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ADOPTION OF AGROECOLOGICAL TECHNOLOGY IN COUNTRY SCHOOLS OF SANTIAGO LACHIGUIRI, OAXACA

ADOPCIÓN DE TECNOLOGÍA AGROECOLÓGICA EN ESCUELAS DE CAMPO DE SANTIAGO LACHIGUIRI, OAXACA

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Adoption of Agroecological Technology in Country Schools of Santiago Lachiguiri, Oaxaca

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ABSTRACT

The objective of the study was to know the adoption of the technology "Preparation and use of super-lean biofertilizer", using the "Field Schools" methodology. The study was carried out with 54 coffee producers, who received direct training from the field technician. The methodology used to determine the adoption achieved was divided into three phases; 1) Knowledge of technology; same that considered the knowledge of the functions of the super lean, and the ingredients with which it is prepared, 2) Participation in group training, mastery of the way of preparation and eventually the preparation individually, and 3) Adoption, which considers the preparation and daily and future use of the product, the conviction of its effectiveness, making changes in the way of preparation and sharing the information with other producers. The results indicate that these are producers over 40 years of age, mostly men (72%), 81% native language speakers, 77% Zapotec and 23% Mixe, with attendance on average at five courses. 74% of producers use mobile phones or cell phones as a means of communication, and of them 85% use the WhatsApp ® social network, 53% receive agricultural videos, and 29% send videos. Of the total participants, 78% are in the technology knowledge phase, that is, they know the biofertilizer, its functions and its ingredients for its preparation, but they did not participate in the group preparations nor do they know the way of preparation, 64% They were placed in the group training phase through participation in the field of practices, but they did not carry out individual preparations, and in the end, 30% of the total, adopted the technology. The Wilcoxon statistical test confirms that there are significant differences between the characteristics of the adopting and non-adopting producers, while the results of the Spearman correlation test confirmed the association between the adoption variable and the number of courses attended variables. Received a copy of the course and the individual preparation of the biofertilizer

***Keywords*:** adoption, fields schools, agroecology, coffe, Mexico

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Adopción de Tecnología Agroecológica en Escuelas de Campo de Santiago Lachiguiri, Oaxaca

RESUMEN

El estudio tuvo como objetivo conocer la adopción de la tecnología "Preparación y uso del biofertilizante supermagro", usando la metodología de "Escuelas de Campo", El estudio se realizó con 54 productores de café, quienes recibieron capacitación directa del técnico de campo. La metodología utilizada para conocer la adopción lograda se dividió en tres fases; 1) Conocimiento de la tecnología; misma que consideró el conocimiento de las funciones del supermagro, y los ingredientes con que se prepara, 2) Participación en capacitaciones grupales, dominio de la forma de preparación y eventualmente la preparación de forma individual, y 3) La adopción, que considera la preparación y uso cotidiano y futuro del producto, el convencimiento de su efectividad, la realización de cambios en la forma de preparación y el hecho de compartir la información con otros productores. Los resultados indican que se trata de productores de más de 40 años de edad, mayormente hombres (72%), 81 % hablantes de un idioma originario, 77% zapoteco y 23 % mixe, con asistencia en promedio a cinco cursos. 74% de productores usan teléfono móvil o celular como medio de comunicación, y de ellos 85% usa la red social de WhatsApp ®, 53% reciben videos agropecuarios, y 29% envía videos. Del total de participantes, 78% se ubican en la fase de conocimiento de la tecnología, es decir, conocen el biofertilizante, sus funciones y sus ingredientes para su preparación, pero no participaron en las preparaciones grupales ni conocen la forma de preparación, 64 % se ubicaron en la fase de capacitaciones grupales mediante la participación en campo de las prácticas, pero no llevaron a cabo las preparaciones individuales, y al final, 30 % del total, adoptaron la tecnología. La prueba estadística de Wilcoxon confirma que si hay diferencias significativas entre las características de los productores adoptantes y no adoptantes, en tanto que los resultados de la prueba de correlación de Spearman, confirmaron la asociación entre la variable adopción y las variables número de cursos asistidos, recibió copia del curso y la preparación de manera individual del biofertilizante.

