Contribution of field schools to extensionism in Mexico

Aporte de las escuelas de campo al extensionismo en México

Contribuição das escolas de campo para o extensionismo no México

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ABSTRACT
Extensionism in Mexico until 2000 was unidirectional, without taking into account the user of the technology or the processes to be transferred. After the introduction of the Field School Model to Mexico, the way of doing extensionism changed, the National Institute of Forestry, Agricultural and Livestock Research (INIFAP), since that year in the implementation of said model and 20 years later through the FORDECyT Projects, Territorial Development (PRODETER) and then through the technical support strategy (EAT ) inserted at the national level as part of the methodology to carry out an extension
where the producers were not users but subjects and beneficiaries of the extension process, that is, based on their problems, they decide what to do in their Family Production Units with the technological options available at your disposal. The results indicate that through Field Schools and “learning-by-doing” there is a greater understanding of the technologies and greater expectations of their adoption, given that they work with producers over 53 years old on average. The objective of this work is to relate how this model has permeated public policies and has been inserted into the taste of producers in three strategies of bringing technologies to producers in the Mexican Republic and its contribution to food self-sufficiency and less dependence on external inputs based on the agroecological transition and more environmentally friendly practices.

**Keywords:** field schools, extensionism, technology transfer, PRODETER.

**RESUMO**
O extensionismo no México até 2000 era unidirecional, sem levar em conta o usuário da tecnologia ou os processos a serem transferidos. Após a introdução do Modelo Escola de Campo no México, mudou a forma de fazer extensionismo, o Instituto Nacional de Pesquisa Florestal, Agrícola e Pecuária (INIFAP), desde aquele ano na implementação do referido modelo e 20 anos depois através dos Projetos FORDECyT, Desenvolvimento Territorial (PRODETER) e depois através da estratégia de apoio técnico (EAT) inserida a nível nacional como parte da metodologia para realizar uma extensão onde os produtores não fossem utilizadores mas sim sujeitos e beneficiários do processo de extensão, ou seja, com base em seus problemas, eles decidem o que fazer em suas Unidades de Produção Familiar com as opções tecnológicas disponíveis à sua disposição. Os resultados indicam que por meio das Escolas de Campo e do “aprender fazendo” há um maior entendimento das tecnologias e maiores expectativas de sua adoção, visto que trabalham com produtores com idade média superior a 53 anos. O objetivo deste trabalho é relacionar como esse modelo permeou as políticas públicas e se inseriu no gosto dos produtores em três estratégias de levar tecnologias aos produtores da República Mexicana e sua contribuição para a autossuficiência alimentar e menor dependência de insumos externos, baseada na transição agroecológica e em práticas mais amigas do ambiente.

**Palavras-chave:** escolas do campo, extensionismo, transferência de tecnologia, PRODETER.

**RESUMEN**
El extensionismo en México hasta el año 2000 fue unidireccional, sin tomar en cuenta el usuario de la tecnología ni los procesos a transferir. Luego de la introducción del Modelo de Escuela de Campo a México, la forma de hacer extensionismo cambió, el Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), desde ese año la implementó dicho modelo y 20 años después a través de los Proyectos (Fondo regional para el desarrollo de Ciencia y Tecnología, (FORDECyT), el Programa de Desarrollo Territorial (PRODETER) y luego a través de la Estrategia de Acompañamiento Técnico (EAT) insertada a nivel nacional como parte de la metodología para realizar una extensión donde los productores no fueran usuarios sino sujetos y beneficiarios del proceso de extensión, es decir, en base a sus problemas, ellos deciden qué hacer en sus Unidades de Producción Familiar con las opciones tecnológicas disponibles a su disposición. Los resultados indican que a través de las Escuelas de Campo y el “aprender haciendo” hay un mayor entendimiento de las tecnologías y mayores expectativas de su adopción, dado
que se trabaja con productores mayores de 53 años en promedio. El objetivo del trabajo es relacionar cómo éste modelo ha permeado las políticas públicas y se ha insertado en el gusto de los productores en tres estrategias de acercamiento de tecnologías a los productores en la República Mexicana y su contribución a la autossuficiencia alimentaria y menor dependencia de insumos externos, basados en la transición agroecológica y prácticas más amigables con el medio ambiente.

