



Learning of trained diplomats on the agricultural innovation system in Cuba

Aprendizaje de diplomantes formados sobre el sistema de innovación agropecuaria en Cuba

 Rodobaldo Ortiz Pérez^{1*},  Rosa Acosta Roca¹,  María Isabel Romero²

¹Instituto Nacional de Ciencias Agrícolas (INCA). Carretera a Tapaste, km 3 1/2, San José de las Lajas, Mayabeque, Cuba.

²Centro de Estudios de Desarrollo Local (CEDEL), Lombillo No. 904 e/ y Belvista, Nuevo Vedado, La Habana, Cuba.

ABSTRACT: Knowledge management is a process of creating values, a fundamental component of the development of Innovations. In local food systems, multi-stakeholder approaches to the process demand the identification of the tools acquired and the ways in which they are implemented to contribute to the adoption or not of them by the multiple actors interacting at the local level. For this reason, this work focused on evaluating the learning of trained diplomats from various territories, after a period of execution of their actions after the learning was completed. Through the application of semi-structured interviews and surveys, it was possible to visualize the knowledge management process developed and the capacities formed to achieve the paradigm shift around agricultural innovation were identified. It was found that, despite the differences detected in the contexts, the skills trained in the diplomats allowed them to draw up strategies in favor of institutional integration with participatory approaches to manage innovations in agricultural systems. Through learning in action and its methodological modalities, it was possible to identify challenges and plan actions to solve them; as well as to design continuous learning cycles in new key actors of the municipalities involved.

Key words: Knowledge management, creation, Participative Action Research.

RESUMEN: La gestión del conocimiento es un proceso de creación de valores, componente fundamental del desarrollo de innovaciones. En los sistemas alimentarios locales, los enfoques multiactorales del proceso demandan, la identificación de las herramientas adquiridas y las maneras de que las mismas son implementadas para contribuir a la adopción o no de las mismas por los múltiples actores que interactúan a nivel local. Por tal motivo, el presente trabajo se enfocó en evaluar el aprendizaje de diplomantes formados de variados territorios, después de un periodo de ejecución de sus acciones finalizado el aprendizaje. Mediante la aplicación de entrevistas semiestructuradas y encuestas, se logró visualizar el proceso de gestión del conocimiento desarrollado y se identificaron las capacidades formadas para lograr el cambio de paradigma en torno a la innovación agraria. Se comprobó que, a pesar de las diferencias detectadas en los contextos, las habilidades formadas en los diplomantes le permitieron trazar estrategias a favor de la integración institucional con enfoques participativos para gestionar innovaciones en sistemas agrarios. A través del aprendizaje en la acción y sus modalidades metodológicas, se lograron identificar desafíos y planificar acciones para solucionarlos; así como diseñar ciclos de aprendizajes continuos en nuevos actores clave de las municipalidades involucradas.

Palabras clave: Gestión del conocimiento, Creación, Investigación Acción Participativa.

*Author for correspondence: ortiz@inca.edu.cu

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INTRODUCTION

In Cuba, an increasingly important role began to be given to knowledge management (KM), where information, knowledge and learning are key to new knowledge and to generating essential competencies in organizations, the latter including personal, technological, organizational, relational and other competencies, constituting intellectual capital (1).

However, KM has transcended from the business scenario to local development strategies, cultural, environmental and development project management, agricultural production, community work, health and natural disaster prevention, and the implementation of forms of social and solidarity economy, with the intention of solving problems of various kinds and increasing the level of well-being and quality of life of citizens. At the strategic level, it allows combining knowledge with development projections to contribute to their materialization (2).

From this perspective, it is proposed to define KM as "the capacity to identify knowledge needs associated with social problems and evaluate them; to search for, produce, transfer, disseminate, apply knowledge and technologies that serve to meet these social needs of the most diverse nature" (3).

One result of KM is innovation processes, from which novelties or improvements in products, processes or forms of organization are implemented, which will contribute to local development to the extent that it generates innovative processes. An innovation system is a fabric that articulates various actors who, supported by institutions, policies and regulatory systems that allow it, interact with each other to produce, disseminate and use knowledge (4, 5).

