Technical Document Series

07

Co-innovation for development

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Co-innovation for development

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Co-innovación para el desarrollo

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Projects included in this publication

Co-innovation for resilient food production in family livestock farming on natural fields in Uruguay

Resilient food production in horticulture-livestock systems for family farming in climatically vulnerable regions of Argentina and Colombia

Support to the formulation of appropriate mitigation actions in Central American agriculture

Climate-smart family agriculture for resilient food production (CSFA-RFP)

Local policies and mechanisms for linkage and implementation of public-private alliances for resilient food production in agrifood value chains in Trifinio in Central America and Adamantina, Brazil

Entities included in this publication

Contents

Abbreviations and acronyms

ASOMAINCUPACO	Asociación para el Manejo Integrado de Cuencas de La Paz y Comayagua, Honduras (Association for the Integrated Management of the Watersheds of La Paz and Comayagua, Honduras)
CIP	Centro Internacional de la Papa (International Potato Centre)
CIPAV	Centro para la Investigación en Sistemas Sostenibles de Producción Agropecuaria (Centre for Research on Sustainable Agricultural Production Systems)
CNFR	Comisión Nacional de Fomento Rural de Uruguay (National Rural Promotion Commission, Uruguay)
CoP	Community of Practice
COVID-19	Coronavirus disease 2019
CSA	Climate Smart Agriculture
CUNORI	Centro Universitario del Oriente de la Universidad de San Carlos de Guatemala (Eastern Campus of the San Carlos University of Guatemala)
FFS	Farmer field school
FIRV (IRGF)	Fondo Inclusivo Rural Verde (Inclusive Rural Green Fund)
FOVIDA	Fomento de la Vida de Perú (Fostering Life, Peru)
SLG	Savings and Loan Group
GHG	Greenhouse gas
GIS	Geographic information system
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GLP	Good livestock practices
ICT	Information and communication technologies
IICA	Inter-American Institute for Cooperation on Agriculture
ILCYM	Insect Life Cycle Modelling
INIAP	Instituto Nacional de Investigaciones Agropecuarias de Ecuador (National Agricultural Research Institute, Ecuador)
INTA	Instituto Nacional de Tecnología Agropecuaria (National Agricultural Technology Institute)
MTFRL	Mancomunidad Trinacional Fronteriza de Río Lempa (Lempa River Tri-national Border Association of Municipalities)
NGO	Non-governmental organization
OPCC	Oficina Presidencial de Cambio Climático de Honduras (Presidential Cimate Change Office of Honduras)
PAL	Plataforma público-privada de Adaptación Local (Public-private local adaptation platform)
FNS	Food and Nutrition Security
SENAMHI	Servicio Nacional de Meteorología e Hidrología de Perú (National Meteorological and Hydrological Service of Peru)
SENASA	Servicio Nacional de Sanidad y Calidad Agroalimentaria de Perú (National Agrifood Safety and Quality Service of Peru)
SFR	Sociedades de fomento rural (Rural promotion associations)
SINTET	Sistema de Información Territorial Trinacional para Guatemala, Honduras y El Salvador (Trinational Information System for Guatemala, Honduras and El Salvador)
SNV	Netherlands Development Organisation
UniFAI	University Centre in Adamantina, Sao Paulo Brasil
USAC	University of San San Carlos in Guatemala

Foreword

The technical document Co-innovation for Development is part of the series of publications developed based on webinars and round table discussions organized by the EUROCLIMA+ programme in the Resilient Food Production (RFP) sector from September 2019 through November 2021.

The series of webinars was arranged to facilitate knowledge exchange between key actors of the EUROCLIMA+ programme and to strengthen their technical and methodological capacities, based on the experience gained from the projects, in cooperation with the implementing organizations, the co-implementing organizations, and the project partners in the Agriculture, Forestry and Other Land Use (AFOLU) sector. The webinars also provided opportunities to identify synergies between the RFP sector and other sectors, such as the Forests, Biodiversity, and Ecosystems (FBE) and Disaster Risk Reduction (DRR) sectors.

The exchange of experiences aimed to support scaling up good practices; to promote climate governance and improved climate policies, strategies, and financing mechanisms for climate change adaptation and mitigation; and to reinforce monitoring systems that provide information for regular country reports on the fulfilment of the Nationally Determined Contributions (NDCs).

In 2021, EUROCLIMA+ organized four international round table discussions, thus creating additional opportunities to exchange experiences to strengthen climate governance in Latin America's agrifood sector.

Systematizing and disseminating experiences and lessons learned is vital in the EUROCLIMA+ programme. Thus, strengthening knowledge management capacity and sharing knowledge is one of the four critical elements of Expertise France's technical assistance strategy for the agrifood sector of the EUROCLIMA+ programme. This publication results from those efforts and aims to facilitate access to relevant, timely, and succinct information regarding technical experiences and solutions for resilient food production. These efforts also arise from EUROCLIMA+'s Green Solutions, which systematize results, good practices, and lessons learned that can be replicated and scaled up in other contexts and can potentially promote green recovery in the countries and accelerate the implementation of their NDCs.

This publication is based on experiences shared during the webinars "Co-innovation in the agrifood sector under pandemic restrictions" and "Virtual solutions for technical assistance and professional training in the agrifood sector," both held in 2020. It describes the concept of co-innovation, defined as the shared creation of new ideas, technologies and ways of doing things, exchanging perspectives and fostering knowledge appropriation and social learning. The publication also describes case studies and lessons learned that key actors shared in the projects co-financed by the EUROCLIMA+ programme in Uruguay, Argentina, El Salvador, Panama, Honduras, Guatemala and Nicaragua.

We hope you enjoy this publication.

Clémentine Moriceau
Project Chief, Technical Assistance for the Resilient Food Production Sector
EUROCLIMA+ Programme
Expertise France

Farmer field schools in El Salvador, (c) IICA

The evolution of co-innovation and experiences in Latin America

Linear knowledge generation and knowledge transfer from research institutions to rural families dominated the processes of agricultural adaptation and intensification until the 1970s. Meanwhile, family farmers continued to generate and develop their concepts, learning, for the most part, from their own experience. In 2020, Albicette-Bastreri and Chiappe-Hernández summarized the stages in the process of modernizing agriculture over the last 60 years as follows, highlighting the evolution towards a participatory research and the participatory development of innovations:

- In the 1960s, efforts to modernize agriculture applied a reductionist approach based on a disciplinary paradigm. It was thought that the failure to adopt new agricultural technologies and practices was due to a lack of knowledge of the farmers and that the solution was to provide training through extension services. This approach reinforced the transfer of technology models, which was the basis of the Green Revolution (Pinheiro, 2000).

