Article

Mexican rural extensionism: conjunctural analysis with a public policy approach

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Abstract

With the objective of contributing to the knowledge of the results of the rural extension public policy in Mexico, the degree of adoption of new technologies and capacity development among the beneficiaries was analyzed according to different attributes and characteristics of their production units. The 2014 national survey of beneficiaries of the monitoring and evaluation system of the extension and productive innovation component was used, which collected information in ten states of the republic and its sample size amounted to 1 062 questionnaires. The rate of adoption of new technologies and capacity development was calculated and it was found that -in contrast to the modernizing paradigm on which the national extension policy is based- small producers are not the priority population for a results-oriented policy, but rather those with average income and productive assets. Statistically significant differences were found between the average value of the index and variables such as sex, age, schooling, area and investment in assets of the production unit, this allows to establish specific strategies to promote a public policy of differentiated extension, focused on empirical evidence to production unit level.

Keywords: adoption of technologies, extension agents, extension component and productive innovation, rural innovation.

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Introduction

Rural extensionism in Mexico and Latin America has regained centrality in government and research agendas due to its importance in addressing rural poverty, inequality and food insecurity through the transfer of technologies and knowledge to small producers with the purpose of increasing productivity, income and, therefore, promoting rural development (Alemany and Sevilla, 2007; Ardila, 2010).

Although a broad narrative is identified that identifies rural extension policies as an instrument aimed mainly at small farmers to stimulate rural development processes (Rivera, 2001; Anderson and Feder, 2003; Rivera and Qamar, 2003; Christoplos, 2010; Preissing *et al.*, 2014; Andersen, 2015; Rendón *et al.*, 2015; Landini, 2016), few investigations provide empirical evidence at the level of producers and their production units (UP) on their results, particularly on aspects of adoption of technologies and capacity development.

There are publications that address problems in rural extension processes in Latin America and Mexico (Rendón *et al.*, 2015; Landini, 2016; Roldan-Suárez *et al.*, 2016; Santoyo-Cortes *et al.*, 2016; Landini *et al*., 2017), in isolated cases adopt a public policy approach that examines the results at the farm level of the beneficiaries, valuing these results from a broader perspective, considering at least two perspectives: the national context in which the public policy, the productive units and the management processes that influence the results. These elements allow to support arguments about the problems that the policy faces in order to achieve its objectives from the perspective of whether its instruments can or cannot achieve what is demanded of them or the values that are sought to be served is not reflected in the implementation.

In this context, the research problem of this work was to determine the extent to which the design and operation of the extension policy in Mexico -captured through the extension and productive innovation component (CEIP)- are oriented towards results. Through the induction of technological innovations and capacity development, the results achieved in this field are examined according to different variables (sex, age, schooling, income, investment in assets of the production units, as well as productive scale and type of supported request). The objective of this work was to measure the results according to the degree of adoption of technologies and capacity building of rural extension policy in Mexico based on empirical benchmarks at the farm level, based on the systematization of data from the monitoring process and evaluation of the national extension policy.

The public policy approach to the analysis of extensionism in Mexico

Rural extensionism, like all concepts, is the product of its own time and its meaning has changed over time, increasing its complexity (Landini *et al*., 2017). This requires rethinking its conceptual foundations to differentiate it from other forms of communication and knowledge transfer in order to establish a complex and critical perspective in order to operationalize it under the public policy approach and be able to update its contents in terms of public policy.

A first distinction of the concept is its educational dimension. Throughout history and around the world there have been patterns of exchange of knowledge in agriculture with certain actors playing the role of advisor. Authors such as Jones and Garforth (1997) locate more or less institutionalized forms of extensionism in ancient Mesopotamia, Egypt, Greece and Phenicia.

The concept of extensionism was born as a function of education, since it originated in the academy, and its common use was recorded for the first time in Great Britain in the 1840s, alluding to the so-called extension movement where universities extended their work beyond the campus. Under this heritage, in the early twentieth century in the United States of America, the term extension education was used to indicate that the target group of university education should not be restricted to students, but should be extended to people who lived in the state where the campus was located (Leeuwis, 1988).

A second distinction of the concept has to do with the communicative dimension, which implies a conception of innovation oriented to the predefined diffusion of technologies, information and advice, in order to promote knowledge. Under this dimension, the concept refers to the premise of transfer and exchange of practical and technological information (Rivera and Qamar, 2003).