The Local Agricultural Innovation System (SIAL, according to its acronyms in Spanish) promoted by the National Institute of Agricultural Sciences (INCA, according to its acronyms in Spanish) is a proposal on how to implement a knowledge management and development system in Cuban municipalities, incorporating horizontality and participation (6).

An auxiliary team of managers is needed, made up of people with capacities (knowledge, skills and attitudes) to facilitate and energize the functioning of the structures of the SIAL and concrete innovation processes. Its principles include the contextualized way of carrying out KM, taking into account the particularities of the territories: it is participatory because groups of producers, technicians and leaders and people from the territory are invited to seed and other product diversity fairs and their contributions are taken into account in the learning process; it is inclusive because it incorporates boys, girls, adolescents, men and women into local agricultural innovation processes; it proposes a dialogue between academic knowledge and local and peasant knowledge; it promotes networks that mobilize capacities for local development (7, 8).

One of the methodological references that support KM in SIAL is the action learning methodology, which is based on adult education and participatory action research, the latter of which combines theory with practice.

In 2017, INCA designed and implemented the Diploma in Local Agricultural Innovation System, to strengthen the system in the municipalities where it was already being applied and in new territories. In the first edition, 34 teachers and researchers from all over the country graduated. In 2018, as learning and as a result of the final work of the graduates, new provincial diplomas were opened in various universities in the country to nurture the local management teams in the municipalities where the SIAL is introduced, training more than 200 new professionals and the second national edition of the SIAL Diploma was executed, 52 new graduates were trained, bringing the total to more than 286 throughout the country, and a systematization was carried out to evaluate the learning of graduates trained in various territories after a period of execution of their actions, after a reasonable period of time after the learning process had been carried out.

MATERIALS AND METHODS

Characterization of the SIAL diploma courses

For the design of the diploma course, a diagnostic study was carried out with the provincial coordinators of the PIAL project, inquiring about the contents they considered needed to be incorporated into the training of a local agricultural innovation manager. At the same time, the national PIAL team talked with advisors from the Ministry of Higher Education (MES, according to its acronyms in Spanish) linked to KM, enriching the knowledge and skills to be acquired. This led to the design of a diploma course for training. The design was a challenge: the necessary credits, thinking about the necessary files of the participants, the curriculum of the professors, processing the documentation until it was approved in 2016.

The general objective of the SIAL diploma course designed was to contribute to the training of managers committed to the participatory mission of innovation at the territorial level, in order to contribute to local agrifood development.

The diploma course was aimed at members of municipal Multi-stakeholder Management Platforms (PMG, according to its acronyms in Spanish), a structure of the Innovation System that extends to several municipalities, as well as local stakeholders involved in integral municipal development processes, all of which contribute to the Integral Municipal Development Program and to stakeholders in the agricultural sector.

The graduate must demonstrate satisfactory performance in: Understanding the context of agri-food development in Cuba. Incorporate a sustainable development model, based on agroecology and a social equity approach. Integrating knowledge management, science and innovation to local development. Identify the components of the SIAL and incorporate instruments for participatory strategic planning in the municipalities. Acquire tools for the implementation of the SIAL: the methodology of action learning, popular education, communication, group work and group facilitation, and public policy advocacy. Acquire tools for development management: project management, social and solidarity economy, cooperativism.

In 2017, the first edition began, with professors from various universities, their Municipal University Centers (MUC) and research centers, which would multiply it in their scenarios. Provincial and municipal diploma courses were generated, and new provinces incorporated the SIAL into their strategy. Local authorities were sensitized to the proposals for diploma courses, which were contextualized. Instruments were generated for field work and all were enriched in the group.

In the second national edition, the number of participants was expanded. The design of the diploma courses at the provincial and municipal levels was based fundamentally on modules that were not precisely those of the national level. The starting point is the reality of the people in their territories. Local human resources are used. Sixteen methodologists from the Branch school of the Ministry of Agriculture (ERMA, according its acronyms in Spanish) joined the program.

In the final work, possible diploma courses were designed to disseminate them in the provinces and municipalities. The discussions of the final papers were held in the localities, and it proved to be an excellent idea to discuss them in the different localities.

