

Innovation in agriculture: a key process for sustainable development

The challenges of today's world are bringing many pressures to bear on agriculture: population growth, the impact of climate change, the need to reduce greenhouse gas emissions in agriculture, rapid development of the emerging economies and growing instability associated with land, water and energy shortages.


This scenario heightens the critical role of innovation to make agriculture more competitive and sustainable.

Innovation, in general terms, is a process by which something new is implemented in a given context; it is socially appropriate and provides benefits for the parties involved. It

serves as a driver of economic growth and competitiveness in the countries.

Innovation and the processes that facilitate it do not emerge from nothing; innovation arises in a particular socioeconomic context and is shaped by the presence (or absence) of favorable conditions in which it can thrive (IICA 2013a).

The innovation process comes about largely within "innovation systems" made up of organizations and private and public stakeholders interconnected in different ways and possessing the technical, commercial and financial competencies and inputs necessary for innovation.



The government plays a fundamental role, supplying the economic, social and institutional conditions that foster innovation; it does this through effective policies for (World Bank Institute 2013):

- Providing innovators with resources (finances, services and knowledge) by building a suitable support system.
- Removing obstacles in regulatory frameworks, including legal, trade, governance and investment barriers.
- Strengthening the country's human resources through a sound educational system that includes all levels of schooling (from primary through higher education) and vocational training, and that counteracts the brain drain.
- Promoting research and access to up-to-date information by means of an effective research policy that encourages greater investment in research and development, meeting the country's needs, seizing opportunities and creating effective linkages among all the creators and users of knowledge.

In line with these challenges, the United Nations Summit on the Millennium Development Goals (MDG) gathered commitments from the governments as follows: "The capacity for technological innovation needs to be greatly enhanced in developing countries, (...) in order to strengthen national innovation and research and development capacity " (United Nations 2010).

The San Jose Declaration of Ministers of Agriculture of the Americas (2011) also reflected current international developments when it expressed its conviction that agricultural innovation is a catalyst for growth and change, and that fostering innovation is vital for meeting the challenges of agriculture and development of the territories, adapting to climate change and improving food security and the quality of life for all inhabitants.

Following this mandate, the Inter-American Institute for Cooperation on Agriculture (IICA), as the specialized agency for agriculture and rural well-being in the Inter-American System, promotes technological and organizational innovation, taking a systemic approach to improve competitiveness, boost production and help improve the functioning of agricultural markets (IICA 2010).

IICA looks to innovation as a philosophy and basic principle of its work as it responds to the countries' technical cooperation needs and seeks a culture of innovation that will permeate all that it does. This requires an enabling environment where innovation is the driving force, the key feature of technical cooperation and the means for advancing the Institute's strategic objectives.

The innovative solutions and capabilities that arise from such work will contribute to the development of rural territories in ways that respect the needs of the many different stakeholders: small-, medium- and large-scale producers and the most vulnerable population groups.

Innovation in the context of agriculture in the Americas

Certain basic elements can contribute to a better understanding of the scope of the concept of innovation: definition, types of innovation, the people who implement them and their objectives.

What does innovation mean?

Innovation is specifically the application of new knowledge to productive or organizational processes. It comes about when society takes ownership of knowledge, ideas, practices and technologies, translating them into a change that is useful and beneficial in productive or organizational life.

A novel idea implemented in a particular way can be considered an innovation if it is new in the context, even though it may not be new to the world.



Plinio Cardona, a Honduran small farmer who grows corn and beans, created a clean technology for safe grain storage.

Innovation

Innovation is the implementation of something new or improved (whether technology or otherwise) in products (goods or services), processes, marketing or organizational methods. In other words, it means applying ideas, knowledge or practices that are new to a particular context with the purpose of creating positive change that will provide a way to meet needs, take on challenges or seize opportunities. Such novelties and useful changes could be substantial (a large change or improvement) or cumulative (small changes that together produce a significant improvement).

Note: Adapted from OECD (2005).

What types of innovation are there?

Innovation can be classified using several different methods. Some apply in certain specific contexts, such as those frequently mentioned in our agricultural milieu:

- **Institutional innovation.** These innovations, for our purposes, entail a change of policies, standards, regulations, processes, agreements, models, ways of organizing, institutional practices or relationships with other organizations, so as to create a more dynamic environment that encourages improvements in the performance of an institution or system to make it more interactive and competitive.
- **Technological innovation.** This is the application of new ideas, scientific know-how or technological practices to develop, produce and market new or improved goods or services, reorganize or improve production processes or substantially improve a service. Technological innovations are generally associated with changes in goods or productive processes; but technological innovations may also be applied to marketing processes or forms of organization by either producers or institutions.
- **Social innovation.** This is the development or substantial improvement of strategies, concepts, ideas, organizations, goods or services, to bring positive changes in the way of meeting or responding to social needs or serving social purposes. Social innovations are constructed jointly by several different stakeholders for the well-being of individuals and communities; they may generate employment, consumption, participation or introduce some other change to improve the quality of life for individuals and that can be duplicated in other settings.

