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Effect of two management models on tacit and explicit knowledge sources in sheep and goat producers

Efecto de dos modelos de gestión sobre fuentes de conocimiento tácito y explícito en productores de ovinos y caprinos

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Abstract

In order to understand the behavior of knowledge as part of production and competitiveness factors in the sheep and goat sector, certain tacit (imagination, a family member, experience, etc.) and explicit (statistics, a researcher, standards, etc.) knowledge sources were studied from an epistemological point of view. This was carried out in 66 sheep and goat farms in Colombia during five years, from 2007 to 2012. During the study the effect of two management systems was evaluated on these; the first one corresponded to a "traditional" technical assistance system with direct analysis and recommendations by a professional to the producer; and the second one corresponded to technical assistance based on the creation and evolution of knowledge provided to the producer, according to knowledge management approaches. Data was examined using the Kruskal-Wallis test, multivariate correspondence analysis, and chi-square and cluster analyses. Results showed that when making a decision, farms tended to privilege tacit knowledge sources over explicit sources. The application of classical technical assistance with direct recommendations did not generate differences in sources of explicit knowledge ($p > 0.05$), nor in sources of tacit knowledge ($p > 0.05$). Moreover, farms intervened with knowledge management did not show differences in sources of tacit knowledge ($p > 0.05$) nor in sources of explicit knowledge ($p > 0.05$), independent of the management system that was used. Furthermore, producers preferred tacit knowledge sources.

Keywords: explicit knowledge, farms, knowledge management, small ruminants, tacit knowledge, technical aid

Resumen

Con el objetivo de entender el comportamiento del conocimiento como parte de los factores de producción y competitividad del sector ovino caprino, desde el punto de vista epistemológico se estudiaron algunas fuentes de conocimiento tácito (la imaginación, un familiar, la propia experiencia, entre otras) y explícito (las estadísticas, un investigador, las normas), en 66 granjas ovino caprinas en Colombia durante cinco años, de 2007 a 2012. En el transcurso del proceso se evaluó el efecto que tuvieron en ellas dos sistemas de gestión: el primero correspondió a un sistema de asistencia técnica "tradicional", con análisis y recomendaciones directas del profesional al productor, y en el segundo se trabajó con asistencia basada en creación y evolución del conocimiento, según los planteamientos de la gestión del conocimiento. Los datos se examinaron mediante pruebas de Kruskal-Wallis y Chi², y análisis de clúster y de correspondencia multivariado. Se encontró que, al tomar una decisión, las granjas tienden a privilegiar las fuentes de conocimiento tácito sobre las correspondientes al explícito. La aplicación de asistencia técnica clásica con recomendaciones directas no generó diferencias en las fuentes de conocimiento explícito ($p > 0,05$), ni en aquellas de conocimiento tácito ($p > 0,05$). De igual forma, las granjas intervenidas con gestión del conocimiento no presentaron diferencias en las fuentes de conocimiento tácito ($p > 0,05$),ni en las de conocimiento explícito ($p > 0,05$). Independientemente del sistema de gestión que se utilizó, las granjas mantuvieron su predilección por las fuentes de conocimiento tácito.

Palabras clave: asistencia técnica, conocimiento explícito, conocimiento tácito, explotaciones agrarias, gestión del conocimiento, pequeños rumiantes

Introduction

In the last 15 years, sheep and goat production systems showed a decrease tendency in per capita consumption and inventory (Instituto Colombiano Agropecuario [ICA], 2016; United Nations Food and Agriculture Organization [FAO], 2016). This dynamic shows that these systems do not respond adequately to an increase in demand caused by human population growth.

Moreover, these systems have a low level of technological development and their production is based on comparative advantages, i.e. on the type of production where the animal is capable of developing under natural conditions without much human intervention (Castellanos, Rodríguez, & Toro, 2010; Moreno & Grajales, 2014).

On the other hand, the economy proposes that, in order for a product to persist and grow in the market, it is necessary to generate competitive advantages, such as those that are incorporated by introducing knowledge into goat and sheep production system processes (Nonaka, 2007; Ospina, Grajales, & Manrique, 2011; Senge, 2005).

From the epistemological perspective of the late twentieth and early twenty-first century, researchers understood that the knowledge on goat and sheep production systems used by humans is of two types: tacit and explicit.

The tacit knowledge is the result of day-to-day experience, including myths and legends, which are passed down from one generation to the next through oral tradition. This kind of knowledge has no formal origin and is the one that producers already have and manage, and that they acquire in their daily work on the farm, feeding on coexistence with their social environment.

The explicit knowledge is the one that has been documented and can be combined, analyzed, validated and socialized, and usually has a formal origin or is produced by a systematic or scientific method. Moreover, explicit knowledge is handled by professionals, researchers, research institutions and academia, among others (Aportela-Rodríguez & Ponjuán-Dante, 2008; Blasch, Breton, Valin, & Bosse, 2011; Nonaka, 1994; Ospina, Montoya, Montoya, & Grajales, 2014; Rodríguez, 2007).

Currently, there has been a serious debate about whether extension work and its method are the most convenient way to bring knowledge to rural producers, taking into account that extension is based on a dialectical vision of the world. However, there is a cultural invasion when a subject who believes that he represents a superior culture, imposes his theories on local subjects, replacing the original theses with new ones, considered superior by those who impose them, and changing values and assuming an antagonistic authoritarian position (Freire, 1998).

As a reaction to this vision and directed towards the opposite extreme, we find the rapid rural appraisals and participatory rural appraisal methodologies, focusing on the producer and his knowledge as the center of the process, leaving aside, as far as possible, the researcher. This approach leaves planning, control, execution and evaluation activities completely in the hands of producers (Chambers, 1994).

On the other hand, and with concern, Rogers' innovations adoption curve questions the extension services and their financers, as it indicates that only 12.5 % of the intervened population accepts the knowledge that these services deliver (Rodil, 2014). Apparently, the system is inefficient and therefore, expensive; furthermore, services are forced to explore other conceptual and methodological alternatives that allows them to be more effective.