Methodology used to obtain information and evaluate the learning process

In order to evaluate the learning of the graduates, two ways of knowing the perception of the graduates were used:

The first being: the survey of the criteria of graduates of the different editions, with a survey of 56 graduates from 26 municipalities in 12 provinces between September and October 2019. Topics of the surveys were related to: learning from the individual point of view; from their institutional role; in the context where they work, what impact they denote in their results; skills they have applied; what activities they do differently; what they consider they have learned; what they promote; what is changing in their performance; what is changing at the local level; how they visualize changes.

The sampling technique was of the non-probabilistic type, the selection of the subjects to be studied depended on whether they were from different provinces, from different editions of the diploma course, national or provincial,

selecting subgroups that represent all the graduates, in a stratified random way, determining the strata they make up in order to select and extract the sample from them.

As shown in [Table 1](#), the survey information was collected with the participation of 46 participants, including 31 women from 12 provinces and 36 municipalities. Respondents represent 20 % of all graduates, which makes the survey of respondents in skills applied after the learning process broad and precise.

Being the second: A meeting between October 28 and 30, 2019 with a sample of graduates and teachers of the diploma courses ([Table 1](#)), 32 women and 20 men participated in the meeting, including 24 young people under 35 years of age. A total of 67 graduates were contacted, representing 40 % of the graduates with almost a year and a half of work after graduation, which gives a satisfactory systematization. Both information gathered provided the necessary documentation to evaluate the impact of the formation of the critical mass created in the educational process, with the support of an expert from the International Center for Applied Agricultural Research for Development (ICRA, according its acronyms in Spanish) of Holland, Dr. Juan Ceballos Müller.

The Kirkpatrick Evaluation Model, probably the best known model for analyzing and evaluating the results of training and education programs, was used to show the main results obtained. This model, as shown in [Figure 1](#), is based on four levels of criteria. Level 1 measures how participants react to the training (e.g., satisfaction).

Level 2 analyzes whether participants have really understood the training (e.g., increased knowledge, skills or experience).

Level 3 looks at whether they are using what they learned in their workplace (e.g., change in behavior?), and level 4 determines whether it had a positive impact on the community/organization/system.

This translates into what is called Theory of Change: a methodology for presenting graphically, with a causal logic ([Figure 2](#)), the objectives that an intervention seeks to achieve and the concrete way in which it intends to achieve them. This method is used as a planning tool, but is also useful for designing and evaluating programs and interventions, especially with a social focus (9).

Table 1. Participants in the surveys and encounters among graduates of the SIAL diploma programs

Collection of information on perception	Participants	Respondents or participants	Percentage represented	Time elapsed after defense
Survey	1 st edition	10 of 34	30 %	26 months
	2 nd edition	20 of 52	38 %	9 months
	Provincial editions.	16 of 80	20 %	5 months
Subtotal	11 editions	46 of 166	28 %	Almost 1.5 years
Meeting between October 28 and 30, 2019	1 st edition	19 of 34	56 %	27 months
	2 nd edition	21 of 52	40 %	6 months
	Provincial editions	12 of 80	15 %	5 months
Subtotal	11 editions	52 of 166	31 %	Almost 1.5 years
TOTAL	11 editions	98 of them actual 67 different	40 %	Almost 1.5 years of experience