Source: Adapted from IICA 2013a; OECD 2011; Albaigès *et al.* 2009.

Other classification systems are more general and can be used more widely, such as the following categories based on the OECD definition (2005):

- **Product innovation:** changes or additions to goods produced or services delivered.
- **Process innovation:** changes to the way goods are produced or services are delivered.
- **Marketing innovation:** changes in the method or conditions for marketing the good, or changes in the placement or target of the good or service.
- **Organizational innovation:** changes in an organization's structure, activities or services, in its processes or methods, or in its relationship with other stakeholders (such as partnerships).

Innovations can also be classified according to who implements them:

- **Entrepreneurial:** These innovations may be implemented equally by small-scale producers or by large companies. Such innovators may introduce changes in products, processes, marketing or organization to bring about economic, social or environmental improvements.
- **Organizational or institutional:** These changes are implemented by various kinds of organizations, institutions or associations, whether public, private, academic or non-governmental. They could also be introduced by national innovation systems. Again, these innovations may relate to products, processes, marketing or organizations and may seek different types of objectives.

What is an agricultural innovation system?

The concept of innovation systems can be understood in a broad sense and may include a wide variety of sectors, including research, extension and other functions that promote or implement innovation.

This systemic approach, unlike the traditional linear model, posits interactive, holistic flows of knowledge among the different participants.

An innovation system consists of a wide array of public and private organizations, firms and individuals that demand and supply knowledge (coded - tacit) and technical, commercial and financial competencies. It also includes the rules and mechanisms by which these different stakeholders interact and relate with one another in social, political, economic and institutional settings (World Bank 2007b).

Investment in agricultural science and technology, generally in the form of research and extension services, has proved to be highly valuable for improving crop yields and lessening poverty in developing countries. Nevertheless, such investments should reflect all the parties' diverse needs for knowledge (World Bank 2007b).

It is currently understood that the performance of innovation systems depends on the interaction among the different people and institutions responsible for generating and disseminating knowledge and technology (OECD 2002), stakeholder learning processes and the creation of an innovation-friendly environment. These issues will be discussed in more depth below.



Selected cases of different types of agricultural innovation

Practical cases of innovations developed in Latin America and the Caribbean (LAC) may lead to a better understanding of these concepts.

The case of Product Chains



For example, in the framework of the project “Technological Innovation Strategy to Improve the Productivity of Product Chains in Central America and the Dominican Republic” (PRESICA), a diverse group of people carried out a collective process, based on producer needs, to begin using **basic grain storage systems (metal silos)**.

These systems use special equipment to strip corn cobs and store the grain, thus extending the useful life of the corn and as a result, overcoming technology problems, improving farmer access to markets and fetching potentially greater income.

This technological innovation, promoted by the Dominican Agricultural and Forest Research Institute (IDIAF) in the region of San Juan de la Maguana, Dominican Republic, was designed to strengthen the local seed production system by endowing it with equipment and training. It succeeded in lowering the post-harvest losses that affected members of the local consortium who had no technology of this kind.

The case of the ‘Grupo Trigo’



Institutional or “soft” innovations could involve rewriting an organization’s “rules of the game” that affect the decisions, perceptions or actions of organization members (De Souza *et al.* 2001).

An example of this kind of innovation is the case of the **Grupo Trigo** (Wheat Group), a strategic alliance of the Uruguayan National Agricultural Innovation Institute (INIA) and the National Consortium of Wheat Seed Producers (CNST), made up of seven large Uruguayan seed-producing cooperatives (Cadol, Calmer, Calprose, Calsal, Copagran, Unión Rural de Flores and Sociedad de Fomento Rural de Tarariras).

The purpose is to combine INIA crossbreeding skills for developing genetic improvements in wheat with the capabilities of the country’s largest seed-reproducing and marketing sector. The **Grupo Trigo** is a forum for dialogue among producers, technical advisors, extension agents, seed marketers and Uruguay’s milling industry as a way to strengthen linkages with different participants in the wheat agro-industrial chain.

The case of the Research Institute for Foresight and Public Policies

Another case is Argentina's new **Instituto de Investigación en Prospectiva y Políticas Públicas (IIPYPP)** (Research Institute for Foresight and Public Policies) created by the Research and Development Coordinating Office of the National Institute of Agricultural Technology (INTA). It produces inputs for strategic and critical institutional thinking, develops skills among INTA personnel for forward thinking about the future of the Argentine agri-food system and provides INTA decision-makers with the information and analysis they need for technology innovation processes.



The case of the dynamic rural development model

Finally, social innovations are much more comprehensive and entail economic or social changes, and changes in networks or civil participation in a particular area or territory. An example of this type of innovation is the **dynamic rural development model with an integrated and territorial approach** in the Corporación VallenPaz, developed in Colombia's Cauca Valley.

