Article

Characterization of rural extension workers in Mexico a contribution from the correspondence analysis

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Abstract

Rural innovation remains a crucial element to solve problems of low productivity in agriculture and rural poverty, rural extension constitutes an instrument of agricultural policy that promotes innovation through its extension workers. In order to characterize the profile of these actors, a typology was made based on their professional attributes and the problems they face. The survey of extension workers of the monitoring and evaluation system of the rural extension policy 2016-2017 was used, it collected information in ten states of the republic and its sample size was 609 questionnaires. The methodology used multivariate statistical procedures, at first, the correspondence analysis estimated principal dimensions, later clusters were constructed to define the typology. Three strata were detected, which grouped the predominant problem and area of the professional studies, this allows a better understanding of the characteristics of the extension workers and establish strategies for solving problems in the extension policy focused on the knowledge of the capacities and conditions of one of its main actors.

Keywords: agricultural training, rural development, rural education, rural typologies.

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Introduction

At the international level, there is broad consensus on the importance of rural innovation as a decisive factor in solving structural problems in agriculture, such as low producer incomes and low productivity of the activity (Ardila, 2010; Christopolos, 2010). Farmers' access to agricultural technologies and knowledge-sharing practices is recognized as a key element in solving these problems. In this sense, rural extension work is a fundamental part in innovation processes, alluding to a non-formal educational function and mechanisms for the transfer of knowledge to farmers and other actors that make up agri-food systems within a rural socioeconomic structure.

This work is especially relevant in the most vulnerable productive systems, where it is necessary to explore new opportunities to improve food security, access the financial and commercial system, mitigate environmental vulnerabilities and achieve representativeness in the political and social sphere.

In these processes of technology and knowledge transfer, rural producers and extension workers have a preponderant role. Extension workers are a key player in promoting rural innovation on the farms; play a prominent role in the adoption of technologies and knowledge among rural producers, additionally they can encourage the organization of producers and access to markets, among other aspects, which represents a key coadjuvant in the construction of alternative solutions to the problems of agricultural producers.

Consequently, the analysis of rural extension policies has recently gained relevance again; however, at the same time it is noted that, despite the important work of the extension workers, there is an oversight in the analysis of their performance, as well as the problems they encounter in the development of their activities (Cook *et al*., 2021). This research starts from the assumption that the extension worker is a fundamental actor in rural innovation processes; from its work of articulation between different actors: producers, marketers, industry, research and technology and innovation transfer and centers. Therefore, it is assumed that analyzing the problems that extension workers perceive in their work routines is a valuable tool to identify, analyze and propose alternatives to increase the efficiency of their work and ultimately, that of rural extension policies.

In this context, the objective of the research was to describe and analyze the profile of rural extension workers in Mexico and to articulate this analysis with the problems they have observed in the development of their professional activity. The first part of the document contains the methodological procedure of the research, the databases and the statistical procedures used are specified. The second includes the results and their discussion, focused on the description of the profile of the extension workers, the analysis of their problems and an approach that grouped main problems with the variable of the professional profile. The last section contains the conclusions.

Materials and methods

In 2016 and 2017, the Food and Agriculture Organization of the United Nations (FAO) evaluated the Extension Component implemented by the then called Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA, for its acronym in Spanish), today the Secretariat of Agriculture and Rural Development. With 609 questionnaires applied to the same number of extension workers in the two years considered, a database was integrated, which supports the quantitative research, mainly descriptive. The database included information from extension workers in ten states of the republic. In each state, a simple random sampling with state representativeness was applied, with a confidence level of 90% and an error of 10%.

The selection of states did not obey probabilistic criteria, the survey was carried out in the states where monitoring and evaluation processes of rural extension policy were established, which makes inference at the national level impossible. However, considering that during the period 2016-2017, 7 114 extension workers were hired at the national level (SAGARPA and FAO, 2018; SAGARPA and FAO, 2018b), the sample size is equivalent to 8.6% of the total number of extension workers in Mexico. Table 1 shows the general characteristics of the sample, divided by state, sample size by state, sex, age, years of experience and area of professional training of extension workers.

Table 1. General characteristics of the sample.