Palabras clave: adopción, escuelas de campo, agroecología, café, México

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INTRODUCTION

The process of technical support for coffee producers in marginalized areas of Mexico aims to develop the capacities of producers, which is expected to be reflected in better levels of production and productivity.

For this purpose, the training and technical support process that is applied is the Rural Extensionism method based on Field Schools, described by Morales et al., (2015), for which the technical team received training at the beginning of the activities. The Rural Extensionism method is an evolution of the Field School model, which originated in Indonesia, since the 1980s, and is based on the premise of being practical, hence the approach of learning by doing, and the training of promoters.

The Field Schools are mainly aimed at the adult population with low levels of schooling, they are based on the principle of learning by doing, that is, that the training process is practical, participatory and of constant analysis, the place of learning and the meeting is the plot, which is transformed into a school plot, in this space field practices and learning are carried out. The training is carried out according to the phenological stages of the crops, that is, seeking the synchrony of the plant stages with the characteristics of the practices (Ardón 2003, Pacheco et al 2009, Bustamante and Febres 2010, Gutiérrez et al 2012, Morales et al 2015, Ramos 2018 and FAO 2022).

A central element in the application of Field Schools is the qualification of some producers as promoters of new technologies. These producers must have some characteristics that make them prone to seek and use new knowledge and techniques. They represent great support in the dissemination and appropriation of new knowledge, with these characteristics they distinguish themselves from other producers. They are the first innovators, since they have a greater capacity to innovate, which is the degree of progress of an individual in adopting ideas, compared to the other members of their social system (Rogers and Svenning, 1973).

The training session, in the methodology proposed by Morales et al., (2015), considers three moments; Theory, Practice and Reflection – Agreements. The theory is done to share knowledge with attendees, as well as present and describe the topic of the day's training, its requirements and advantages. While the practice is done seeking that it be, in a strict sense, in the way of learning - by making, that is, that all attendees participate in the practice, including the technical staff. The last phase of the training is

reflection – agreements, which is about a quick evaluation of it, but, above all, that each attendee defines and shares the date on which they will replicate the practice just carried out. In the end, the technician will agree with the producers on the date on which he will visit them in their production units, to see the application of the technologies that are promoted, as well as address other doubts and interests of the producers. This visit is of utmost importance, since it strengthens the relationship with the producers by specifying the meaning of the technical support. The model evolves to Rural Extensionism by adding the aspects of replication and technical parcel support.

Regarding the concept of adoption, Rogers and Shoemaker (1974) define adoption as the resolution to fully use a new idea, as it is the best available path. Cadena et al (2018) point out that adoption is a series of acts. that an individual goes through until the moment of using a novelty, whether it is an idea or a product, Sagustame et al (2006), that adoption is the result of the producers' decision to use or not use a certain technology in the production process, and considers cognitive change as a prerequisite.

Various studies have identified factors that influence the adoption of agricultural innovations; Foster (1964), although the concept of adoption of innovations is widely surpassed by various authors, who differentiate innovations from technologies; In the book traditional cultures and technical changes, he points out the influence of human factors in technological development, alluding to cultural, social and psychological barriers, while Rogers and Svenning (1973) point out cosmopolitanism, age, schooling, empathy, exposure to the media, local policies, among others. In this sense, it coincides with what was stated by CIMMYT (CIMMYT Economics Program, 1993).

Hoyos and Henao (2022) state that the key factors in the technology adoption processes are; attitude towards technology, perceived usefulness and perceived ease of use, while Damián et al., (2007), states that limited access to production factors, relevance of traditional practices, performance of other activities, migration and little advice.

Cuevas et al., (2013), in a study on dual-purpose livestock farming in Mexico, found that the factors that influence the adoption of innovations refer to the number of adult cows, the distance of the production unit from the municipal capital. , as well as technical aspects such as the reproduction method and type of milking, as well as the number of years of receiving technical assistance.

Feder (1981) states that the limiting factors for adoption are: the size of the production units, agricultural aspects, availability of labor and equipment, risks and availability of credit. Fatai et al., (2024), point out that Field School activities present a positive relationship with the skills and needs of cocoa farmers in Nigeria.