This model centers around comprehensive development of rural communities through community organization, production organization and building linkages between the business sector and farmers, in territories that were taken over during armed conflict. The first step of the model was to weave a new social fabric by introducing residents into organic farming systems. This built trust among the people as social capital developed and small-scale producers gained credibility. As a result, farm families have boosted their income and improved their living conditions.



The case of the local consortium of innovation

These are separate examples of the different types of innovation; however, innovation usually results from a combination of technological, institutional and social changes.

Another case study is the **local consortium of agricultural technological innovation in the green pepper chain**, an initiative implemented in the western-central region of Costa Rica. This project promoted all three kinds of innovation – technological, institutional and social – by building synergies and teamwork among the members of the consortium so as to offer the market a new variety of high-productivity, low-cost green-pepper seeds produced locally.

The project combined the work of Institute of Agricultural Innovation and Technology Transfer (INTA), the University of Costa Rica (UCR), the extension agencies of the Ministry of Agriculture and Livestock (MAG), the CoopeZarcero R.L. multi-services cooperative, the Zarcero association of greenhouse farmers (APROINZA), the women's association (AMUSAP), the agricultural center of the Santa Bárbara Canton and the agricultural center of the Alajuela Canton.

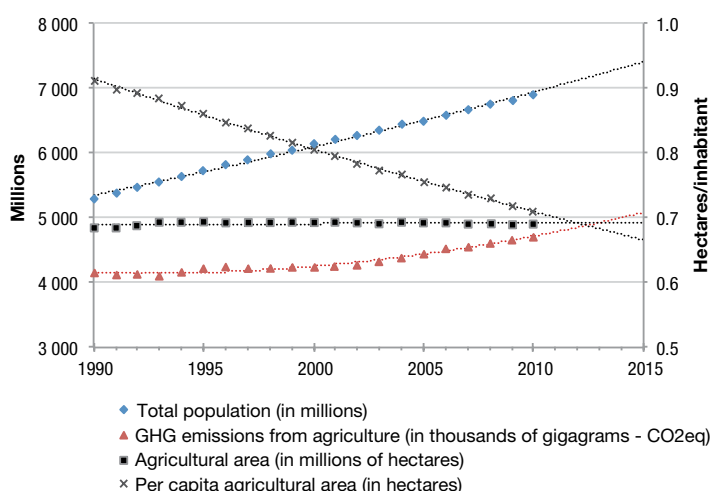


The importance of innovation

There is broad consensus that innovation is critically important for meeting the challenges that confront the human race, including the need to improve competitiveness, sustainability and equality in agriculture.

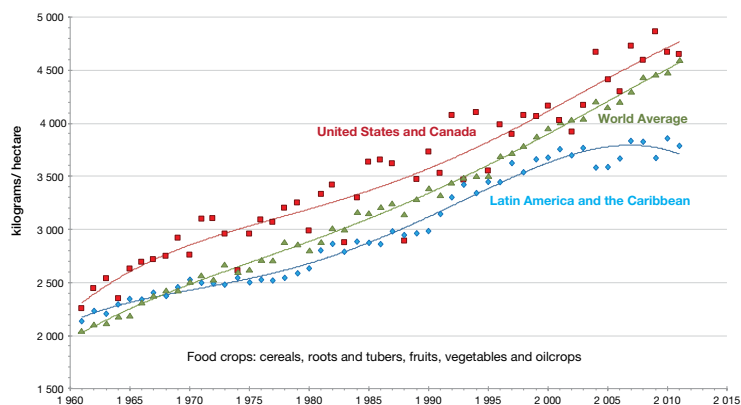
Agriculture also needs to produce more food for a growing population, using a limited amount of farmland, while at the same time reducing its greenhouse gas emissions to avoid worsening climate change (Figure 1). This suggests that agricultural production needs to use knowledge more intensively, which means it must innovate.

Figure 1. Evolution of selected variables (1990 - 2010)



Note: The population estimate for 2050 is 9 306 131 000 inhabitants
Source: Based on data from FAOSTAT (2013).

Figure 2. Food crop production trends per hectare (1961-2011).



Source: Developed by the IICA Program on Innovation for Productivity and Competitiveness, using data from FAOSTAT (FAO 2013).

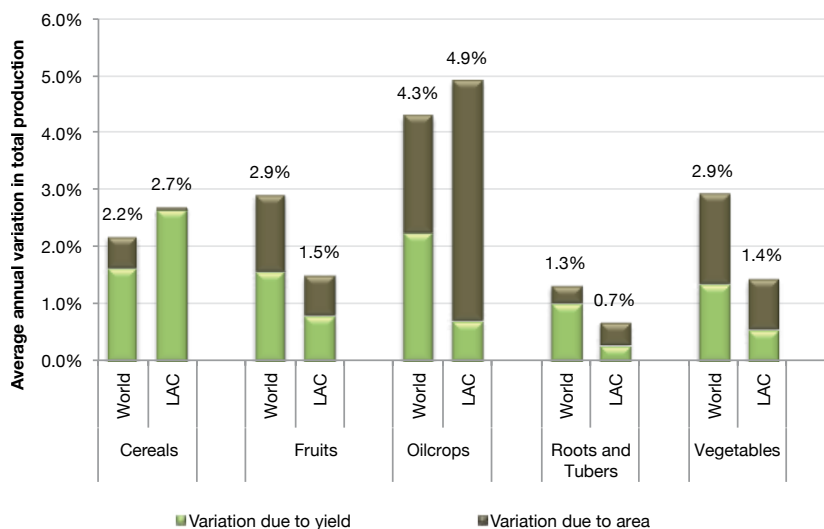
An analysis of per-hectare food-crop production in recent decades shows that the sector has stagnated since 2000 in LAC, compared with the trends posted by the region's more industrialized economies and even compared to the global average (Figure 2).

