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Characterization of the typology of producers in the "sembrando vida" program in Oaxaca, Mexico

Abstract

In Mexico, research work documented at plot in the field or producer level is uncommon and with limited information, due to the fact that it is expensive and requires specialized personnel. This research work carried out by the National Institute of Forestry, Agriculture and Livestock Research (INIFAP) and financed by the National Council of Humanities, Science and Technology (CONAHCYT) was based on a field diagnosis to determine the description of the typology of the participating "sowers" producers enrolled in the Sembrando Vida Program (PSV), of the Federal Goverment of Mexico belonging to the state of Oaxaca, and thus, be able to implement strategies for training and follow-up attention on a massive scale. A total of 383 sample surveys were analyzed from a population of 37,719 small producers representing an estimated crop area of 56,578 hectares distributed in two regions of the state of Oaxaca.

It is concluded that the diagnosis continues to be a fundamental information tool to identify and address more precisely and timely the problems at the farmer's plot level and with any type of crop. Another fundamental activity was the visit or technical visits to the territories that are representative of the regions in order to validate the information obtained. With the results obtained in this research, it was possible to address the main problems through personalized and directed technical assistance under the scheme of field schools (learning-by-doing) throughout the development of annual and fruit crops that the planters have in the MIAF within their PUPs (Small Production Units). Likewise, insert the main training needs at the express and consensual request of all program stakeholders: researchers-trainers, PSV technicians and sowers.

Keywords: characterization of producers in Oaxaca, MIAF system, small production units

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Introduction

Mexico is considered a "megadiverse" country, as it is part of the select group of nations possessing the greatest number and diversity of animals and plants, with almost 70% of the world's diversity of species.[1]

Mexico's richest areas in terms of biodiversity are those with the highest rates of poverty and backwardness, due to the lack of public policies and government programs to increase the level of well-being and social progress of rural households and satisfy their basic food needs through self-production of food, commercialization of surpluses and generation of employment. Due to these conditions of poverty, the rural regions of the country have suffered, in recent decades, an important process of deforestation and overexplotation of natural resources, causing soil degradation and the negative modification of their microclimates, thus affecting their productive potential, their profitability and generating food insufficiencies in the communities themselves. However, Mexico's rural areas can become a strategic sector for the development of the countryside and the improvement of the country's environment, if work is done to increase their productivity, under a sustainable approach and with a long-term multi-regional development vision that contributes to reducing the vulnerability in which these people live.

The Sembrando Vida Program (PSV), was instituted by the Federal Government of Mexico starting in 2019, with the purpose of contributing to the social welfare of the rural sector through the promotion of food self-sufficiency in 21 of the 32 states of the country. With this government initiative, it is intended to contribute to two major problems of the country: rural poverty and environmental recovery; by inviting small producers (sowers), to establish production units of 2.5 hectares, distributed with two production systems: Agroforestry Production Systems (SAF) with an area of one and a half hectares, and Milpa Interspersed with Fruit Trees (MIAF) with an area of one hectare.

The rules of operation of the PSV define the MIAF system as "an Agroforestry System (SAF) of intercropping, consisting of at least three species, the fruit tree (epicultivation), corn (mesocultivation) and beans or other edible species, preferably leguminous (sotocultivation) in intense agronomic interaction and that has the following purposes, the production of corn and beans as strategic elements for the food security of rural families, significantly increase the net family income with the harvest of fruit and timber crops, increase the organic matter content, control water erosion of the soil and thus achieve a more efficient use of rainwater. In this way, its main objectives are to rescue the countryside, reactivate the economy of the towns and regenerate the social structure.

The technical-administrative forms of operation of the PSV are carried out through a command channel with a vertical hierarchical structure and are directed from the head of the program and general coordinators as a national command center, to coordinators, facilitators, productive and social technicians for each state, culminating in an operation center for groups of sowers called "Centro de Atención Campesina" or CAC's, which is the last link in the chain of command in the hierarchical phase of the program (these forms of hierarchical structures are very fast and effective). In the forms of communication, the same hierarchical structure is used, but much of the information

is done strategically through the use of cell phones and social networks, which generates a fast and timely way of working for field activities throughout the PSV territories. Similarly, it operates for the registration of information and the communication channel is also two-way in that hierarchical scale.

