, direct seeding, precision agriculture, etc.

-Brazil's agricultural miracle
Brazil's progress has been underpinned by the state agricultural-research company and pushed forward by GM crops. Brazil represents a clear alternative to the growing belief that, in farming, small and organic are beautiful. Norman Borlaug, an American plant scientist often called the father of the Green Revolution, told the *New York Times* that, referring to the *cerrado* (Brazil's savannah): "nobody thought these soils were ever going to be productive." They seemed too acidic and too poor in nutrients. Embrapa changed that and today the *cerrado* accounts for 70% of Brazil's farm output.
Source: The Economist, Aug. 26, 2010

Nonetheless, since the late 1980s, public agricultural research has steadily declined, budgets have been reduced and the public sector is providing fewer and fewer extension services. At the same time, private enterprise has taken the lead in the field of research, creating innovations, patenting them and marketing them successfully (for example in the seed industry, biotechnology, agricultural machinery and pest and disease control). Unfortunately, such advances, which could benefit agriculture, are concentrated in only a few countries and in the most economically-profitable crops.

Innovation can take place in the public and private sectors. However, given the element of risk inherent to innovation, as well as the need to protect the intellectual property of those who generate products and processes, public policy has a crucial role to play in triggering and/or strengthening innovation processes. Evidence from around the world shows that innovation markets suffer from serious weaknesses, or market failures. In broad terms, public policy has three overarching roles to play: a) to diminish or eliminate the barriers to entry (for example,

those represented by high risks; b) to establish regulatory frameworks intended to protect intellectual property rights; and, c) to promote, together with the private sector, the development of a culture of innovation and entrepreneurship.

SECTION II: CHALLENGES FOR AGRICULTURE IN LATIN AMERICA AND THE CARIBBEAN

Agriculture is facing a number of challenges that are affecting its performance not only in the short, but also in the medium and long terms, which will have to be met to varying degrees by incorporating more knowledge and innovation into production.

In the short term, one of the most serious challenges facing agriculture is the volatility that has characterized agricultural markets in recent months. The inability to predict market movements has made it difficult for the economic agents of agriculture to make decisions, and has introduced risks into agriculture and trade that businesses view as an additional cost, which has discouraged investment in agriculture. The volatility in agricultural markets is due in large measure to climatic instability, which, coupled with the concentration of agricultural production and trade in few countries, means that floods, droughts, frosts or any other extreme climatic events that occur in Australia, Russia, the United States, Europe or the Southern Cone have a serious impact on international agricultural markets.

To address the volatility of agricultural markets, innovations are needed that make it possible to cover more risks, more information and transparency in the operation of the markets and new instruments for forecasting weather and making financial predictions. In today's society, where many risks are global in scope, innovation in the management of any kind of risk is a very important challenge.

In the medium and long terms (2050), the principal challenges of agriculture will be related to the capacity of the food supply to cope with a roughly 70% increase in demand. Population and economic growth in developing countries[1] will translate into an increase of approximately 70% in global demand for crops, not only for human consumption, but also for use as animal feed. However, the food supply's capacity to cope with such an increase is limited, due mostly to the fact that agricultural yields are increasing more slowly,[2] that little new arable land is available for food production and that there is growing competition for the use of land (for biofuels,[3] other non-food uses, and urban and industrial uses).

Another issue, with short- and long-term implications, is climate change. The changes in climate that are becoming evident will likely affect the lives of rural populations and agricultural activities. Climate change is affecting, and will affect even more in the future, the development of food production and food security in large areas of the Americas. Inasmuch as some agricultural activities emit greenhouse gases and others are adversely affected by the accumulation of those

---

1 By 2050, the GDP of the developing countries will be 15 times greater, and their populations will have grown by 50%.

2 For example, the increase in the rate of growth of corn yields fell from 3% in 1970-1980 to almost half that figure (1.6%) between 2000 and 2009. The figures for wheat were 3.3% (1980-1990) and 0.6% (2000-2009); and for rice, the world's most important food crop, 2.5% (1980-1990) and 0.8% (2000-2009).

3 The production of ethanol from agricultural raw materials used as food grew by 167% between 2007 and 2010, and biodiesel by 200%.

gases in the atmosphere, efforts are needed both to mitigate and to adapt to climate change. In this regard, the agricultural sectors within the hemisphere have taken the first steps towards addressing this issue, but in the years ahead, they will have to move more quickly in making decisions and taking pertinent actions commensurate with the importance of the challenge in question. This issue is explored further later in this document.