A novel position is that pointed out by Jiménez et al (2023), considering that learning links are more important than other variables such as age or education of the producer to promote changes in adoption levels, stating that no one innovates more than they your relationships allow you. In the same sense, Monge and Hartwich (2008) affirm that those who have more contact with other producers have more adoption; On the other hand, Ayala, et al., (2014) indicated that adoption is a process where producers bear the risk.

Pérez et al., (2018), points out that adoption is determined by the socioeconomic conditions of the producers and the characteristics of the production unit, highlighting that the results are largely due to the use of Field Schools. The previous concepts confirm that adoption is an individual physical and mental process of reasoning to reach the decision to accept or reject a technology, with different aspects that can favor or limit it.

To estimate the adoption of technology, various methodologies have been developed, the oldest and also the most used is the one proposed by Rogers since 1962, Rogers (1995) called Theory of the Diffusion of Innovations, which considers four elements for adoption. of innovations or new ideas; 1) innovation, 2) communication, 3) time, and 4) social system. This methodology continues to be used in different contexts and areas of knowledge, such as business and electronic resources (Torreon and Pérez., 2004).

Innovation is conceived as an idea, practice or object that the individual perceives as new. If the individual considers it new, the idea is innovation. “Innovation” is nothing more than the result of the creative process of an innovator faced with an unresolved need. The characteristics of innovations; as perceived by the receivers are; the relative advantage; which is the degree of perceived superiority in the innovation with respect to the idea that is surpassed, compatibility; is the perceived degree of consistency between the innovation and existing values, past experiences and needs of recipients, complexity; is the perceived degree of difficulty in understanding and using a new idea; experientiality;

It is the degree to which an experiment can be tried on a restricted basis, making it experimentable, and observability is the degree of visibility of the results of an innovation to others.

Communication is the process of transmitting messages from a source to a receiver, that is, transmitting ideas from a source in order to modify the behavior of the receivers.

Time: In this dimension, they intervene; 1) the decision process about innovating in which the individual goes from his first contact with the new idea to adopting or rejecting it. The innovation decision process is the individual's mental process of moving from the first knowledge of the innovation to deciding to adopt or reject it or to confirm the decision. Rogers' initial proposal was five steps; know, interest, evaluate, test, decision, was later modified and reduced to four stages; know, persuade, decide and confirm (Rogers and Shoemaker, 1974). Knowing is when the individual is exposed to innovation, learns about how it works. Persuading is the formation in the person of a favorable or unfavorable attitude towards novelty. Decide; It consists of carrying out activities leading to a choice to adopt or reject the innovation. Confirm; the individual reinforces the decision to innovate or reject that he has adopted.

Other theories to study adoption are mentioned by Hoyos and Henaes (2022), as described below: Theory of reasoned action. It refers to human behavior as a consequence of the attitudes and beliefs of individuals. In this sense, behaviors are not the product of chance, but are predictable from intentions, which in turn are determined by the attitude towards the behavior or personal evaluation and by the subjective norm or social evaluation. That is, an individual will behave in a certain way if he evaluates that this behavior is positive and, furthermore, if he considers that the consensus of the close social group expects him to behave in this way.

Social cognitive theory. It explains the behavior of individuals based on the bidirectional interaction of three fundamental elements: the environment, personal factors and behavior. Additionally, in the relationship between these three elements, four processes are developed: self-observation, self-evaluation, self-reaction and self-efficacy. In this theory, self-efficacy is a key aspect and refers to the perception that the individual has about his or her abilities to execute a behavior; This perception, in turn, has a direct impact on behaviors.

Theory of planned behavior. It assumes that an individual's intention toward the execution of a behavior is determined by three fundamental factors: attitudes, subjective norms, and perceived behavioral control. Attitudes can be experiential, such as liking or disliking an object; or instrumental type, which allow objects to be valued according to generically accepted categories, such as healthy or unhealthy. Subjective norms are related to the individual's perception of the social pressure exerted to perform a behavior, with the perception of the behavior of others and with the importance given to the opinions of other people. Perceived behavioral control is related to the resources, capabilities and level of autonomy that the individual perceives they have to carry out a certain behavior.