Based on the educational and communicative dimensions, it is established that extensionism operates within broad knowledge systems that include agricultural education and research. Under this idea, knowledge is generated by researchers and transferred to producers by extension agents, with which producers are expected to adopt the developed technologies (Rivera, 2001; Anderson and Feder, 2003; Christoplos, 2010).

The last dimension of the concept of extensionism is the prescriptive, which realizes that extension is a communicative action that seeks to influence people in a particular way, seen from the public sphere in accordance with certain policy objectives. This dimension is particularly important because extensionism is also conceived as part of the set of policy measures that governments use to influence the rural environment. Given this, international organizations such as FAO (Rivera, 2001), the BM (Anderson and Feder, 2004) and IICA (Ardila, 2010) place extensionism as a key element to accelerate agricultural innovation and technological change and thus contribute to the reduction of poverty and the improvement of the standard of living of rural populations.

Based on this background, current extension systems, especially in Latin America, should be seen as a result of the evolution of different paradigms used; through, of the time by the countries for the provision of education services/technology transfer and provision of technical information to the producers. This involves scientists, professors, students and producers, in interrelation and with feedback schemes, in such a way that the problems and challenges of the productive sector are transformed into research and study topics for the rest of the actors.

The creation of extensionism institutions in Latin America and Mexico had an important support through technical assistance and cooperation from the United States of America, mainly in the 1940s and 1950s, which was defined his conception and modernizing paradigm that sought the transfer of technologies of the so-called green revolution and the incorporation of small farmers to

markets of inputs and products. In Mexico, the current extension policies are governed by this modernizing paradigm, which has a linear and hierarchical approach, and a conception of innovation oriented to the predefined dissemination of knowledge. Knowledge is generated by researchers -often without considering the rationality of the producers- and transferred to the producers by the extension agents, with the expectation that the former passively adopt the technologies developed by the researchers.

In this sense, the national rural extension is a policy instrument whose purpose is the achievement of public interest objectives used to promote rural development. As a concept, it refers to a non-formal agricultural educational function and knowledge transfer processes for farmers and other actors in agrifood systems. What refers to the premise of transfer and exchange of practical information. The transfer is preceded by the training of human resources through agricultural education, the generation of knowledge and technology from research centers, and is based on its adoption by producers -through extension agents- in order to favor rural development processes.

The instrument of extension policy in Mexico was the CEIP, called in 2017 and 2018, component of extension, capacity development and productive associativity. Technical assistance and training are promoted through private services paid with public resources. These services are provided; through, the figure of the extensionist, which acquires an essential function in the management and operation of the Component since it is the one that offers the professional services of extension and productive innovation to the producers.

Materials and methods

Integration of the database

From the analysis to the survey of beneficiaries of the CEIP 2014, designed by FAO and the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), within the framework of the establishment of the monitoring and evaluation system of the programs in resource concurrence, a quantitative, mainly descriptive, research was conducted to measure the degree of technology adoption and capacity development among the Component's beneficiaries. The survey was applied in ten states (Chiapas, State of Mexico, Guanajuato, Michoacán, Nuevo León, Oaxaca, Puebla, San Luis Potosí, Sinaloa and Tabasco), where a representative probabilistic sample of each entity was collected, derived from a sampling simple randomization, which generated a sample of 1062 questionnaires.

The questionnaire included eight sections: information on the support received, socio-demographic profile of the beneficiaries, area of the production unit, characteristics of the UPs (with modules differentiated according to the orientation of the extension service received, agricultural production unit, livestock, aquaculture and fishing), product commercialization, control of production and accounting records, productive assets and sources of income.

The selection of states did not obey probabilistic criteria but technical administrative reasons that allowed the survey to be carried out. This makes an inference at the national level of the estimators impossible; however, the included states cover five of the seven socioeconomic regions of the classification of federal entities of the National Institute of Statistics and Geography (INEGI, 2004).

Index of adoption of new technologies and development of capacities (IANTDC)

It is a synthetic measure of capacity development in rural areas and accounts for the degree of rural innovation based on extension services. Unlike other indices that only consider the quotient between the number of practices carried out by producers on the total of practices based on a specific catalog, such as the so-called Adoption of Innovations Index (Roldan-Suárez, 2016; Santoyo-Cortes *et al.*, 2016), the IANTDC calculates the number of practices carried out at a given time and examines the following areas: changes in productive reconversion, at the organizational level, in productive linkages, in production and accounting records and in access to markets, derivatives of the service provided by the extensionist in the UP.

