NATIONAL SCHOOL OF PLOT IRRIGATION, ECUADOR

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ABSTRACT

Within the framework of the Latin American Investment Fund of the European Union (LAIF), as a complementary contribution to the Technified Irrigation Project for small and medium producers in Ecuador, the Spanish Agency for International Development Cooperation (AECID) handed an assistance to the Ministry of Agriculture and Livestock of Ecuador, which is developed by its Under-Secretary of Technified Irrigation of Plots. The LAIF action includes the design and implementation of the National School of Plot Irrigation (ENIP) of Ecuador, commissioned by AECID to the spanish state company TRAGSA, during the period 2017-2021.

The specific objective of ENIP is to strengthen the national capacities in design and management of irrigation systems, through the consolidation of a critical mass of experts and professionals in irrigation, which contributes to the improvement of the productive systems, to the efficient management of irrigation water and to the resilience of ecuadorian territories to climate change. ENIP has constituted an Academic Coordination Committee and has three main components: training and technical assistance in irrigation, investments in Universities,and research & development & innovation.

Within the training, three academic levels have been designed. First one, for irrigation consultants aimed to irrigation specialists. A second level, aimed to managers and administrators of irrigation systems. And a third level, directly to the farmers. In the component of investments, demonstration plots of irrigation are being built and equipped with Universities in different parts of Ecuador, in order to have a network reference experiences, both in the coast and mountain regions, representative of territorial diversity.

At the same time, ENIP is creating a National Irrigation Observatory, with the development of forums, publication of irrigation technical books, Finally, the main lines of R&D&I in which progress is being made are resilience to climate change and agroecology and interculturality in plot irrigation.

Keywords: capacity building, irrigation systems, efficient water management, sustainable rural development, climate change, food security.

1. INTRODUCTION

Within the framework of the Latin American Investment Fund of the European Union (LAIF), as a complementary contribution to the Technified Irrigation Project (PIT) for small and medium producers in Ecuador, the Spanish Agency for International Development Cooperation (AECID) handed an assistance to the Ministry of Agriculture and Livestock of Ecuador, which is developed by its Under-Secretary of Technified Irrigation of Plots (SIPT).

The LAIF action includes the design and implementation of the National School of Plot Irrigation (ENIP, by its initials in spanish) of Ecuador, commissioned by AECID to the spanish state company TRAGSA (www.tragsa.es), wich is specialized in

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environment and rural development with more than 40 years of experience. ENIPis going to be developed within the period 2017-2021.

Figure 1. Logos of ENIP, European Union, Spanish Cooperation and Ministry of Agriculture and Livestock of Ecuador.

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2. METHODS

ENIP has constituted an Academic Coordination Committee where SIPT and AECID-TRAGSA, and Universities of Ecuador and Spain are integrated; such as Polytechnic Superior School of the Army(ESPE), Polytechnic Superior School of Chimborazo (ESPOCH), Polytechnic Superior School of the Littoral (ESPOL), Central University of Ecuador (UCE), Salesian Polytechnic University (UPS), Polytechnic University of Madrid (UPM), Technical University of Manab i(UTM) and the National Institute of Agricultural Research of Ecuador(INIAP). At the same time, alliances are being generated to incorporate other Universities as Technical University of the North(UTN) and National University of Loja(UNL), orfrom different countries.

As well as opportunities with international organizations, such as the Food and Agriculture Organization of the United Nations (FAO) or the International Commission on Irrigation and Drainage (ICID).

The training component has three academic levels. First one, for irrigation consultants aimed to irrigation specialistswith a multidisciplinary approach. A second level, aimed to managers and administrators of the different irrigation systems in Ecuador. And a third level, directly to the small and medium farmers. In each of these levels, there are three phases of work: design, preparation of teaching materials and teaching of training courses.

Design studies are made of the target population in each level, to find out their level of knowledge and needs to perform their functions.The goals are also redefined to train 420 managers and 420 administrators of irrigation system,in 14 provinces of Ecuador.And the training of 150 irrigation consultants aimed at irrigation specialists of different professions. Irrigation projects require an integral approach, where their technical, social, environmental and economic technical aspects are valued, forming multidisciplinary teams with different specialist professionals to guarantee their sustainability.

For the first level: training of trainers, is necessary to implement a permanent and adequate approaches and communication, using online and face-to-face methodologies.It has been established to train 100 teachers for irrigation especisalist and 80 teachers for managers and administrators of irrigation systems.

For the third level, a national study of training needs of farmers is necessary to establish didactic tools applied to use directly with farmers, which can also be developed individually or collectively according to training needs. The design of this program will be completed by adaptating the ENIP approaches, with a strong link to the PIT, which will allow subsequent developments depending on availability of resources.

The different teaching materials are being prepared in a process of collective construction, under an integral and multidisciplinary approach, in a process of learning by doing from the territory to the academy, for sustainable rural development.

