Training as key element for the diffusion and adoption of seed technologies in the Cuban livestock production sector (Technical note)

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ABSTRACT

A work was conducted aimed at the participatory identification of the training needs and the construction of a horizontal learning process, as basis for the adoption and diffusion of pasture seed technologies. To evaluate the factors which influence the adoption of such technologies, local workshops were carried out, in which the problem tree and the objective tree were elaborated for each of the identified problems. With this information and with the one obtained in the exchanges with producers from the formal and informal sectors, the theoretical-practical course "Production and technologies of tropical pasture seeds" was designed. The importance of knowledge acquisition and its increase was evaluated through the aspects "knowledge checking" and "project of perspectives and development"; while the evolution of the training process was analyzed in three projects, among the ones presented by each of the developing farms. It was concluded that through participatory training those implied in the adoption and diffusion of pasture seed technologies were achieved to propose the topics in which further study was necessary.

Key words: research diffusion, pasture seed, training

INTRODUCTION

The Pasture and Forage Research Station "Indio Hatuey", since its creation in March, 1962, focused on the encouragement of innovation processes in Cuban livestock production, and has been outstanding in the technologies for pasture seed production, processing and conservation (Miranda *et al*., 2012). More recently, and in partnership with the Institute of Pasture and Forage Research (IIPF) and the Institute of Animal Science (ICA), the EEIH considered adequate to develop a new approach for the generation, diffusion, adoption and improvement of appropriate seed technologies for the primary producer, which demanded to take into consideration their needs and to use participatory methods associated to technology and innovation management (Pérez *et al*., 2007).

Likewise, to enhance diffusion and adoption of those technologies, a client-focused approach, as well as a set of methods and procedures related to entrepreneurial and technological management, which include benchmarking and improvement, such as the level of excellence of the seed production technologies and farms, was developed and/or introduced (Pérez *et al*., 2007); this process was carried out along with the IIPF, the ICA, the Cuban Association of Animal Production (ACPA) and the Ministry of Agriculture (MINAG). The procedure allowed to determine that the level of excellence was 62,06 %, considered a favorable result, because excellence begins from 65,0 %. Among the limitations, the low degree of acceptance of the training and postgraduate study offers generated from the technology, due to the lack of an attractive diffusion system and because these activities are always carried out in scientific institutions, was identified. These aspects are not intrinsically associated to the technologies, but the authors classified them as linked to management.

On the other hand, Montuy and Mendoza (2003) stated that producer training is the key to achieve adequate technology adoption, for which the challenge is to disseminate and for such purpose training must be undertaken. In this sense, Mesa and Machado (2009) claimed that training the human capital is very important for the adoption of sustainable technologies, because

it demands to have adequate vision; as well as the necessary knowledge to ensure the sustainability of agricultural production systems, through a program adjusted to their productive needs.

For these reasons, the objective of this work was the participatory identification of the training needs and the construction of a horizontal learning process, as basis for the adoption and diffusion of pasture seed technologies.

MATERIALS AND METHODS

The methodology Determination of the Training Needs was adapted according to the andragogy models (Alcalá, 1995; Cruz del Ángel, 2000) –aimed at adult training–, which is based on the different processes that operate in the entities; but with the particularity of focusing the attention on seed technologies, because the diagnoses were developed in livestock production enterprises with potential for seed production; they were classified into two categories:

- Developing farms (farm A): they have the capacity to assume seed technologies, and have the disposition and the human and infrastructure potential for such purpose.
- Farms under exploitation (farm B): they work with certain development in technology adoption.

Several participatory workshops were carried out in livestock production enterprises from the Matanzas, Cienfuegos and Villa Clara provinces, which were selected from the previous work experiences of the EEPFIH in research projects. The technique used was brainstorm. The problem tree and the objective tree were elaborated in the discussions for each of the identified problems. Afterwards, they were grouped regarding their dimension in each of the farms. In the workshops two types of participatory learning techniques (Knowles, Holton and Swanson, 2011) were used: 1) participation techniques in class: question and answer, general discussion and spontaneous group discussions; and 2) stimulation techniques: process of critical incidents, practical exercises of managerial decisions and participatory cases.