State	n	Sex (%)		Age	Years of experience	Academic background (%)				
		H	M			Agronomy	Zootechnics	Social	Biology	Other
Chiapas	82	79.3	20.7	36.9	2	46.3	37.8	2.4	1.2	12.2
Durango	60	81.7	18.3	45.7	2.4	43.3	41.7	10	0	5
State of Mexico	73	65.8	34.2	39.2	2.8	46.6	41.1	6.8	0	5.5
Guanajuato	72	70.8	29.2	43.7	4.1	31.9	56.9	8.3	2.8	0
Michoacán	62	59.7	40.3	42	4.3	37.1	41.9	14.5	4.8	1.6
Oaxaca	85	75.3	24.7	37.4	2	61.2	16.5	7.1	10.6	4.7
Puebla	27	74.1	25.9	40.3	2.4	37	40.7	7.4	7.4	7.4
San Luis Potosi	41	87.8	12.2	48.2	2	36.6	56.1	4.9	0	2.4
Sinaloa	70	82.9	17.1	42.8	3	44.3	27.1	15.7	7.1	5.7
Sonora	37	75.7	24.3	46.4	3.2	35.1	18.9	24.3	2.7	18.9
Total	609	74.9	25.1	41.6	2.8	43.5	37.3	9.5	3.8	5.9

Statistical analysis

The correspondence analysis (CA) methodology was used to study relationships between categorical variables. CA is an adapted extension of the methodology of principal component analysis, it is used for the statistical management of categorical data obtained in social surveys. CA identifies dimensions for which little dispersion in profiles or groups is noticed and eliminates dispersion directions that provide little information, thereby reducing dimensionality (Greenacre, 2007). From the analysis of contingency tables with numerical frequency data, it allows a simple graphical representation that provides the understanding of a large number of data (Greenacre, 2007; Abdi and Williams, 2010).

The principle of CA is to generalize a graphical representation of a scatter plot, where data are represented in the form of points in relation to the axes of perpendicular coordinates: the horizontal axis (the *x*-axis) and the vertical axis (the *y*-axis). CA allows analyzing the correlational behavior between categorical variables in one or several dimensions, in addition, from these dimensions, it is possible to establish hypotheses of interpretation of the population included in the sample.

CA has been used in social studies to define typologies of rural producers (Bouyer *et al*., 2011; Urcola *et al*., 2015; Fantappiè *et al*., 2020). In the present research, CA was used to analyze the aggregate profile of extension workers in Mexico, mainly the relationship between the type of major studied and the difficulties presented by these actors in the performance of their activities in rural extension programs. A chi-square test was used to assess the level of significance of the results obtained. The software used for statistical analysis was RStudio.

Results and discussion

Of the total number of professionals consulted, 74.9% were men and the rest were women. When contrasting these results with similar ones in Latin America, it is noted that the low prevalence of female professionals in extension policies is a recurrent condition in several countries in the region. In a study in 10 Latin American countries, it was found that, on average, the male population represents 70% of the total number of extension workers (Landini, 2016). This scenario contrasts with the new trends in the design of more plural extension policies that seek to strengthen the institutional capacity of organizations within the extension policy with the incorporation of the gender approach.

Based on the recognition that extension services are traditionally oriented towards male farmers, through mostly male extension workers, authors such as Qamar (2011) point out that there is international evidence that shows the effectiveness in the impact of extension policies when the strategy includes two areas: extension services aimed exclusively at women and that are provided through female extension workers.

Although there are experiences in countries of the African (Lahai *et al*., 1999) and Asian (Lamontagne-Godwin *et al*., 2017) continents where, based on statistical analyses, the results of extension services provided by male extension workers and female extension workers have been examined and no statistically significant differences have been found, the international debate has considered that the gender approach in rural extension can represent a valuable strategy due to the role that women play in agriculture and agri-food systems, especially in Latin American countries.