Technology acceptance model; It refers to four elements within the acceptance process: behavioral intention, attitude, perceived usefulness and perceived ease of use. Perceived usefulness is the degree to which a person believes that the technology improves their job, and perceived ease of use is the low level of effort involved in using it. These two factors precede the attitude and this, in turn, triggers the intention to use. This model considers a direct connection between perceived usefulness and intention to use.

Unified Theory of Acceptance and Use of Technology. Consider four main factors. First, performance expectancy, defined as the individual's belief that the use of technology will provide better performance. The second factor is the expectation of effort, which is the perception of the ease that comes with using the technology. Thirdly, the social influence that leads the individual to perceive how his environment and those around him want him to use the technology. Finally, the facilitating conditions, which refer to the user's perception that there is an environment and an organizational structure willing to support them. The model proposes that gender, age, experience and voluntariness regulate the relationship between the four main factors and intention to use.

Another proposal of interest is the appropriation of technology based on the typology of agricultural producers, formulated by Damián et al., (2005), it is based on the design of an agricultural technology appropriation index, it evaluates the degree to which producers appropriate the technologies while serving as a basis for developing the typology of producers.

The proposal by Sagustame et al., (2006) is interesting in the sense that it does not only consider the final aspect of adoption, but rather considers the initial information, shortly after the producer knows

the technology and calls it the Acceptability Index. to know the interest of the producers to implement the technologies, subsequently the acceptance index, which allows us to know how many of the producers served establish or abandon the technology, and the adoption study, to know how many producers have integrated the technologies into their systems. of production or and impact studies once the project has concluded its field activities.

From the review, the methodology used was integrated with different components indicated by Rogers, Segustame, the technology acceptance theory and technology appropriation. Regarding the results of technology adoption, the following are cited: Simba et al (2018) points out the adoption of different technical aspects in cocoa, due to the use of technical support in the Field Schools and the farmer-to-farmer modality, while Noriega et al (2019) found 47% of adoption of corn varieties, and 31% in seed inoculation, using the Field School methodology.

MATERIALS AND METHODS

The work with coffee producers began in 2020, in different communities of the municipality of Santiago Lachiguiri, Oaxaca, for which the coffee producers of the municipality were called and invited to voluntarily participate in the different training courses designed based on a diagnosis in the territory, and its subsequent analysis to identify problems and opportunities. Four years after the program began in the municipality of Santiago Lachiguiri, Oaxaca, the present study was carried out to understand the adoption of the technology "Preparation and use of super-lean biofertilizer", which the technician has promoted more regularly in the municipality. .

According to Hernández et al (1998), the present study corresponds to a non-experimental research of a transectional, descriptive and correlational type. That is, where there is no deliberate manipulation of variables, where a group of producers, after designing and developing a training plan, receive various trainings, hoping that they will be adopted and, consequently, improve their production capabilities.

The study was carried out in four communities in the municipality of Santiago Lachiguiri, in the region of the isthmus of Tehuantepec, Oaxaca. From a total of 110 producers participating in the training program, the sample was defined, using the formula proposed by Rendón and González (1989), suggested for studies that are based on information obtained through surveys:

$$n = \frac{N\,K^2}{(N-19\,)\delta^2 + K^2}$$

Where;

n = Sample size for multiple purposes.

N = Population size.

δ = Relative precision with respect to the population standard deviation (σ), it is a value between 0 and 1

K = Value of the Z or t tables, when the distribution of the estimator is normal or approximately normal.

The estimated sample is 54 producers, that is, 49% of the total, who were selected randomly, who were interviewed in their communities of residence. The technology that was evaluated is the "Preparation and use of super-lean biofertilizer", super-lean, which is a liquid biofertilizer, which is obtained through anaerobic fermentation, acts as a plant nutrient and can be used in all phenological stages of crops. The ingredients for its preparation are fresh manure, molasses or piloncillo, whey or raw milk, vegetable ash and natural water; Yeast, green plant material, rock flour or minerals such as Zn, Mg, Cb, B, Cu, Ca, Mn, Na and Fe can be added (Sader, 2019). Specifically, and for the purposes of developing the instrument for obtaining information in the field, the technical team prepared a technological sheet that describes the basic aspects of the technology, just as the training was carried out with the groups of producers of interest. , that is, the ingredients used, quantities, the method of preparation, the times and the characteristics that indicate that the product is ready to use, as well as the method of application or use.