Figure 2. Participatory workshops and schedule by provinces for training courses.

Workshops have been held in the SIPT to study the different profiles, coordinated with PIT, Universities, TRAGSA and the Technical Secretariat of the National System of Professional Qualifications.These workshops are attended by members of institutions and organizations from different regions of the country to achieve representativeness. The work is done directly with the recipients of these training to improve their knowledge and skills.

Also it is necessary a rural zoning of the territory at a national level for face-to-face training. The defined groups and provinces are: Carchi, Imbabura and Pichincha, Loja, Azuay and Cañar, Tungurahua, Chimborazo y Bolivar, El Oro y Santa Elena, y Guayas, Los Rïos y Manabí. And the development of a platform for on-line training. It has been worked with spanish academics- fromPolytechnic University of Madrid (UPM) and National University of Distance Education (UNED) - and ecuatorian computer professionals for its implementation.

Through the Academic Coordination Committees, the component of investmentswas presented, and the characteristics and conditions for its development were communicated. In this sense, it is necessary to adjust the proposals for demonstration plots within the principles of the ENIP, its link with agricultural communities for their social benefit and sustainability,and their integration within the knowledge network, as well as the availability of water resources and land. To this end, numerous meetings and visits to the field (campus and facilities) have been carried out at the Universities and INIAP, to support the technical definition of the proposals for irrigation, and review of compliance with the necessary requirements for these investments.

This work has been carried out jointly between teachers andresearchers of the Universities and INIAP, and technical personnel of SIPT and TRAGSA, until establishing a document of the action for each irrigation plot.

Figure 3. Signature of agreement for irrigation demonstration plots with Universities, Under-Secretary of Teachnified Irrigation of Plots and TRAGSA.

Just as it is planned to implement adapted software and drones to support the development of the irrigation projects.

ENIP also includes the creation of a National Irrigation Observatory in the Ministry of Agriculture and Livestock of Ecuador, where the information and knowledge generated by the project is centralized. Activities and reflection events will be promoted, a national debate on irrigation and public policies, as well as exchanges of experiences. This observatory could also encourage the incorporation of indicators of sustainability and climate change. The National Irrigation Observatory has among its goals the development of national and international forums and the publication of technical books on these topics.

The main R&D&I lines in which progress is being made are resilience to climate change - deepening the water needs of crops -, and agroecology and interculturality in plot irrigation - integrating the experiences and worldview of the rural population.

Figure 4. Agrometeorological stations and hydraulic testing laboratories.

3. RESULTS AND DISCUSSION

3.1 Training Plan

This component has begun with the training of trainers. Teachers are being trained for irrigation specialist by onlinemethodologies, with the UPM and UNED Universities. And teachers for managers and administrators of irrigation systemsby face-to-facemethodologies.

Contents for trainer of trainers to irrigation specialist:

1. Fundamentals of digital distance learning.
2. Bases for the design of online courses and production of materials.
3. Learning activities, training feedback and evaluation in online courses.
4. Support systems for students through tutoring.
5. Quality of online courses.
6. Approaches of ENIP.

And contents for trainer of trainers to managers and administrators of irrigation systems:

1. The foundations of ENIP for small and medium producers: farmer family agriculture and the social management of irrigation; interculturality; gender; environment and climate change; legal and institutional framework for irrigation.
2. Adult education and teaching planning: how the knowledge is constructed? how do adults know? how should I teach adults? pedagogical mediation; planning teaching.
3. How does didactics improve?: activities and didactic materials.

Figure 5. Training manuals for managers and administrators of irrigation systems.

For the next phase, ENIP has develped the courses of managers and administrators. Contens for managers of irrigation systems:

1. Managers, general approach to their work and daily activities.
2. The organization of irrigators and their strengthening for the implementation of technical irrigation.
3. Improvement of agricultural production and technical irrigation.
4. Operation and maintenance of technical irrigation systems and support tools

And contents for administrators of irrigation systems:

1. Administrators, general approaches to their work and and daily activities.
2. The administration of an irrigation system.
3. Regulations for economic management and accounting control.
4. Organizational strengthening mechanisms and tools.

Different materials have been developed, such as manuals and support videos for training.

Figure 6. Videos on land irrigation, farmer women, micro reservoirs, good agricultural practices and the daily work of the manager.

Finally, first promotions of professionals who have received training are already resulting.The Technical Secretariat of the National System of Professional Qualifications (SETEC) has joined the work for the certification of these professionals trained in ENIP.

Figure 5. Teaching of training courses and delivery of certificates to students.

3.2 Demonstration Plots of Irrigation

First demonstration plots of irrigation experiences have already been built and equipped, around the Universities of Ecuador, in both regions: the coast and the mountains. This has been achieved with a joint work of Universities, SIPT and AECID-TRAGSA.

These plots have all the equipment and facilities to show students, specialists and farmers the different irrigation techniques and the development of representative crops, considering the territorial diversity.