Knowledge management poses a new way of approaching this problem, proposing tools such as knowledge management systems (KMS). According to figure 1, in the KMS, the knowledge that a farm possesses is of two types: tacit and explicit (Nonaka, 1994, 2000; Nonaka & Toyama, 2003; Shu, Page, Gao, & Jiang, 2011), and the farm is comprised by three worlds. The first includes biological aspects and its processes; the second is tacit knowledge; and the third is explicit knowledge (Hall, 2005; Kragh, 2012; Popper, 1978).
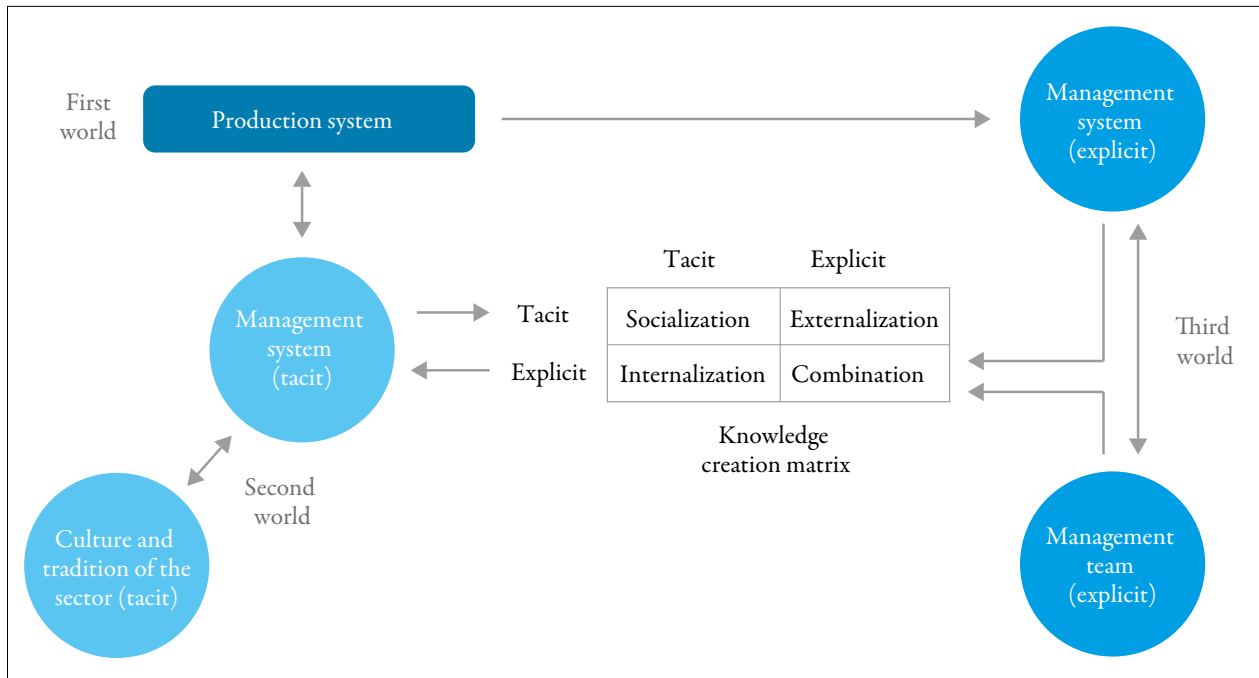
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Figure 1. Knowledge management system (KMS) used in the Sigetec project.
Source: Elaborated by the authors

By combining the latter two in the knowledge creation matrix, new knowledge that is useful for the productive system is created (Aportela-Rodríguez & Ponjuán-Dante, 2008; Montuschi, 2001a, 2001b; Nonaka, 1994, 2000; Shu et al., 2011). This new knowledge, based on what is tacit, is put to the test, i.e. it dies or it survives. If it survives, it has to evolve into a cybernetic circuit of knowledge, which would create continuous and useful competitive advantages for the organization (Blasch et al., 2011; Boyd, 1996; Hall, 2005; Johansen, 2004; Silva, 2002, 2014), creating new knowledge that later evolves in the farm.

In this study, we analyzed the behavior of tacit (KSt) and explicit (KSe) knowledge sources on an ontological level in goat and sheep farms in the Colombian departments of Antioquia, Boyacá, Cundinamarca, Santander, Sucre, Tolima and Valle del Cauca, and the effect of two management systems on these.

We organized farms in three groups: (1) the first group includes producers who received traditional assistance schemes with direct or "imposed" recom-mendations given by a professional, and which relied on information systems and indicator analysis. (2) in the second group, we worked with "Sistemas de gestión tecnológica para la cadena ovino-caprina (Sigetec)" [Technological management systems for the sheep and goat chain]; in this knowledge mana-gement system of the Sigetec project, knowledge is created as a whole when the producer interacts with the professional. It is based on the creation of a knowledge matrix, on evolutionary epistemology, on knowledge cybernetics and general system theory (Aportela-Rodríguez & Ponjuán-Dante, 2008; Blasch et al., 2011; Boyd, 1996; Hall, 2005; Johansen, 2004; Kragh, 2012; Montuschi, 2001a, 2001b; Nonaka, 1994, 2007; Nonaka & Toyama, 2003; Ospina et al., 2011, 2014; Popper, 1978; Shu et al., 2011; Silva, 2002, 2014). (3) The third group of producers did not receive any kind of intervention and were used as a control group.

We carried out an evaluation to establish if the sources of tacit and explicit knowledge varied when the management system changed. Likewise, we analyzed if there were differences when changing the role of the professional that applied the classical

technical assistance model, in which the knowledge goes from the professional, as issuer, towards the producer, as a receiver (Aladro-Vico, 2011; Chambers, 1994; Freire, 1998). Then, this model was compared with the model in which the producer creates the knowledge (Blasch et al., 2011; Nonaka & Toyama, 2003; Ospina et al., 2011, 2014; Rodríguez, 2007) with the support of a professional. Furthermore, these two models were compared in relation to the control group, which did not receive any type of intervention.

Hypothesis

Regarding the problem posed, the following hypotheses were tested:

H1a = there are no differences in the KSe in producer types C, S or G.

H1b = there are differences in the KSe in producer types C, S or G.