When analyzing the age of the extension workers, an average of 41.6 years was found, when disaggregating the analysis by sex, it is noted that women reported a lower average age, of 36.3 years, while for men it was 43.4 years. This allows inferring that it is a relatively young population, when stratifying the analysis by age group, it is relevant to observe that 22% of the extension workers are people under 30 years, at the opposite extreme was the stratum between 50 and less than 60 years (21.3%). The most important group in relative terms was 30 to less than 40 years, which represents almost a third of the total number of extension workers.

Eighty-two-point three percent of extension workers have completed a bachelor's degree, which is consistent with the design of the extension policy in the period studied, whose regulations established the hiring of professionals with at least one completed degree in the area of natural sciences. In this sense, two areas stand out, the first is that 2.1% of hired actors reported having a completed technical bachelor's degree, and at the opposite extreme 15.6% declared having a postgraduate degree. Likewise, 0.7% of extension workers in Mexico hold a Doctor of Science degree and 14.9% have a master's degree in science.

Of the total number of professionals hired to carry out processes of extension work, 43.5% have studies related to agriculture/agronomy and 37.3% have studies in livestock/zootechnics. Professionals with studies related to social sciences represent 9.5% of the total. Most of the extension workers are general agronomists and specialists in phytotechnics and zootechnics, together these represent 36.6% of the total, on the other hand, zootechnician veterinaries are an important population in relative terms, they constitute 26.3% of the total of extension workers. Three-point eight percent of extension workers have studies outside rural development, both in technical and social terms.

Professionals with studies in law, chemistry, physics-mathematics, computer science, psychology and international relations were found. The professional profile shows that rural extension in Mexico constitutes a process that has marginally considered the multiple social and political factors that shape rural life, on the other hand, access to processes of adoption of technologies mediated by fundamentally technical practices has been privileged.

Producers' access to agricultural technologies is recognized by extension policy as the crucial element of its actions, which assumes is a fundamental factor in improving their livelihoods. However, it is ignored that extension practices are based on socioeconomic, political and cultural processes that characterize rural livelihoods, this shows some disconnection of the extension service with the complex realities of farmers, as well as their relationships and practices. Cook *et al*. (2021) argue about the importance of introducing extension to the real world through the transfer of knowledge and technologies to farmers not only from a productive aspect, but from different approaches that build complex knowledge capable of accounting for and solving the multiple problems faced by actors in the rural environment.

In the case of Mexico, there is little participation of professionals from social, economic and political areas. The absence of certain technical profiles reveals the lack of attention to strategic issues that are related to the solution of problems such as: the conservation of natural resources, the social organization of producers and issues related to market and risk analysis, among others.

Analysis of extension workers' problems

Table 2 summarizes the problems that the extension workers defined based on information on the critical performance of their work and indicates the failure to meet goals or unexpected consequences within the 2016-2017 policy of rural extension work in Mexico.

Table 2. Main problems of extension workers in Mexico.

Problem	Academic background					$\bar{x}$ (%)
	Agric./ Agron.	Livest./ Zootechny	Soc./ Economy	Biology	Others	
Lack of timeliness regarding productive calendars	65.8	19.8	7.2	1.8	5.4	19
Lack of continuity to extension groups	41.7	43.8	8.3	1	5.2	16.4
Productive training for extension workers	27.1	49.4	10.6	5.9	7.1	14.5
Job precariousness of extension workers	40.3	33.9	16.1	4.8	4.8	10.6
Lack of articulation of the extension policy	37.5	37.5	10.4	4.2	10.4	8.2
Short-term services with beneficiary groups	39.4	42.4	9.1	3	6.1	5.6
Low linkage between groups of beneficiaries	60.6	24.2	12.1	0	3	5.6
Excessive bureaucratic processes during service	45.2	41.9	3.2	6.5	3.2	5.3
Poor coordination within the Component	38.1	33.3	14.3	4.8	9.5	3.6
Bureaucratization of monitoring and evaluation processes	25	50	0	15	10	3.4
Selection of extension workers without objective criteria	62.5	37.5	0	0	0	2.7
Services outside of beneficiary demands	42.9	42.9	7.1	7.1	0	2.4
Excessive meetings for the management of the component	11.1	66.7	22.2	0	0	1.5
Productive training for beneficiaries	0	50	16.7	16.7	16.7	1

Based on BD (2016-2017).