- There was a shift to a more systemic approach during the same decade, based on agricultural sciences and systems research (Hegedüs, 2002). The lack of adoption of new agricultural technologies and practices was considered the result of constraints on the farms. This led to the farms being viewed as experimental spaces. With the ensuing on-farm research, a consultative relationship between technicians and farmers began to develop.

- During the 1980s, a systemic approach was adopted, which emphasized social sciences, considered the reality of the farmers, and considered their input (Foladori and Tommasino, 2006). Issues regarding adopting new technologies and practices were linked to creating technology. This, together with the recognition of the validity of informal research conducted with farmers, marked the start of participatory research in small-farming (Biggs, 1990).

- At the start of the 1990s, social scientists working in agriculture interacted with farmers to take local knowledge into account and understand the difficulties involved in adopting new technologies and practices (Chambers et al., 1989). Among those difficulties was the lack of understanding of the scientists regarding farmers' decision-making processes. As such, participatory research focused on developing technology together with the farmers, using methods such as Participatory Technology Development (Jiggins and de Zeeuw, 1992).

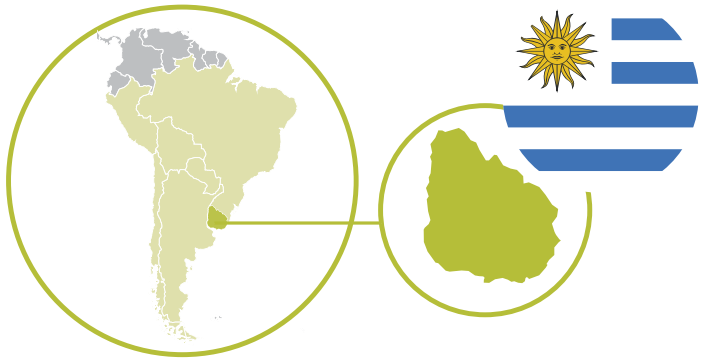
- During the following decade, participatory approaches were emphasized as a step towards local innovation. Since then, farmers and researchers have worked together under this perspective to identify problems and design, execute, and evaluate experiments on the farms (Selener, 2006). This has led to procedures such as Participatory Innovation Development (Scheuermeier et al., 2004).

In summary, the concept of co-innovation is defined as the joint production of new ideas, technologies, or ways of doing things through a process that involves sharing perspectives and promoting knowledge appropriation and social learning. Co-innovation is considered an effective means to achieve impact among small-scale farmers. The toolkit developed in the 1990s with support from German international cooperation, which contains 80 tools for participatory development (covering diagnosis, planning, monitoring and evaluation), continues to be an essential reference source regarding co-innovation methods and tools and how to use them (Geilfus, 2009). The projects supported by EUROCLIMA+ presented in this document contribute to the continued evolution of the concept of co-innovation in the current context of restrictions on social contact as a result of the global pandemic.

Concepts of co-innovation shared by webinar participants (Source: EUROCLIMA+ webinar, mentimeter.org survey, 26 Nov., 2020

Experiences from Uruguay:
Co-innovation for the development of family livestock farming

Location



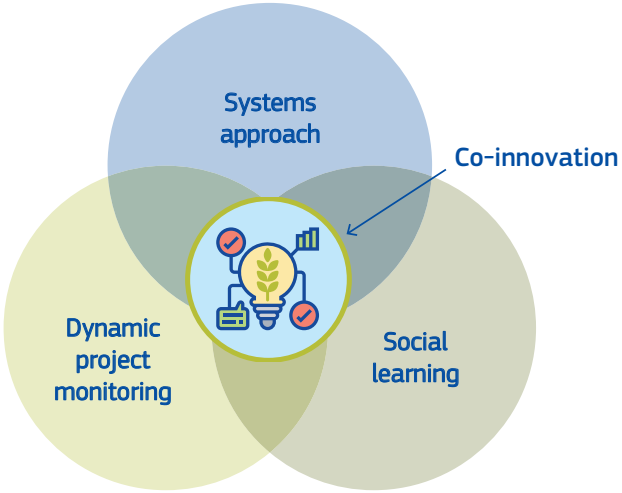
The implementation of co-innovation combines three approaches: the systems approach, dynamic project monitoring and social learning. The co-innovation project supported by EUROCLIMA+ in Uruguay was implemented in two climate-vulnerable regions – Basalto and Sierras del Este. The project worked with 52 families, grouped into six rural promotion associations (SFRs). Six agronomists and four veterinarians were hired for the project. Their activities were coordinated by the National Rural Promotion Commission (CNFR), in consultation with the SFR boards of directors. The National Agricultural Research Institute (INIA) provided methodological training for the field technicians.

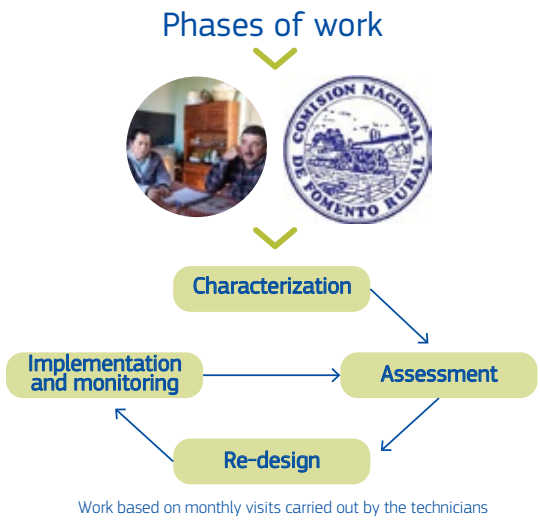
The co-innovation process, which leveraged an organizational structure that includes the CNFR (which operates at the national level), the SFRs (which work at the local level), and the farming families who are members of the SFRs, was implemented with the families, to implement good livestock practices (GLP). The experience was documented, and efforts were made to build inter-institutional coordination to develop strategies to continue and scale the activities and outcomes. The project was able to work around the COVID-19 restrictions thanks to previous work on co-innovation carried out with the organizations in the territory and thanks to accessing finance and the nationally-validated GLP.

