Short Communication

Contribution of knowledge transference to health management in goat production farms

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Abstract

The objective of the study was to evaluate the contribution of knowledge transference to the better health management of four goat production farms belonging to individual farmers of the Ciego de Ávila province, under Cuban conditions of sustainable production, during three years. The research was supported on a system approach (identification of the factors that limit production, socioeconomic aspects, infrastructure, technological capacities and human potential). The bioproductive indicators weight of the kids at birth, average delivery live weight, and mortality, were evaluated. At the end of the period an improvement of all the indicators (antiparasitic treatment, use of natural medicine, waste treatment and disease prevention) was achieved, and significant difference was observed in the comparison between the initial and the final diagnosis. As the most significant aspects it was achieved that the farmers used the Famacha card as strategy of selective treatments, which implemented the rotation of the available antiparasitic drugs and that they applied natural medicine variants to treat the animals. The multifactorial intervention of a group of extension workers allowed a favorable result regarding the transference of knowledge about the health management of goat production farms in Ciego de Ávila, with the subsequent improvement of the bioproductive indicators.

Keywords: goats, mortality, weight at birth, technology transference

Introduction

Goat production in Cuba appears as an interesting alternative for obtaining protein of high biological value, especially in those ecological areas which are unused or underutilized by other species of animal husbandry interest, according to Bidot (2013). This demands timely decisions that allow the improvement of their productivity through the use of sustainable technological systems and the enhancement of the infrastructure supported by a technology management system and innovation, to increase meat and milk production in goat rearing (Pesántez *et al*., 2014).

Technology transference, or dissemination and adoption processes, as it is also known, is one of the first and most traditional paradigms of agricultural extension work; whose essence, as asserted by Landini and Bianqui (2013), lies on taking to the farmers the necessary information to reach theoretical and practical elements that allow them to increase their productions.

Closely related to the above-mentioned facts, knowledge transference is the use of learnt wisdom in a different situation, which refers to the knowledge recovery and use process in moments after they were assimilated. Wisdom/knowledge transmission assumes multiple forms: it can be more or less original, creative or appropriate; it can link aspects which are close or rather far from each other and it occurs when that learned in a context improves a related performance in another context. Just like in a scientific laboratory, wisdom transference is passing ideas and ways of seeing and observing nature or society by a person with more ability than another one, and the growth of this knowledge depends on each person and on the way of processing knowledge.

In Cuba the National System of Agricultural Extension Work (SEA, for its initials in Spanish) of the Ministry of Agriculture is the most complete attempt to achieve higher adoption of science and technology results, in order to increase the competitiveness of the farming sector; but it still shows some weaknesses, such as: insufficient access of farmers to technological and entrepreneurial information, insufficient relation among research centers, universities and production systems and difficulties to respond to the demands of training technologies and management knowledge (Suárez *et al*., 2002).

According to Guevara (2003), the results of the different attempts to develop transference of technologies aimed at small animal production farmers in the country, although encouraging, have not been sufficient, as proven by the low meat and milk productions. Nevertheless, an increase has been observed in the interest in the study and breeding of goats in order to find answers to the growing need of animal protein sources (Bidot, 2013).

Due to the above-explained facts, the objective of this research was to evaluate the result of wisdom transference in the health management of goat production farms of Ciego de Ávila.

Materials and Methods

The study was conducted from 2013 to 2015 in four farms which are representative of goat production (table 1), selected by the Small Animals Husbandry Enterprise (EGAME for its initials in Spanish) in the Venezuela and Majagua municipalities, Ciego de Ávila province.

The farms, belonging to the Venezuela municipality (with the exception of "El Naranjal"), were diagnosed *in situ* in 2013 (table 2), and their evolution in the evaluated period was followed up, through visits every three months and the application of a technical survey to each owner, with the participation of municipal specialists from the enterprise, from the capacity building centers (CCC for the initials in Spanish), from the Biofood Research Center (CIBA for its initials in Spanish), as well as from the Universities of Ciego de Ávila and Camagüey.

The surveys were elaborated according to the report in the guide-diagnosis proposed by Bergamín and Ferrer (2008), emphasizing the sustainability vision with the inclusion of 20 actions, five within each of the following four indicators:

1. Parasite control: rotation of antiparasitic drugs, use of the Famacha card, grace period (waiting time for the meat to be consumed after the treatment), delivery of feces samples to the veterinary diagnosis network.
2. Use of natural medicine: use of different variants of natural medicine, adequate use according to the problem to be treated, utilization variety of medicinal plants, adequate preparation, correct dosage.
3. Waste treatment: type of treatment given to waste, use of the treated waste, treatment time,

Table 1**.** Production systems in the studied farms.