The definition of problems was made based on the frequency in which each was mentioned by the extension workers. The main problem was the lack of timeliness regarding productive calendars (1). In this sense, 19% of extension workers identified as their main concern the low correspondence between the beginnings of extension services and the productive cycles on the producers' farms. They mention that this situation influences decision-making at the farm level, because when they begin their functions in the production units, the most important technical decisions have already been made by the producers.

The national evaluation of the extension policy in 2017 concluded that 94% of extension workers started activities between June and August, which technically shows that they arrive at the farm when producers have already made the decisions regarding what to produce and how to do it, at least for essential processes such as sowing, mainly in rainfed agriculture or calving periods in livestock farming (SAGARPA and FAO, 2018b). There is empirical evidence showing a positive correlation between the timeliness at the start of services and the increase in productivity (Santoyo-Cortés *et al*., 2016).

Secondly, 16.4% of interviewees observed the problem related to the lack of continuity of extension groups (2); conceptually, rural extension policies constitute a strategy for the achievement of goals, for the effectiveness and legitimacy of these, to have lasting processes where extension groups and producers have continuity in the medium term plays an important role. Thirdly, the productive training of extension workers was noted (3). The orientation of the extension policy shows that the strategy has focused on a predominantly productive area.

The discourse that defines the relationship between farmers and extension workers emphasizes that the solution of problems will be achieved with a productive approach, therefore, the training that extension workers receive from the public administration is based on a set of technological practices of a technical and productive nature. However, extension workers have found in praxis that this approach not only ignores the sociocultural, economic and political processes that shape rural livelihoods, but that this results in an extension policy disconnected from the realities of farmers.

The training practices for extension workers focused on the productive aspect are exclusionary mechanisms that establish limits that legitimize an approach that does not start from the principle of recognizing the problems of the rural environment. Authors such as Bartlett (2010) mention that these processes have the consequence that extension workers ignore the sociopolitical, economic and cultural processes that shape rural life. These processes are in turn related to another problem pointed out by the extension workers, which is that the training of beneficiaries by the extension workers is highly production-oriented (14).

The problem of job precariousness of extension workers (4) is an issue of the existing institutional capacity to implement the rural extension work policy. In this sense, the extension workers identify that there are no efficient processes in the payment of their fees, they also highlight the lack of social security schemes and no support for operating expenses. This situation has been reported in several countries in Latin America, where there is a usually temporary hiring of extension workers and with a high turnover of personnel, which has an impact on the quality of extension services (Ardila, 2010).

Fifthly, the lack of articulation of the extension policy (5) was observed, relative to the fact the technological packages that are disseminated do not consider the productive limitations of the target population. The interviewees raise the need to articulate extension services with supplemental investments to support the technological changes promoted. Five-point six percent of extension workers identified short-term services to groups of beneficiaries as a problem (6). Analyses by SAGARPA and FAO (2018, 2018b) show that, during 2017 and 2018, the average duration of services was 7.1 and 8.1 months respectively, this means short-term services, which in the narrative of extension workers makes it impossible to fully develop their services and cover at least one complete productive cycle.

At the international level, the effects of this obstacle have been analyzed and there is a conviction that short-term extension policies are inefficient in achieving productivity and knowledge transfer objectives (Solleiro *et al*., 2020). In addition, it has been observed that the processes of rural extension have not strengthened the organization through the linkage between groups of beneficiaries, so the low linkage between groups of beneficiaries is noted as a problem (7), in this sense, the extension workers find it essential to develop strategies where there is greater linkage between groups of beneficiaries.

The problems of excessive bureaucratic processes during the service (8) and during the monitoring and evaluation processes (10) are two dimensions, according to the extension workers, who refer to difficulties in the ability of the institutional apparatus to perform the tasks effectively and efficiently. The poor coordination within the agencies with respect to the staff that coordinate the operation of the extension policy is added to these problems (9).

Previous studies have documented the range of instances included in the operation of extension policy in Mexico (Santos *et al*., 2019). The continuity of this problem in 2016 and 2017 shows an absence in the change of operating routines of the so-called agencies staff that has generated bottlenecks in the bureaucratic processes of the policy, precisely as the problem of excessive meetings of the Component (13).