Project actions were modified to comply with the required health-related protocols, making it possible to continue implementing the activities in the field with the families, according to the country's conditions. Another significant advantage was the excellent level of internet coverage in the country, which enabled male and female farmers and

leaders of farmer organizations to develop new skills in using information and communication technologies (ICT) and social networks. Using virtual modalities (webinars, Zoom meetings, etc.) made it possible to adapt the activities as needed, particularly within the regional collaboration component (Carriquiry, 2021).

Concept of co-innovation in the Resilient Family Livestock project in Uruguay





Source: Dogliotti et al, 2013 | Scarlato, 2018

Lessons learned

Foster capacity development, based on the participants' needs:

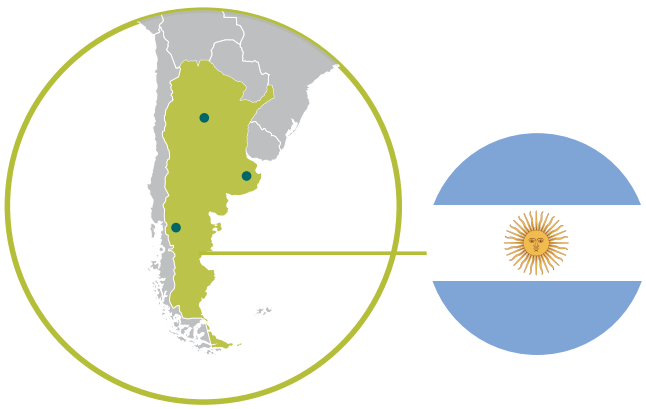
- When technology is available and its use becomes indispensable due to social distancing requirements, families develop skills in the use of virtual communication technologies.
- If service providers are able to identify the needs of the beneficiaries and strengthen their capacities, constraints like the pandemic do not impede the process of collaboration and innovation.

Apply complementary perspectives:

- Knowledge exchange and interdisciplinary work are challenges that must be embraced in working with the farming families and in systematizing the process and the lessons learned.

Experiences from Argentina:
Co-innovation in the development of family horticulture farming

Location



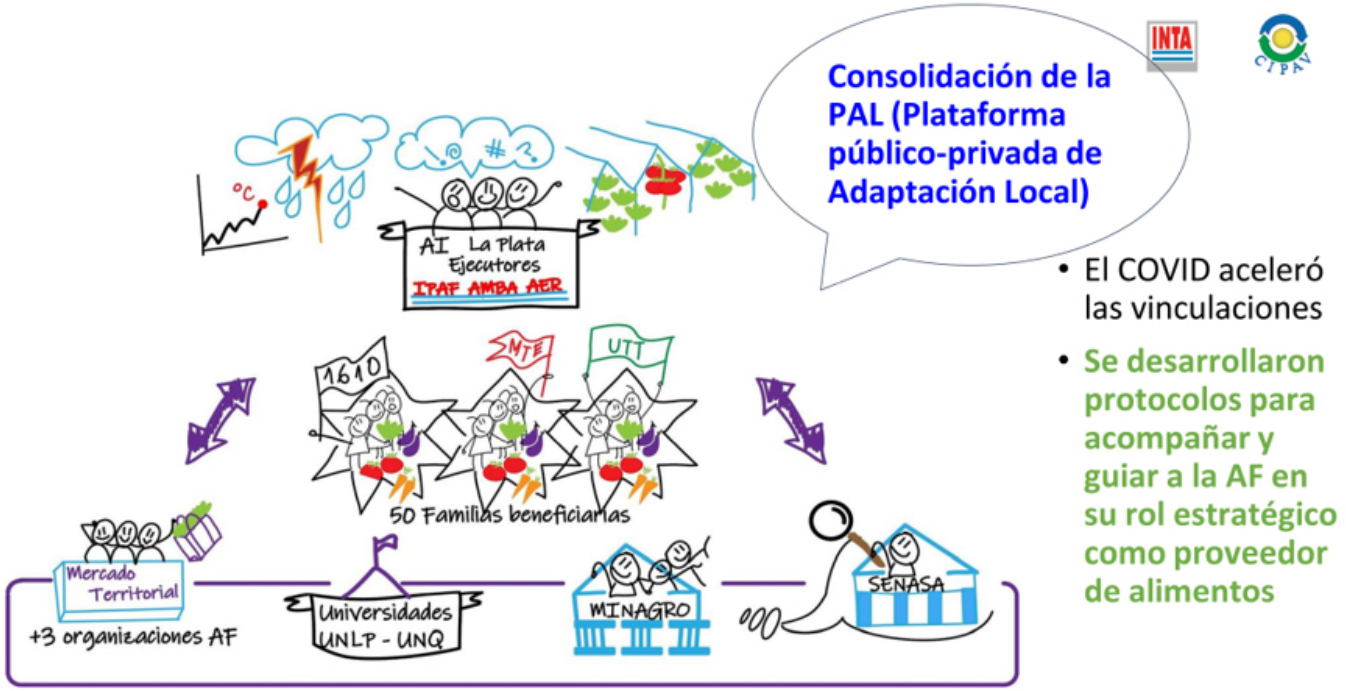
The National Agricultural Technology Institute (INTA), in Argentina, and the Centre for Research on Sustainable Agricultural Production Systems (CIPAV), in Colombia, are applying co-innovation through a joint learning process between technical teams and 200 farming families in four areas of intervention. The process covers climate risk assessment, data analysis, and the design, implementation and systematization of adaptation measures. The methodology aims to strengthen the adaptive capacities of the families by co-creating enabling solutions that foster their autonomy.

Because of the COVID-19 pandemic, the modality of the participatory work, originally based on field activities and in-person learning and discussion, had to be modified. Extreme climate events, such as the fires around Cordona and intense snowfall in Patagonia, further required that alternative means be adopted to carry out the work. As such, the management teams turned to new channels of communication, holding virtual meetings and using cell phones to send reports and propose measures. This flexibility and the possibility of continuing the dialogue with the families was key to the process.

In La Plata, the project strengthened short distribution channels for the sale of fresh vegetables in peri-urban areas. The pandemic accelerated the creation of a public-private platform for local adaptation (PAL), which brought together supportive traders, farmer organizations, universities and the INTA, as well as other state entities, such the National Agricultural Safety and Quality Service (SENASA). The latter is a decentralized branch of the Ministry of Agriculture in charge of implementing national policies regarding animal and plant safety and quality as well as food

safety for foods falling under its mandate, and in charge of enforcing the corresponding regulations. Through the PAL, recommended protocols were established for the sale and distribution of returnable containers for vegetables, an information campaign was designed with short videos, and improvements were made in the packaging rooms in terms of infrastructure and supplies (Battista 2020).