The value of the IANTDC was calculated by the following formula:

$$IANTDC_i = \frac{Inc_i + Nivo_i + Nea_i + Ned_i + Rpc_i + Nanm_i}{6}$$

Where: $IANTDC_i$= index of adoption of new technologies and capacity development of the ith producer; Inc_i= sub-index of the implementation level of innovations; $Nivo_i$= subscript of the organizational level; Nea_i= subscript of the backward chaining level; Ned_i= subscript level of forward chaining; Rpc_i= subscript of the level of production and accounting records; $Nanm_i$= subscript of the level of access to new markets and customers. The index i= 1…n identifies each beneficiary in the sample, n being the total of beneficiaries of the sample. The values of the index range from 0 to 1, where 1 represents the highest degree of technology adoption and capacity development and 0 that did not register agricultural adoption and innovation.

Subsequently, the statistical relationships between the average value of the IANTDC and the following categorical variables were analyzed: sex, age, schooling, income, assets, area of the UP, type of request supported and sub-sector supported. An analysis of categorical variables was used and the chi-square test was applied to identify the statistical significance.

Results and discussion

The results are presented in eight sections, the first four devoted to describing the extension system in Mexico, the size of public investment, key aspects of design and operation, as well as the type of support distributed by the CEIP. The following parts are devoted to examine data at the level of the UP, especially the last two to analyze the IANTDC in general and by different attributes of the beneficiaries and their production units.

Analysis of the extension system in Mexico

Extension processes are carried out within the framework of agricultural research and education systems. In Mexico, there is no formal system in which agricultural research, education and extension activities are coordinated, what remains is a *de facto* system in which public and private agents interact to carry out this type of activity in isolation. In general, the agricultural research and education institutes have not consolidated the innovation process (due to the structural crisis that they have suffered since the 1990s) and have little impact on the transfer of technologies and therefore, little connection with the programs of extensionism and to a lesser extent with the productive sectors (Ekboir *et al*., 2003; McMahon and Valdes, 2011). In turn, producers have little capacity to influence programs and supply of research/education institutions, which limits the possibilities for research centers to privilege the needs of agricultural producers.

In addition to the above, a differentiation of services is not identified from the problems of the different segments of the agricultural population. For this reason, a fragmented system is seen in the generation-transfer-adoption of technology as well as with the agricultural community, denoting a fracture of the demonstration component within the extension system in Mexico. This component should be based on processes of analysis of the UP problem, hierarchical selection of innovation options, creation of adapted innovations, technology exhibition, demand generation, validation of innovations and adoption of technologies and capacity development. Therefore, the government actions do not derive from the needs of the UPs, predominantly an assistance approach of the extension policy that identifies the producers as depositories of technologies.

Investment of the policy of rural extension in Mexico

The fact that extension operates in a de facto and fragmented system adds that the allocated public investment is reduced and moderate average annual growth, which was 2.7% in the 2011-2016 period, although with a downward trend from 2013

Although extension actions have an important role in the general strategy of SAGARPA, given that it is one of the few initiatives that focus on human and social development, the amounts allocated are small within their total budget, since they represented 1.7% in 2016 (Figure 1).

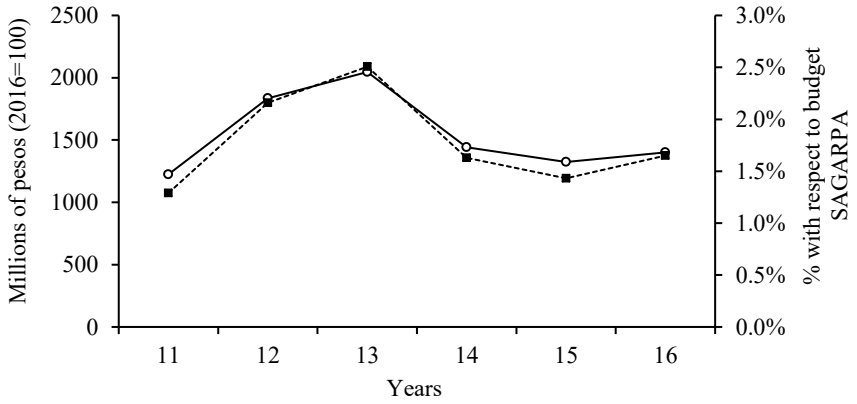

Figure 1. Public investment in rural extension services in Mexico (2011-2016).