Two point seven percent of interviewees indicated that the selection of extension workers without technical criteria was a problem (11). As noted in this study, the findings show the hiring of professionals in the area of law, chemistry, international relations, physics and mathematics, which from the perspective of most extension workers does not contribute to the resolution of productive problems of the farms, especially when it comes to one-person work programs. Another critical element shows that extension services are outside the needs of the beneficiaries (12), a hypothesis derives from the fact that the work of the extension worker focuses on attending to what the bureaucratic routines of the extension policy dictates instead of the specific needs of the producer.

Correspondence between the identified problem and the professional profile of extension workers

Table 3 shows the representation of the four vertices that constitute the problems of extension workers according to their professional area and the percentages of variance explained by each dimension. By adding the values, one can know the variance explained by the dimensions. Dimensions 1 and 2 explain 64.6 and 17.4% of the total, respectively, which corresponds to a cumulative percentage of the total variance retained by the two dimensions of 82.1%.

Based on the variance explained by each axis as a dimension, the sum of the two principal dimensions can be expressed, whose aggregate value is 0.1169, therefore, the chi-square statistic of independence between two variables is equal to 83.36975. When applying a statistical test using a chi-square distribution, the *p*-value of the estimate yields a highly significant value (p= 0.003738235).

Table 3. Decomposition of inertia by principal dimension.

Dim.	eigenvalue	(%) variance	(%) cumulative variance
1	0.09211995	64.64	64.64
2	0.0248523	17.44	82.08
3	0.01866507	13.1	95.18
4	0.00687508	4.82	100

Figure 1 shows the representation of the symmetrical map of the relationship between variables, which allows observing the degree of association between the professional studies of extension workers and categories of the problems indicated. This facilitates the interpretation of relative positions and gives an idea of the behavior of variables. Agronomy/agriculture profiles are related to problems 1, 11 and 7, while professional studies in biology are closer to problems 10 and 14.

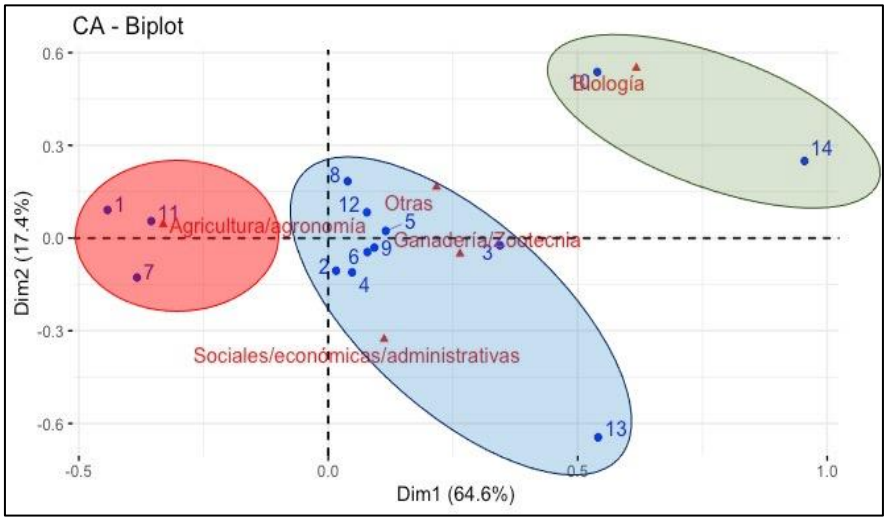

Figure 1. Symmetrical map of relationship between data.

The map allows identifying the overall pattern within the data, the rows are represented by blue dots and the columns by red triangles. The distance between any row of points or column gives a measure of their similarity (or dissimilarity). Three groups are clearly identified from the CA. By including a factor analysis based on a cluster dendrogram, the delimitation of three groups was verified (Figure 2). Extension workers were discriminated in three strata.