Farm	Area/ha	Breed	Quantity of animals in the flock (January, 2013)	Grazing system
El Naranjal	15	Boer	47	Semi-intensive in silvopastoral system
CPA Ramón Domínguez	30	¾ Nubia x ¼ Creole	57	Semi-intensive Continuous grazing
El Renacer	35	¾ Alpina x ¼ Creole	76	Semi-intensive Continuous grazing
La Esperanza	28	¾ Nubia x ¼ Creole	52	Semi-intensive Continuous grazing

Table 2. Main characteristics of the studied flocks.

Farm	System	Rearing objective	Grazing time (hours/day)
El Naranjal	Semi-intensive in silvopastoral system	Breeding to sell breeding stock to farmers	8
CPA Ramón Domínguez	Semi-intensive Continuous grazing	Self-supply and commercialization	8
El Renacer	Semi-intensive Continuous grazing	Self-supply and commercialization	8
La Esperanza	Semi-intensive Continuous grazing	Self-supply and commercialization	7

waste collection frequency, location of the deposition site and tools used.

4. Disease prevention: vaccination, stock control, vector control, hygiene of the facilities, perimeter fence.

To measure quantitatively the impact of the wisdom transference, to each of the twenty actions a score from one to five was assigned, for which the maximum possible score was 100 points: 5: very good, 4: good, 3: regular, 2: bad, 4: very bad.

The study was supported by a system approach (identification of the factors that limited production, socioeconomic aspects, infrastructure, technological capacities and human potential), according to the proposal made by Landini (2012).

Statistical analysis

A non-parametric statistical analysis was used through Wilcoxon test, with a significance level of $p < 0,05$. For such purpose the statistical package SSPS version 15.0 for Windows® was used. The results were summarized in tables processed by the Microsoft Excel Windows program.

Results and Discussion

Significant difference was observed in the comparison between the initial and the final diagnosis, because all the farmers obtained a higher quantitative qualification after the multifactorial intervention.

Other similar experiences carried out in Latin America with regards to knowledge transference to small farmers facilitated that, along with the social components which allowed them to make decisions related to their particular situation, more motivation, commitment and dynamism could be generated by them, so that they adopted an active positioning, were enterprising and transformed their living conditions (Landini and Bianqui, 2016).

Table 3 shows the progressive increase of the score obtained in each of the farms, as consequence of the knowledge transference regarding health management.

These results are justified by the reports made by Landini *et al*. (2013b), who stated that the function of extension workers is to facilitate the basic knowledge and technological options to farmers in order to stimulate discussion and encourage them to experience new choices and ideas. It is not just about offering technologies; it is also necessary to stimulate the goat production farmer to reflect, from his/her experiences, so that he/she feels to be part of the system and is able to act on the environment and transform it.

Thus, the successive increase in the score given to each farm showed the sum of the evaluated aspects, derived from the action of those who transferred the model to the actors involved in this process. The exchange of experiences among the farms, considered primary centers of technological diversity, was favored, besides making the small farmer feel part of the change and the achievements. Similar results were observed in experiences developed by the Pastures and Forages Research Station Indio Hatuey with cattle production farmers (Miranda *et al*., 2012).

The actions intended to enhance changes in man and promote his advance, by turning him into manager of his progress, through the development of potentialities and capacities that allowed him to reach higher self-sufficiency (Altieri and Toledo, 2011).

In the first visit it was detected that, concerning the antiparasitic treatment, in no case the feces were

Table 3. Effect of knowledge transference on management.

Farm	Indicator											
	Antiparasitic treatment			Use of natural medicine			Waste treatment			Disease prevention		
	1	2	3	1	2	3	1	2	3	1	2	3
El Naranjal	50	60	90	60	71	80	70	72	80	60	70	80
CPA Ramón Domínguez	50	75	80	65	75	80	60	76	90	62	70	80
El Renacer	55	75	90	60	76	90	70	78	80	54	66	80
La Esperanza	45	80	94	60	85	100	70	82	100	54	90	100

Legend: each indicator in the diagnoses received a score from one to five (1: very bad, 2: bad, 3: regular, 4: good, 5: very good) up to a maximum possible value of 100 points. 1: initial diagnosis (January, 2013) before the technology transference, 2: intermediate diagnosis (January, 2014), 3: final diagnosis (January, 2015).

sent to the territorial laboratory of veterinary diagnosis to determine the type of parasitism present. Nevertheless, there were preferences regarding the use of Labiozol® (Albendazole sulfoxide LABIOFAM S.A., Cuba), as sole therapeutic option, without doing rotations of the anthelmintic or using the FAMACHA® card as strategy of selective treatments, all of which was changed along the experience. Regarding the above-stated facts, Hoste *et al*. (2010) reported that the parasite infestations produced by gastrointestinal nematodes (GINs) constitute one of the highest limitations in goat production.