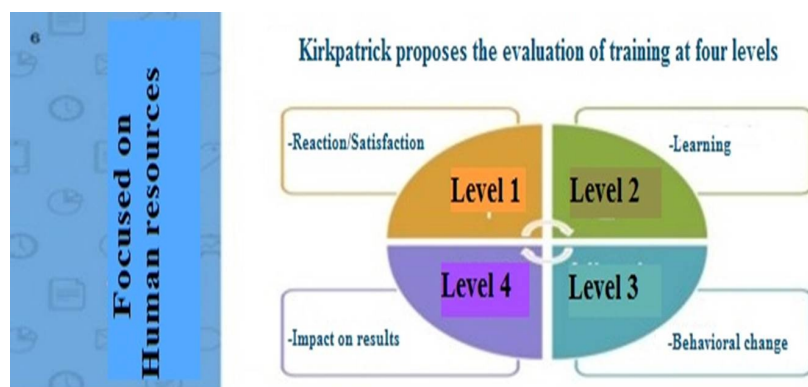


Figure 1. Evaluation of the results according to the Kirkpatrick Model

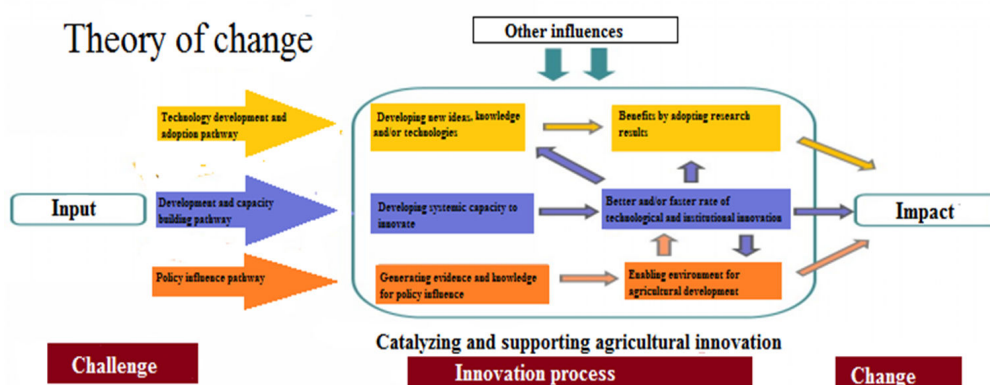


Figure 2. Theory of change

When used for planning and design purposes, a properly elaborated theory of change is the result of a creative, rigorous and participatory process in which the actors involved articulate their objectives and the actions required to carry them out. Every social program is implicitly or explicitly based on a theory of how and why the program works or is intended to work.

In the case of the meeting, four subgroups were created to evaluate the learning in the different groups (group of the 1st edition of the diploma course, group of the 2nd edition, group of participants at provincial or municipal level and the group of teachers). The four levels of satisfaction, learning, impact on results and change in behavior or attitude were analyzed.

The input was based on the capacity building and political influence project being implemented in 75 municipalities in 12 Cuban provinces (PIAL).

RESULTS AND DISCUSSION

Analysis and comments on the responses to the surveys conducted with graduates of the different editions.

- In relation to the four levels of criteria, in the evaluation of the training (Figure 1), at levels 1 and 2 all participants expressed satisfaction, achieving a considerable increase in knowledge and skills. At level 3, all participants reported that they are using what they learned in their workplace, emphasizing behavioral change, and at level

4, most reported a positive impact on the community/organization/system.

- An active collective participation and dialogue of knowledge, a good identification of spaces for concertation of local actors and conciliation of demands. They manage better facilitation in different spaces, concertation and negotiation with local actors, better popular communication, work management and coordination of groups and platforms.
- Use of participatory methodologies, articulation of actors, was the main basis that respondents defined as principal.

What do they do differently?

- They work in function of the articulation with actors, they negotiate with local actors for their articulation, they promote the system vision in local development, they manage direct participation with producers.
- They seek alliances with different actors in the municipality. Identify new actors and problems by applying the action learning methodology.

What do they consider they have learned?

- Being receptive, inclusive and giving free reins to true participation, making better use of collective spaces.
- They attach great importance to the three basic principles of SIAL in all spheres of life (Participation, Collective Protagonism, and Dialogue of Knowledge) in order to be a real agent of change.

What do they promote?

- Multi-stakeholder platforms must be inclusive, participatory and fully horizontal.
- Formation of groups of managers, use of participatory tools and methodologies, mobilization of actors through exchanges, workshops, fairs and festivals, field days, conviviality, SIAL courses and diplomas.

What is changing?

- Real exchanges between and with producers, learning from communication to influence public policies.
- Promotion of the inclusion of a new perspective: gender, group facilitation, use of participatory methodologies, project development, knowledge management and inter-institutional cooperation in the strategies and activities of the institution to accompany and advise the actions of the PMGs.
- Search for partnerships for the solution of demands,
- Evolution of the role of farmers who become leaders, protagonists of innovation processes.
- Improved communication and coordination between the entities involved and the farmers and their associations.

What is changing in the governments?

- Gradually, creation of alliances, incorporation of government and PCC (Cuban Communist Party) decision-makers in training activities, integration of actors, cooperation among them to solve difficulties that arise,

How are the changes visualized?