The applied instrument was divided into two parts; a) general data and b) About Supermagro technology. The general data questionnaire included open and closed questions on personal aspects, participation in the training program, attendance at training, visits by the technical team to the plots, assistance of producers on technological tours carried out in the territory and outside it. , as well as the use of mobile communication devices. To determine the degree of adoption of the “Preparation and use of super-lean biofertilizer” technology, the methodology used considered three basic aspects:

1. If the producers know the technology, its functions and the ingredients with which it is prepared.

2. If they have done the test, that is, if the producers know how to prepare the product, the process times for its use and the conditions that indicate that it is ready to use, if they participated in group training and especially if they have prepared the product in individually.

3. If the producers use the technology, that is, if they are preparing and applying the product individually, if they have made changes in the way of preparation and application, and if they have shared the information with other producers.

According to the technology sheet, and considering the three basic aspects, a weighting was made of the contribution of each aspect to the entire adoption, by specialists in the subject of technology transfer and adoption, that is, of the 100%, so the following assignments were made; If they know the technology correctly, 15 points were assigned, if they have taken the test, know the preparation and have done the preparation individually, 35 points correspond, and if they use it, share and make modifications to the process, the value is 50, with which adds up to a total of 100 points.

The information was captured in Microsoft Excel ©, and the analysis was carried out in SPSS © to obtain the descriptive information. Wilcoxon tests and Spearman correlations were also performed, as they were nominal and ordinal data

RESULTS AND DISCUSSION

The average age of the participating producers is 44 years, with 74 years being the age of the oldest producers. It should be noted that there are young producers, up to 19 years old. This scenario is laudable, given that, in other contexts, the age of workers in agricultural activities is 49 years (Government of Mexico, 2024), while the Agricultural Census indicates that 68% of those responsible for agricultural units production in the state of Oaxaca are over 45 years old, and 24% of this total are over 65 years old (INEGI, 2023), which contrasts with the situation of this municipality, it is assumed that the conditions that have been generated around coffee cultivation, such as the preparation of specialty coffees, the search for new markets and the use of agroecological inputs, allow the interest of young people.

Regarding education, the participating producers attended, on average, up to the first year of secondary school. Producers with complete or truncated professional studies (2) were also identified; they are those who have begun the experience of preparing specialty coffees. But situations of illiteracy also

occur (two cases). In general, it is observed that schooling in the municipality is slightly lower than the state average, which is second year of secondary school, and the national average, which is completed secondary school (INEGI, 2020).

Regarding the gender of the participants, the greater participation of men in the program (72%) is notable, compared to women (28%). In the case of men, this figure is lower than what is reported at the national level, which is 82% men, and higher than the case of women, which is 18%. (INEGI, 2023).

The marital status of the participants, 80% live in couples, whether married or in a common law union, 20% remain single. 81% of those interviewed are speakers of an indigenous language, 19% indicated that despite not speaking an indigenous language, they consider themselves indigenous. Of the speakers, 77% are speakers of the Zapotec language and 23% are speakers of the Mixe language, typical of the Mixe region, but which is linked to the Zapotecs due to proximity and mobility due to work, and various social aspects.

Regarding the years of participation in the training program, on average the interviewees indicated that they have been participating for two years, although some indicated a participation of up to 5 years and those who have just begun their participation with one year. In principle, it is a data that It does not correspond to the time that the operating program has in the territory, given that the activities began 5 years ago, so said average of two years is surely attributed to the fact that participation is voluntary, which is why many attend voluntarily and irregularly.