Figure 6. Construction and equipping of demonstration plots of irrigation in Universities of Ecuador.

They also allow the measurement of different parameters to improve irrigation practices as well as researches.

At the same time conventional farming systems are reproduced, new technologies such as hydroponics are proposed, offering different possibilities in the parcel demonstration plots.

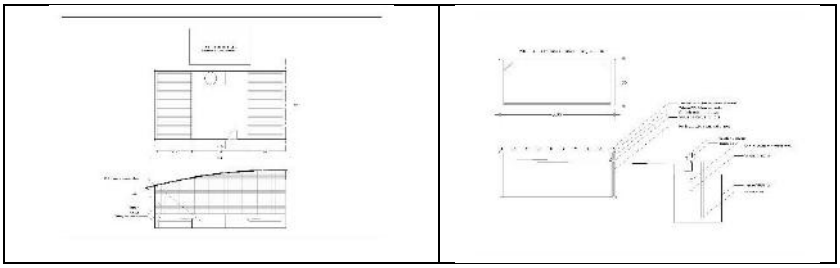

Figure 7. Hydroponics systems designs.

The network of demonstration plots is managed to share different techniques between the different Universities and INIAP at the national level. As a further purpose, this project pursue the integration of knowledge, between the academical and the one that is in the hand of the local farmers.

3.3 National Observatory of Irrigation

The National Irrigation Observatory has developed different forumsas:
- International forum on the importance of smallholding irrigation in family agriculture (2017)
- International forum of ancestral practices on the productive use of water (2018)
- National forum of agroecological experiences and water management for resilience to climate change (in action, 2019).

Figure 8. International Forum with experiences from Ecuador, Colombia, Peru, Bolivia, Mexico and Spain.

3.4 R&D&I

In a joint work of TRAGSA and the SIPT with the Universities and INIAP, the research lines of the ENIP have been created, under a collective research concept and network of shared knowledge at the national level, with international projection.

The lines of research that were approved in Academic Coordination Committee are:

1. Resilience of agriculture to climate change
2. Agroecology and interculturality
3. Territorial planning and governance

For each of them, a Research Working Group was set up, with researchers from the different Universities, INIAP and TRAGSA.

The greatest development has occurred with the first group, related to the resilience of agriculture to climate change, with specific meetings and exchange of proposals to consolidate this line of research. This responds to the need to have in Ecuador with crop coefficients (kc) typical of real agroclimatic conditions and that reflect the diversity of the country, for the most significant crops in the region.

Work has been carried out on the logistics of a territory research network, which covers both the reality of the coast and mountain regions, and of the north and south, as well as its insular specificity. It is planned to develop in the campuses of different Universities and INIAP, distributed according to this territorial representation and national scope. They will also incorporate more Universities in ENIP to achieve this complete network.

This investigation complements the installations of the National Institute of Meteorology and Hydrology (INAMHI) of Ecuador.

Finally, a lysimeter model has been defined and designed, by the agreement of the research work group.

Figure 9. Design and construction of lysimeter model.

In relation to the working group of research in agroecology and interculturality, we have worked on initial proposals that are being developed for their consensus, based on its principles and according to their cosmovision.

In this sense, and within the framework of the National Irrigation Observatory, it has been agreed as a theme of the third forum of ENIP, agroecological experiences and water management for resilience to climate change.

In this sense, the emphasis of the research is on the real needs, especially among the farmers of the country, based on their knowledge and direct experiences.

4. CONCLUSIONS

The creation of meeting places like ENIP allows to strengthen the efforts that are being developed by the different Institutions and Universities, and to generate collaborative alliances. The Academic Coordination has been established collegiate and participatory, working with a collective construction approach of ENIP. ENIP also generates joint research lines at national and international level, addressing issues of greater territorial scope and facilitating the systematization of trials.

The construction of demostration plots of irrigation allows to cover the territorial diversity and local knowledge, and to generate a network of experiences in common.

National Observatory of Irrigation allows to centralize in the Ministry of Agriculture and Livestock of Ecuador the irrigation knowledge generated by different Institutions and Unviersities, to share and develop discussion forums, which also accompany public policies. ENIP has priority in small and medium farmers, integrating their needs so that irrigation professionals can respond to the challenges of food sovereignty in the face of climate change, respecting ancestral knowledge and knowing agro-ecological principles.

The courses are conceived as an integral dimension in the training of professionals in irrigation, that will further strengthen the creation of multidisciplinary teams with a horizontal articulation between different specialties. At the same time, a vertical articulation that connects the knowledge of farmers and the academy to enrich the questions and solutions offered. ENIP facilitates the creation of national representation and participation in international commissions such as ICID for the exchange of knowledge.

ENIP can be a pilot program for other national irrigation schools in Colombia, Peru or Bolivia, as well as grouping the Andean Region, or other regions as Central America.