Cooperation system in La Plata, Argentina



Source: Battista 2020

Lessons learned

- Identify alternative communication channels to maintain communication between the technical teams and the families. New projects should include and ensure the proper functioning of these communication channels.
- Establish public-private platforms for local adaptation or networks that can support cooperation in the territory, based on a clearly-identified shared interest.
- Leverage opportunities in peri-urban zones: Food provision does not stop during a pandemic and such situations highlight the importance of family agriculture.

Experiences from El Salvador and Panama: Co-innovation in farmer field schools

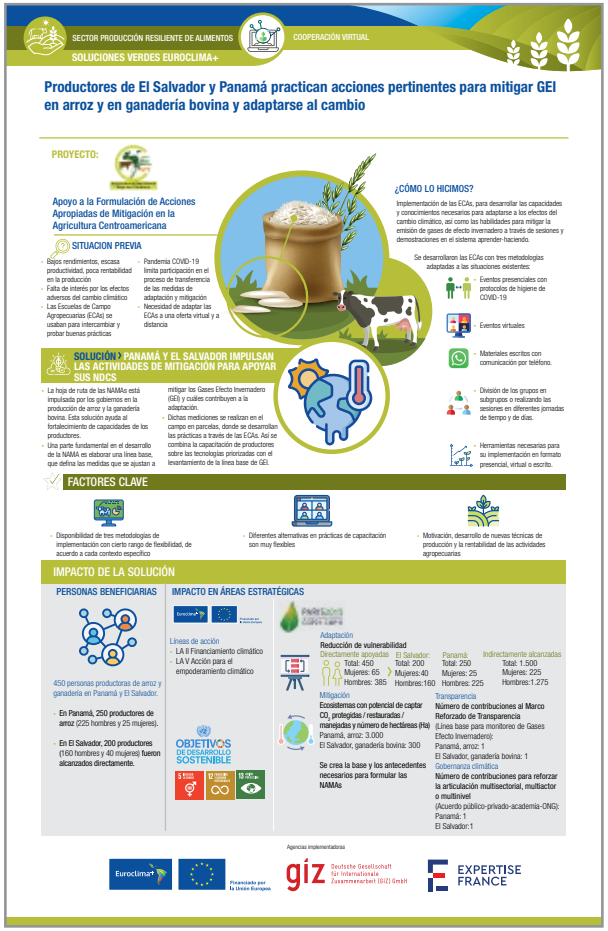
Location

Mitigation is the primary objective of the Nationally Appropriate Mitigation Actions (NAMA). The governments of Panama and El Salvador decided to develop and implement NAMAs for rice (in Panama) and cattle (El Salvador), with technical assistance from the Inter-American Institute for Cooperation on Agriculture (IIICA). In order to increase farmers' interest in participating in these activities, it is essential to identify climate change mitigation measures that provide important co-benefits for agrifood sector adaptation. It is also essential to understand how the sector contributes to global warming.

Farmer field schools (FFSs) are considered the primary vehicle for co-creation of knowledge between farmers and technical personnel, within a systemic context. Before the pandemic, FFSs were implemented via in-person training, using learn-by-doing methods. With COVID-19-related restrictions in place in both countries, the main problem was the restriction on face-to-face meetings, and thus, on the training sessions that were to be conducted with the farmers. In response to this situation, three options were identified for implementing the FFSs: face-to-face sessions, online virtual sessions and the use of text messages. These methodologies, adapted to the "new normal", made it possible to implement the FFSs with the target groups of farmers, including even women, whose participation usually is low.

An essential element in developing the NAMAs for rice and cattle was the baseline assessment that established the measures that would be adopted to reduce greenhouse gas (GHG) emissions and which would also contribute to climate adaptation on the farms. The assessments were conducted in the field – on the plots where the field activities of the FFSs were implemented.

In this way, training the farmers in the mitigation and adaptation technologies that had been prioritized for the NAMAs was combined with conducting the baseline studies regarding GHG emissions. This helped strengthen the capacities of the farmers as part of the roadmap for developing the NAMAs for rice and cattle.



Source: Pitre et al. 2021

Lessons learned

- Be flexible in proposing venues and means for co-innovation. Despite the sanitary restrictions, by leveraging the three different modalities for implementing the FFSs, it was possible for each technical facilitator, according to the resources available, to reach his or her target group.
- Motivate the crop and livestock farmers to participate by developing new agricultural activities and advising them of the profitability of the activities being promoted. These are key elements to maintaining farmer interest and commitment throughout the process.
- Promote the FFSs as spaces for sharing different points of view and for the co-creation of knowledge that can be applied directly on the plots where the FFSs are conducted. The training materials should highlight the complementary nature of the adaptation and mitigation technologies that are shared and prioritized.
- Adapting FFS implementation to pandemic-related restrictions can be replicated in any place, for any activity and at any time, as long as the correct use of the virtual platform is ensured.