Palabras clave: escuelas de campo, extensionismo, transferencia de tecnología, PRODETER.

1 INTRODUCTION

Braun, et al., (2006) document that Field Schools were developed in the eighties, in Indonesia, in response to serious losses in rice *Oryza sativa* cultivation, caused by pests and natural enemies of the crop. From this, this model emerges a central element in the methodology, such as the training of promoters, originally from the communities to work with producers in their own communities. As a result, Field Schools were implemented to improve the analysis and decision-making capacity of producers, seeking to break dependence on pesticides, something similar occurred when they were replicated in the Mexican Republic. (Morales, et al., 2015, Cadena, 2016). The term "Field Schools" is based on the "learning by doing" approach, where an exchange of experiences, knowledge and knowledge takes place between the participants. This principle is typical of andragogical or adult training processes. In informal environments where action is privileged in the process and the teaching-learning process is carried out by doing or putting into practice what has been learned. Andrology plays an important role in the field school model, since when working with rural producers, it is generally done with adults, who require teaching-learning processes in informal environments, and Andrology is precisely that, education. Of adults in informal settings. In the process there is not one who knows and another who learns, rather it is an experience where everyone learns from everyone mainly by doing things, (Robles, 2022) he mentions it as technical support and learning communities. Cadena, et al., 2022, mentions that implementing Field School activities in Mexican agriculture has a real impact on reducing migration from the countryside to cities since it is an inclusive work method, as demonstrated in the EAT of the Field School Program. Production for Wellbeing (PpB), where producers play a very important role in the development of an agroecological transition.
The main point of the implementation of Field Schools, in addition to being an andragogical method, where "learning by doing", is that it can be for any sector where there are technologies available to solve a problem or mitigate its effects, in addition to having as actors main producers, a facilitator, a leading producer or regional promoter and whoever finances the process, at least in the first years, and then leaves them self-managed as consolidated groups.

2 FIELD SCHOOLS AND THEIR OPERATIONALIZATION

The Field Schools are a space where a group of producers and technical teams meet to analyze, share and exchange knowledge and experiences from their productive life, to seek and apply solutions in order to achieve change in their production system and improve well-being of his family, it is also considered a School without walls, where producers learn through observation and experimentation in their own fields, this allows them to improve their management skills and become knowledgeable experts in their own lands. To achieve the above, the following steps are taken:

1. Diagnosis of the production system
2. Analysis of potentialities and limitations
3. Design of alternative solutions
4. Training and technical support program

The Field Schools consist of three stages in the operation: a theory talk about what is intended to be transferred and/or resolved according to the problems and limitations of the Production Unit or the territory, later the group moves to a land where the practice is carried out, which must be carried out by the members of the group, once the practice is carried out, they return to the initial site and reflect, highlighting the details, risks, advantages and areas of opportunity of the technology shown and the commitments and next meeting are collectively agreed upon according to the training program established with the group.

Since 2000, INIFAP has worked on the implementation of other models to make transfers more participatory and less vertical, with this it was operationalized first in Oaxaca, the southern state of Mexico, and later in four states of the Mexican Republic, including Oaxaca itself, Veracruz, Yucatán, and Chiapas, a project was financed by the National Council of Science and Technology today (CONAHcyT). Where field schools were implemented as part of the training strategy for producers, in the latter we worked
with 120 families per state in two municipalities per state, 26 researchers and six institutions committed to contributing to food self-sufficiency, and to take advantage of local resources rather than bringing crops and practices external to the context, this is widely documented in Altieri and Nichols, (2010); Cadena, et al., (2019). Later this work model was taken to Nicaragua, Paraguay and Belize, where we worked in association with the International University of Agriculture and Livestock of Rivas, in Nicaragua and the National University of Asunción in Paraguay, with the Ministry of Agriculture of Belize, respectively.

3 AGROECOLOGICAL AGRICULTURE AND FIELD SCHOOLS IN THE EAT

In principle we must indicate the intention of agroecological agriculture and its implications for the Mexican territory and how it is associated with Field Schools. The design of agroecological practices is carried out according to the interactions between plants, animals, the environment and humans, in order to conserve biodiversity and improve the components of the agroecosystem, as indicated (Venegas et al., 2018).