According to data from the Organization for Economic Co-operation and Development (OECD), at the international level, investment in extension activities represents less than 0.5% of the value of agricultural production (production at the farm level) in its member countries (OECD, 2017). In absolute and relative terms, investment in Canada stands out, which represents 9.3 times the budget allocated by Mexico for these purposes, and it also has the highest investment among the OECD countries. In Mexico, in 2016, the equivalent of 0.03% of the value of agricultural production was invested in extension activities (Figure 2).

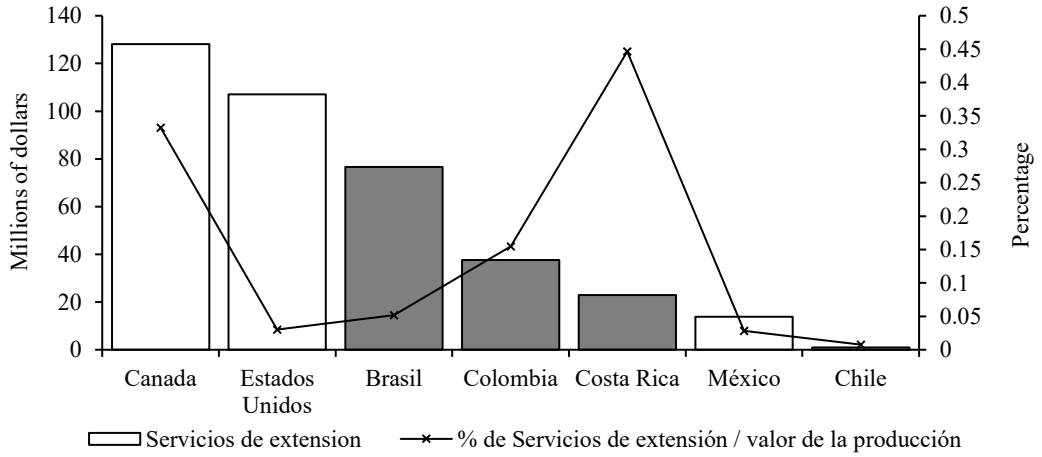

Figure 2. International comparison in investment in extension services, 2016.

Of the non-member countries of the OECD (shaded with gray in Figure 2), Costa Rica stands out and invests 0.45% of the value of its agricultural production in extension services. Also, financing in Colombia and Costa Rica is greater in absolute terms and relative to the investment assigned to extensionism in Mexico. According to the World Bank (Feder *et al*., 1999), one of the main reasons for the reduced budget and its negative growth trend, not only in Mexico but internationally, is the lack of results from these policies, as well as from their few visible impacts.

Objectives of the rural extension policy in Mexico

The CEIP was designed with the purpose of '... promoting the development of territories, product systems and priority value chains in the states, through an extension and innovation strategy focused on improving the capacities of the producers inserted in them, in order to increase productivity, competitiveness, entrepreneurship and income' (SAGARPA, 2014).

In order to fulfill this objective, the design of the CEIP contemplates two management modalities: the one of national execution, that directly depends on the General Direction of Development of Capacities and Rural Extension of the SAGARPA and in second term, the one of execution under specific agreement with the state governments (concurrency, in order to synthesize), which is financed by both levels of government acting as the responsible unit the aforementioned address. The Ministry of the branch in each state (executing agency) is in charge of defining the priorities to be served in its territory, as well as managing the financial resources that allow the component to operate in its territories.

The objective of the CEIP defined its orientation towards increasing UP productivity. The target population included producers and organized groups of people; as well as physical and moral persons dedicated to agricultural, livestock, aquaculture and fishing activities. The analysis of objectives and target population reflects an ambiguous delimitation of both elements within the extension policy. In the target population, no attribute is defined to identify the results of the Component, which means that the number of producers to be served is very broad and the focus is limited.

Characteristics of the CEIP supports

The intervention of the CEIP in 2014 was mainly oriented to agricultural and livestock activities. The 92% of the supported groups developed actions to promote new technologies and training to agricultural and livestock producers. Fishing and aquaculture activities were marginal.