Experiences in Honduras:
Co-innovation in adaptive project management

Location

Lenca woman, (c) SNV

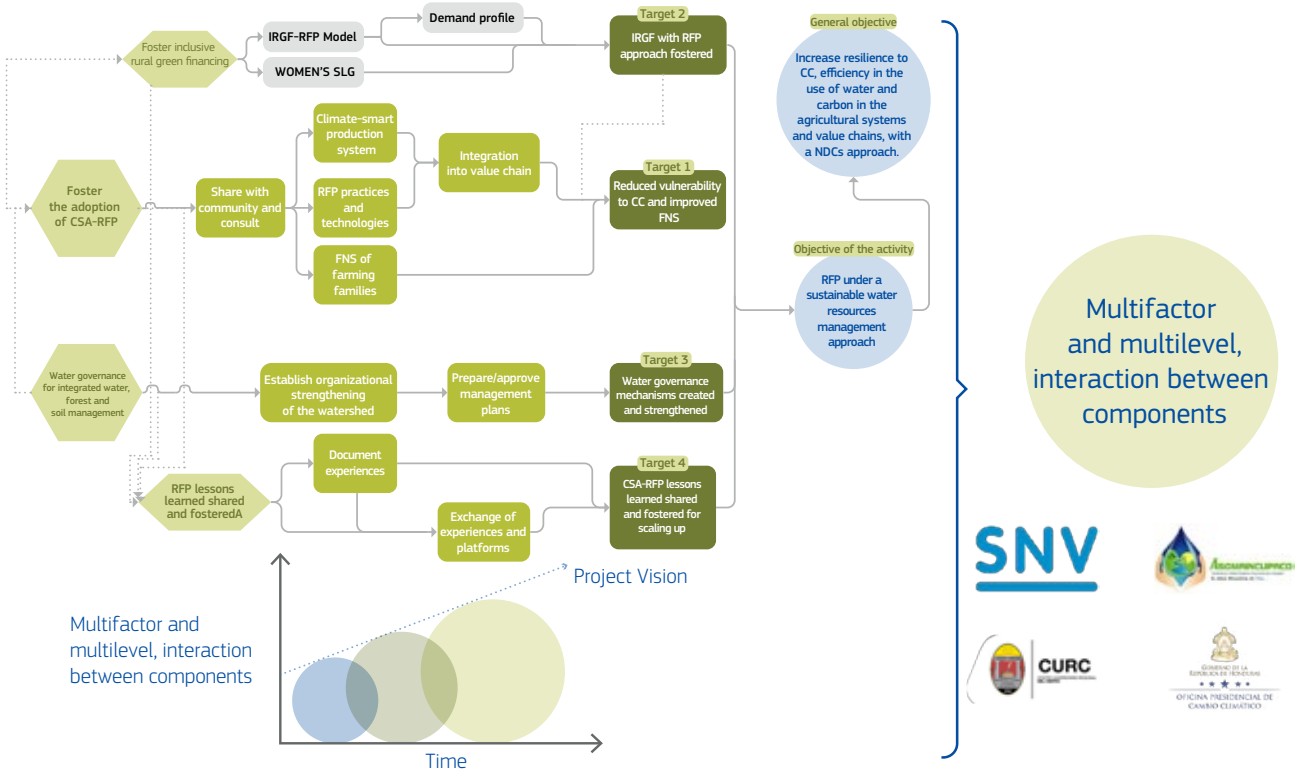
Co-innovation is joint, complementary innovation carried out by different stakeholders. Co-innovation arises as a result of the need to respond in an adaptive manner to a sharp and sudden change in the context that affects an existing plan. For the project Climate-Smart Family Agriculture for Resilient Food Production (CSFA-RFP), coordinated by the Netherlands Development Organisation (SNV) and implemented jointly by the Association for the Integrated Management of the Watersheds of La Paz and Comayagua, Honduras (ASOMAINCUPACO), and the Presidential Climate Change Office of Honduras (OPCC), in 2020, the original project plan was affected by sanitary restrictions related to the pandemic and by the impacts of hurricanes Iota and Eta in the area of intervention. In view of these circumstances, adaptive management and multistakeholder and multilevel action were incorporated into the project's implementation strategy.

The structure and operation of the project management unit proved to be beneficial to the efficient implementation of the activities. The contributions of an experienced global organization familiar with the national and regional contexts (SNV) and of a local organization with strong social capital within the project intervention area (ASOMAINCUPACO), accompanied by the strategic guidance of the OPCC, facilitated the implementation and validation of the solutions as well as their alignment with and contribution to the country´s 2015 Nationally Determined Contributions (NDCs) to the Paris Agreement.

Adaptive management means being flexible enough to modify existing plans, while remaining focused on project objectives and expected outcomes. The structure of the project management unit and the multistakeholder and multilevel approach contributed to creating enabling conditions

for the process of co-innovation. However, three external hindrances (hurricanes Eta and Iota and the COVID-19 pandemic), made the achieving an efficient co-innovation process more challenging (Benavidez, 2020).

The concept of co-innovation



Source: Benavidez, 2020

Lessons learned

- Adaptive management should be part of the implementation strategy of rural development projects, given that the measures implemented in such projects are related to dynamic contexts in which adjustments are needed when the scenario changes, requiring flexibility.
- In order to ensure a multilevel and multistakeholder approach, key stakeholders should be included in developing the project design (initiating negotiations from the development of the concept of the initiative), and/or a local partner with strong social capital and a political counterpart with strong advocacy capacity should be included.
- Strengthen capacities and democratize the use of ICTs among local stakeholders and farmers. Rural youth are an excellent resource for promoting the use of these technologies.

Virtual media in co-innovation processes

©Sotz'il. Women in Guatemala take part in a webinar on how to cultivate camote, organised by SNV, Sotzíl, MTFRL and the Centro Internacional de la Papa

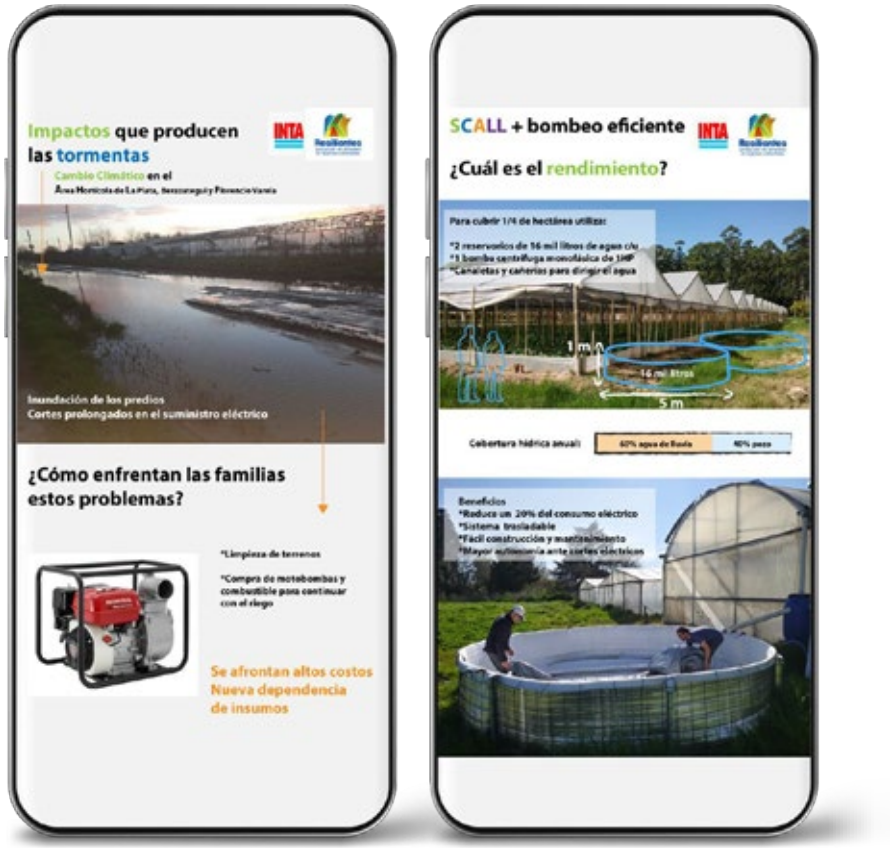
In Latin America, the EUROCLIMA+ programme has carried out integrated experiences through co-innovation processes that aim to support the adoption of good practices within the Agriculture, Forestry and Other Land Use (AFOLU) sector; promote vertical and horizontal governance and improved policies and strategies; develop financing mechanisms for climate adaptation and mitigation; strengthen monitoring systems for regular country reporting; and integrate gender and intergenerational approaches as important cross-cutting themes. These experiences are also expected to support the implementation of the NDCs under the Paris Agreement of the United Nations Framework Convention on Climate Change.