The agroecological transition described by Guadarrama y Trujillo (2019); is defined as the "... process of change in agricultural practices and the biological readaptation of an agricultural system, to achieve balanced results around production, independence from external inputs, especially agrochemicals, the restoration of all ecological and social processes that allow it to approach sustainability", reviewing the evolutionary approach to the agroecological transition and based on an original idea by Stuart Hill, which are taken up by Paddel et al, (2018), and cited by Robles, 2016, conclude that: "... The state of the agroecological transition is conceptually stuck in a permanent process of substitution of chemical inputs for organic inputs." Which, coincides with Venegas, et al., (2018) and Iglesias, et al., (2022), anticipates these ideas and declares the territory as a larger scale, where actions and interventions will be developed and not only the Family Production Unit.

Latin American efforts to make a change in productive paradigms have to do with changes in individual actions, from groups to social movements, often with balances that are not very pleasant for those who intervene. In Colombia, the agroecological transition came to the national forefront in that country as a necessity for agrarian communities, because they were emerging from a peace agreement between the State and armed groups, in favor of a change in the productive model at the national level; The change is towards
an agroecological model, which is based on the seizure of land and mobilization of producers, which to achieve this emanates more from support as a public policy. In Cuba, a more specific study was carried out on a farm, where it was based on the resources identified as natural and human, it was determined that to be sustainable and be able to support an average family in rural areas, a larger area is needed for self-consumption of at least 3 hectares (ha); something similar is planned in Mexico to support producers who normally have 5 hectares, in addition to seeing the Family Production Unit (UPF) as something more holistic and interrelated; For this reason, they suggest establishing areas to replace energy access for livestock with grasses of the genus Pennisetum spp, and sugar cane Saccharum officinarum, in addition to obtaining their own organic fertilizers from agricultural resources (González, et al., 2022). Something similar was found by (Krainer, et al., 2022), when carrying out a characterization and measurement of energy flows on a farm and they observed that, by increasing the biodiversity of the farm, a family of five members can feed themselves perfectly without external resources; In addition to how profitable the UPF can be, the holistic sense of the intervention is the richness of the approach in a transition period. (Gervais, et al., 2022) found similar results when studying the farms and the possibilities or alternatives that Ecuadorian producers carry out in their UPF, these are more profitable and sustainable, when they see their resources in a comprehensive manner and when prices are very high. the costs of external inputs to the farms, the proposal, preparation and application based on organic waste is an imperative necessity; This is a common denominator in studies from South America and the Caribbean, compared to the Mexican case, which are aimed at low-scale producers or small producers.

A clear strategy to achieve food self-sufficiency is described in Gervais, et al., (2022) in the Republic of Benin, who used organic fertilizers for plant nutrition, taking care of the health of animal plants and avoiding the use of pesticides of industrial origin, in addition, the UPF It was seen holistically; However, among other problems derived from this agroecological approach, the adequate market for its products was found, as well as low technological support, different from what is happening in Mexico with the Production for Wellbeing Program (PpB), where Technicians in charge of monitoring are closely linked and rooted in the work areas.

For their part Maldonado, et al., (2022) they indicated in a study in the Sierra de Lobos in the state of Guanajuato, Mexico in the center of the country, that the agroecological transition is more focused due to the proximity of population centers and
has more influence on agricultural practices. Producers due to their proximity, since they require safer products, in addition to making a real change in production processes. On the other hand, these authors point out that, in other populations, changes towards an agroecological transition are more linked to the availability of natural resources, such as water and soil fertility. This is a true notion and the need to make a change in the agroecological transition, which is far from the vision that the Ministry of Agriculture currently has.

Since 2010, Cadena, et al., (2019), indicated that the design of agroecological practices were the product of interactions between plants, animals, the environment and humans, in order to conserve biodiversity, and improve the components of the agroecosystem, concepts very advanced for those dates where the productive model was still neoliberal and productivist. Along these lines, Velasquez, et al., (2023), when testing 32 agroecological practices in the province of Valle Chillón, in Lima, Peru, with 162 producers to whom it provided technical support, found that the use of agroecological practices implemented in the Producers' plots contributes to reduce the use of chemical inputs, increase agrobiodiversity and recover environmental and productive quality.