The average duration of the services was seven months within an exercise, which reveals short-term services. Empirical evidence shows that the generation of results in extension services requires in the case of agricultural production units at least four consecutive cycles (Santoyo-Cortes *et al.*, 2016). This is compounded by the inopportunity of the service with respect to the productive cycles, since they begin in July and August, when the strategic decisions of the farmers have already been made. In livestock, given that there is a broader range of innovations to be made (food, nutrition, reproduction and health, among others), it is noted that at least one year is required to demonstrate the first productive and economic results (on specific issues such as genetics and reproduction the results are slower).

Profile of beneficiaries 2014 of the extension policy in Mexico

The actions of the CEIP were implemented through attention to groups of producers and to a lesser extent individual requests. Of the groups supported, informal workers predominated, representing 69% of the total number of supported applications, while 27% of the services provided technical support to legally constituted organizations. The average size of the groups was 36 members.

Distinguish that the proportion of women participating in extension groups equivalent to 21% of total beneficiaries, which corresponds to the national average of agricultural landowners, but reflects an important gender gap; it has been detected that the presence of women in extension groups is fundamental for the agriculture of small producers to be more productive and competitive (BM *et al.*, 2012).

The average age of the beneficiaries was 51 years women registered an average age of 48 and men of 53 years. In the case of men, given that they are the majority group, when analyzing by age stratum it is noticed that a third part was in the age range of more than 60 years (Figure 3). This condition represents a challenge for the policy of extension, because this population group could express particular interests, as well as demand adapted pedagogical methods.

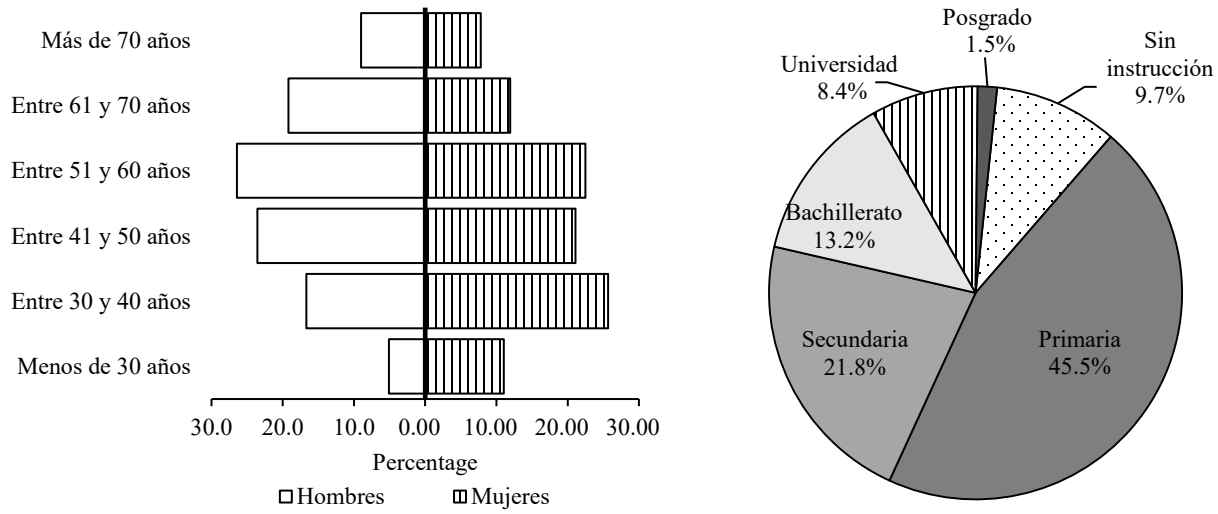

Figure 3. Age and education of the beneficiaries of CEIP 2014.

Schooling is an important precondition for the type of strategy and the incorporation of technologies based on the adoption of new capabilities. The average beneficiary has completed primary education, while 9.7% did not report instruction in the formal education system. The 5% of beneficiaries do not know how to read or write, which is another challenge faced by the extension workers, since it has been documented that the low educational levels of the producers make it difficult to understand the information and the technical arguments, therefore, this characteristic limits the adoption of technologies (Gaitan and Pachon, 2010).

Regarding the income of the beneficiaries, 38% comes from activities outside the UP, reason why the extensionist service could have less scope in the pluriactive production units if a type of service applied exclusively in the productive scope is considered. Different studies consider the composition of income important in designing rural development programs, particularly in extension there is evidence that if the proportion of family income that comes from non-agricultural activities is high, the extension service support for primary activities may not be a priority (Christoplos, 2010, McMahon and Valdes, 2011).