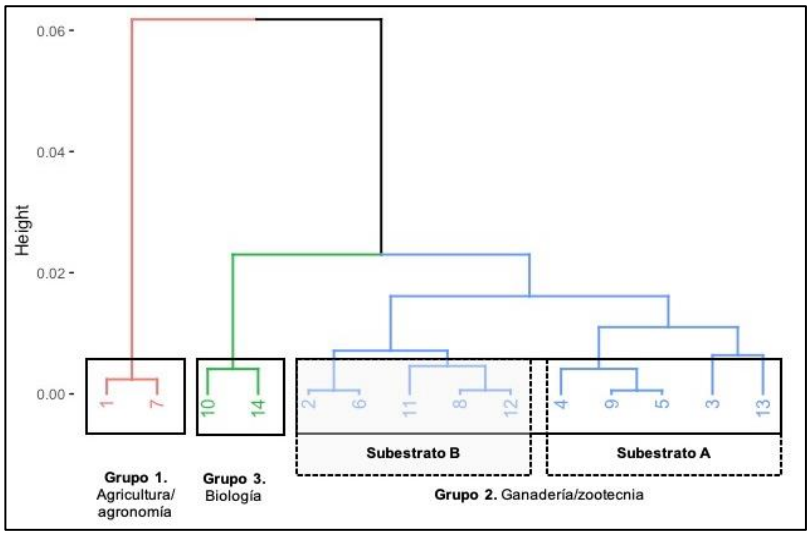

Figure 2. Cluster analysis dendrogram.

The first group included 43.5% of them, it corresponds to professionals with studies in agriculture and agronomy, problems 1 and 7 were associated with this group, the second included professionals in the area of livestock/zootechnics, this group has a longer list of problems that groups them into a stratum (problems 2, 6, 11, 8, 12, 4, 9, 5, 3, 13), the last group included extension workers with studies in biology, who were grouped by problems 10 and 14.

Description and analysis of each identified cluster

Group 1. (Agriculture/agronomy) was associated with problems of lack of timeliness of extension services with respect to productive calendars and low linkage between groups of beneficiaries. It is the largest group of extension workers, who register an average age of 42.5 years, based on their experience in recent extension policies (2.7 years), they mention that strategies for the adoption of technologies focused on increasing production require timeliness in the beginning of services, and that promoters arrive at the plot before producers carry out their productive activities.

This articulation between producer's decision-making and extension strategies becomes more relevant in services oriented to the agricultural field, where the timely establishment of the extension strategy includes very broad processes of dissemination and adoption of technologies, ranging from the selection of crops and varieties, technologies that include machinery, equipment, as well as fertilization programs and applications of other agrochemicals, and good practices in the management of cultural tasks, even the way in which producers insert themselves in the chains of purchase of inputs (Aguilar-Gallegos *et al*., 2015).

Since it was a topic that was mainly highlighted by professionals engaged in agricultural activities, it is possible that this problem is more noticeable in this subsector than in livestock. The problem of low linkage between groups shows that these actors believe that innovation strategies aimed at improving the productive aspect are insufficient, by themselves, since more frequent interaction processes between producers and extension workers are required.

Group 2. (Livestock/zootechnics) represents 37.3% of the total number of extension workers, who register an average age of 41.3 years, constitutes a group with high heterogeneity in relation to the problems that the statistical analysis associated with their profile. Derived from the dendrogram of the cluster analysis, it can be seen that, within this group, two substrata are identified, one interested in changing the bureaucratic paradigm of the agencies of the extension policy and another focused on improving extension services considering its role as a facilitator in innovation processes.

The first substratum A and the aggregate analysis shows the concern to improve the performance of government agencies of the extension policy in Mexico and establish actions aimed at improving their organization, service and control, in order to make their management process more efficient. Problems aimed at establishing actions so that the agencies comply with the established regulations and improve the quality of services are identified. The objections of this group are related to the precariousness of the job of extension workers, the lack of coordination within the public administration, the lack of articulation of the extension strategy with other similar strategies within the sectoral policy, as well as excessive meetings to which bureaucratic routines constrain them to attend, in addition to the fact that training meetings maintain a productive approach.