This aggregate indicator may be reflecting fluctuations in a variety of factors, such as changes in the production structure, incorporation of marginal lands, or less investment in crops. At the same time, it may be a warning that appropriate technology is not being incorporated effectively into production systems.

Figure 3 takes a more in-depth look at this possibility: It suggests that production increases in LAC attributed to better yields is lower, by contrast with the global average, for any product category except grains. These

figures highlight the urgent need to set a higher priority on innovation in LAC as a tool for helping the region's production to compete more effectively with the rest of the world (IICA 2012).

Figure 3. Contribution of yield and area to production fluctuations (2001-2012).



Source: Developed by the IICA Program on Innovation for Productivity and Competitiveness, using data from FAOSTAT (FAO 2013).

Investment in agricultural research and development (R&D) has been shown to improve economic growth, agricultural development and poverty reduction in LAC over the past fifty years (IAASTD 2009 and World Bank 2007a).

Investment in agricultural research is very profitable, according to Rao *et al.* (2012), who examined 2186 assessments

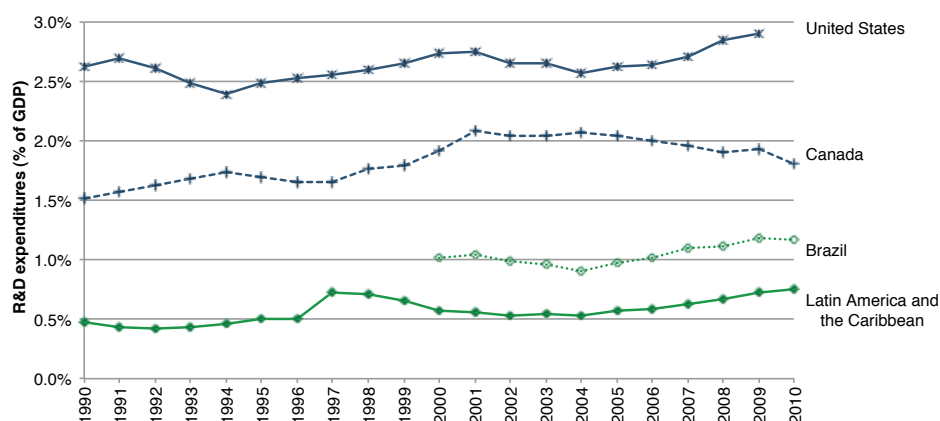
of research and development investment profitability published all over the world in the past 50 years, and reported an average internal rate of return of 49.4% per year and a median of 40.7%. A similar earlier study by Alston *et al.* (2000) found that LAC posted a mean of 46% and a median of 43%; both values are identical to the overall average for developing countries.



The ratio between R&D expenditures in all sectors of the economy and gross domestic product (GDP) places LAC on a slightly rising trend starting in the mid-2000s (Figure 4). Two points should be clarified: most of this trend (70% of investments) can be attributed to Brazil, and investments were barely 0.75% of GDP even in the highest instances, which is considered insufficient to meet the region's production needs.



Figure 4. Trends of R&D investment intensity as a percentage of GDP (1990-2010).



Source: Developed by the IICA Innovation Program using data from RICYT (2013).

Favorable conditions for innovation

An enabling environment for innovation

Innovation in agriculture and rural development, as in other sectors, takes place in a given socioeconomic context and is determined by the presence (or absence) of favorable conditions, including most particularly, sufficient domestic development, institutional and regulatory frameworks, a reservoir of knowledge and human skills, economic and financial conditions, a society that is demanding innovation, and a welcoming regional and global environment.

Certain interactions and linkages also condition innovation. Innovation processes generally arise in response to different types of triggers, whether from the market, technology, society or the environment; regardless of origin, they always require the presence of favorable conditions. It is therefore important to ensure an enabling environment for innovation, and the government (including the different sectors, ministries and institutions) must play a key role.

The OECD (2013) emphasizes that government policies can foster innovation by creating favorable long-term conditions and improving the quality of human resources by means of a sound educational system, health policies, infrastructure and the like.

A basic component of favorable conditions to foster innovation is the existence of agricultural policies that eliminate market distortions. Equally important are policies

for science, technology and innovation, intellectual property rights policies, simplification of regulations whenever possible, and the development of financial and technical services that support innovation processes along the links of the value chains.