Of the activities within the UP, agriculture stands out, agricultural is carried by 73% of the beneficiaries, while livestock by 52%. This could favor the effectiveness of extension services, since a sectoral orientation predominates, privileging the agricultural sphere.

Adoption of technological and organizational practices

The purpose of the extension processes is to transmit knowledge to the producer in order to develop knowledge and skills to improve their conditions and standard of living. The starting point for this process is the adoption of innovations, which includes the exhibition of technologies, the generation of demands, the validation of technological solutions, the adoption and appropriation of said solutions. During 2014, 27% of beneficiaries did not adopt technological innovations derived from extensionism, this shows that in these cases the actions of the Component did not transcend,

at least in the short term. When inquiring about the immediate scope of extension services in the UPs (with those beneficiaries who did report innovations), it was found that the main result of the adoption of technological and organizational practices was to have more adequate technologies for the UPs, in addition to 60% of producers indicated that the new practices generate higher performance in their properties.

This situation has been described in several studies (Baloch and Thapa, 2016, Landini, 2016), observing that low yields derive from inappropriate practices or lack of knowledge of new technologies, thus inducing a process of innovation adjusted to the agroecological environment, as well as the characteristics of producers have a direct impact on yields.

Results of the IANTDC estimate

The 2014, IANTDC estimate, with a value of 0.14, when the technological ceiling is 1 (Figure 4), shows marginal results in the supported farms. In general, it is noted that the extension model has had a low level of success and that the design of the services is not result oriented. This scenario shows that rather than processes of extension in Mexico, there are processes of training and technical assistance that represent scattered and disjointed efforts (Rendón *et al*., 2015), whose results are marginal because they do not start with an identification of the multifactorial problems faced by rural producers.

The analysis of the IANTDC by sub-index shows the highest values in the sub-index implementation of innovations in the UP (0.42), this reflects that as a result of the activities of the extension agent, the beneficiaries declared having made some agricultural innovation in their production units, in the agricultural part is about innovations on the elaboration of nutritious substrates for crops, integral management of crops and genetic material with high productivity, while in the livestock part the sanitary management of cattle, artificial insemination practices and reproductive management have been privileged as well as aspects of animal nutrition and feeding.

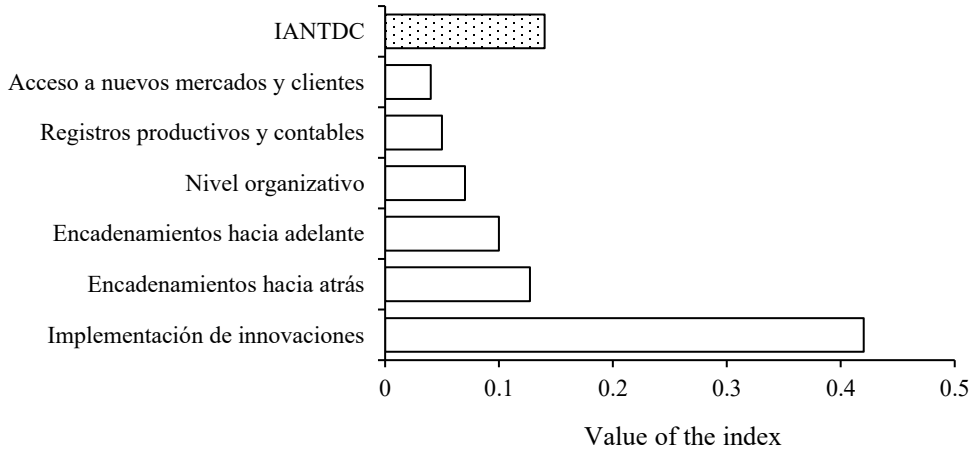

Figure 4. Value of the IANTDC by component, 2014.

When analyzing the processes of capacity development and the adoption of technologies from a multifactorial perspective, it was found that the CEIP did not induce organizational schemes among the beneficiaries, which is reflected in the fact that 54% of them declared not being organized with other producers, therefore the value of the organizational level subscript presented a minimum estimate of 0.07. The low level of organization among producers is not a condition exclusive of the beneficiaries of the Component, the National Agricultural Survey 2017, carried out by the INEGI, reported that in 9.9% of the agricultural production units have as main problem the lack of organization for the production (INEGI, 2018).