The activities of the field technician in the region focus mainly on the delivery of training courses for producers, based on the methodology of Rural Extensionism based on Field Schools. In the interviews, the producers mentioned 31 different types of courses, the following stand out: Supermegro (28), Preparation of bioles (29), Bocashi (19), Compost (8), Honey (8), Grafts, Measurement of parameters, Mountain microorganisms, Coffee seedbed, Pest control, Pruning, Nursery, Vermicompost , Ash Broth, Living Terraces, Soil Study, Bordeaux Broth, Sulfocalcium Broth, Bioinput Application Practice, Leachate, Ph Regulation, Dosage, Coffee Roasting, Agroplus, seedling transplant, vegetables, amino acids, and shade regulation. According to the statistics of the training program, the field

technician has reported 51 courses taught in the territory, in the period from 2022 to 2024, the producers interviewed mentioned that on average they have attended 5 courses.

As noted above, each training event consists of three moments, that is; the theory, practice part and the final phase called reflection and agreements. In the present study, it was found that 87% indicated that the field technician actually carried out the training at the three indicated moments, 13% indicated that they did not differentiate the moments in which the training was developed. It is assumed that the field technician correctly applies the training methodology.

Regarding the materials used in each practice, the interviewees indicated that they are supplied by the producers and also by the technician. Emphasizing that the materials that are not available in the community are those that the technician brings, who do not know how it is financed, but that they provide the local materials and their resources to carry out the practice. This aspect is important in the sense that the technician brings the products that are not available in the community, which generates a dependency on the role of the technician for the availability of the supplies that are required to carry out the practice.

An important aspect of the Field School methodology is the delivery of instructions or a practice report in each training course carried out. In the interviews carried out, it was found that 55% of the producers indicated that they have received copies of the topic. treated, while 45% indicated that they did not receive said material. It is interpreted that the delivery of the report is not a normal practice of the technical team, so it is common for producers to carry their notebooks and make their notes, which in most cases is incomplete, which reflects that the field, does not fit the work method.

Another element of relevance in the application of the Rural Extension model based on Field Schools is the visit of the technician to the plots with the purpose of providing support, verifying and verifying that the producers are applying the technical information received from the training on the In particular, 54% producers indicated that they have received a visit from the technician in their plots while 46% indicated that they have not been visited by the technical team. Again, this is an aspect that denotes that there is not a correct application of the methodology given that not all the producers interviewed have received a visit from the technician in their plots. Regarding the visits, it was found that on average

of those who have been visited, they stated that the technician has gone up to five times, on average, to his plots.

Regarding the experience exchange tours between producers, which is understood as a meeting between peers, that is, between the same producers who apply or develop different technologies, in the interviews carried out it was perceived that there is not full knowledge of that methodology, both by producers and by the technical team, since the events are actually training courses for producers in different locations, so they travel to said locations and are mistakenly given the appointment of tours to exchange experiences between producers. It is important to emphasize this aspect, since it is the opportunity to create and give real meaning to the relationship from farmer to farmer, with an advantage and impact on the actions that are carried out (Pidaassa., 2006, and Holt., 2008).