A basic requirement is the presence of safe, predictable legal and regulatory frameworks with stable government objectives that encourage innovation; innovation systems also need to be developed.

The private sector and innovation

The private sector stands at the forefront of innovation processes and is a source and the primary recipient of new technologies. It is made up of companies (large, medium-sized and small) and profit-seeking firms, regardless of ownership structure, scale or size, or of whether they are legally registered or directly involved in some link of the agricultural production value chain.

IICA has recognized the need to develop a policy and strategy for its actions by which it can work and cooperate more closely with the private sector. IICA's specific objective is to help create an environment where the private sector can contribute technologies, innovation models and investments to keep value chains productive, competitive and sustainable.



Extension is essential for skills development.

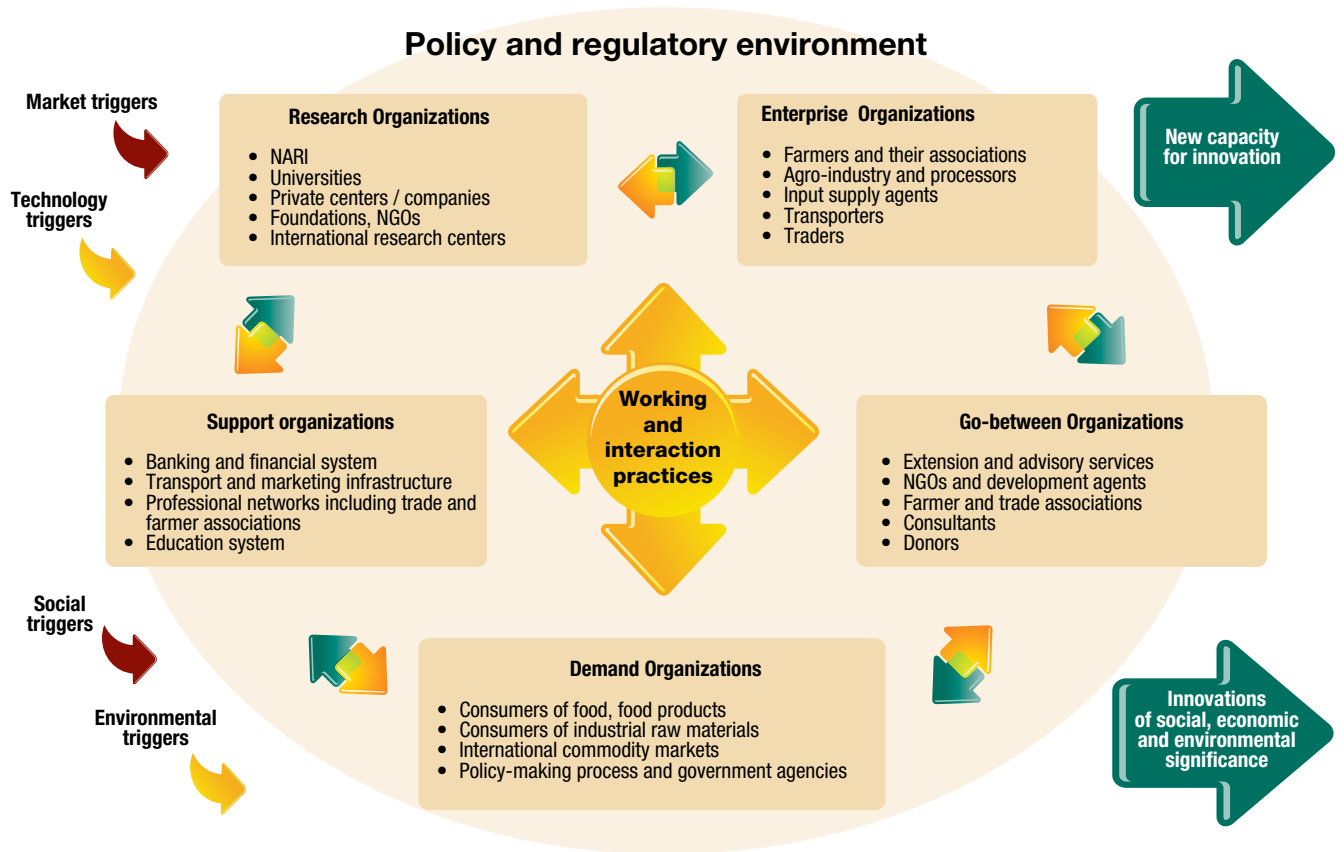
Agricultural innovation systems (AISs) are characterized by two chief factors: the combination of participants involved, and the dynamic interactions among them. The key participants include farmers and farmer associations, providers of inputs or technical and financial services that promote the development or adaptation of new knowledge, those who encourage an exchange of knowledge and promote learning, those who are engaged in adding value to production, and those who facilitate market access.

Research and technology development organizations are an integral part of the AIS, as are public and private extension services that play a critical role in facilitating access to knowledge and capacity building.