Another challenge with implications for the short and medium terms is that of eliminating exclusion and widespread poverty in the rural areas of the region. This poverty deepens when the food security of the population is affected by price hikes and volatile prices, or because the fragility of small-scale agriculture makes it extremely difficult for farmers to integrate into the most dynamic markets and technological and innovation processes. Therefore, innovation is called upon to play a key role in efforts to involve small-scale agriculture in processes that will add more value to their products and thereby reduce poverty in rural territories.

Lastly, it is important to mention the challenge of incorporating the region into the production of food with greater value added, in the broadest sense of the term. Some countries of the Americas have made important progress in transforming their agricultural sectors, using state-of-the-art technologies and processes in agricultural production. Nonetheless, in general, the region's food industries are clearly lagging behind as far as the production of more sophisticated foods are concerned. Functional foods are a case in point. If the ability to compete increasingly depends on the development of agrifood chains, it is very important that the countries begin to implement initiatives and policies that adopt this approach. The world is witnessing a New Food Revolution, and the region must begin to incorporate more soft and hard technologies if it wishes to participate fully in it.

In meeting these challenges, there are more requirements and restrictions today than in the past; environmental, social and trade-related restrictions. It is necessary to make production more efficient, produce more on the same amount of land, keep environmental damage to a minimum and use water more efficiently and in a socially-responsible manner.

SECTION III: THE POTENTIAL OF INNOVATION TO CONTRIBUTE TO THE ATTAINMENT OF SUSTAINABLE, COMPETITIVE AND INCLUSIVE AGRICULTURE

Innovation processes offer a range of opportunities and options for changing the way in which agriculture is practiced, especially from an environmental perspective and in terms of social inclusion. It is essential that more intelligence and knowledge be incorporated into the production and processing of agricultural products, production processes, commercial strategies and organizational designs. Innovation and knowledge management have a key role to play in these tasks.

Despite the high rates of growth achieved in recent years, the agricultural economies of the countries of the Americas are growing more slowly than the region's economies as a whole. Disparities in the productivity of the land are increasing within countries and between countries in the hemisphere. In the case of various crops, and in a number of countries, the productivity of the land is declining; in the case of other countries, such as those in the Caribbean, productivity is falling.

It is important to bear in mind that, in terms of the environment and equity, innovations are not neutral. Innovations can bring about environmentally-sustainable growth in production or the deterioration and degradation of natural resources. Similarly, innovations can lead to the integration of large groups of producers, or cause them to lag behind or be excluded altogether. We are referring, then, to proposals that offer solutions, innovations that integrate producers and promote the sustainable and responsible use of natural resources and social inclusion. A very good example of the latter are concepts such as good agricultural practices, good energy use practices, animal well-being and social responsibility among businesses.

By incorporating innovations, it is possible to produce more and better food as well as non-food agricultural products, using the same amount of productive resources and resources of the same quality (productivity). By developing more environmentally-friendly technologies and good cultural practices, we can achieve a more sustainable form of agriculture (sustainability). Innovations that can be transferred more efficiently and more quickly to the different stakeholders in production chains can help narrow the technological gaps between different groups of producers and ensure that the well-being generated by those innovations benefits increasingly larger groups of agricultural producers, including small and medium-scale farmers (inclusion). All these aspects make it possible to improve the quality of agricultural products and meet the standards required to gain a foothold or expand their presence in different national and international markets (competitiveness).

In the knowledge era, it is very difficult to imagine how some of the main challenges of agriculture can be addressed without innovation. Climate change, and the mitigation and adaptation actions required to tackle it, are a case in point. There are many areas of adaptation to climate change for which new technologies and cultural practices are required, and innovation has a key role to play. These areas include more efficient irrigation and the reduction of the water footprint, the creation of new crop varieties, genetic improvement of forest species, the

management of soils and planting seasons, and the control of animal and plant pests and diseases. The same is true of mitigation, through innovation in the measurement and reduction of the carbon footprint and the development, transfer and adoption of the good agricultural, livestock and energy use practices required.

Another area in which innovation can make a major contribution is food security and the need to produce more and better food for the earth's current population of seven billion, with the figure expected to reach nine billion by the year 2050.