From the needs detected in the farms, the theoretical-practical course "Production and technologies of tropical pasture seeds" was designed, whose general program was elaborated from the experience of a scientific team in research, training and advisory; as well as in the diffusion and adoption of technologies (Pérez *et al*., 2007). Likewise, to elaborate this course the information obtained in the exchanges with producers from the formal and informal sectors of seed production, during the execution of two R+D+i projects[1], funded by the Ministry of Agriculture in its science and technology program "Agricultural Extension Work".

The course was developed based on the visualization methodology, which starts from the premise that the worker is an active subject, with knowledge obtained from his/her daily experiences (Hernández, Lara, Wilde and García, 1994).

To exemplify the value of knowledge acquisition and increase, the analysis was focused on the results of the following aspects: a) knowledge checking, and b) project of perspectives and development; they were both divided in the two farm categories formed to implement the model for the adoption and diffusion of pasture seed technologies.

To analyze evolution in the initial training process and to have concrete examples, three projects from the ones presented by each of the farms belonging to category A (developing farms) were evaluated; nevertheless, this work only reflects the conclusions of those projects.

RESULTS AND DISCUSSION

The problems that affected more farm A (enterprise 1) –according to the workers' and staff's criterion (table 1)– were grouped in two main dimensions: "man" and "environment", both with the same priority level. In this sense it was a concern that the participants in the brainstorm did not mention the training factor among the principal or secondary problems, because as they do not have pasture seed farms, there is neither work experience nor qualified personnel to undertake the creation of both foreseen farms in such productive entity. In this regard, Lacki (2005) stated that in order to achieve sustainable development the availability of natural resources and capital goods is not essential,

[1]The projects to which reference is made are: "Proposal of a management model for the diffusion and adoption of seed production technologies in the Cuban livestock production sector" and "Diffusion and adoption of pasture seed production technologies with entrepreneurial approach and their impact on livestock production of the Villa Clara, Cienfuegos and Matanzas provinces".

but rather the capacity of people to become change agents, that is, the development of the human factor.

In farm B (enterprise 2), the problems grouped in the "man" dimension were the most relevant among the identified ones (table 1). Training was the focus of the discussion, because the workers considered it essential to achieve a good functioning of the farm; as well as to reach higher levels of pasture seed production and marketing.

Taking into consideration the need of training –as a result of the brainstorm– the postgraduate course "Seed production", which was being regularly taught by specialists from the EEPFIH, to professionals and specialists from different enterprises and research centers related to pasture and forage production, was redesigned. This was necessary, because most of the participating workers did not have a university degree.

Developed training program

The general program of the course is shown in figure 1. In this sense, the incorporation of modules I, III and IV in its redesign is relevant; this is the result of the entrepreneurial approach which was added to the technologies for the production, processing and conservation of forage plant seeds, in order to not only disseminate and adopt such technologies in an innovative way; but also to generate technologies within a participatory context, as well as to increase seed marketing.

In this regard, Pérez *et al*. (2007) stated that among the processes of benchmarking and improvement of the excellence levels of seed production technologies and farms are the conception of innovation in the farm itself, permanent interaction between the researcher and the producer, and training.

In this sense, Mesa and Machado (2009) considered that the training system should also provide the formation and development of all the human capital, so that they allow to reach an efficacious performance in the functions with high competitiveness, under sustainability conditions.

As a result of the course, at the end of the training program the participant should be able to:

- Identify the responsibilities and acting spaces of the different social actors of seed production, in enterprise improvement processes and the application of the entrepreneurial management model.
- Know the basic concepts about the productive chain –which goes from the selection of the site for planting to seed commercialization– that allows them to elaborate proposal in which there is a balance between the human and technological factors, to reach higher quality, productivity and competitiveness levels.
- Know the most recurring problems faced by the technological innovation processes for seed production, processing and conservation; as well as propose different alternatives for their solution.

Table 1. Problems, according to the dimension, identified from the brainstorm in the two farm categories.