If the work of the AIS can be improved through better coordination among participants, it will produce a greater capacity for innovation to respond to emerging needs and opportunities. It can also encourage the private sector to invest in creating and implementing innovations.

The diagram in Figure 5 shows the systemic interrelationships in the AIS among all the public and private, civil-society and academic participants for creating, disseminating, adapting, learning and using knowledge to improve agriculture's ability to implement innovations at all links of the value chain.

Figure 5. Dynamics of the innovation system.



Source: Adapted from the OECD (2013).



Innovation processes for community development with a comprehensive, participatory chain approach

LAC has witnessed a number of experiences in which stakeholders implement their innovations using a different approach, thus demonstrating how important innovation can be in this region. The communities in these cases were able to take ownership of the technological and institutional innovations as a result of joint efforts between researcher and producer, coordination

among the various participants, and capacity building. The combined effort had an impact on the recipients of innovative changes, including small- and medium-scale producers, because of the interactive, participatory and comprehensive approach to innovation processes. See below a selection of experiences in innovation for the development of family agriculture:

Impactful innovations benefiting family agriculture: the importance of working together

A recent study (IICA and IDB 2013) by the Regional Fund for Agricultural Technology (FONTAGRO) documented high-impact innovations in LAC that have benefited small-scale producers, made their labor more productive and competitive, and thus allowed them to build more value into their native products, raise prices and improve income and standards of living. The success of these experiences has rested heavily on interaction and combined effort among the various stakeholders.

Coordination among different stakeholders. One of the experiences described in the study was Ecuador's "fine-aroma cocoa" production. Collective innovations implemented in this example featured the development of local innovation networks made up of scientists, agricultural technicians and small-scale farmers to meet different technology needs on family

farms, move small-scale producers into value chains and make their products more competitive. Another case study, production of native potatoes in Ecuador, expanded these partnerships over the longer term by means of contractual relationships with processing firms.

Participatory approach. Inclusive, competitive, sustainable and associative models have been adopted in several ways, such as the organization of small-scale bee producers in Argentina and the Dominican Republic, or the participatory approach to production chains for Andean potatoes in Peru. These examples showcase participatory work by R&D teams and networks of territorial specialists (extension), which facilitates the identification of new business opportunities, development of standards and public policies, sustainable uses of biodiversity and the development of production clusters to benefit family farming.

Participatory construction of knowledge and learning.

The examples of improved forage and a better environment in the understorey of the Chaco forests in Salta, Argentina, and native potatoes in Cundinamarca, Colombia, show opportunities being created for researchers and family farmers to share modern knowledge and traditional wisdom. Both groups were able to enrich their knowledge. Family farmers were equipped with effective technology to meet their needs and to strengthen family organization on the farm.

Development of skills, attitudes and competencies.

The case of native potato crops in Cundinamarca also shows that when small-scale producers build their skills (for example, by adopting new technologies for crops, organizational development and business acumen), the process is even more successful.

Innovative processes with multiple objectives:

Technology innovation processes hold the potential to bring economic, social and environmental benefits. The use of climate-smart methods for the corn crop in Ixcán, Guatemala demonstrates that corn productivity and family income can be increased, and production costs reduced, while improving soil fertility, preventing erosion, minimizing the advance of the agricultural frontier and protecting forests and biodiversity.

► *In Colombia, opportunities were provided for researchers and family farmers to share modern and ancestral knowledge, thereby enriching the knowledge of both.*





Technical cooperation for innovation: the IICA vision

The internal environment at IICA

The Institute should seek sustainable processes of innovation in all spheres of its internal environment: technical, administrative and managerial. It needs to create a culture of innovation. Staff and management should build a shared commitment and facilitate conditions whereby all personnel will innovate as part of their own work, in their processes, services and duties. Innovation needs to become the cornerstone of IICA technical cooperation if the Institute hopes to promote innovation in value chains and rural development processes.

IICA will promote a culture of innovation to support changes in the institution. The basic principles for an innovative culture in an organization are: **focus on concrete results, develop mutual trust** in the entire hierarchical structure, **allow challenges to the status quo** with innovations and ideas for improving technical cooperation and institutional management and **encourage inspiring leadership** able to exert a positive influence on the work team.

Niches for IICA work in innovation for technical cooperation

IICA technical cooperation in innovation, under this new vision, has a more comprehensive and interactive emphasis, and it reaches beyond research and the Institute's traditional support for the NARIs. Innovation is understood more broadly as a driving force of the economies and rural development.

It is also clear that capacity building is key for knowledge management, and that cooperation in the countries should be oriented toward making every innovation system more dynamic. Knowledge is thus understood to originate from a diversity of

sources: research centers (including NARIs, universities, private institutions, NGOs, international centers and others), extension systems, the know-how of farmers themselves, or a combination of all these.

The approach for achieving this vision will be to create internal and external conditions that facilitate innovation in agriculture. Such conditions could include, for example, fostering and gaining access to knowledge and new technologies, and strengthening the capacities of private and public stakeholders to generate innovation processes in the agricultural sector.