A **New Agricultural Revolution** is needed, one very different in terms of its challenges and technological and organizational paradigm from the Green Revolution of the 1960s and 1970s. The key technological challenge of the new agriculture is to produce more and better foodstuffs and non-food agricultural products through productive processes that generate fewer greenhouse gases, make more efficient use of water, utilize basically the same surface area and can cope with the new biotic and abiotic stresses caused by climate change, while at the same time allowing society to monitor the technologies used more closely. All these restrictions and requirements were practically non-existent at the time of the Green Revolution. Innovations unquestionably have a key role to play in each of these areas.

The challenge is how are we to trigger and/or strengthen intensive and permanent innovation processes, trigger virtuous circles of innovation? One important issue that must be borne in mind is the diversity of the stakeholders involved in agriculture in the hemisphere, and the need to promote innovation among them all. Of course, the level of sophistication and the scale of the innovations required vary greatly depending on the type of agriculture involved (small, medium or large-scale). The needs of agroindustrial operators are also different. In the case of small and medium-scale agriculture, it is often a case of adapting proven technologies and affording access to them; incorporating new ways of running agribusinesses, such as contract agriculture; or improving farm management.

The world in general, including our hemisphere, has seen different generations of pro-innovation policies come and go. Various stakeholders are currently advocating and promoting third-generation policies and this raises a series of issues. First of all, the policy must be the right one, and the public and private resources required to implement it must be available. Secondly, the economic and business environment must permit investors to express their entrepreneurial spirit and provide a basis for the development of a culture of innovation and enterprise. Thirdly, suitable mechanisms must be created to take advantage of the technological advances and innovations that become available around the world, such as the establishment of partnerships, the implementation of technology surveillance mechanisms and the development and/or strengthening of regional integration mechanisms like the PROCIs. Fourthly, national agrifood innovation systems must be developed, with clear governance and sufficiently linked to national innovation systems.

If the development of biotechnology, ICTs, nanotechnology, bioeconomics in general and other emerging sciences has broader and unanticipated applications in the innovative development of agriculture, and continues to do so in the decades to come, the existence of points of convergence among them will merely multiply those applications and capabilities. A case in point is what is currently occurring with bioinformatics and the incipient uses of nanotechnology in precision

agriculture. Another is the fact that in 2010, more than 87% of the world's transgenic crops (grown on 148 million hectares) were produced in the Americas and 90% of the farmers involved (14.4 million) were small-scale producers.[4] What we are witnessing is only the beginning of this trend, so further points of technological convergence are to be expected.

One short-term action to promote innovation in agriculture that the countries should take, without delay, is to increase investment in research and development significantly. Strengthening the NARIs, renewing and/or updating the expertise of key scientific staff, and modernizing the laboratory infrastructure are essential to raising the productivity and enhancing the competitiveness of agrifood chains. Technological innovations call for major investments of capital, as well as investment in human talent. To meet this challenge, the ministries of agriculture should promote public and private sector partnerships for specific tasks that produce financial returns and strengthen innovation processes.

[4] Clive, James, 2010, quoted in ISSSA, 2011.

SECTION IV: ELEMENTS THAT NEED TO BE STRENGTHENED TO INCREASE IICA'S SUPPORT FOR INNOVATION IN AGRICULTURE

IICA has been providing technical cooperation in the areas of technology and innovation for agriculture for 68 years, and has actively supported the structuring of the Hemispheric System for Technology and Innovation. IICA has promoted the development of collaborative technology integration programs such as the PROCIs, operates the Technical Secretariat of FORAGRO and is an active partner in FONTAGRO, the agricultural technology fund. It has also supported the development of the NARIs and national agrifood innovation systems.

Given the tremendous opportunities opening up for the region's agriculture and agrifood industry, and the enormous challenges they face, IICA believes that the way in which we support agriculture in the Americas and the Hemispheric System for Technology and Innovation needs to be strengthened and updated. For this reason, in recent months the Institute has been placing renewed emphasis on its work in the areas of technology development, innovation and the development of markets, focusing on support for small and medium-scale producers and broadening its actions to include the promotion of initiatives aimed at incorporating innovations into the different links of agrifood chains.

Working with the countries, IICA aims to boost the role of innovation in agriculture by helping the countries to devise their strategies and policies; modernize the institutional framework; develop national capabilities; manage and disseminate knowledge; and support the formulation and implementation of investment projects designed to promote innovation. It is also endeavoring to support the countries in their efforts to mobilize the external resources needed to help make such innovation possible, especially in the area of institutional modernization.