H2a = there are no differences in KSt in producer types C, S or G.

H2b = there are differences in the KSt in producer types C, S or G.

Where:

Knowledge sources

KSe = sources of explicit knowledge

KSt = sources of tacit knowledge

Types of producers

C = producer to whom only a basic characterization survey was applied

S = producer that received a management system that included traditional technical assistance, support with information systems and indicator analysis workshops

G = producer intervened with the KMS

Materials and methods

In the framework of the project "Sistemas de gestión tecnológica para la cadena ovino-caprina (Sigetec)" [Technological management systems for the sheep-goat chain], 66 goat and sheep producers were identified, selected among those who fulfilled the requirement of being linked to a local guild, and located in the departments of Antioquia, Boyacá, Cundinamarca, Santander, Sucre, Tolima and Valle del Cauca.

Each producer was intervened with one of three management systems: Group C: control group producers; Group S: producers with management support comprised of traditional technical assistance supported with information systems and analysis of indicators; and group G: producers intervened with the KMS.

Every producer was linked to one group randomly. Due to personal issues, some producers withdrew from the process and were not replaced because doing so, would have altered the process and the results. The execution of the work was carried out in five phases.

Phase I: characterization of producers

In this phase, 66 producers were characterized through a survey in which the producer, his farm, location features and sheep and goat races used were identified, among other factors; moreover, different technological development aspects were evaluated by the study group (Moreno & Grajales, 2014). In general, most were small producers with an average of 32 animals grazing, and in most cases, with poor technological development and limited access to technical assistance.

Phase II: management through information systems and indicator analysis

An information system was set up for 54 out of 66 producers, which was monitored monthly for four years. Animals were identified, 54 databases were opened with the OvisWebs® program and was fed

by a regional technician with data on births, weightings, milk control and inventory movements. This was carried out with a frequency of 30 to 45 days using the same frequency to synchronize the data in an online database on the software website (OvisWebs, 2015), to monitor, control and generate global statistics.

Six months after starting the follow-up process, the project professionals held management workshops for the 54 producers, defining the mission and vision of the farms, analyzing the indicators and defining the objectives, strategies and goals.

Work was carried out in three successive biannual workshops in which the statistics of the information system were used, and population, reproduction and production subsystems were comprised in an inclusive manner in each farm. Producers paid attention to the recommendations of the professionals, and a work plan was designed and follow-up was given on a permanent basis.

Phase III: intervention with a knowledge management system

Twenty-four months after the beginning of the follow-up process and after the third workshop, 26 of the 54 producers were randomly selected and intervened with the Sigetec KMS. These producers received new workshops, i.e. complementary and different, which led them to apply the methodology proposed by the KMS.

At this point, the mechanics and roles that had been applied in the indicator analysis workshops were changed. Moreover, in these, new workshops knowledge is created, it is not transferred, but it generates from the interaction of the explicit knowledge of the professionals with the tacit knowledge of the producer. The remaining 28 producers received a management workshop with the methodology of the traditional technical assistance and professional recommendations, as had been the case until now.

Phase IV: monitoring and evaluation

After conducting the KMS workshops, we waited six months, expecting that the direct influence of these would have disappeared, and the knowledge that had been appropriated could be established. The evaluation comprised a survey which measured the KMt and KMe of the producer using the Likert scale (Blasch et al., 2011; Hall, 2005; Ospina-Rave, Sandoval, Aristizábal-Botero, & Ramírez-Gómez, 2005).

The survey was conducted through a personal interview. It was structured and applied as a written questionnaire to the three categories of producers: type C: producers belonging to the control group, to whom only the characterization survey was applied; type S: producers with management support based on technical assistance, with a professional who analyzes and gives recommendations, supported by an information system and workshops for the analysis of indicators. And type G: producers intervened with technical assistance based on the elements of the KMS of Sigetec.

For the survey, 50 statements were drawn up and designed following the guidelines of the observation, orientation, decision and action (OODA) loop of epistemology (Blasch et al., 2011; Boyd, 1996; Hall, 2005), which provides the basis to identify knowledge flow and feedback in an organization as a system.

As a conceptual complement, rationalism elements (imagination and logic) and empiricism (experience and observation) were included and adapted to the circumstances of a sheep and goat producer; media were excluded and subjects who could be a source of tacit or explicit knowledge for a farmer were defined.

Following the method of designing this type of tool, initially the survey was tested with researchers and then with professionals; later it was tried with university students and, finally, with producers, to verify the clarity and relevance of the questions (Elejabarrieta & Iñiguez, 2010; Ospina-Rave et al., 2005).

Researcher explained and accompanied all the surveys, ensuring the uniform interpretation of the statements. For each assertion, the following options were given: I completely disagree, I disagree, I am indifferent, I agree, and I totally agree, which were replaced with numbers, i.e. 1 being in complete disagreement and 5 being in complete agreement.

For statistical processing, the Likert scale has the ability to measure the knowledge of a person from their position on an ordinal scale, in response to a given statement (Blasch et al., 2011; Elejabarrieta & Iñiguez, 2010; Montuschi, 2001b; Várnagy, 2000).

Phase v: data processing

The data was stored in a database built in Microsoft Access® where the queries that process the qualification data of the questions were developed for each survey chapter: KSe and KSt. Results were converted to Microsoft Excel® format and exported to the programs SAS®, SPSS or Stata 11®, for statistical analysis.

Analysis of each survey statement was carried out against the type of producer using contingency tables, establishing whether there was an association or not, and using cluster analysis, Chi-square and Kruskal-Wallis tests. These were modified to calculate the difference between treatments, and the answers were analyzed by means of a multivariate correspondence analysis.