Regarding the agroecological transition promoted by the Government of Mexico through the Ministry of Agriculture and Rural Development, Iñiguez, (2023), indicates that the novelty of the "extension" approach is its territoriality, in its analysis it indicates that the Technical Support Strategy (EAT) of the PpB, continues to be unidirectional and transfers packaged components, which differs from the work philosophy of the EAT, since it treats the producer as a beneficiary and is the object of its own development, which involves it based on its resources. At UPF, it prepares and incorporates components with an agroecological emphasis into production, which leads to food self-sufficiency, thus suggesting an "endogenous" model based on UPF resources, a situation that is currently being managed. For his part, Robles, (2022) he indicated that the strategy to combat food inflation must focus on producers generating their own inputs, since for a long time they became consumers. Ubiergo , et al., (2020) already pointed out the need to work territorially and provide certainty to producers from various points of attention to small-scale agriculture: "... 1) the importance that these producers have for the country; 2) the signs of exhaustion that the Mexican countryside presents, reflected in a stagnation of productivity, competitiveness and profitability; 3) inefficiency in public spending directed at the rural sector; and, 4) programs in favor of small-scale agriculture have been implemented in several countries of Latin America and the world" (SIC).
For their part, Ubiergo, et al., (2020) in a study with the Ch'ol people of northern Chiapas, found profound wisdom in the management and conservation of agroecological knowledge of the agroecosystem in older people, which means that you can work with them in a better way, since in addition to staying in the town they are very attached to the conservation of the habitat, which is consistent with the philosophy of the EAT of the Federal Government of Mexico in the sense to support the holders of the resources, since they are in charge and guardians of production and native Resources.

The agroecological transition of the EAT of the Government of Mexico is based on the gradual changes in the Family Production Units (FPU) and through the Field Schools where producers from various territories participate, in which they learn-by-doing with the agroecological technicians or extension workers, who provide “technical support” not extension activities, the participating producers who subsequently replicate it in their local groups, in this way an exchange of knowledge is carried out between producers and technical personnel.

The priority topics have to be friendly to the environment, to food self-sufficiency and to the comprehensive management of the UPF, gradually replacing industrialized agricultural inputs with bioinputs made by the producers themselves with resources close to them, such as leachates, composts, green fertilizers and the use of agroforestry systems that can provide an economic engine for the production of basic grains, without forgetting the rescue and conservation of native resources, mainly corn Zea mays, beans Phaseolus vulgaris and the components of the “milpa” such as the pumpkin Cucurbita spp; chilies Capsicum spp; broad bean, Vicia faba; among others.

4 ANOTHER VISION OF EXTENSION THROUGH PRODETER WITH FIELD SCHOOLS

The public policy in the Mexican Republic for the 2018-2024 six-year period was issued and in the general provisions and operational guidelines of the rural development program of the Ministry of Agriculture and Rural Development, it is indicated that the support of the Development Program Rural (PRODETER). The program will be aimed at small producers in areas of high and very high marginalization, applying criteria of social inclusion and gender equity. In Family Production Units (UPF), which are: "...a group of producers who associate to achieve a common goal, without legal formality or constituted as associative figures in accordance with the national legal system." For this,
efforts from three parties were combined: extension, research and the productive sector, in order to create synergies and be able to manage innovation (Avalos, et al., 2021; de la O-Olan, et al., 2021 y Cabrera, et al., 2021). The Ministry of Agriculture and Rural Development conceptualized territorial development as an action where two segments converge: investment in infrastructure and investment in knowledge, an aspect widely documented in Avalos, et al., (2021), with the aim that farmers, ranchers, producers or ranchers (in the case of this document, the management of the three concepts will be considered synonymous with each other and makes a differentiation with livestock farmers, due to the activity carried out, based on the concepts expressed by (Chayanov, A. 1974, Wolf, 1975, y Galesky 1997); and the pro-peasant conceptions of Armando Bartra, cited by Boltvinik, (2009), at the time etc.), are considered as subjects and not as beneficiaries and recipients of government programs that help benefit them and their families. The Ministry of Agriculture and Rural Development of Mexico conceptualizes three interrelated aspects, Producers, Extensionists and Researchers. Regarding the above, in the knowledge segment, the National Institute of Forestry, Agricultural and Livestock Research (INIFAP) has a direct participation in which it is committed to having three fundamental actions: bringing the available technologies to the producer, providing technical assistance support for the UPF. Grouped into functional organizations to achieve or manage innovation, carry out a territorial diagnosis characterizing the UPF, prioritizing the problems detected and intervening with a differential work model in the selected territories.