These innovation processes will tend to hasten economic development, improve food security, make sustainable use of natural resources and boost the well-being of small- and medium-scale producers in the Americas. IICA will work on innovation for technical cooperation in the following niches:

■ **Public policies and institutional frameworks for innovation**


The idea will be to contribute to the design, development, strengthening and fine-tuning of policies, strategies and regulatory frameworks able to create conditions and an environment that will encourage, foster, implement and guide innovation in agriculture.

Certain requirements must be met for creating an innovation-friendly environment. Innovation for agriculture needs to be positioned as a national strategy or as part of State policies in the countries, and these policies need to include innovation for family agriculture. The public sector should play a central role in coordinating innovation processes and in helping all public and private stakeholders adopt a shared vision for building consensus on proposed objectives, strategies and priorities that will push innovation.

A number of instruments are available to support work in arenas such as these. One would be national agendas for innovation as a roadmap to position the issue and move toward a culture of innovation; another would be to introduce strategies for communication and knowledge management on innovation, and policies that facilitate it.

Analytical and assessment studies on the status of innovation in agriculture should be performed in each country, leadership skills need to be built, and regulatory and policy frameworks should be developed for R&D, extension and innovation. Finally, the countries should share knowledge on experiences and public policies.





■ **Strengthening agricultural innovation systems**

The idea of working in this niche is to support the countries in changing, driving and streamlining their AIS and the people working in it to make it more effective in promoting and implementing innovation, for the benefit of small- and medium-scale producers.

It is important, first of all, to assess the status of the AIS by conducting participatory assessments, knowledge mapping, agendas for joint action or tools for monitoring and evaluation.

IICA should also contribute to the design and implementation of strategies to build skills among AIS participants in such areas as leadership in innovation, interactive and horizontal working approaches, use of ICTs or other knowledge management tools, creating networks or managing partnerships, depending on each country's needs.

An additional goal of this niche will be to provide approaches that facilitate the shared creation of knowledge and the development of extension strategies for innovation that will hasten learning processes in stakeholders, linked to formal capacity-building programs, that is, the education system.

A final goal will be to strengthen innovation platforms or systems at the territorial level by documenting experiences and instruments for managing local innovation consortia and networks in the territories.

■ **Fostering innovation to improve the well-being of participants in chains and territories**

Innovation would benefit small- and medium-scale producers in high-priority value chains. New innovative technologies, processes, products and services would be disseminated, adapted and put to better use, to make these farmers more productive and competitive and improve their standards of living in a framework of sustainable and efficient use of natural resources. In other words, the idea will be to share information, lessons learned and knowledge on technologies that have a potential impact all along the agri-food chains. These are technologies that can provide greater value, income, competitiveness, resilience, quality and productivity, better standards of living and the potential to solve specific problems or seize opportunities.

The use and ownership of new knowledge and learning can be promoted throughout a territory by means of better access to information on technologies and innovations oriented toward developing sustainable agriculture, resilient production systems, efficient use of resources, and mitigating the environmental impact of agriculture.

Again, these strategies should include the development of innovation skills in the territory and working with local consortia to develop projects for territorial platforms or chains.

Conclusion

Innovation is a driver of economic growth and well-being in the countries. It is a dynamic, holistic process that generally occurs inside the AISs. If the work of diverse participants is strengthened – research, agricultural extension and other forms of support for innovation – the AISs can become more efficient and competitive. This can happen if all stakeholders can develop and strengthen their own capabilities, and if relationships among them are bolstered.

The new IICA vision of innovation for agriculture revolves around a

comprehensive, broad-based approach whose cornerstone is innovation work and whose efforts are directed toward promoting a welcoming environment that includes public policies and an institutional framework to reward and support innovative, entrepreneurial work, strengthen the AISs and promote promising technologies with the potential to have an impact on the territories and the high-priority value chains.

The tools for achieving this will depend on the context or reality being addressed; this means there are no recipes for promoting a culture of innovation, but that solutions may arise from many different sources, stakeholders or types of innovations.