Results

The number of producers surveyed was 66, and these were distributed as follows: 15 in Antioquia, 10 in Boyacá, 4 in Cundinamarca, 21 in Santander, 3 in Sucre, 7 in Tolima and 6 in Valle del Cauca (figure 2). The number of farmers is different in each region because, with time and due to economic, social and guild reasons, some departments had more producers available than others.
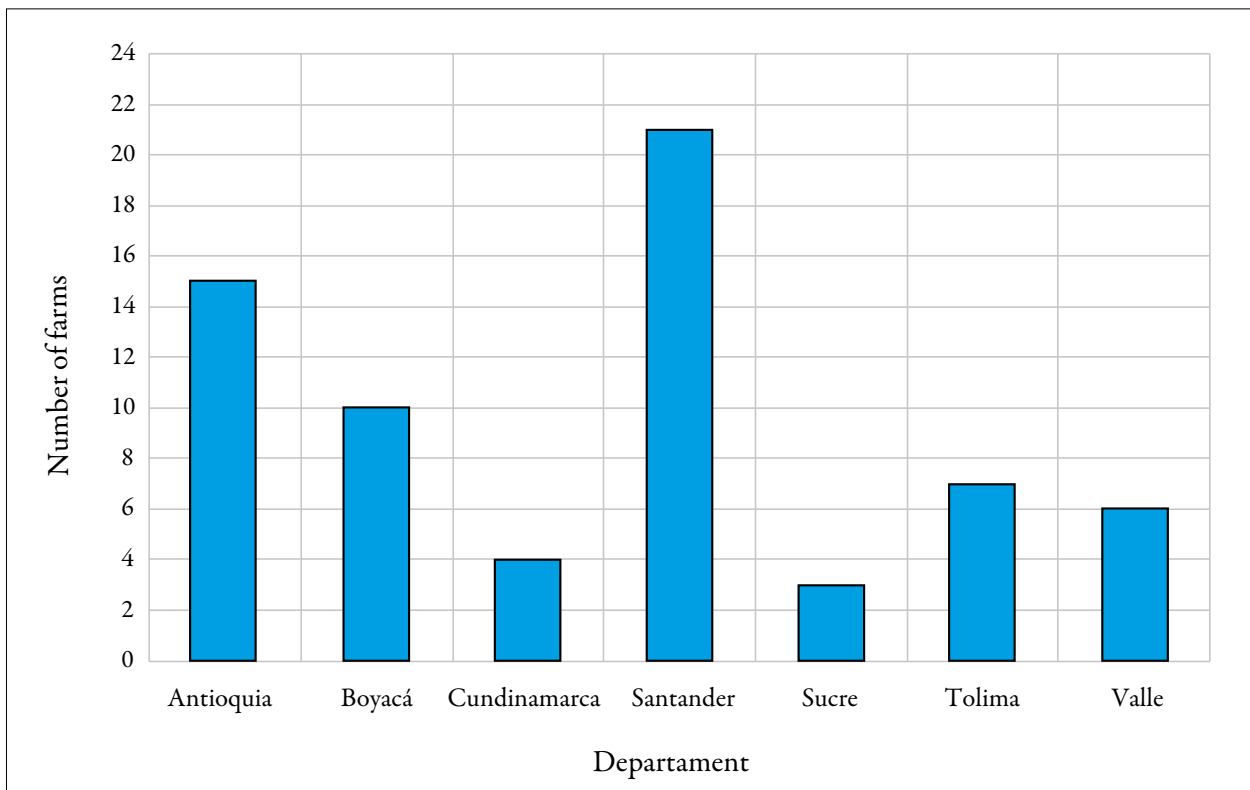

Figure 2. Number of farms in the knowledge management system by department.
Source: Elaborated by the authors

The departments with the highest number of participants was Antioquia, Boyacá and Santander. The number of surveys according to the type of producer was 28 for G type, 26 for S type, and 12 for C type producers.

Cluster analysis of the survey questions

To verify the consistency of survey responses, we decided to verify, through statistical analysis, if the questions were well formulated and if the inter-pretation logic of the respondents was correct, to be able to differentiate the tacit from the explicit knowledge.

With this objective in mind, the statements made in the surveys to 66 producers (without division by producer group) were processed and led to a cluster analysis with the hierarchical cluster technique in Chi-square distances and presented as a dendrogram in SPSS 19, with the result shown in figure 3.
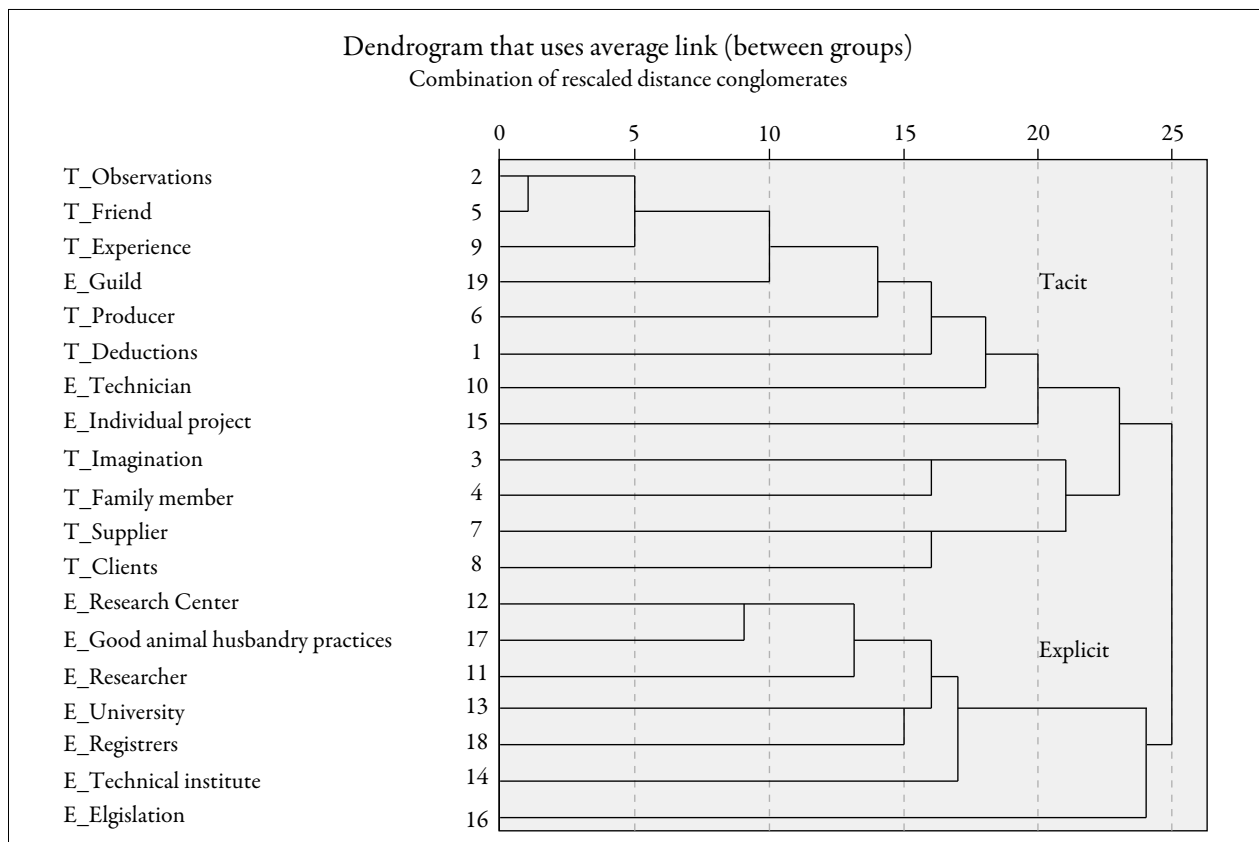
Figure 3. Dendrogram per question.
Source: Elaborated by the authors