According to the Ministry of Agriculture and Rural Development (SADER, 2022),[2] the PSV closed the year 2022 with a list of beneficiaries of 37,719 small producers and a cultivated area of more than 56,578 hectares in the state of Oaxaca. At the organizational level, the PSV considered the state in two territories known as Oaxaca Istmo Region (18,943 sowers) and Oaxaca Mixteca Region (18,776sowers) respectively; in which 30 facilitators, 150 productive technicians and 150 social technicians operate; with a total of 1,509 farmer learning centers (CAC's).

To ensure a better development of the implementation of a program as large and important as the PSV, **it was necessary to categorize producers based on registration requirements and establish a single typology that integrates and associates producers and conditions the form of operation, objectives and goals of the PSV**. The requirements of the typology were: to be an agrarian subject living in a municipality or locality with social backwardness, to be of legal age, to be an owner and have 2.5 hectares available, and finally to accept compliance with all the legal provisions applicable to this program. The beneficiaries of the program receive a monthly payment of $6,000.00 (six thousand) Mexican pesos. The amount is delivered directly through an electronic transfer and they are also subject to additional support in the form of inputs or basic tools.

Producer typology refers to the process of classifying agricultural producers who have similarities among themselves. This process is defined based on the producers' own characteristics, where each type is a representative model of a portion of the population under study, forming sets of elements that meet certain common, individual or combined conditions.

Agricultural activities are carried out in a heterogeneous natural environment due to the diversity of physiographic, climatic and ecological conditions, among others, in addition to the different ways in which men and women appropriate natural resources to satisfy their needs. This diversity is manifested in the differences in the quantity and quality of the resources possessed by productive units, land use patterns, levels of technological development, productivity and profitability levels, as well as the degree of social marginalization of the areas they inhabit.[3]

At this point, the works aimed at knowing the typology of producers generally help to identify and understand in more detail the reasons that force them to make certain decisions in their Production Units (UP); in addition, they constitute a valuable tool in the decision-making process,[4] since the generation of differentiated policies to improve production systems[5] allow predicting the possibilities of success of any type of intervention aimed at improving the functioning of the system. According to Paz[6] typology is a methodological tool that allows grouping producers and farms with similar characteristics, as well as similar potentialities and restrictions in relation to one or several selected elements.[7]

In the case of Mexico, there are different researches that have generated typologies to classify producers based on their personal characteristics and the management of their production unit,[8] according to the orientation of their production units -family or semi-intensive,[9] or their market orientation: traditional in transition or entrepreneurial.[10] In general, all these approaches have been useful to classify producers based on a specific context and dynamics. However, producers are immersed in new dynamics based on their inability to integrate economically. They are becoming multifunctional, reflected in pluriactivity as a resilience mechanism in the face of this uncertainty in their income from their agricultural activities.[11,12]

The objective of this work was to obtain information at the level of small producers (sowers) enrolled in the PSV, through a series of diagnostic questions, that would allow to know the differences and similarities between producers of some basic indicators to identify the main land tenure systems, species cultivated in the MIAF system, age, sex, number of economic dependents, knowledge of crops, among others, in order to provide a horizontal intervention strategy of training focused on the development of skills and technical capabilities for the efficient operation of the MIAF system.

Materials and methods

Study site

The work was carried out in the period from June to December 2022, by conducting a semi-structured survey that took as its universe the total number of producers benefited by the PSV in the state of Oaxaca and the desired total sample would be at least one producer from each of the CACs. The state of Oaxaca considered two territories known as Oaxaca Istmo Region (18,943 sowers) and Oaxaca Mixteca Region (18,776 sowers) considering 30 facilitators, 150 productive technicians, 150 social technicians and 1,509 Farmers Learning Centers (CAC's); in which, first, the most representative municipalities were selected, considering variables such as agroecological characteristics of the region, number of producers and total area benefited by the Sembrando Vida Program.

Type of sampling

In each municipality and localities, the interviewed producers were selected through a simple random procedure (Otzen and Manterola, 2017)[13] dictated by a constant selection interval: membership in a CAC's.

The survey design included a series of closed questions and some open questions focused on typifying the main characteristics of the producers benefited by the PSV. The questions were elaborated by INIFAP researchers based on more than 25 years of experience in the management of the MIAF system and in the training of the farmers, which considered aspects such as gender, age, education level, marital status, land tenure and land area, as well as the origin of the labor and economic resources that were used for training and monitoring of MIAF activities.

This diagnosis also included the five most established crops, the current level of adoption of MIAF technology, level of mechanization, dependence on glyphosate and other herbicides for weed control, predominant edaphic characteristics in the Small Production Units (PUP) and main biotic and abiotic limitations to the development and production of the species cultivated in the MIAF system; however, this document only presents the results obtained in the characterization of the typology of producers enrolled in the PSV.