Extensionism in PRODETER consisted of three aspects: a). Technical-productive diagnosis of Family Productive Units, b). Technology transfer proposal and c). Technical Support Strategy, the transfer models were the Field Schools and the Livestock Group Validation and Technology Transfer Model (GGAVATT), both generated and adapted to the conditions of Mexico and its regions.

5 RESULTS

5.1 FORDECYT

With the implementation of work in the south-east of Mexico, the results indicate that by working with 480 families in Oaxaca, Chiapas, Veracruz and Yucatán, states of the Mexican Republic, with two municipalities per state and 26 researchers from six
institutions, the application of field schools as a work method where the Training of promoter producers is prioritized so that they can replicate it in their communities or groups, the results were very encouraging given that: the consolidation of at least 8 groups with legal registration was achieved, at least two for each state of the republic, the result of creating agribusiness with producers was such that in addition to the training and the technological offer, it was proposed as a third element and economic driver, giving added value to local products.

The results were later taken to the Republic of Nicaragua, and work was done in conjunction with the International University of Agriculture and Livestock in Rivas Nicaragua, where said work model was implemented and after two years they had formed work groups to make Chips of “Plantain Macho” (Musa Spp), in addition to including in their study plan the Agribusiness Course, where each student to graduate would have to bring a business portfolio for their locality and launch them, and that was a resounding success, given that As indicated by Cadena, et al., (2019) field schools as an element within the proposed innovation model are part of one of the axes described in said Transfer model.

In Mexico, some of the outstanding results were in each of the states of the Mexican Republic: p.e. Oaxaca, the cultivation of Tomatoes solanum lycopersicum, under protected agriculture, carrying out 6 applications of insecticides and obtaining a yield of 15 kg/m², to obtain 25 kg per meter² and make only 3 applications, as a result of training and good use and management of water and knowing the nutrient contents in each greenhouse. For the corn system in Chiapas, Oaxaca, Veracruz and Yucatán with a sample of 360 producers, it was found that the simplest processes to adopt are those that only involve the change of genetic materials, such is the case of seeds, but not the Milpa System Intercropped with Fruit Trees (MIAF) which involves a much longer period of time, at least four years to be able to see the production of fruits, it is more difficult to adopt this practice or the acquisition of improved materials that on average are equivalent US$200 for 20 kg or 60,000 seeds.
Table 1 - Technological components

<table>
<thead>
<tr>
<th>Technological component (n=360)</th>
<th>Adopted</th>
<th>in progress</th>
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</thead>
<tbody>
<tr>
<td>Soil pest control</td>
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<td>√</td>
</tr>
<tr>
<td>Planting method</td>
<td>√</td>
<td>√</td>
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<td>Fertilization opportunity</td>
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<tr>
<td>Fertilization method</td>
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<tr>
<td>Weed control</td>
<td></td>
<td>√</td>
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<tr>
<td>Selection and improvement of your seeds</td>
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<td>√</td>
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<tr>
<td>Commercial corn</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>MIAF</td>
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Source: own elaboration 2021 from field work

5.2 FROM THE PRODETER

An important part of this work scheme was the technical support strategy, whose objective was to provide feedback to producers and extension agents in the application of technological components, which allowed direct interrelation in the field between extension agents, producers and the researcher. The technical support was provided on the plots and/or ranches of the producers and ranchers. The researcher designed a program of visits to the territory, considering: the phenological stages of the crop, the physiological stages in the animals, the recommended technological components and other specific aspects, the work method was the Field schools, under the philosophy of "learning - doing".

Of the 420 PRODETER established throughout the Mexican territory, 126 were under the direct responsibility of INIFAP, the results of 5,734 surveys carried out among producers indicate at least four main points for the adoption of technologies, 1. Ad hoc technologies for each area of the Republic, 2. marketing channels, 3. continuous advice and 4. Financing sources.