The dendrogram identifies two groups corresponding to the type of knowledge source that was applied in the survey; the first group located in the upper part corresponds to the statements related to tacit knowledge and the one located in the lower part comprises statements related to the explicit knowledge.

The type of KMt identified were direct observation, a friend, experience, another producer, own deductions, imagination, a family member, a provider and a client. Within the tacit knowledge group, producers included three KMe: the guild, the technician and the research project, probably because the research project made them aware of their own culture. Moreover, we found also the research center, good animal husbandry practices (GAHP), a researcher, a university, the registers, a technical institute and the legislation.

Descriptive statistics of knowledge sources

As established in the methodology, results were tabulated according to the three types of producers considered. Table 1 shows qualification means stated by producers according to the type of producer and the knowledge evaluation point. In all groups, tacit knowledge source rating was higher, with a total average of 3.68, compared to the explicit knowledge with a total average of 3.49.

Table 1. Result of the survey (data shown are means by type of producer)

Type of producer	Knowledge	
	KMe	KMt
C	3.58	3.69
S	3.40	3.76
G	3.49	3.60
Total	**3.49**	**3.68**

Source: Elaborated by the authors

Regarding results established with the Likert scale, values ranged between 3.5 and 4.0. In this scale, a 3.68 is interpreted as a tendency to agree in the use of these sources, while a 3.49 is between 3.0 and 3.5, which is understood as a tendency towards being indifference towards using these sources.

Sources of explicit knowledge

In relation to the KMe, on a scale of 1 to 5, the results by respondents showed an average of 3.49, a median of 3.6, a mode of 3.9, and an interquartile space of 0.70. Taking into account that in the survey a 3.0 corresponds to being indifferent and a 4.0 to agreeing, we suggest that, at the moment of making a decision, the producers have an attitude that goes from indifference to agreeing with accessing the KMe.

Figure 4 indicates that, when making a decision, the producer tends to agree to use the KM coming from the following sources (with a rating from 1 to 5): the technical assistant (4.3), farm registries (4.1), the guild (3.8) and a sheep and goat research project (3.7). On the other hand, producers are indifferent to KM given by a researcher (3.4), a technical institute (3.3), the standards of good animal husbandry practices (GAHP) (3.3), the legislation (3.1), universities (3.1), and goat and sheep research center (2.8).
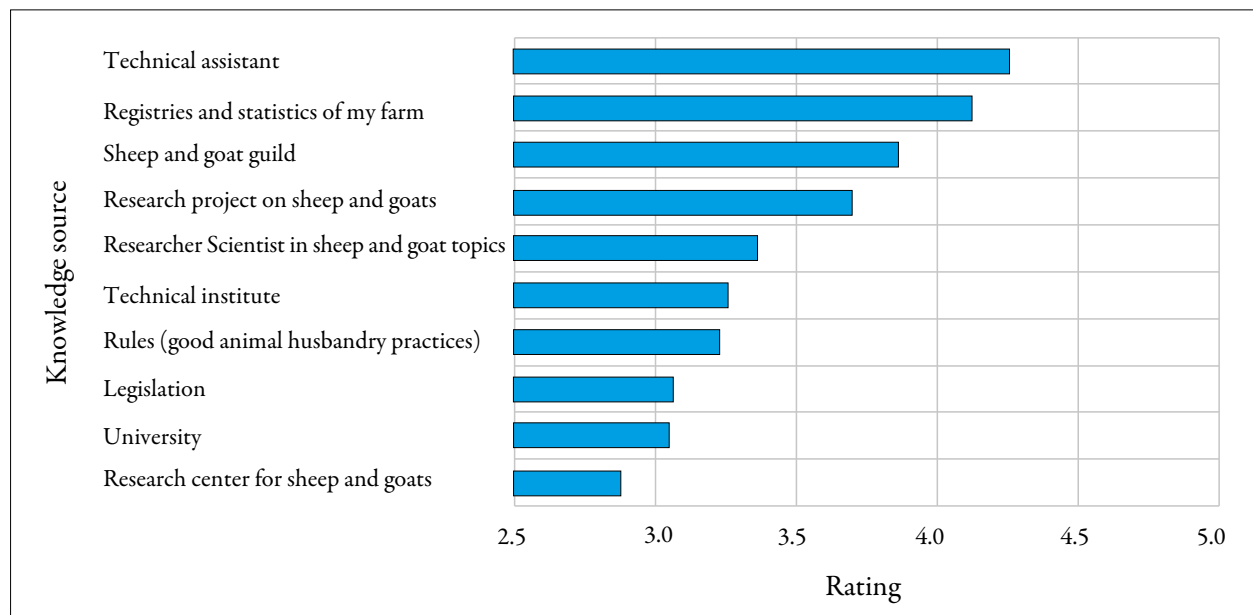

Figure 4. Assessment of the sources of explicit knowledge of sheep and goat producers.
Source: Elaborated by the authors

In addition, producers show a tendency that ranges from being indifferent to agreeing to use KMe when making a decision on the farm. The technical assistant is the preferred source and consulting a sheep and goat research center is the least used source.