- Increase in food production.
- In the municipal local development strategy, many of the initiatives are formulated by producers.
- Greater relevance to the role played by women in productive tasks and family care.
- Management of agroecologically based economic alternatives that respond to local problems with the support and advice of the PMGs. Examples: juice production, agro-tourism, rabbit farming, mini-industries for wine, sausages, points of sale of fresh products, food preservation, yogurt sales, sale of handicrafts made from recycled products, etc., that benefit the locality.
- Local seed production and local seed certification systems.

Impacts of the diploma courses raised in the workshop held between October 28 and 30, 2019

The workshop was held within a reasonable period of time after the graduation of the graduates. It was feasible to evaluate the possible impacts of the graduates because all of them had already had a reasonable amount of time to work in their communities.

As a result of the analysis with 31 % of the graduates of the two editions of the national diploma courses and

a small representation of provincial diploma courses and 10 professors or members of the academic committees, it was possible to obtain valid information to rely on the impacts described.

Based on the Impact Pathway defined by the participants, what changes needed to be achieved?

To train managers to strengthen local agricultural innovation and to empower them where they already existed. Multiply the proposal among different groups and strengthen commitment.

What have they learned ? (results reiterated by all participants)

Linked to the Context: To develop socio-educational intervention processes in agricultural contexts, taking into account their problems and potential.

Linked to the Local Agricultural Innovation System: Institutionalize the tools and Good Practices of the SIAL for sustainability. Incorporate SIAL languages and principles in their skills.

Linked to conflicts: Need for the training of managers to handle conflict mediation techniques Articulation relations: Identify procedures for the articulation of institutions and actors, including producers.

Good Practices: Perception of the implementation of good agroecological and action learning practices as a dynamizer of social economic development.

Linked to learning: Incorporate individual, group and institutional learning. Work with action learning cycles.

About the execution of the diploma course, what has been learned: To visualize that there was a wide interaction between professors and students that created a commitment, that a high motivation was created in the students, that the topics were contextualized and that allowed gaining clarity in the interpretation of knowledge. Elaborating a design of the final papers in two variants was very well directed to the objective of training managers (designing a local diploma course and elaborating a plan of action of the SIAL) and making the discussion of the final papers in the territories. Understanding how the integrated agricultural knowledge management system works and the structure of agriculture itself provided greater integration of the various subjects.

Changes achieved in the institutions where the graduates participate

A culture of participation in action learning processes has been acquired in scientific institutions. Formulation of national projects for collaboration with international projects. The articulation between Municipal university center (CUM, According its acronyms in Spanish) and MINAG has been favored towards the needs of agricultural training aimed at local development.

a. Evaluation of learning: What has been learned and impact in the territories? Achieved a higher level of awareness among the different leaders and producers. Increased levels of effective participation

of the different local stakeholders in decision-making on issues affecting the local agricultural context based on the different degrees of involvement. Examples: training courses, expo-fairs, creative women, field work in research, workshops, commemorative dates. Design of communication strategies in the institutions.

b. Potential impact of the development of the SIAL Diplomas. The action learning methodology is based on adult education and participatory action research, a modality that combines theory with practice, promoting processes of action-reflection-action. It has the singularity of rethinking the role of the researcher by privileging collective construction and recovering the knowledge of researchers and producers, breaking with the classic subject-object binomial of the traditional technique.

In action learning, participants learn from their own experience in exchange with others, discover a challenge and propose alternatives to face it, the contribution of all participants is relevant, as everything happens through different moments: planning, execution and continuous reflection. In this process it is essential to have a facilitation team that coordinates each learning cycle according to the challenges identified.

In Cuba, the action learning methodology has been applied since 2000, being very active in FP and PIAL projects, stimulating innovations in agricultural production (e.g., cultivars obtained through participatory plant breeding, design and production of organic fertilizers, production of preserves and dried condiments, among others). After fifteen years, the thesis is confirmed that in the municipalities where it is implemented, economic benefits increase and innovation is reoriented towards the demand of Cuban consumers for seeds, technologies and food.

The collaboration with the Branch School of the Ministry of Agriculture (ERMA, according its acronyms in Spanish) and the participation of the general management of the ERMA in the preparations and having been its director, member of the different academic committees, main professor of the first course of the diploma, achieved a real impact in the Ministry of Agriculture, making possible, together with the impacts achieved in the different localities where PIAL participates, that the Directorate of Science and Innovation of MINAG demanded to INCA, that the SIAL Specialty be designed by the protagonists of the PIAL project.