The use of the FAMACHA© method is based on the selective treatment of the animals depending on the color of the conjunctive mucosa, which is related to different degrees of anemia (Arece and López, 2013). Being implemented by all the farmers as a parasite control strategy, it allowed to reduce the use of drugs, because only the infested animals were treated and thus the selection pressure for drug resistance in parasites was reduced.

According to Rodríguez *et al*. (2015), in Cuba the control of parasite diseases is arbitrarily done, without taking into consideration in most cases the epidemiological information. This has caused that the parasite control plans are not sufficiently efficacious and, in the most critical situations, gastrointestinal parasites have developed resistance to the most widely used anthelmintics.

The reinforcement of the disease prevention measures, such as higher hygiene of the facilities, implementation of vaccination plans and vector control, allowed a reduction of the incidence of diseases in all the farms (table 4).

Regarding the use of natural medicine, the insertion of such variants as washing with *Ceiba pentandra* and *Cecropia peltata* leaves after parturition to prevent infections, infusion of guava (*Psidium guajaba* L.) leaves against diarrhea and squash (*Cucurbita pepo* L.) seeds in doses of 100 to 150 g, as anti-cestode –against flatworms–, was achieved (Gohari *et al*., 2011).

Altieri and Toledo (2011) emphasize how necessary it is to put technology transference, training and technical assistance services within the reach of small animal production farmers, as well as to identify the farmers with productive potential. Closely related to the above-stated fact, Castro and Rajadel (2015) reported as urgent the practice of extension work which pays attention to technological, organizational and social management aspects under the participation-action scheme.

An alternative involves universities, with the models of rural extension work and the vision of rural development within a territorial framework (Landini, 2012; Landini *et al*., 2013a). Another alternative is found in the different research centers of Cuba, with their huge scientific potential and sustainable development strategies. In this new scheme, acknowledging the importance of investment on the human and social capital of small animal production farmers is of high priority.

Concerning the waste (remainders of feedstuffs and excreta) treatment, it should be emphasized that

Table 4. Most frequent diseases in the farms.

Farm	Most frequent diseases		
	2013	2014	2015
El Naranjal	Foot diseases Parasitism Tetanus	Foot diseases Tetanus	Foot diseases
CPA Ramón Rodríguez	Foot diseases Parasitism Tetanus	Foot diseases Parasitism	Foot diseases
El Renacer	Foot diseases Parasitism Mastitis Ecthyma contagiosum	Foot diseases Mastitis	Mastitis
La Esperanza	Foot diseases Parasitism Mastitis Tetanus Ecthyma contagiosum	Foot diseases Ecthyma contagiosum Tetanus	Foot diseases

in January, 2013, when the research began, in none of the productive entities the wastes were treated, but in all the cases they were dispersed in the paddocks without previous treatment, which favors parasite infestations, along with the subsequent negative effect on the environment. From the specialists' intervention, these malpractices could be reverted and all the farmers started waste treatment through composting.

This technology, according to Weiland (2006), has among its advantages the stabilization of the organic matter until it is transformed into a product similar to the humic substances of the soil, free from pathogens and weed seeds; it does not attract insects, can be managed and stored without causing disturbances and it is beneficial for the soil and plant growth.

Several bioproductive indicators experienced a significant improvement during the period of study from the extension workers' intervention (table 5).

Such authors as Kamal *et al*. (2013) emphasized that the correct health management of the goat flock, as well as a positive result in the health indicators are factors that allow a productive increase of the stock. The better health status of the flock not only favors animal welfare, but allows the expression of the productive potential of the individuals.

It is highly important to develop technology transference programs based on participation, which have as objective not only increasing production, but also promoting with such actions the sustainable livestock production development with agroecological practices by the farmers and their families. In this sense, technology transference to the farmers related to small animals supports the plan for the development of the rural sector in the country.

It is concluded that the multifactorial intervention of a group of extension workers allowed a favorable result regarding the transference of knowledge about the health management of goat production farms of Ciego de Ávila, with the subsequent improvement of the bioproductive indicators.

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Table 5. Performance of some bioproductive indicators.

Farm	Bioproductive indicators								
	Weight of the kids at birth (kg)			Average delivery live weight (kg)			Mortality rate (%)		
	2013	2014	2015	2013	2014	2015	2013	2014	2015
El Naranjal	2,3	2,5	3	25	27	28	3,8	2,6	1,3
CPA Ramón Domínguez	2	2,2	2,4	26	27	28	3,9	3,2	2,8
El Renacer	2	2,2	2,3	26	27	27,5	3,2	2,8	2,3
La Esperanza	1,9	2,3	2,9	25	28	30	4,3	3,2	1,2

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