When applying the Kruskal-Wallis test no differences were observed in qualification means of C, S or G type producers ($p > 0.05$), i.e. the KMe ratings do not vary compared to those of the control group, despite the intervention of an information system with indicators and analysis or the action of a KMS.

Additionally, figure 5 shows the correspondence plane product of the multivariate analysis. In the multivariate correspondence analysis, the Likert scale statements were grouped according to the intensity of the response (1, 2, 3, 4 and 5), but there was no association with the type of producer involved. Producers C and S were close to each other but far away from those of type G, which denotes differences between the types of producers, although they are not reflected in the KM.
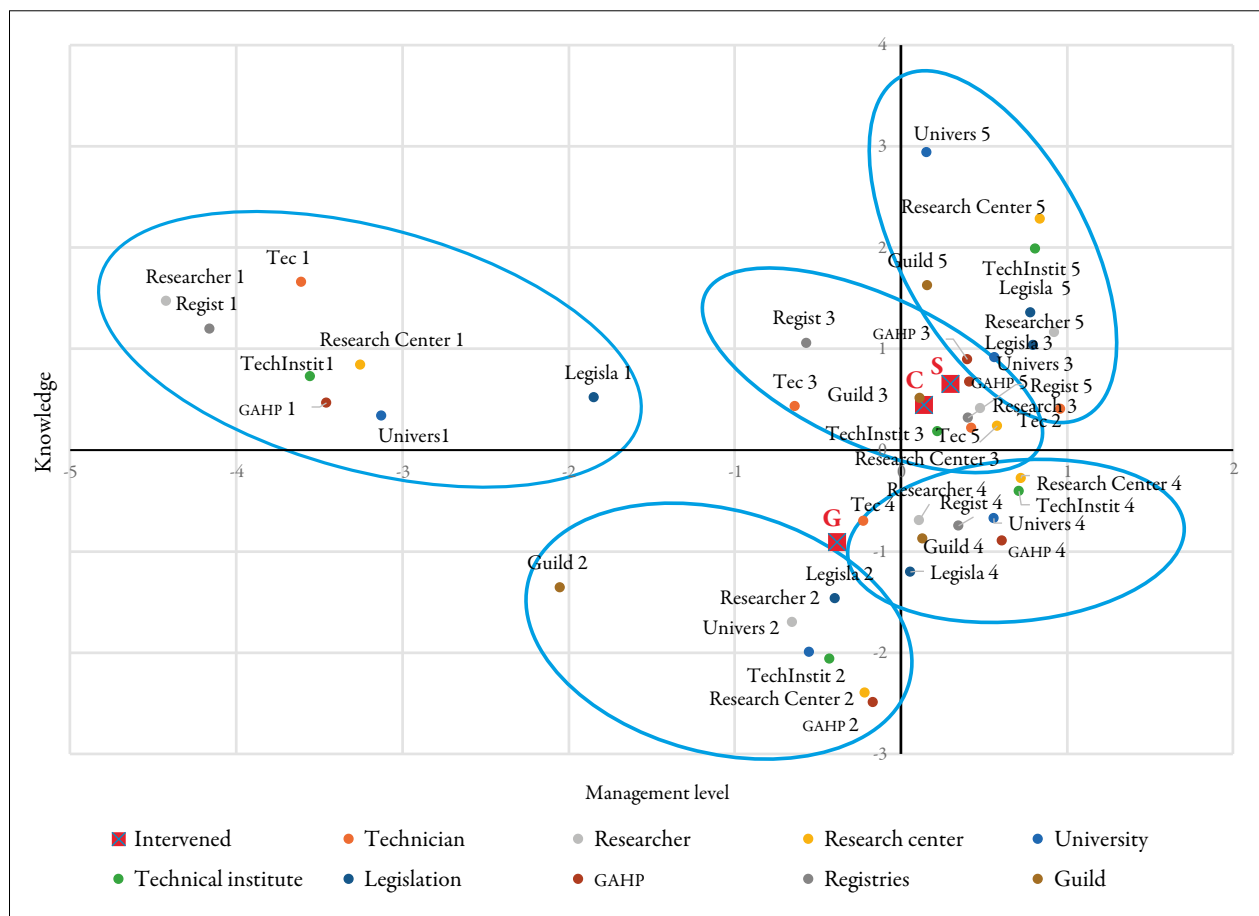

Figure 5. Multivariate correspondence analysis of explicit knowledge.
Source: Elaborated by the authors

Sources of tacit knowledge

In the case of KMt, which recorded an average score of 3.68, a median of 3.83, a mode of 3.93 and an interquartile range of 0.86, we considered that in the survey a 3.0 is equivalent to being indifferent and a 4.0 corresponds to agreeing. We then suggest that producers agree to use the KMt when making a decision and move away from the position of indifference towards any particular source.