To fulfill its commitment to innovation, within the framework of its 2010-2020 Strategic Plan and 2010-2014 Medium-term Plan, IICA is placing emphasis on work in the following overarching fields:

In the field of institutional innovation: the enormous changes taking place in agriculture call for comparable changes in national institutions, meaning rules, standards and regulations. Innovation in institutions is, therefore, an important area of agrifood development. In this regard, IICA, which is also engaged in a process of internal changes and modernization, is promoting regulations that provide adequate protection for technologies, products, processes and plant genetic resources through the management of intellectual property; fostering the harmonization of standards in the area of biosafety and organic production; and facilitating effective interaction and the development of common agendas among the different stakeholders in national agrifood innovation systems (research centers, universities and private enterprise, among others).

In the field of innovation in organizations and businesses: the different stakeholders in national agrifood innovation systems are endeavoring to adapt to the current environment, which is characterized by greater uncertainty and more opportunities and challenges. In this context, IICA is supporting the development of networks and partnerships that will give stakeholders access to cutting-edge knowledge and good practices related to many different areas; facilitating the

development of knowledge management through various mechanisms; and supporting the development of new types of associative arrangements for producers and the different stakeholders in agrifood chains. It is also promoting different ways of fostering enterprises, a key aspect in the development of sustainable innovation processes.

In the field of technological innovation: technological advances and research are a very important source of innovation processes in agrifood chains. IICA is working with countries that request assistance to promote the safe development of biotechnology, helping the ministries of agriculture with the development of standards for the biosafety protocols, and with the new uses of agricultural biotechnology products; supporting the development and application of technologies and good practices to mitigate and adapt agriculture in the hemisphere to climate change; fostering the diversification of production to help achieve food security; promoting the revamping of extension systems; supporting the development of national agrifood innovation systems and the modernization of the NARIs; and helping to strengthen and renew FORAGRO, FONTAGRO and the PROCIs.

Across these three overarching fields, IICA aims to develop mechanisms that promote actions aimed at improving the use of information and communication technologies (ICTs), for example, in extension for agriculture (e-extension), the modernization of the public institutional framework; the development of intelligent agricultural markets; the management of networks; the management of intellectual property; the development of observatories of good practices resulting from innovations; and the improvement of the different areas of agribusiness management.

Increasingly, the constant development of innovation processes will be underpinned by the various ongoing technological revolutions and, especially, the points of convergence among them. Prospective analyses are essential, so that the region is better equipped to take advantage of these new opportunities for innovation. IICA intends to step up its work in this area in the years ahead.

FINAL CONSIDERATIONS

a) The world is preparing for a New Agricultural Revolution, a revolution that will be technological and organizational in nature. This new revolution is based on a new technological paradigm and the new needs of markets and agrifood chains. The revolution is already changing our traditional concept of agriculture and the way in which it is practiced, and generating new products, services and wealth.

b) In this era of productivity and competitiveness, innovation is at the heart of the tasks carried out by all productive sectors. The region's agricultural and food potential will only be fully realized when the different sector stakeholders take advantage of the revolutions in ICTs, biotechnology, nanotechnology and other emerging technologies.

c) The challenges involved in mitigating and adapting to climate change, and in achieving food security, call for new and/or strengthened broad, intensive innovation processes. In this context, the countries need to promote the development of a culture of innovation and enterprise, and a move away from national agricultural research systems towards national agrifood innovation systems. In doing so, all the stakeholders in the systems need to be strengthened, and especially the NARIs.

d) In a risk society, the management of different kinds of risk becomes a key aspect of innovation. In the 21st century, insurance and coverage are an increasingly important feature of agriculture.

e) IICA has gathered knowledge (successful and unsuccessful experiences in the field of technology innovation and transfer), strengthening its position to promote innovation in agriculture and in rural territories. Its actions are geared towards supporting efforts to trigger and/or strengthen self-sustaining innovation processes. IICA can also help identify opportunities for competing fairly in agricultural markets, to enable the countries to focus their actions and better define the technologies that should be developed.

f) The regional technological integration mechanisms that IICA has promoted also have an important role to play in promoting innovation and supporting its implementation by the ministries of agriculture.

g) The governments need to invest more financial resources in the research institutes, in revamping extension systems to incorporate new approaches and in developing quality human capital to address the current lack of innovation in the agrifood sector. Part of the investment in innovation (mainly investment in research) produces returns in the medium term; other investment may not. In any event, the need for more investment must be addressed as a matter of urgency; the enormous challenges, as well as the tremendous opportunities for agriculture in the hemisphere, demand it.