The type of sampling used for the research was identified as stratified.[14] The sample size was calculated based on the PSV beneficiary register of the state of Oaxaca for the year 2022, using the equation proposed by Montatixe and Eche[15]

$$n = \frac{N * Z^2 \alpha * p * q}{d^2 * (N-1) + Z^2 \alpha * p * q} \quad \text{.....Equation (1)}$$

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Where N: is the total population; Z^2 α: is 1.96^2 if the desired reliability is 95 %; p: is the expected proportion or probability of success, in this case, as the variance is not known and there is no reference to it (p=0.5); q=1-p; d: is the precision (5 %).

The total number of surveys applied (n=383) was obtained, at a confidence level of 95%, a margin of error of 5% and a population of 37,719 planters and 1509 CAC'S, as shown in equation 1.

The completed surveys were concentrated in Excel spreadsheets for their respective statistical analysis. Descriptive statistical analyses were obtained, such as: minimum, maximum, mean and standard deviation, to determine the average dispersion of all data points around their group mean. The results obtained in the surveys were validated by means of field visits and direct interviews with producers and key technicians, using the brainstorming technique and interviews to obtain additional information kept by the field technicians.

The experience accumulated by the technicians in the years of development of the Sembrando Vida program made it possible to identify specific problems at the regional and production unit level, as well as the training needs of the PSV technicians and sowers.

Results and discussion

In the study entity OAXACA (Figure 1), there is a record of a great diversity of climatic, edaphic, technological, social, religious, economic and cultural conditions that predominate throughout its eight regions. The PSV technical team and producers made multiple interpretations and adjustments to the MIAF system (it was accepted that there was variability and flexibility in some parameters of the MIAF system) such as: different crops, not only corn and beans, different fruit trees in rows and within the same row, arrangements in different numbers of plants and trees and furrow widths, among others, all in order to adapt the system to their environment and achieve with the rules of the program.

Figure 1 Map of the states that belong to the "Sembrando Vida" Program in Mexico.

This situation of flexibility of the MIAF system made difficult to opérate program's operability, as well as its establishment and adequate maintenance, a situation that might affect the medium and long term goals of the PSV in Mexico. Given these conditions, any type of training and follow-up intervention aimed at PSV technicians and producers, focused on developing their technical capacities and skills in the management of the MIAF system, should not be vertical; on the contrary, it should consider farmers' knowledge, the exchange of experiences and the technical training and follow-up of experts to meet the program's goals.

Typification of PSV beneficiaries in the state of Oaxaca

In rural Oaxaca, as in other states of the country, the participation of women in primary activities such as agriculture has increased little by little over time. The results obtained in the survey indicate that the participation of women in the PSV was 45.96% and 54.04% corresponded to men (Figure 2); which is extremely interesting due to the fact that, in this state, the female sex has a large percentage of presence in the agricultural sector.

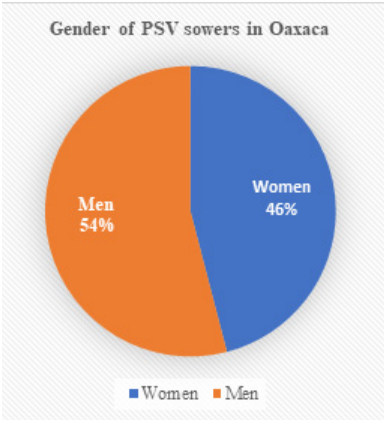

Figure 2 Gender of PSV sowers in Oaxaca.

This could be corroborated during the training courses that were carried out *in situ* (sowers' plots), where a large number of women farmers (sowers) were registered. This relationship contrasts with the data on tenure and possession of ejido and communal rights; since, according to RAN[16] out of a total of 3.3 million Mexican ejidatarios, 74.5% are men and 25.34% are women. On the other hand, with respect to age, it was found that 16% of the planters in Oaxaca are between 21 and 30 years old; 22% between 31 and 40 years old; 20% between 41 and 50 years old; 20% between 51 and 60 years old; 11% between 61 and 70 years old; 4% between 71 and 80 years old and 1% between 81 and 90 years old respectively (Figure 3).