Figure 6 shows that when making a decision, the producer tends to agree to use the following KMt (in order of importance, and rated from 1 to 5):his personal experience (4.3), his observations (4.1), his own deductions (3.9), a friend with sheep and goat tradition (3.8), another goat producer (3.7) and his imagination (3.5).
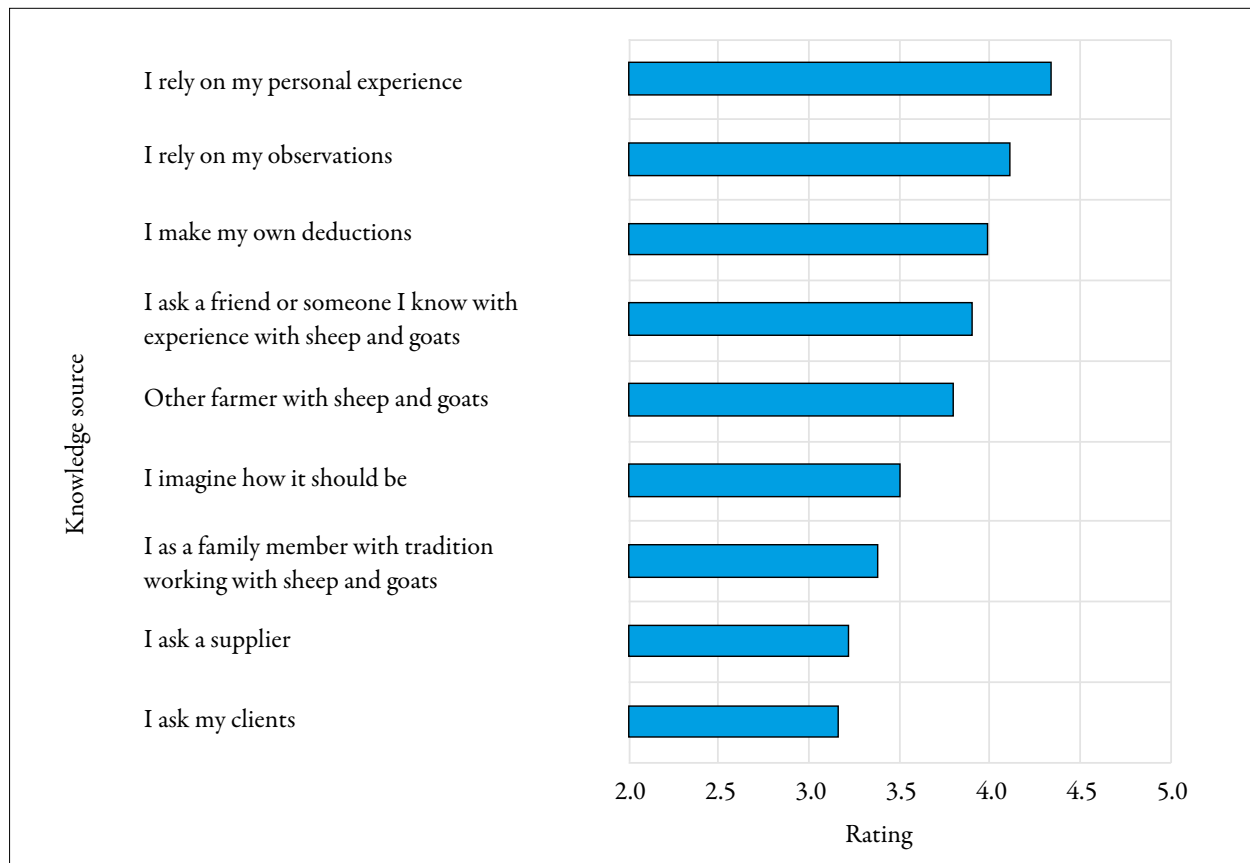

Figure 6. Assessment of tacit knowledge sources of sheep and goat producers.
Source: Elaborated by the authors

Producers tend to use less or to be indifferent to consulting a relative or family member with sheep and goat tradition (3.3), suppliers (3.2) and customers (3.1). Moreover, they seem to rely on tacit knowledge when they have to make a decision on the farm, i.e. they prefer to use their own personal experience, and they would not use very much the option of consulting with their clients.

When applying the Kruskal-Wallis test no differences were observed in the qualification medians of C, S or G type producers ($p > 0.05$), i.e. the KMt that had the intervention of an information system with indicators and planning, or the action of a KMS, did not vary compared to the control group. Producers give higher ratings to KMt than to KMe, which suggests that they feel closer to the former than to the latter.

In the multivariate correspondence analysis, which results can be observed in figure 7, the statements of the Likert scale were grouped according to the intensity of the response (1, 2, 3, 4 and 5), but no association with the type of producer involved was presented. C, S or G type producers were not close to each other, which implies that there are differences between these types, but this was not seen in the KMe.
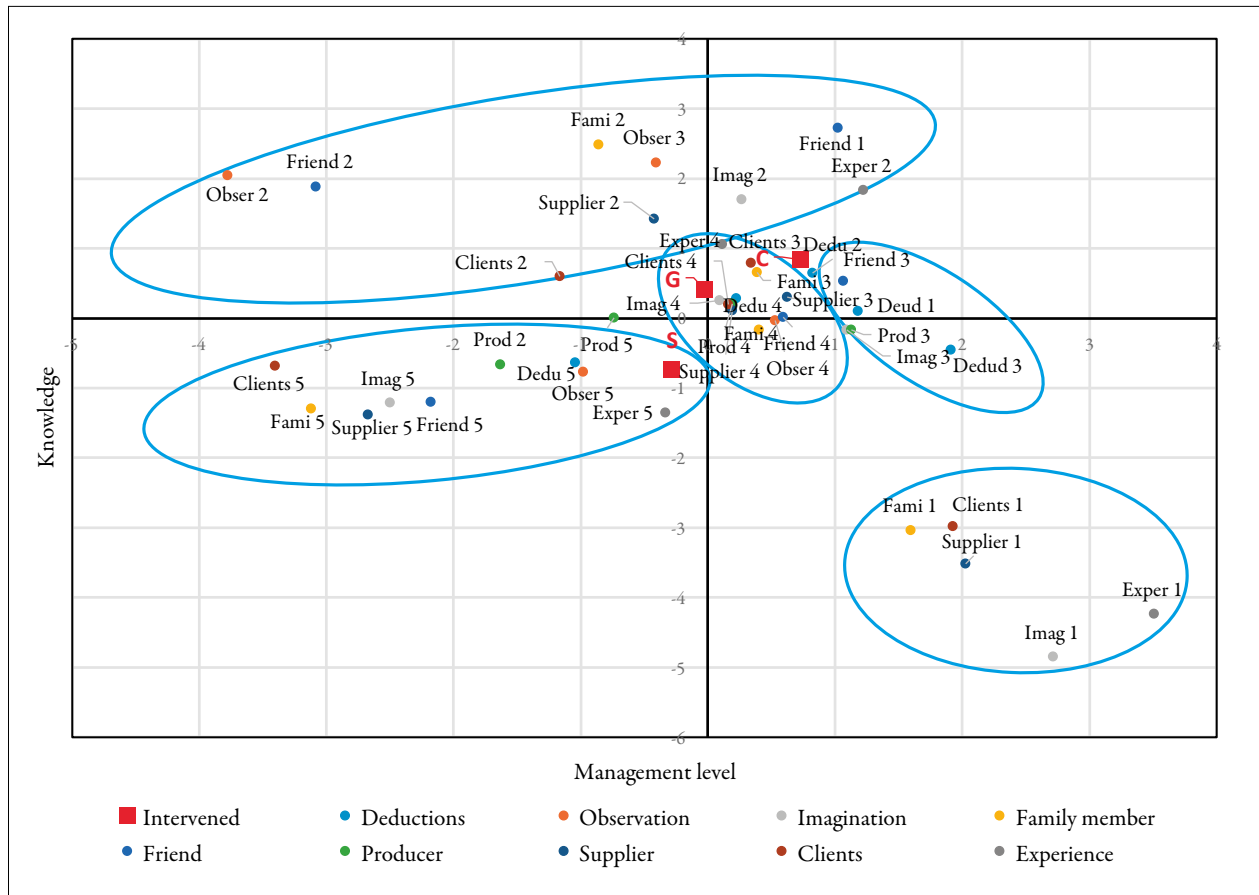
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Figure 7. Multivariate correspondence analysis of tacit knowledge.
Source: Elaborated by the authors