References

- Albaigès, J.; Morales Gutiérrez, AC; Águila Obra, AR; Padilla Meléndez, A; Nuez, de la, JM; Bel Vignal, A; García Salguero, M; 2009. La innovación social, motor de desarrollo de Europa. Socialinnova, Seville, Spain. Available at http://comunidadinnovacia.guadalinfo.es/sites/default/files/innovacion_social_librocompleto.pdf
- Alston, JM; Marra, MC; Pardey, PG; Wyatt, TJ. 2000. A Meta Analysis of Rates of Return to Agricultural R&D: Ex Pede Herculem? IFPRI Research Report 113. Washington D.C., IFPRI. Available at <http://www.ifpri.org/sites/default/files/publications/rr113.pdf>
- World Bank. 2007a. World development report 2008: Agriculture for Development. Washington, D.C. Available at <http://siteresources.worldbank.org/INTWDRS/Resources/477365-1327599046334/8394679-1327614067045/WDROver2008-ENG.pdf>
- _____. 2007b. Enhancing Agricultural Innovation: How to Go Beyond the Strengthening of Research Systems. Washington, DC: World Bank. Available at <https://openknowledge.worldbank.org/handle/10986/7184> License: CC BY 3.0 IGO
- ECLAC (Economic Commission for Latin America and the Caribbean, CL); FAO (Food and Agriculture Organization of the United Nations, IT); IICA (Inter-American Institute for Cooperation on Agriculture, CR). 2013. The Outlook for Agriculture and Rural Development in the Americas: A Perspective on Latin America and the Caribbean 2014. Executive summary. San Jose, CR. Available at <http://repiica.iica.int/docs/b3166i/b3166i.pdf>
- De Souza Silva, J; Cheaz Peláez, J; Calderón Romero, J. 2001. La cuestión institucional: de la vulnerabilidad a la sostenibilidad institucional en el contexto de cambio de época. San José, CR, ISNAR "New Paradigm" Project. Series: Innovation for Institutional Sustainability
- FAO (Food and Agriculture Organization of the United Nations, IT). 2013. FAOSTAT (online). Rome, IT. Consulted Nov. 15. 2013. Available at <http://faostat.fao.org/>
- IAASTD (International Assessment of Agricultural Knowledge, Science and Technology for Development). 2009. Synthesis report with executive summary: A synthesis of the global and sub-global IAASTD reports. Washington, D.C. Available at [http://www.unep.org/dewa/agassessment/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Synthesis%20Report%20\(English\).pdf](http://www.unep.org/dewa/agassessment/reports/IAASTD/EN/Agriculture%20at%20a%20Crossroads_Synthesis%20Report%20(English).pdf)
- IICA (Inter-American Institute for Cooperation on Agriculture). 2010. 2010-2014 Medium-term Plan: Promoting competitive and sustainable agriculture in the Americas. San Jose, CR.
- _____. 2012. Situación y desempeño de la agricultura en ALC desde la perspectiva tecnológica. San Jose, CR.
- _____. 2013a. Innovación para la cooperación técnica en el IICA. Directorate of Technical Cooperation. San Jose, CR. Unpublished.
- _____. 2013b. La extensión para la innovación: una visión de los sistemas de extensión al servicio de la innovación para el desarrollo. Discussion document. San Jose, CR. Unpublished.
- IICA (Inter-American Institute for Cooperation on Agriculture) and IDB (Inter-American Development Bank). 2013. Impactful innovations: lessons from family agriculture in Latin America and the Caribbean. San Jose, CR.
- OECD (Organization for Economic Cooperation and Development). 2002. Benchmarking Industry-Science Relationships. FR. Available at http://www.keepeek.com/Digital-Asset-Management/oecd/industry-and-services/benchmarking-industry-science-relationships_9789264175105-en#page1
- _____. 2005. Oslo Manual. Guidelines for collecting and interpreting innovation data. Third Edition. France. European Communities. 164 p.
- _____. 2011. Fostering innovation to address social challenges. Workshop proceedings. Innovation Strategy. Available at <http://www.oecd.org/sti/inno/47861327.pdf>
- _____. 2013. Agricultural Innovation Systems: A Framework for Analysing the Role of the Government. OECD Publishing. Available at <http://dx.doi.org/10.1787/9789264200593-en>
- Rao, X; Hurlley, TM; Pardey, PG. 2012. Recalibrating the Reported Rates of Return to Food and Agriculture R&D. Staff Paper. St.Paul:University of Minnesota, Department of Applied Economics. Available at <http://ageconsearch.umn.edu/handle/135018>
- RICYT (Network for Science and Technology Indicators, AR). 2013. Input indicators (online). AR. Consulted Nov. 15. 2013. Available at <http://www.ricyt.org/indicadores>
- San Jose Declaration of Ministers of Agriculture (2011, San Jose, C.R.) Meeting of Ministers of Agriculture of the Americas. San Jose, C.R. 6 p. Available at http://www.iica.int/Esp/prensa/Documents/JIA2011Declaracion_eng.pdf
- UN (United Nations, USA). 2010. General Assembly. Resolution adopted by the General Assembly on September 22, 2010. Keeping the promise: united to achieve the Millennium Development Goals. Available at <http://www.un.org/en/mdg/summit2010/pdf/mdg%20outcome%20document.pdf>
- World Bank Institute. 2013. Introduction to Innovation Policy for Developing Countries. Module 1. 15 p.



This document was prepared by James French, Karen Montiel and Viviana Palmieri. The authors would like to recognize the contributions of Xinia Quirós, the Innovation Program specialists and all the other persons who helped review this document.

Inter-American Institute for Cooperation on Agriculture
Headquarters. P.O. Box 55-2200
San Jose, Vazquez de Coronado, San Isidro 11101 — Costa Rica
Phone: (506) 2216 0222 / Fax: (506) 2216 0233
e-mail: iicahq@iica.int / Website: www.iica.int