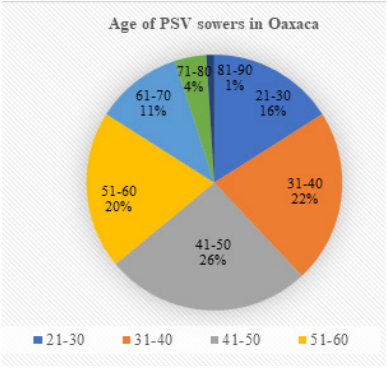

Figure 3 Age of PSV sowers in Oaxaca.

These results show that approximately 50% of the sowers are between 31 and 50 years old, which indicates that young people are already staying in the fields and do not tend to migrate to the big cities as in the past in this state of the country; which is extremely interesting since it guarantees that future generations will continue to work the land in the short term and will be able to provide food for Oaxacan families and for the rest of the country.

These age results are related to the variable level of education of the sowers, since in this state, there are no sowers without studies, since 53% have completed primary school (basic education), 31% have completed secondary school (middle school), 13% have a bachelor's degree (high school) and 3% have completed a College (higher education) (Figure 4).

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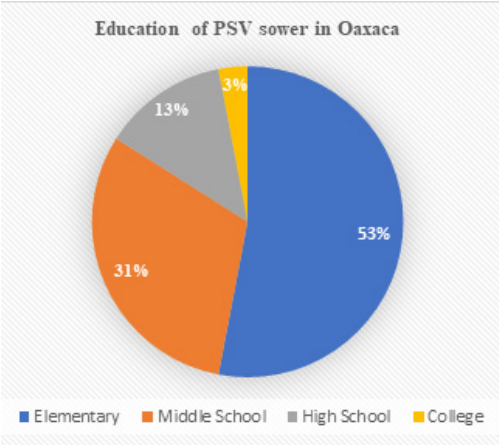

Figure 4 Education of PSV sowers in Oaxaca.

This could be the effect of the fact that this state, like others, the last governments have implemented public policies for the improvement of education and because of them, there are possibly a minimum number of people who do not know how to read or write; which, among the sowers, generates a certain competition that literally forces them to constantly improve themselves. According to some research, the age of producers is strongly related to their level of education and other factors linked to the adoption of new technologies (Zayas et al.,[17] i.e., younger producers generally have a higher level of education, Canales & Corilla, 2019).[18]

Other research by García-Zalazar et al.,[8] among others, concluded that the educational level of producers is strongly related to the rate of technology adoption. However, some research such as those conducted by Hernández-Chavarría et al.,[8] in some agricultural districts of Durango, Mexico, indicate that the level of productivity of plots was not associated with the level of education, age and gender of sowers and that exogenous factors such as access to water could have a greater influence.

Regarding the number of family members, it was found that 16% of the sowers' families have fewer than two members and 3% have more than five members respectively. Most of the families (81%) are made up of three to five members. These results show that families in rural areas of this entity are relatively small compared to rural families in other states such as Chiapas, where families have more than seven people in their households.

These data are directly related to the number of active and economic dependents of the sowers, since 88% of the cases have less than two economic dependents, while 11% have between three and five economic dependents and only 1% have more than five economic dependents of the sower; It was also found that 87% of the sowers have less than two economically active people in their families in Oaxaca, while 12% have between three and five people and finally 1% of the families have more than five economically active people in their families.

Another indicator found in this research was the formality of the families, since in both genders 58% of the sowers are married, 24% live in free union, 12% are single, 5% are widowed and 1% are divorced. These data show that more than 50% of the families have a stable family nucleus and a very small percentage (1%) are divorced (Figure 5); this is extremely interesting because, given that there is a high percentage of solid families, this means that future generations may also have solidity in their future families.

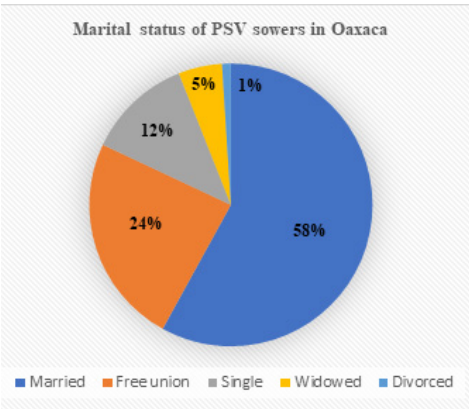

Figure 5 Marital status of PSV sowers in Oaxaca.