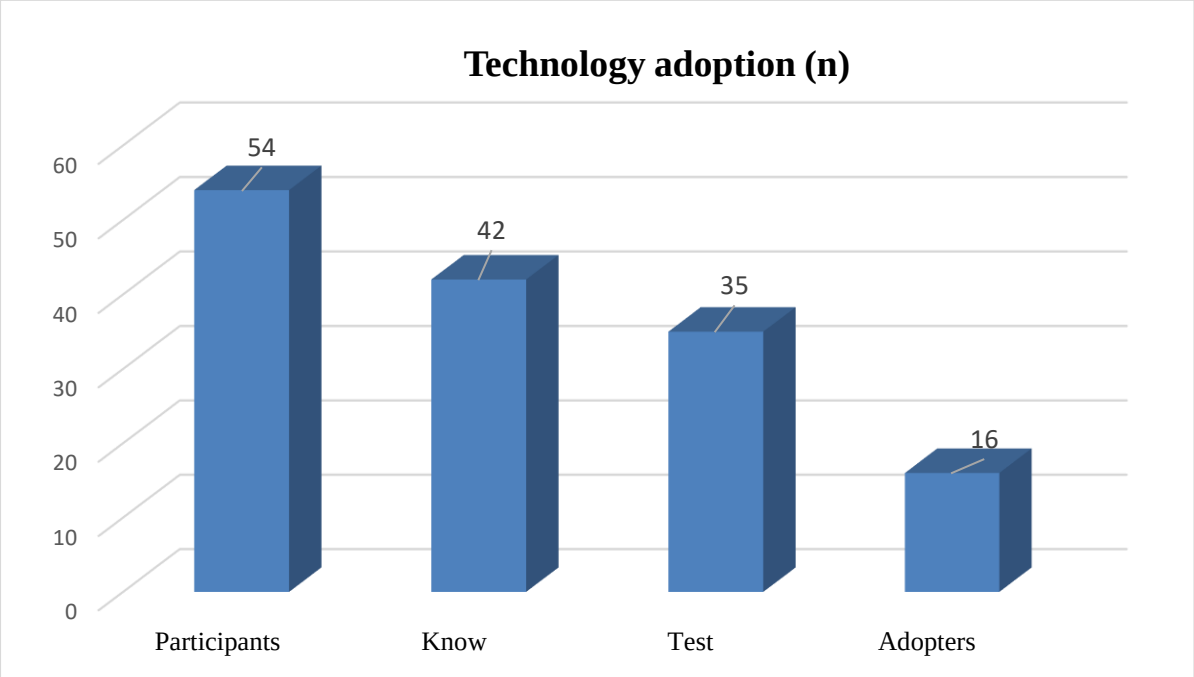
In this study, the issue of mobile phones or cell phones was addressed; in the interviews conducted, it was learned that 74% of the producers interviewed claimed to use cell phones as a means of communication, 26% of them did not use it.

Of the 74% who use a cell phone, 85% use the WhatsApp application ©, to send and receive messages, of which more than half (53%) stated that they receive agricultural videos with topics that are related to their productive activities, and 47% do not receive videos.

Among those who use WhatsApp, 38% stated that they have recorded the practices in which they have participated, but of those, only 29% have shared it with their Field School classmates and with other people. Sharing of videos is limited to Field School classmates, family and friends.

A figure equivalent to that of the promoters, in the program under study, is called the innovative producer. In this case, 44% claimed to know the innovative producer, the remainder stated that they did not know of the existence of the innovative producer, they only recognized that there is a representative. of the training group (it is the innovative product), but it does not carry out the function indicated for the innovative producer, since it only develops the function of sharing the dates of training sessions, and communicating it to colleagues.

Figure 1. Adoption process of Supermagro technology among coffee producers in Santiago Lachiguiri, Oaxaca. 2024.



As can be seen in Figure 1, of 54 participants, 42 (78%) do know super lean, its functions and the ingredients needed for its preparation. The group of 42 participants who, if they know, have full knowledge of the functions of super lean, know its functions, and adequately describe the ingredients for its preparation. While 12 (22%), are people who, although they attended the training, were not interested in learning more about the technology; that is, its function and the ingredients for its preparation. These people are characterized by being older than the average of the total group, who can no longer carry out activities that require considerable physical effort, in addition to not being able to travel to places far from their community, they are also people who have a lower level of education. , and who attended fewer training courses than average.

Of the 42 who learned about super lean, 35 (83%) went to the test phase, that is, they correctly described the way of preparing super lean, they participated in the group practices that the field technician organized and developed, they knew the ingredients , they learned the preparation procedure, the times for its use, they recognize the characteristics of the product, when it is ready to use, what corresponded to them, they received various quantities of the product, which they applied on their lands, and eventually carried out individual practices.

There is a difference of seven producers who did not advance to the testing phase, that is, they learned about the product, but did not attend the group training and did not master the way of preparation. This group is characterized by being younger than the average, they attended fewer training courses than the average and did not receive a copy of the training topic. For their attendance at the group practices, the producers received the amount of product that corresponds to them based on the total prepared, with the maximum amount received being 110 liters.

Finally, out of the total participants of 54 participants, 16 adopted the technology, i.e. 30% of the total. Of the group that attended the group training, 19 producers did not complete the individual preparation. The argument for why he did not do the preparations individually, highlights that they do not have time to do it alone, because they also do it as a group in this program and in sowing life, due to the difficulty in obtaining the inputs, mainly molasses and because the price of it, which they consider expensive, because they need instructions to consult how to prepare it, when they have questions, and because they always work as a group.