Farm	Dimension	Problem
Farm A Enterprise 1	Man	Resistance to old paradigms. Little vision about oncoming problems. Lack of abilities to conquer the environment. Need of a conception change: the most important thing is man. Insufficient risk management. Need of strengthening the sense of belonging.
	Environment	Contradictions with the environment regarding supplies. Instability of payment systems.
	Resources	Affectation in the fuel supply. Insufficient safety and protection means for the workers.
	Nature	Drought.
Farm B Enterprise 2	Man	Lack of training. Scarcity of tools. Scarcity of work clothes.
	Technique	Lack of irrigation.
	Enterprise	Lack of attention to the farm by the enterprise.

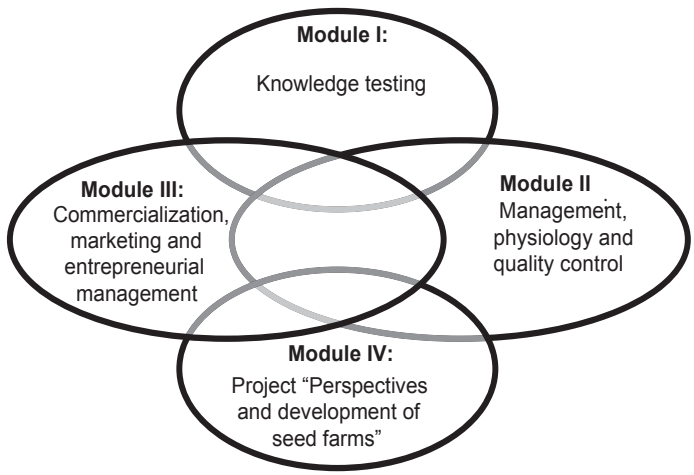

Figure 1. General program of the course "Technologies for the production of tropical pasture seeds"

- Identify their work experience as a highly important element in the generation of proposals to reorganize the work in the enterprise and/or farm.

Knowledge checking (module I)

Knowledge checking consisted in five questions about comprehensive issues regarding the topic "seed production and technologies"; in addition to inquiring into the course expectations.

From the answers of the participants from the type A farms the following results were obtained: only 40 % of the species they mentioned appear on the list of commercial pasture varieties. They made reference only to leucaena as tree species, although in their surroundings there is abundance of other forage woody plants with potential for livestock production. They did not know the scientific name of the most important pasture and forage species. There was consensus on the fact that the pastures which were utilized in the enterprise did not solve the existing problems with the feeding basis. Only 52,6 % knew the multiplication forms; but from that group, 60 % provided incorrect answers about which one is the best. As technology elements they mentioned: soil preparation, irrigation, crop management and seed treatments before planting and the drying process for storage. Another group of students (37,6 %) said that they were not familiar with the technologies.

The course expectations were the following: acquiring new knowledge; bettering themselves to achieve the outlined goals (creation of the farm); learning the management for pasture seed production; knowing deeply the technologies and applying them.

Concerning the answers of the participants who belonged to the type B farms, the following results were obtained: from the mentioned species, 85 % is on the list of commercial varieties; there was lack of knowledge of the scientific name of the species, as well as a consensus related the need of higher production volumes to solve the problems with the feeding basis. On the other hand, they explained correctly the advantages and disadvantages of each one of the multiplication ways; and mentioned as technology elements: soil preparation, irrigation, fertilization, sowing density, sowing date, harvest moment, storage and commercialization.

Their main expectations were: increasing production, improving the economic aspect, widen the market, harvest high quality seeds and increase the knowledge about quality tests and pre-germination treatments.

Module I was based on questions that allowed to obtain wide and varied knowledge about the state of knowledge of the participants, related to objectives and subjective issues which limited the adoption and diffusion of forage seed technologies. This module allow to detect the producers' training needs, to enlarge the reach of the concepts and experiences proposed in module II and introduce the new elements conceived in module III.

For such reason, knowledge testing was aimed at knowing the problems and lacks of each worker which prevented him/her to satisfactorily perform functions in the farm or enterprise. The participatory techniques used (visualization methodology) led

the participants to develop an intellectual effort to construct and reconstruct the reality in their seed farms; as well as to associate, combine and relate previously identified problems with their training needs and then, to systematize and generalize the information and their experiences; in order to propose solutions that would increase work productivity and the quality of the productive process and, thus seed quality and the economic solvency of the farm (module IV).