Within the framework of the so-called "family agriculture" cited by Garner and Campos,[19] considered the engine of productive and economic transformations in the rural sector in Mexico, SAGARPA and FAO[3] worked on the elaboration of five family strata based on a typology of Rural Economic Units (REU), in which aspects such as family work and its relationship with the productive unit, productive rationality and its relationship with the market and income strategy are considered. According to this classification system, it has been hypothesized that most of the production units belonging to the PSV in the state of Oaxaca could be classified in stratum "E1", which corresponds to subsistence family agriculture without market linkage, and only a small part could belong to stratum "E2", called subsistence family agriculture with market linkage.

The results obtained in this study indicate that the rural Oaxacan family that participates in the PSV is abundant, with a high percentage of economic dependents and a low availability of family labor. Given that the current production systems in these communities generally involve small extensions of land (<4 hectares [less than four hectares]) minimally technified, with little injection of economic resources and technical advice, the harvests are generally for self-consumption with overstock that lack a market. The results are a fragile family economy with little or no expectations of development.

This relationship coincides with the data on tenure and possession of ejido and communal rights since, according to (Registro Agrario Nacional [RAN], 2022)[16] out of a total of 3.3 million Mexican ejidatarios 74.5% are men and 25.34% are women. This proportion is maintained for the state of Oaxaca as just over 30% of ejido rights belong to women (Registro Agrario Nacional [RAN], 2021).[20] In this sense, only 2.7% of the cases held a position in ejidal or communal bodies (Instituto Nacional de la Mujeres [INMUJERES] 2020).[21]

Land tenure

The distribution of land tenure within the PSV in Oaxaca was not different tan before this program began operations in 2019/20. In this perspective, it is necessary to mention that, in Mexico, land tenure for agriculture mainly revolves around two major axes, such as ejido and small property; however, in the state of Oaxaca, it was found that the PSV sowers, have five types of land tenure that allows the inclusion to the PSV for the development of their MIAF.

These data show that, in Oaxaca, the highest percentage of land tenure is communal with 70.1%; followed by small property and ejido with 11.3% for both cases, 5.2% in the rented modality and 2.1% in sharecropping respectively (Figure 6).

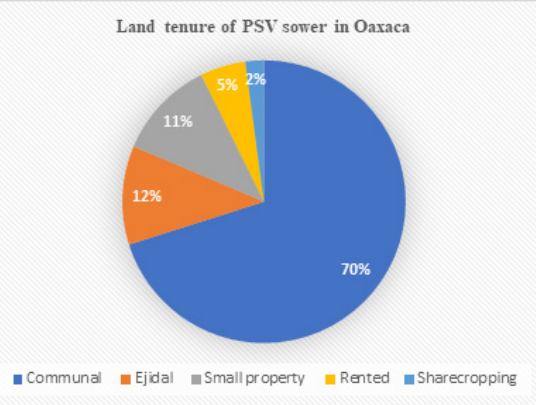

Figure 6 Land tenure of PSV sowers in Oaxaca.

It is important to mention that the respondents stated that they worked on rented land or under other types of arrangements agreed upon with the landowners. There are still ejidos dedicated to conventional agriculture, which is extremely important since farmers are the main suppliers of food from the countryside for the region and municipalities near the urban area of the state; likewise, there were few landless producers who decided to rent land in order to participate in the program.

Given that in Mexico the ejido is the main form of land tenure recognized by the Agrarian Reform (Andrade-Sáenz, 2009) and that the census is composed of slightly more than 5.2 million ejidatarios that inhabit 32 thousand agrarian nuclei distributed throughout the Mexican Republic, it is logical to understand that the ejido is the main form of land tenure in the PSV. This context could explain, in part, the low participation of women in the PSV (46%) since according to the Procuraduría Agraria (2011) and RAN,[22] only 25.9% of the total number of ejidatarios are female.

Labor and financial resources for the MIAF

It is known that the cost of labor (wages) is different in each region, state and country, so in the state of Oaxaca is no exception, it was found that the cost per daily wage is very varied because 75% has a cost greater than $200.00 (two hundred Mexican pesos), 20% varies between $101.00 and $200.00, and only 5% costs less than $100.00 since the latter is basically used for sporadic work with a duration of less than 4 hours. (Units in Mexican pesos).

Given the above, in some localities there is a certain shortage of labor due to the fact that many children of sowers emigrate to the United States of America, despite the great demand for labor required for the management of MIAFs. Likewise, it was found that 29% of the MIAFs require more than 10 day laborers per hectare to prepare their land, 33.1% require between five and 10 day laborers and finally 37% require less than five day laborers per hectare, for the development of this activity respectively (this depends on the type of crop, site and mainly on the slope of the soil). In the context of the previous paragraph, the results obtained in this work are in line with the arguments presented by Camas-Gómez et al.,[25] who assert that the MIAF system is a generator of jobs and, in many cases, is a factor that could influence the reduction of migration in rural areas and the abandonment of the countryside.