At the same time, the design of the short-cycle career of Agricultural Innovation Manager (AIM) was processed, one more link to make the dissemination of knowledge management a reality in the different localities. In 6 provinces, the governors asked the MES to design the TS AIM career.

There is a critical mass of almost 300 people in SIAL, a figure that will increase in the coming years. The diploma contributes to municipal development strategies and prepares people for the country's new policies.

Knowledge management in the Local Agricultural Innovation System (10) is a working tool for local governments. A theoretical approach of the KM

category, its arrival in Cuba and the particularities of its application is made. It presents the fundamental concepts for understanding the relationship between knowledge management and innovation for local agricultural development and presents the results of knowledge management in SIAL. The results show contributions of KM to agrifood and local development, as well as increased well-being of agro-producers and a strong motivation of boys, girls, youth, men and women towards IAL.

It was generally agreed by the participants that, as part of the SIAL, the Local Agricultural Innovation Groups (GIAL, according its acronyms in Spanish) articulate actors allied to development demands, with common challenges and interests, who innovate to generate solutions in the socioeconomic and productive sphere, for example: a group of farmers interested in producing locally certified bean seeds. Groups such as this are the basic level of the social organization of innovation proposed by SIAL.

Among the methodological references that support KM in SIAL are the methodology of action learning and the concept and methodology of popular education, which are of great importance for the operation of the System (5, 6).

The main results and achievements of the various editions of the diploma course, according to the participants in the meeting, were as follows:

1. Hundreds of farmers, researchers, technicians, civil servants and teachers, as well as local organizations and governments, scientific institutions, universities and technological institutes were involved under the principles of SIAL.
2. The development of diploma courses was promoted in several universities and CUMs in the country. To date, several have been held, demonstrating the multiplier effect generated.
3. Work was defended in 37 municipalities in the two editions, involving the CUMs of 12 universities, aimed at designing local diploma courses and strategies for implementing the SIAL in the territories, encouraging interest in carrying out diploma courses with a view to achieving a critical mass of facilitators to make the SIAL sustainable and strengthening alliances for the implementation of provincial and municipal diploma courses.
4. Several tutorials were prepared, the most widespread being the one that characterizes SIAL, entitled *Por un enfoque participativo en la gestión del desarrollo* (For a participatory approach to development management). Texts to support the Diploma Course for the implementation of the Local Agricultural Innovation System (11).
5. The book *Arreglos productivos locales en Cuba*. Experiences from GUCID and PIAL, which is a compilation of the works resulting from the two editions and a repository with relevant information for stakeholders interested in the SIAL proposal (12).

6. The promotion of local development processes from an integral and decentralized conception presupposes a cultural change in the way they are conducted and in the ways of training the actors involved in agricultural innovation. It is therefore necessary to incorporate a multi- and transdisciplinary, dialogic and participatory vision in this type of training process.
7. The prestige achieved made it possible for the Directorate of Science and Innovation of MINAG to request INCA to design the SIAL Specialty and the decision of the Minister of MES to design and implement it as a network, taught in all the territories (5,8).

CONCLUSIONS

- In the case of the diploma course studied in its different editions, it is important to highlight the careful selection of the group, the teachers, and the work with participatory conceptions and methodologies that generated high levels of involvement and influenced the high motivation of the participants.
- The creativity shown in the group productions evidenced the development of innovative thinking and attitudes necessary to put the SIAL proposal into practice. The cross-cutting nature of the theory-practice relationship for the application of the lessons learned favored the appropriation of knowledge, skills, and values by the group. The group analyses demonstrated the relevance of the diploma courses for solving agrifood problems in the territories.
- Knowledge management is an important pillar of SIAL because it promotes the implementation of agricultural innovations with an impact on local agrifood development and on the quality of life of producers, increased well-being, and a strong motivation of boys, girls, young people, men, and women toward IAL. Through action learning and its methodological modalities, challenges are identified and actions are planned to solve them, in addition to learning cycles that favor the formation of key actors for participation in local agricultural innovation processes.
- The results show the implementation of diploma courses, the SIAL Network Specialty, the preparation of research, papers, manuals, and texts on SIAL experiences, and various communication products that disseminate and make it visible.

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