This subgroup strongly criticizes the agencies responsible for implementing the extension policy, often judging them as unable to comply with and enforce existing rules. Substratum B showed concerns regarding the continuity of groups, short-term services that do not respond to the needs of producers, selection of extension workers without technical criteria and, as in the aggregate of group 2, they did not ignore problems related to the excessive bureaucratic processes of the extension policy. It is clear to this substratum that the promotion of technologies based on short-term policies will not generate productivity and knowledge transfer results in producers, in addition, considering that services last between seven and eight months, the observations of this substratum are aimed at developing a more lasting linkage between extension workers and producers.

Based on these problems, it is noted that there is a bias in the extension policy, it is unlikely to achieve results with discontinuous strategies and short-term services. The classical theory of the dissemination of innovations shows the importance of establishing lasting and relevant interactions to persuade at least a minority of producers (pioneers and adaptors) to apply the proposed innovations (Rogers, 2003). This again shows the centrality that extension workers give to the processes of social interaction, which is consistent with various studies that show that since, conventionally, the interventions and methodologies of rural extension programs include processes of accompaniment from producer to producer, where the identification of pioneering producers who have adopted innovations is required so that they function as key actors in the dissemination of technologies among their peers (Cook *et al*., 2021), which will hardly be transformed into transcendental results if short-term interventions and services with a duration of less than one year are maintained.

In addition, in this subgroup, there is a concern about the inefficiency of extension services, since they do not usually respond to the problems of the beneficiaries, which they attribute it, in part, to the lack of technical processes in the hiring of extension workers, since in their opinion there are profiles of professionals that do not agree with the sectoral strategies of the extension policy. The institutional framework of extension policies has neglected the development of capacities in extension workers, as well as the fit of their professional profile so that they can respond to the new challenges of world agriculture.

Group 3. (Biology) showed a concern about the prevalence of a productive extension model, oriented to primary production, which neglects the complexity of agriculture and the emergence of new challenges in production. It is interesting to note that this group represents a minority of extension workers concerned about the emergence of new trends in agriculture. This is consistent with the analysis of international organizations, such as FAO, that have made visible the importance of expanding the functions of rural extension and making it more plural and include issues related to markets, organization, financial services, cooperativism, agroindustry, management of natural resources, development of rural non-agricultural activities, among others (Christoplos, 2010).

At present, it is noticed that the problems of agriculture have become more complex. Although the need to promote agricultural innovations that improve the productivity, profitability and sustainability of farmers remains in force, there is a growing recognition that calls into question the effectiveness of extension models that are based on the predominance extension workers with profiles of a productive nature (Bartlett, 2010; Sewell *et al*., 2017).

In the same sense, it has been highlighted that rural extension work is a very complex practice, which usually exceeds specific professional training, given that producers work with living beings and with a high level of risk, so they require more than just productive advice, they also need skills in marketing, organization, communication as well as in specific topics related to edaphology or animal health, to name a few examples, so it is possible that extension workers are called to work in teams and also develop their own organizational schemes.

Conclusions

In the present research, a typology of problems in the performance of the work of extension workers in Mexico was constructed. From an analysis of the extension workers' profile, it was possible to characterize the general features of the extension policy in Mexico. It is a policy with a sectoral approach that bases its strategy on profiles of extension workers in the areas of agronomy and livestock. Marginally, extension workers with profiles from the areas of biology and social sciences have been employed. In addition, empirical evidence showed that during the period 2016-2017, extension work in Mexico was developed mainly by middle-aged men. From the analysis of problems, a list of obstacles perceived by extension workers was identified, which is an input to contribute both in a diagnosis of the extension policy in Mexico and possible ways to improve its efficiency under a broader vision.

Additionally, the cluster analysis grouped main problems by type of extension worker according to their professional area, which can help in the establishment of a policy of attention to the problems of extension workers in a differentiated way. Finally, this perspective must be enriched with a more robust typology of extension workers that groups these actors according to their performance at the farm level, which would allow to characterize successful experiences and replicate them within the framework of the extension policy in Mexico. In addition to the conception of these actors, it is necessary that it articulated with different studies and empirical evidence directly from the farms of the beneficiaries, with the aim of having a multidimensional assessment and tending towards a holistic vision, which is one of the challenges of the national rural extension work that has been outlined in this research.

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