It is true that, being a complex technology, the MIAF system requires more work for its implementation and maintenance; however, it also requires greater investment when family labor is scarce. Work carried out by Ruiz-Mendoza et al.,[26] in the Mixe highlands of Oaxaca, showed that labor for the establishment and maintenance of the MIAF system can become very high since for one hectare of land a total of 173 day laborers are required.

Land tenure is an important factor when talking about gender equity; since land is considered the most important asset of rural families, the possession of a plot of land is a factor that contributes substantially to women's wellbeing and empowerment, poverty reduction and control of their income.[23] Conversely, landlessness decreases their difficulties in obtaining firewood, water and plants important for the health and food security of their families.[24] The Sembrando Vida program specifies that each sower must have at least 1 (one) hectare of MIAF (Interspersed Milpa in Fruit Trees) and 1.5 (one and a half) hectares for SAF (Agroforestry Systems) in their PUP's; however, there are sowers that have a larger area than indicated by the program, as it is intuited that many of them had a greater vision about the great benefits of the MIAF system.

The distribution of the PUPs is shown in Figure 7. 64% have between 2.1 and 3.0 hectares, 12% have between 1 and 2 hectares, 6% have between 3 and 4 hectares, 4% have between 4.1 and 5.0 hectares, and 1% have 1.0 hectares respectively.

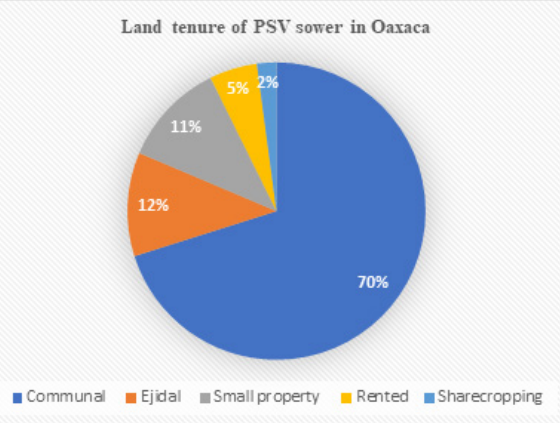

Figure 7 Surface área (hectare) of PSV PUPs sowers in Oaxaca.

As mentioned in previous paragraphs, the establishment of the MIAF system requires a large initial investment, mainly for the purchase of fruit trees and labor for the layout of contour lines and the planting of annual and perennial crops, which can be very costly and difficult to finance for a subsistence farmer located in marginal areas.

There are several sources of financing that were found in this work; Without a doubt, although not the only one, the most important source of resources was provided by the federal government (even though it is known that the planters who are enrolled in the Sembrando Vida Program receive an economic stimulus each month to maintain their Small Production Units), so within this diagnosis the question was posed to identify whether their systems inject more resources than they receive monthly, and it was found that more than 70% of the resources they use in their PUPs come from the government and the rest would be their own resources, loans and remittances.

Finally, one of the main limitations of the MIAF system is that its establishment requires a lot of manpower and economic resources to carry out activities such as clearing, drawing contour lines, making vines (holes for fruit trees), purchasing fruit trees, planting, purchasing or making vermicompost or Bocashi, installing tutors and the sediment filter.[27–30]

Conclusion

The diagnosis continues to be a tool of information that allows to identify and to attend with more clarity and precision the solution of a problem, especially at the level of small producer. Most of the production units belonging to the PSV in the state of Oaxaca could be classified in stratum "E1", which corresponds to subsistence family farming without market linkage, and only a small part could belong to stratum "E2", called subsistence family farming with market linkage. With the typification obtained from the PSV participants, it was possible to plan new strategies to improve the program in terms of operation, development and territorial scaling. The Oaxacan rural family participating in PSV is abundant, with a high percentage of economic dependents and a low availability of family labor. The sex, age, land tenure and level of education of the sowers in the state of Oaxaca show optimal conditions for the development of a technological intervention strategy based on the co-participation of farmers, technical and scientific knowledge for the development and conservation of the MIAF system. The results obtained in this research, it was possible to address the main problems through personalized and directed technical assistance under the scheme of field schools (learning - doing) throughout the development of annual and fruit crops that have sowers in the MIAF within their PUPs.

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None.

Conflicts of interest

The autor declares there is no conflict of interest.

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