Project "Perspectives and development of seed farms" (module IV)

The studies on adult learning, as well as on group processes, have proven that they accumulate experience, have a proper concept and have certain specific social functions to fulfill. For such reason, their time perspective is different and they are interested in learning to immediately apply the acquired knowledge (Hernández *et al*., 1994).

For the development of the project work was done in small groups, in order to exchange experiences, solve doubts, discuss causes and elaborate solution proposals; the groups were formed by the personnel from the enterprise and/or the farm. After group work, the plenary meeting was made in which their conclusions were presented; they allowed to study in depth the concepts and problems related to work organization, training and technological change, as well as their repercussions on the adoption of technologies with an entrepreneurial approach.

Since that moment, the groups returned to work on the elaboration of the final project. Each participant could offer useful ideas and suggestions; some of the group members had experience in the seed production sector and it contributed, to a large extent, to increase the others' knowledge. In general, group learning tends to be superior to the one obtained through traditional methods. The final goal (the change project) was constructed in a participatory way and the members showed how capable they were to learn and go into knowledge in detail through the interaction within the group, because they identified the problems of their farms and proposed methods and procedures for the development of seed farms in general.

In order to analyze evolution in the initial training process and have concrete examples, three of the projects presented for each of the farms belonging to category A were analyzed. The conclusions of those projects are shown below.

Farm A1. For the functioning of this farm it is essential that the administrative facilities are built, to improve the control of the work by the technician (farm chief); as well as to keep the paperwork (technological charts, cost cards and other economic controls). This is also essential to facilitate the preparation of all the personnel.

On the other hand, it is necessary to build the drying plate and the seed storehouse, and the perimeter fences in the seed bank to manage the rotation of the animals. In addition three ox teams and their implements; as well as the tools for manual work with the seeds: scales, weights and recipients for quality analyses; containers and cardboard for the identification cards, are needed. Other office materials are also required. Likewise, it is foreseen that once the pastures and mulberry are established, rabbit rearing will begin, as an economic alternative to lower the cost of productions and propitiate farm diversification.

Farm A2. The workers claimed in their project proposal that the infrastructure required by the farm should be created: offices; drying platform with a third of the area roofed; a storehouse with good ventilation, high ceiling and pallets to deposit the seed bags; and sufficient area to plant different species not only for farm use, but also for the sale to other nearby enterprises and entities. It is also necessary to create a livestock production area to benefit the economy of the farm, repair and keep ready the combine harvester; as well as to acquire two ox teams and achieve the economic independence of the farm.

Farm A3. In this farm the outlined perspectives were the construction of a drying platform, a storehouse and an office; as well as the electrification of the facilities and the irrigation system; improvement of the perimeter fence; creation of multiplication plots; purchase of an ox team with a box cart, two plows, two harrows, a cultivator and several manual field work tools. In addition, a cattle weigher should be acquired and sieves should be built for seed processing. Rabbit rearing is also proposed to begin when the pastures are established. On the other hand, it was considered opportune to establish the carrying of cattle manure for earthworm humus production, in order to fertilize the plantations; as well as to work with phytosanitary barriers and living fences.

The participatory construction of each project allowed to make the participants aware about the farm that in the farm everybody is an active actor and influence decision-making and development

actions. This process also allowed them to identify and size the diagnosis process; analyze and know the proposals and the implementation of solutions to their technical-productive problems; as well as to utilize the knowledge and experiences of producers and other actors. Besides, they enhanced and utilized the organization potential and encouraged cooperation with other organizations and institutions.

CONCLUSIONS

Through participatory training it was achieved that those implied in the adoption and diffusion of pasture seed technology proposed the topics that needed further study within the course; that is why knowledge acquisition was a process in which those who were trained learned from the experiences of their fellow students. The final evaluation comprised the integration of the contents received in classes, through a project of development and perspectives which could be materialized afterwards in each of the farms. The process showed that the adoption of pasture seed technologies demands the training of human capital, with the vision and the necessary knowledge to ensure the sustainability of seed production farms, through a training program that is adjusted to their productive needs.

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