In agreement with this variable, the induction of productive linkage schemes (forward linkage subindex and backward linkage subindex) is also marginally developed by the extension agents, so values of 0.10 and 0.14 were obtained respectively in each subscript (Figure 4). It is noteworthy that extension services in Mexico did not induce consolidated purchases, contracting services for primary production, management of specialized training, but above all did not develop associated schemes such as the production of inputs in common among the beneficiaries, which usually impacts on the reduction of production costs and that could be promoted from the training provided to the beneficiaries by the extension agents.

In the subindex of level of productive and accounting records, where another very low value was obtained, of just 0.05, it is explained because 62% of the beneficiaries acknowledged that they do not keep productive or accounting records in the UP, which is important to highlight because it represents a sensitive edge both for the monitoring that can be done on the farms and for the extension agents to have a tool to contrast the advances derived from their services.

In the part of market development (subindex of access to new markets and customers) the lowest value of the sub-indexes of the IANTDC was observed, because the beneficiaries sell their products mainly in local markets or at the foot of the farm, as reported by 48 and 25% respectively, and the extension agents did not incorporate agendas to find market alternatives, and 50% of beneficiaries sold individually and essentially to intermediaries, which reinforces the finding that producers have limited alternatives for marketing their products.

Estimation of the IANTDC by type of producer

Several studies show that the typologies of producers are an important input to determine priorities by type of beneficiary and represent an instrument to optimize the allocation of resources (Santos *et al*., 2014). Although the scope of the study does not account for a typology based on robust statistical methods, variables are listed to establish a non-experimental empirical stratification of the beneficiaries of the CEIP and to estimate in which strata the highest values of the IANTDC are recorded.

When analyzing the profile of the beneficiaries, it was found that the greatest results in extension were in women (χ^2= 2.21, p= 0.33); however, they represent one fifth of the total beneficiaries, by age group the population between 30 and 40 years had the highest IANTDC values (χ^2= 14.86, p= 0.137), although this group represents 19% of the beneficiaries. There are statistically significant relationships between schooling and the IANTDC, according to schooling, the highest

results are obtained in beneficiaries with baccalaureate (χ^2= 54.47, p= 0) while in the income level part, those producers with a gross annual income of more than 200 thousand pesos presented the highest values of the index (χ^2= 53.29, p= 0.000) (Table 1).

Table 1. IANTDC according to the characteristics of the beneficiaries and of the UP, 2014.

	Analysis variable		n	Min	Max	Med	Statistical association*
Profile of the beneficiaries	Gender	Woman (20.5%)	218	0.0179	0.565	0.1487	χ^2= 2.21**
		Man (79.5%)	844	0.0056	0.6319	0.1393	p= 0.33
	Age	Less than 30 years old (7.9%)	84	0.0262	0.447	0.1512	χ^2=14.86**
		Between 31 and 40 years old (17%)	181	0.0179	0.6319	0.1488	p= 0.137
		Between 41 and 50 years old (23.2%)	246	0.0056	0.6162	0.1428	
		Between 51 and 60 years old (25.7%)	273	0.0218	0.4213	0.1386	
		Between 61 and 70 years old (17.8%)	189	0.0218	0.565	0.1424	
		More than 70 years (8.4%)	89	0.0175	0.3329	0.1183	
	Scholarship	Without instruction (9.7%)	103	0.0218	0.3842	0.108	χ^2= 54.47**
		Elementary (45.5%)	483	0.0175	0.5254	0.1299	p= 0
		High scholl (21.7%)	231	0.0056	0.6319	0.1454	
		Bachelor´s degree (13.2%)	140	0.0363	0.6162	0.1811	
		University (8.4%)	89	0.0338	0.4852	0.1648	
		Postgraduate (1.5%)	16	0.0363	0.2773	0.1572	
Profile of the UP	Sales revenue	Without income (1%)	54	0.0298	0.3907	0.1458	χ^2=53.29**
		Less than 60 thousand (35.0%)	435	0.0175	0.565	0.1221	p= 0
		Between 61 and 200 thousand (36%)	390	0.0056	0.6319	0.1499	
		More than 200 thousand (28%)	183	0.0218	0.6162	0.1671	
	Assets	Without assets (22.1%)	235	0.0175	0.3684	0.1059	χ^2= 149.48**
		Less than 100 thousand (35.5%)	376	0.0056	0.565	0.1263	p= 0
		Between 101 and 500 thousand (30.2%)	321	0.0262	0.5254	0.1562	
		More than 500 thousand (12.2%)	130	0.0218	0.6319	0.2111	
	Surface	Less than 1 ha (15.4%)	163	0.0179	0.6319	0.1517	χ^2= 12.75**
		Between 1 and 4.99 ha (32.1%)	341	0.0179	0.6319	0.1395	p= 0.12
		Between 5 and 9.99 ha (13.9%)	148	0.0175	0.565	0.1451	
		Between 10 and 25 ha (18.9%)	201	0.0056	0.4612	0.1405	
		More than 25 ha (19.7%)	209	0.0218	0.5254	0.1338	
Management of the CEIP	Request	Informal group (68.7%)	730	0.0056	0.565	0.1289	χ^2=52.08**
		Formal organization (26.8%)	285	0.0175	0.6319	0.1725	p= 0
		Individual (4.5%)	47	0.0302	0.3238	0.1431	
	Subsector	Agricultural (52.7%)	560	0.0175	0.4852	0.1375	χ^2= 58.28**
		Livestock (39.5%)	419	0.0056	0.6319	0.1385	p= 0
		Aquaculture (3.6%)	38	0.0302	0.361	0.18	
		Fishing (1.8%)	19	0.0696	0.2451	0.153	
		Postproduction (2.4%)	26	0.0512	0.3673	0.1412	