The changes described above require consultation, knowledge exchange and learning. When the situation permits, this entails in-person events, such as workshops and meetings, farm visits, FFSs, seminars and conferences, to name a few of the most common types of activities. However, when distances are great or access to the locations is difficult, as is often the case in rural development projects, the expense involved in bringing stakeholders together can be very high.

Information and communication technologies (ICTs) are becoming more accessible to stakeholders in the Latin American agrifood sector, including rural families, extension workers, scientists, government employees and others. Not only do they facilitate participation in new models of

cooperation and information, they also create opportunities for people to access services and technical assistance that are made possible by virtual technologies. Youth, in particular, are taking on new roles in this context, and more emphasis is being placed on intergenerational collaboration. Finally, more applications are being developed for smart devices, which provide opportunities for all the interested parties to co-create answers to the sector's challenges.

Expanding and promoting the use of virtual technologies has become much more important since 2020, due to the COVID-19 pandemic. Enabling conditions, such as expanded internet coverage, better access to training centres or smart devices, the availability of platforms and applications for communicating with target groups and the routine use of digital devices in daily life on the part of many, have facilitated the development and provision of virtual services by development organizations, extension services and academic and professional training institutions. Obviously, countries that are more advanced in terms of internet coverage, such as Uruguay, have been able to leverage these opportunities to a greater extent. However, it is apparent that all countries are adapting to this "new normal", which is nullifying the previous paradigm: "Only in-person events can have an impact."



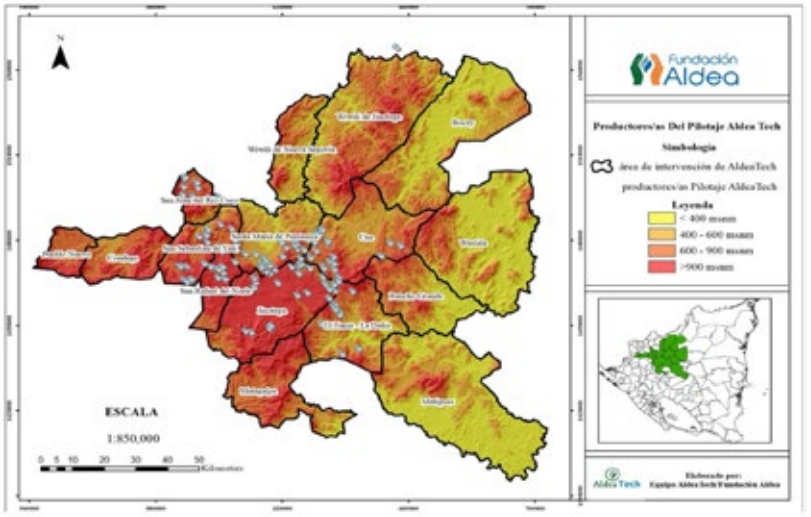
Source: INTA

Case study:

Nicaraguan coffee farmers participate in co-creating the AldeaTech platform

The AldeaTech platform is a technical assistance model based on the use of ICTs, which analyses data and information from specific sites to design agricultural recommendations tailored to the reality of each farm. Using coordinate systems and digital platforms, the tool monitors the climate, in particular the variables that affect coffee, the crop chosen to pilot and develop the tool.

Additionally, the constant monitoring of pests and diseases and the characterisation of the farms provide a broader vision for identifying agricultural practices that can improve coffee productivity and reduce climate-related risks. Farmers are also provided with agrometeorological reports and agricultural recommendations through a mobile application of the AldeaTech platform.



Source: Sánchez, 2020

In 2020, AldeaTech was piloted with 150 coffee farmers in Nicaragua, located in strategic zones where recommendation domains, or homogenous zones, are more easily identified. Investments were made in innovative technologies to characterise the soil and in big data and machine learning to fully automate the platform's mobile application.

The challenges that arose during the pilot were the lack of connectivity in some rural areas and the lack of technological literacy on the part of some farmers, known as tech migrants. Certain conditions are necessary in order to replicate this technical assistance model, including having the necessary technical capacity, internet connectivity in rural areas, communication strategies, alliances with similar organizations and financial resources.

This initiative has shown that investing in technology can benefit male and female farmers, who receive assistance to improve their crops at a relatively low cost, as well as organizations, which can shorten distances and offer their services to more people by using technology, while significantly reducing their operational costs, increasing their footprint and improving their positioning – all key elements for the growth of an organization (Sánchez, 2020).

Lessons learned

- It is key to develop a product that satisfies a given need.
- Paradigm shifts related to male and female farmers' resistance to using technology can take time.
- Generational renewal is the stepping stone for leveraging technology in the field.
- All technological development projects must have a pilot phase. It is essential to constantly monitor the use of platforms in order to learn about their functioning and make the necessary adjustments.
- Strategic alliances with service providers can help to cover the costs of platforms.
- Expanding the service to other sectors can drive further development of platforms.