For the operation, a group of a technical expert in comprehensive planning and a project developer was established, which in the first instance formed the group of interested producers, which averaged 300 producers. The program itself was good in its conception, but public policies emanating from the Government suspended the PRODETER program and it was not possible to verify the goodness of the program as such and its impact on productive levels, however, the fact of having at least a
technological model for each detected problem confirms that the tripartite link between producers, extension agents and researchers works at least in the year of execution.

The process with the producers showed that the previous work of planning and integration of work groups was deficient and not because the pioneer technicians had done their work poorly, on the contrary, the old vices of the producers emerged given that many of them, did not They knew the scope of PRODETER. In short, the cohesion between the producers did not occur as expected, in part due to personal and social characteristics that are seen in two relevant aspects: Producers learn from other producers, more than from technical staff. The producers are not incorporated into the organizational processes, which was the spearhead to later create the associative figures necessary to continue with the self-management processes, individual action has been promoted more. Areas of improvement in agricultural production were identified. Although there are environmental, economic, cultural, marketing, technological and access to differential resources conditions throughout the national territory, the need to participate in processes of continuous improvement of producers is evidenced by the acceptance of the work of INIFAP and its researchers in the number of events where they participated, in addition to the opportunity to exchange experiences between them. It is understandable that the genesis of the PRODETER project had a vision and an objective that was difficult to achieve due to the well-known questioning of the subjects of the program... "What support did it bring us", which never happened, and with few honorable exceptions the producers They expected direct support as they were used to, especially that on this occasion, as part of the PRODETER model, they were asked for a contribution so that they could find means of production appropriate to their vocation; That is to say, through productive projects with high recovery value, the Government of Mexico provided a part of the infrastructure or means of production and the group of producers provided another part, depending on the type and cost of means requested, the percentage granted by the Government, which It varied from 20% to 50% of the contributions.

5.3 OF THE TECHNICAL SUPPORT STRATEGY

Regarding the Technical Support Strategy of the Production for Wellbeing Program, the results are very outstanding and expectations are high since the number of participants in each field school grows year after year. The comprehensive vision in each field school and each productive chain not only includes the agroecological transition, but
also soil analysis studies to see the amount of nutrients in each field school, in addition to analyzing the soil microfauna, the samples of the bioinputs that are applied as part of a transition plan in such a way that this impacts the quality of the products, mainly grains maíz Zea mays; frijol Phaseolus vulgaris; arroz Oriza sativa; trigo Triticum spp, chía Salvia hispánica; amaranto Amaranthus spp; caña de azúcar Saccharum officinarum; cacao Theobroma cacao; café Coffea arabica, miel de Apis mellifera y Melipona beecheii and family dairy, coming from Bos Taurus y Bos indicus.

From the first year of work in the EAT and in all regions, a diagnosis or baseline was prepared, with the purpose of identifying the current problems generated by the irrational use of agrochemicals, destruction of biodiversity, the socioeconomic aspect and conformation of the communities. And producers, as well as the support received in previous years, among others. To move towards an agroecological transition, actions were carried out, which were linked to one of the four axes of the technical support strategy, which were indicated above; which were carrying out field work to implement agroecological practices linked (soil preparation and health actions or planting are not mentioned) to nutrition (physical and foliar mixtures), phytosanitary management, monitoring of pests and diseases, application of bioinputs for management soils, phytosanitary management, plant resistance inducers and grain harvesting, among others, in some ECAs. In that sense, bioinputs were being produced such as: 1. Plant nutrition, bioles; leachate from cattle, goat and sheep manure; multiplication of mycorrhizae and element-fixing bacteria: 2. Pest control (insects and fungi), plant extracts, production of beneficial microorganisms (example: Metarrhizium and Beauveria); and the use of pheromones to control fall armyworm, among others. These products were applied in a timely manner to the crops and according to the availability of production in the biofactories. In this sense, innovative producers with the support of agroecological technicians prepared different bioinputs, such as: vermicompost, bovine compost, bovine manure leachate and vermicompost, manure bioles and bocashi, for plant nutrition in different crops. To control diseases, copper-based fungicides were made, such as Bordeaux paste and Bordeaux broth. In pest control, water-soluble plant extracts based on garlic, Allium sativus, chilies, Capsicum spp; cinnamon, Cinnamomum verum, and neem, Azadiracta indica. The multiplication of fungi: Metarrhizium anisopliae and Beauveria bassiana in aseptic conditions, which develop easily in rice and with high relative humidity. Likewise, the fungus Trichoderma harzianum was multiplied in corn cobs, which was applied and its effectiveness as an antagonist of parasitic fungi Fusarium
sp., and *Rhizoctonia* sp., among others, was evaluated. The bacteria *Bacillus subtilis* and *B. thurigiensis* were acquired commercially for the control of soft-bodied insects in the larval stage (*Spodoptera frugiperda, S. exigua*), so that producers know and use these microorganisms for specific purposes.