Source: elaboration based on survey of beneficiaries of the CEIP 2014-2015. * χ^2= chi square; **p= value less than 0.5 the test is statistically significant.

A statistically significant relationship was found between the size of the farms supported and the values of the IANTDC, in this respect the farms with less than 1 hectare had the highest values (χ^2= 12.75, *p*= 0.12), but with assets- the assets productive included physical capital, such as animals, equipment and machinery, vehicles and agricultural buildings- above 500 thousand pesos (chi square= 149.48, *p*= 0, lower are estimated in informal groups (χ^2= 52.08, *p*= 0) In this point it is important to reiterate that in 2014 most of the support was oriented to informal groups.

Considering the current approach with which the extension service is provided through the CEIP, the highest values of the IANTDC were found in formal groups, with a predominance of women up to 40 years old and a level of education equivalent to a finished baccalaureate, with income above 200 thousand pesos and with production units with assets of more than 500 thousand pesos, as well as a scale of less than one hectare.

The identification of the highest values of the IANTDC according to different variables of interest, helps to establish that the series of innovations promoted by the component, according to the current modernizing paradigm that governs it, does not favor the generation of organizational, process, product and market in small producers, but in middle-aged women, with consolidated organization groups and an intermediate level of assets.

In this sense, the results of the IANTDC show elements to guide extension investments by focusing attention by type of producers in those strata where there is evidence of achieving a higher level of technology adoption and capacity development or, failing that, offer differentiated services with the capacity to respond to the characteristics of each stratum of producers.

Conclusions

The results of the IANTDC show modest values, despite the fact that 73% of beneficiaries acknowledged that they adopted technological and organizational practices. The index registered a value of 0.14, marking wide margins of improvement in the services of the component so that they improve their results.

The evidence shows that the extension services granted to formal organizations have greater results, possibly due to the degree of consolidation of these and their ability to generate collective learning, so it would be important to increase their presence in the list of beneficiaries.

Another action that is considered transcendental is to reinforce the promotion of a holistic approach to extensionism that stimulates the adoption of technologies, administrative capacities and insertion in markets, which is reflected in better management and income of the UPs; that is, preventing Component services from concentrating exclusively on productive and technical aspects.

Given the predominance of medium and small scale producers, technologies adapted to this type of producers must be promoted, which imply low investments, which allow to increase the productive yields and the quality of the products and to that extent, increase the income of the beneficiaries.

This highlights the need to develop a strategy to delimit the target population based on a typology of producers, and a clear definition of objectives of this system that assess the problems faced by rural producers, as well as the precise definition to Priori attributes that allow a rigorous impact evaluation. The design of an evaluation system should start from the very implementation of the program, including a robust monitoring and evaluation system that provides qualitative and quantitative information, to establish a continuous improvement scheme.

The work shows a possible way to reorient investments in beneficiaries where the empirical evidence shows greater results; however, it is necessary to improve the mechanisms to strengthen links within the agricultural research and extension system and to expand the methodologies to address the diversity of beneficiaries in coherence with their interests and rationalities.

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