Case study:

Communities of practice in the Andean region facilitate innovation in pest management based on life-cycle modelling of insects, using ILCYM 4.0

Location

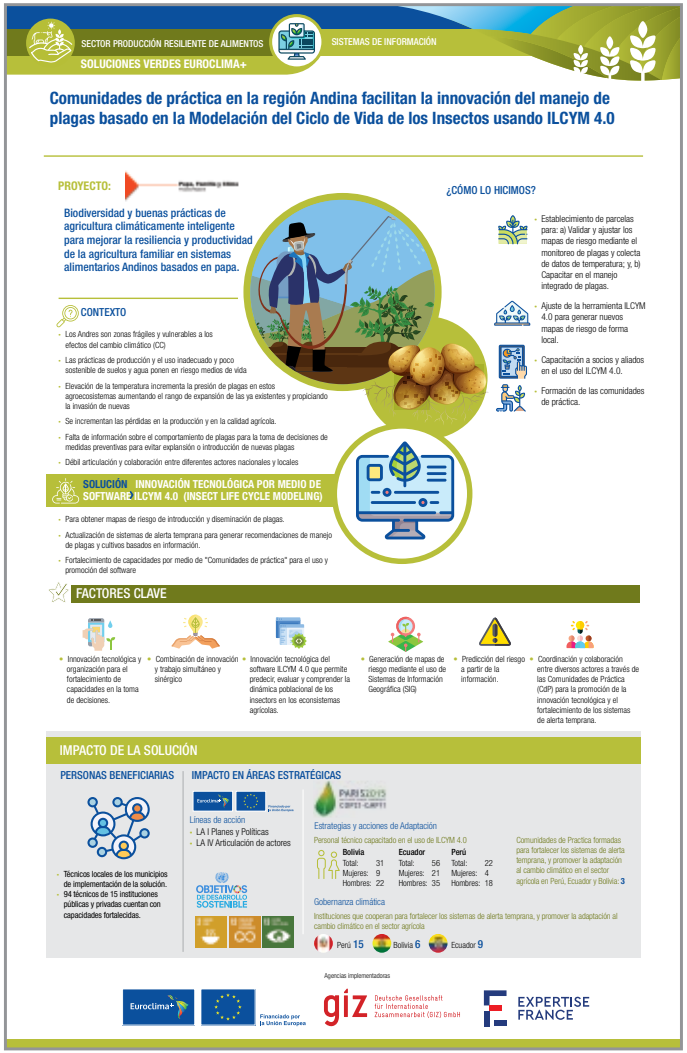
The tool Insect Life Cycle Modelling 4.0 (ILCYM 4.0) produces maps showing the risk of pest introduction and spread, which feed into early warning systems and support decision-making. Communities of practice in over 30 institutions in Bolivia, Ecuador and Peru foster the exchange of information, generate knowledge around the tool and apply the tool to other major pests in their countries. The primary target audience for the tool is technicians who are involved in local and national early warning systems in each of the countries, who transmit possible solutions for preventing pest introduction and expansion in the farmers' crops. The tool has been implemented in the Andean countries for the main pests affecting the potato sector. The information generated in the process of validating the tool allowed for the developmment of technical recommendations for improving the climate resilience of the farming families, particularly related to changing temperatures and the spread of pests.

Local technicians from the municipalities of Independencia, in Bolivia, and Concepción, in Ecuador; from the regional office of the Ministry of Agriculture in Cotopaxi, Ecuador; and from the NGO FOVIDA, in Peru; welcome the information generated, as they can apply it to advise farmers in their areas of operation.

Ninety-four technicians from 15 public and private institutions linked to early warning systems, as well as civil society organizations, contribute to the system and have strengthened their capacities in modeling, creating pest life cycle tables and using GIS systems, working together in communities of practice. Peruvian institutions, such as the National Meteorological and Hydrological Service (SENAMHI) and the National Agrifood Safety and Quality Service (SENASA) as well as Agrocalidad, in Ecuador, indicate that the information generated through the ILCYM 4.0's risk maps, provides better and more scientific guidance on where pests may appear, which enables them to make decisions on where prevention measures should be implemented to avoid potential losses. Furthermore, the National Agricultural Research Institute (INIAP), recommends the use of ILCYM 4.0 on a regional level as it enables the institute to make predictions regarding the appearance of pests and the severity of the infestation.

The maps and risk indicators produced by ILCYM 4.0 are "impact precursors" which, through early warning systems and the transfer of technology, can have a positive impact on the farmers. In disseminating the information and recommendations created through these systems, it is important to take into account the different needs of men, women, youth and vulnerable groups, in terms of their access to resources and services, their different levels of participation in decision-making and in civil society organizations, their different productive and reproductive roles, and differences in other socioeconomic and cultural variables. These considerations are essential to converting the impact precursors generated by the ILCYM 4.0 tool into positive impacts for farmers and for vulnerable groups.

The implementation of the tool is a process of participatory research that is action-oriented and aims to strengthen capacities, including knowledge management, in all the phases of the process: from the establishment of plots for pest monitoring and temperature data collection, through the use of the maps for decision-making purposes. The knowledge which is generated in the process is managed at two levels: first, with field technicians and farmers in order to learn about the relationship between the life cycle of the insects and temperature, and how that relationship impacts the spread of the pests as well as the implications for pest management; and second, at the level of communities of practice (COP). The latter, based on field experience, use the tool to strengthen climate warning systems and technology transfer systems. The process also makes use of training materials and evidence (Velasco et al., 2021).

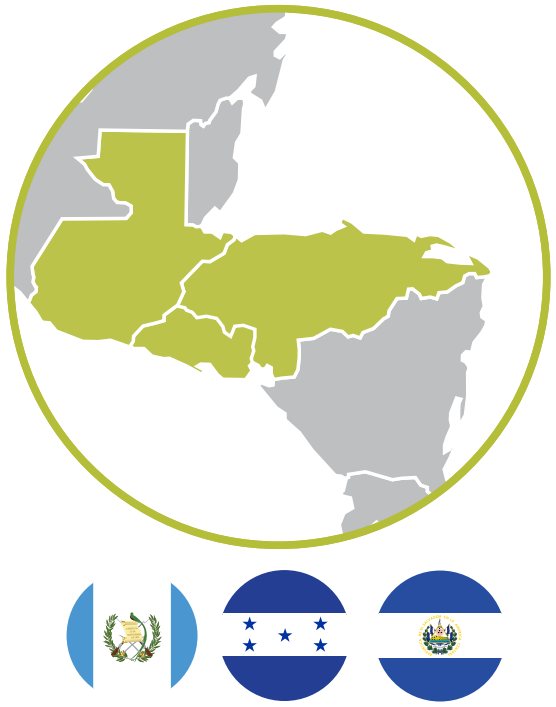


Source: Velasco et al. 2021

Case study:

Profesionales en áreas rurales de la región Trifinio co-crean conocimientos nuevos sobre el cambio climático en un diplomado virtual