As a method of extensionism, field schools offer an alternative to transfer knowledge, technologies and processes to the rural inhabitants of the Mexican Republic, who represent 24% of the population and who live in highly marginalized areas, in the first instance, Both technicians and rural producers, whether men or women, have the opportunity to learn by doing using necessary technologies and trying to solve a local problem, without this being an imposition on the part of the promoter or the financier.

Being a method for older adults allows it to be a successful methodology that, in addition to being proven in Mexico and other countries, offers the versatility that can be applied to various sectors and production chains. It only requires at least three elements: a group of producers, a technician or promoter or also called an extensionist, in addition to the technical support that can be offered based on rural problems by researchers or academics, or companies that provide answers and solutions, and the most important part, a financing scheme in at least the first three years to consolidate the groups and make them self-managed, in principle for the resolution of a productive problem and later for the integration to market their products.

6 CONCLUSION (S)

As lessons learned with FORDECyT and the Field Schools: small marginalized producers CAN…trigger processes of technological innovation by themselves and access better living conditions, contrary to those who claim that rural poverty is a structural problem. It is important to identify local potential to generate business taking into account the market, which is consistent with the theory of competitiveness. If the human capabilities of the actors are improved and the availability of knowledge is facilitated, it is possible to access higher levels of competitiveness. It was also found that: In addition to field schools, more activities are required that strengthen the capacities of producers to achieve their empowerment and sustainability. One of the main constraints was that the PRODETER Program was financed by the State for one year only and with that it limited the intervention in the first instance to see the effects and levels of adoption of the technological model in the Family Production Units, in addition that it was
operationalized during the SARS-CoV-2 pandemic. It has been proven that with the Technical Support Strategy (EAT) of the Production Program for Wellbeing (PPB) promoted by the Undersecretariat of Food Self-Sufficiency and through the General Directorate of Production Organization, it has positioned itself within the producers. poorest, motivated to generate their own sustainable and safe food, as well as the development of capacities to produce their own inputs at a low cost and improved profitability. The organization in the territory has been favored to increase the number of benefited producers, through organized producers' assemblies, in addition to the incorporation of new producers in the registers of each productive chain. This is fundamental in the PPB EAT, so the registers of producers of the agri-food chains addressed and the others requested by the producers must continue to be improved since the purpose is to benefit the poorest and most abandoned producers dedicated to production. of sustainable foods. The agroecological transition suggested in the different agri-food chains of: corn, bread-making wheat, beans, rice, cornfields, coffee and sugar cane. For this reason, agroecological technologies will continue to be promoted and that producers select their native or local seeds, prepare their bioinputs and apply them in a timely, profitable and effective manner in their fields selected by the Field Schools under the “learning by doing” scheme. With the sum of these comprehensive actions, among the institutions of the Government of Mexico, producers and non-governmental organizations, food self-sufficiency is sought first by improving and opening job opportunities for young people, producers, in such a way that substantially reduce migration and the local, regional impact of climate events caused in part by the use of agroindustrial inputs in agricultural production for local consumption.
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NOMENCLATURES

INIFAP  National Institute of Forestry, Agriculture and Livestock Research
PRODETER  Territorial Development Program
EAT  Technical Support Strategy
PpB  Production Program for Well-being
GGAVATT  Livestock Validation and Technology Transfer Groups
UPF  Family Production Unit