Discussion

Sources of explicit knowledge (KMe) is the formal type and corresponds to research centers, researchers, universities and regulations, among others. They are distinguished from the information given by means of communication because the latter transmits the knowledge from an emitter to a receiver, but they do not produce it (Aladro-Vico, 2011).

Regarding the sources of this type of knowledge, we found that producers have an attitude that goes from indifference to agreeing to access KMe when they make a decision. This result agrees with what Polanyi and Sen (2009) proposed, because it is understood that the knowledge that is applied in the real plane has an underlying tacit dimension.

Explicit knowledge is only a fraction of the tacit, and producers will tend to use the second more than the first, since there is a distance between the producer and the knowledge of explicit origin when making a decision (Montuschi, 2001a; Polanyi & Sen, 2009).

In the KMe there were no differences between the type C, the control and one type of S producer, which received management support with professional recommendations, information systems and statistical analysis, or between these with type G that was intervened with a KMS ($p > 0.05$).

In general terms, producers have access to KMe to a greater or lesser degree, regardless of whether they have an information system or not. Explicit knowledge is available, and if the producer wants

it, he/she can access it, but the critical point is not availability, but its internalization and use (Llanusa-Ruiz, Rojo-Pérez, Caralloso-Hernández, Capote-Mir, & Pérez -Piñero, 2005).

When evaluating the effect of information and communication technologies (ICT) on the public health of a community in Cuba, Llanusa-Ruiz et al. (2005) found that these technologies generate changes in organizational, management and financial processes, but that development is not only technology or its availability, but also the underlying ideological component.

In our study, when exposed to ICT, producers used these but they did not provoke a profound change in their "ideology" or way of thinking and acting (Llanusa-Ruiz et al., 2005). Documentary management of information and knowledge are concepts that, despite being close, are different. The fact of having documents does not mean having the information that is required, and that having information does not mean that it automatically becomes knowledge (Gauchi-Risso, 2012).

On the other hand, according to epistemologists the sources of tacit knowledge (KMt), offers the one that originates in oral tradition, personal experience, imagination, own deductions, family members or other people with whom the producer interacts with normally, among others.

In our study, it is understood that producers agree that they use KMt when making decisions (Blasch et al., 2011; Montuschi, 2001b; Nonaka, 1994; Ospina et al., 2014). Tacit knowledge has been used since ancient times in combination with work and creativity, to produce goods, services and scientific or technological advances (Drucker, 2004; Montuschi, 2001b), and it is to be expected that it is well qualified by producers.

In this regard, no significant differences were found between C, S and G types producers ($p > 0.05$). Regardless of the treatment, the KMt remained

the same. Tacit knowledge is subjective and based on experience, it is defined by context and contains emotions, so it is difficult to express it in words, sentences, numbers or formulas.

It also includes beliefs, images, intuition, mental models, skills and artisanship techniques (Polanyi & Sen, 2009), which will always be present, regardless of the management model used or the explicit knowledge load applied to the producer (Muñoz & Mejía, 2015).

In other knowledge areas such as industrial design, studies have found that in addition to formally acquired knowledge, it is necessary to develop tacit knowledge, based on experience and context (Refaiy, 2011; Wong & Radcliffe, 2000).

On the other hand, in the field of accounting management, it has been proven that the ability to solve problems arises from tacit rather than on explicit knowledge, and that knowing the accounting standards does not imply that the person has the competence to solve problems proficiently (Stone, Hunton, & Wier, 2000).

In 75 companies in Egypt, studies found that competitive advantage is achieved by transferring tacit organizational and technological knowledge, and that the key lies in its development (Refaiy, 2011). Similarly, in technology companies in Germany, it was evident that research and development have a large component of tacit type knowledge. Furthermore, in innovation there is a high percentage of this type of knowledge, which should be avoided, but documenting it as stories or metaphors (Goffin & Koners, 2011). However, producers value and use their own knowledge, consciously or unconsciously.

Nonetheless, these observations proposed by other researchers, coincide with the results found in our study, i.e. that when farmers make a decision about a problem, they rely more on the KMt than on the KMe. For explicit knowledge to be used, it has to become tacit (Nonaka, 1994, 2007; Nonaka & Toyama, 2003).

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Conclusions

When making decisions, producers on farms tend to be indifferent to the sources of explicit knowledge and agree more to use sources of tacit knowledge.

Traditional technical assistance, as well as the one that implements knowledge management, did not generate changes in the sources of tacit or explicit knowledge in the assessed farms.

If you want to carry out management practices with producers, you must recognize that they act, to a greater extent, according to sources of tacit knowledge and, therefore, this should be the work scope of professionals and researchers.

Acknowledgements

Disclaimer

The authors agree with the publication of this article and declare that there are no conflicts of interest.

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