Location



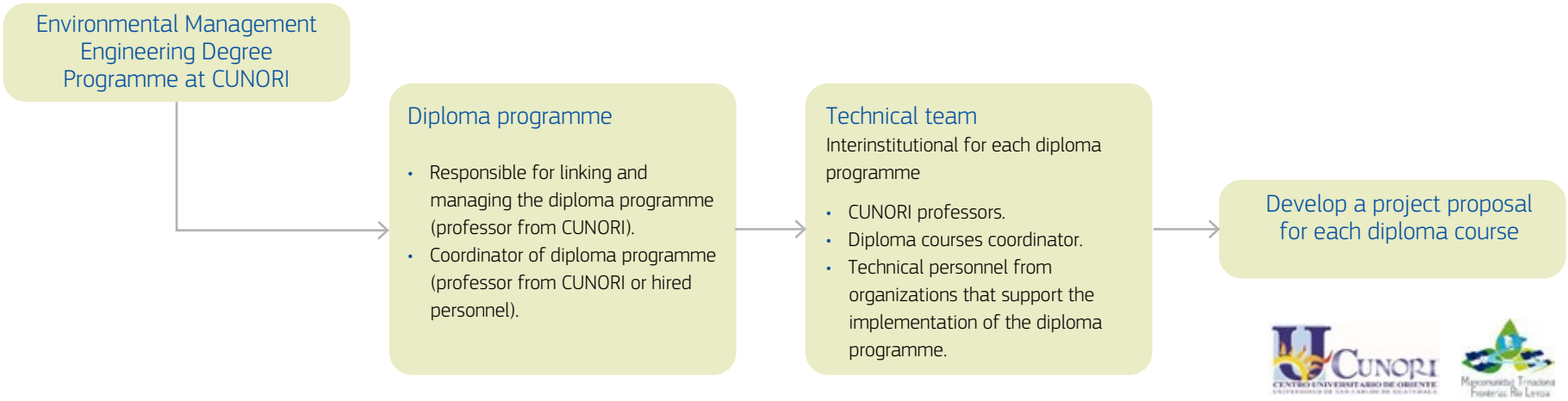
Since 2011, the academic programme of the Eastern University Campus (CUNORI) of the San Carlos University of Guatemala (USAC) has responded to the need for capacity development in the Trifinio region, with face-to-face training and with technical and financial support from organizations operating in the countries of the Trifinio Region (El Salvador, Honduras and Guatemala). These organizations are the Tropical Agricultural Research and Higher Education Center (CATIE) and the Rio Lempa Trinational Border Association of Municipalities (MTFRL).

In 2020, in response to the requirements for social distancing and mobility restrictions related to the COVID-19 pandemic, with the support of a project financed by EUROCLIMA+, a virtual diploma course was offered to 45 municipalities of the trinational region with synchronous and asynchronous study sessions. The course was aimed at technical personnel from municipalities, associations and NGOs, farmers, university students and professors. It was designed based on the training needs identified within the territory and among the target audience. The course applied an open approach that enabled persons of different educational levels to participate (from those who completed three and six years of primary school to undergraduate or postgraduate degrees). The course was conducted virtually with groups of 25 to 30 participants. The course was conducted virtually with groups of 25 to 30 participants whilst the trainings were delivered.

From the start, particular attention was given to the program's long-term sustainability. Resources had to be guaranteed to cover the costs of the essential virtual services: hosting for the Trinational Information System for Guatemala, Honduras, and El Salvador (SINTET), a videoconference platform, and internet service. Additionally, capacities had to be strengthened in using virtual tools: Moodle platform, interactive whiteboards, producing and editing educational videos, etc. Applications were created to collect information and monitor students and graduates to facilitate the learning and innovation process within CUNORI programmes. Finally, information systems continue to be strengthened as tools for capacity development (García, 2021).

Participants in the Training by the Eastern Campus of San Carlos University (CUNORI-USAC), in Guatemala.

Structure of the diploma programme of CUNORI (Eastern Campus of the San Carlos University of Guatemala)



Source: García, 2020

Lessons learned

- Building interinstitutional alliances that contribute to adapting to virtual modalities helps make the process cost-efficient.
- Having a virtual platform that is efficient, user-friendly and stable contributes significantly to the training process.
- Resolve promptly any lack of reliable and high-capacity internet services to avoid issues, mainly when this is a limiting factor, as it is in the Trifinio region.
- Provide participants with internet service and devices (smartphones or tablets) for the virtual training to avoid any constraints to their participation.

Conclusions

The starting point for co-innovation is the needs and knowledge of all stakeholders:

- Co-innovation starts with the concrete needs of the target group and respects the prior knowledge of all those involved. This applies to very diverse areas of interest: the design of technical, social, economic and environmental solutions; the professional training of youth, farmers or women's groups; scientific/technological exchange to strengthen the innovation processes or the adaptive management of a project.

- For rural families in Latin America, co-innovation is an effective methodology for finding feasible solutions to their challenges, which not only increase their climate resilience but are also climate friendly.

Increase scope through the use of information and communication technology tools:

- COVID-19-related sanitary restrictions accelerated the evolution of co-innovation by driving the use of new, virtual channels of cooperation and co-creation. This has demonstrated the creativity of the stakeholders and the real progress in the coverage of telephone and/or internet service in many countries, nullifying the old paradigm of "only face-to-face events work".

- Virtual methods do not replace in-person activities if they do not offer complementary opportunities to reach target groups on all three levels – the family, extension workers and scientists. They must also facilitate real-time access to pertinent information so that they reach any number of participants at any distance, not only in times of pandemics.

- Key to the above is strengthening strategic alliances with service providers and/or organizations or institutions that have prior experience. This saves time, prevents errors at the start of the process and helps to reduce costs..

- It is important to ensure that the necessary technical capacities and virtual methods and tools (online platforms) are in place in order to support the transition from in-person to virtual activities.

Foster the inclusion of youth, women and indigenous communities:

- At the community level, the role of promoters who live in the communities is even more important in the context of health-related restrictions. Promoters serve as a bridge of trust between the technical teams and the families, which helps them come to an agreement on the topics to be covered in the virtual events, regarding the community members' farms.

- However, it has been noted that the participation of youth, women and indigenous communities in processes of knowledge co-creation and decision-making increases with the increased use of virtual methods.

Foster adaptive management within the projects:

- Finally, co-innovation is a good approach for adaptive project management in development projects due to its flexibility in the face of changes that can impact existing plans.

- Monitor the co-innovation process to support the learning process of those involved. This includes evaluating the process through a satisfaction survey administered to the various stakeholders.

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