The group that adopted the technology pointed out that they are already convinced of the usefulness of Supermagro, because they have seen the results in their coffee plantations, mainly that the plant greens up with the applications, sprouts emerge, which is better than chemical fertilizers and that nourishes the soil.

It is highlighted that 80% of the adopters have recommended the "Preparation and use of super-lean biofertilizer" technology to other producers, so that they can use it, pointing out their experience as the main argument. Also relevant is the fact that two producers stated that they have made changes to the way of preparation, that is, they have incorporated new ingredients and changed some quantities of them, based on their experience in their use.

If it is observed as a process, it can be seen in Figure 2 that of the total number of interviewees, 78% achieved knowledge of the functions and ingredients for its preparation, 64% participated in the group test, learned the procedure for its preparation and the proper use of the product, 30% did the individual test, adopted the technology, shared it and sought to make modifications to it.

Statistic analysis

To define the statistical tests to be carried out, according to the number of samples (more than 50), the Kolmogorov – Smirnov normality test was carried out, comparing the adopting and non-adopting producers of the technology "Preparation and use of the superlean biofertilizer", a significance value of 0.000 was obtained, less than 0.05, so it is assumed that the variables do not follow a normal distribution, so non-parametric statistics were used. To find out if there is a difference between the adopting and non-adopting producers of the Supermagro technology, the Wilcoxon non-parametric test was carried out. The results can be seen in Table 1, which confirms that there is a difference between the adopters and non-adopters.

Table 1. Results of the Wilcoxon test between adopting and non-adopting producers of the "Preparation and use of super-lean biofertilizer" technology in Field Schools of Santiago Lachiguiri, Oaxaca.

Variables	Significance level
Adopters/Non-adopters	0.000

Wilcoxon signed rank test

On the other hand, Spearman's correlation analysis was carried out to find out if there is an association between different independent variables with the dependent variable adoption. The significance levels obtained are presented in Table 2.

Table 2. Level of significance in Spearman tests between the adoption of the technology "Preparation and use of super-lean biofertilizer" and different independent variables in Field Schools of Santiago Lachiguiri, Oaxaca.

Variables	**Significance level**
Age	.409
Sex	.104
Scholarship	.805
Native language speaker	.319
Years of participation	.549
Number of courses attended	0.002[a]
Received copy of course	0.004[a]
Technician visit to the plot	.618
Number of technician visits to the plot	.844
Use cell phone	.136
Use WhatsApp	0.097
Receive agricultural videos	.295

Recorded videos in training	.599
Share videos recorded in training	.592
Know who the innovative producer is	.264
Number of attendance at group trainings	.071
Number of preparations individually	0.043 [b]

a Significant correlation at the 0.01 level
b. Significant correlation at the 0.05 level

It was analyzed using a Spearman correlation to find out if there is an association between different independent variables with the dependent variable adoption. The significance levels obtained are presented in Table 2.

The association can be observed between the variables adoption of Supermagro technology in the Field Schools, with the number of attendance at the training courses, that is, there is a greater number of attendance at the courses, there is a greater adoption of technology, Likewise, the importance of the fact that the technicians give the attendees a copy of the training topic, since it allows the producers or a family member to review or review the instructions on how to prepare the biofertilizer, and the last association identified deals with the carrying out of the practice by the producers individually, this is central to the adoption process, since adoption is a personal decision, and the fact of doing the practice in their homes or land, indicates the final test for decision making on the adoption or rejection of the technology.

CONCLUSIONS

In the training process of the technology "Preparation and use of super-lean biofertilizer" in the Field Schools, of the total participants, 78% achieved knowledge of the functions and ingredients for its preparation, 64% participated in the group test, learned the procedure for its preparation and the proper use of the product, 30% did the individual test, adopted the technology, shared it and sought to make modifications to it. This means that the intervention prior to this study has worked and they have appropriated the transferred technology and that there are other factors still undefined that prevent the population's adoption. It has been proven that it is not enough for producers as a group to know and try, but the finest detail is when they, in their own Family Production Units, prepare and apply it.

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