

Andragogy as a Process for Strengthening the Capacities of Producers in Areas of High and Very High Marginalization

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Abstract

In Mexico, the rural population is over 50 years old, and generational change is not occurring. Therefore, government and private sector programs must be implemented with the existing population. To bring processes and technologies to the rural population and empower them, non-formal adult education processes have been used, specifically Andragogy. This document aims to highlight the use of this working method in support programs of the Mexican government, operationalized by the National Institute of Forestry, Agricultural and Livestock Research (INIFAP). These programs are accompanied by other working models that contribute to the transmission of appropriate knowledge within the context of the environment and the existing technological gradients in Mexico. The results indicate that the mixing of knowledge and the exchange of these are crucial as long as there is no generational change in rural areas, so andragogical methods are the ideal mechanism for the transmission of knowledge, technologies and processes that improve the quality of life of the rural population.

Keywords

Andragogy, Marginalized Areas, Field Schools, Mexico

1. Introduction

In Mexico, based on INEGI data (2020) [1], the majority of agricultural producers are over 50 years old, [2] placing them in the older adult age group. Knowledge exchange processes for this type of producer require very specific strategies that consider appropriate knowledge sharing processes between adults and those responsible for transferring knowledge and/or technologies. Knowledge interaction processes for this type of producer require highly specific strategies that take into account appropriate knowledge-exchange methods between adults and those responsible for transferring knowledge or technology. In this context, andragogy as a discipline within the agological sciences facilitates an effective capacity-building process. This educational concept goes beyond mere instruction to encompass a teaching-learning dynamic that seeks to enhance each individual's inherent skills, knowledge, and resources. It aims to make the educational process particularly in informal settings more efficient, moving beyond rote memorization or the view of the learner as a mere repository for deposited knowledge, where the teacher simply teaches and the student simply learns. The Latin American educator Paulo Freire highlighted this perspective as early as 1965, noting that adult learners who in this case are producers with established mindsets and ways of being actively compare their existing knowledge against the innovative proposals presented to them [3]. In some cases, proposed changes involve risks, but they can lead to improved productivity or potential benefits for the producer. The dynamics of change are approached with caution due to these risks and their implications, especially in fragile economies such as those of subsistence farmers or small producers who generally live in areas of high and very high marginalization.

Andragogy, through strategies such as learning by doing and a teaching-learning process, allows the fear of risk to be minimized and interaction processes can take place, valuing risks and providing for the development of capabilities that do not break with established structures, whether cultural, forms of organization, conservation of natural resources or other factors that are influenced by the processes of change and development. The objective of this work is to understand Andragogy as the ideal mechanism in the processes of capacity development of Mexican producers in areas of high and very high marginalization, based on a government program in six years of operation.

2. Background

The concept of Andragogy, which stems from the epistemic roots of educational sciences, traces its origins back to Socrates, [4] and his application of the Socratic method. Through this method, he facilitated his students' learning in a unique way, by questioning topics that fostered the development of their thinking and acting abilities [5]. This is one of the fundamental principles of Andragogy: it does not seek to impose itself as a linear, inductive process, but rather to develop the capacities of the process's participants, in this case, rural producers. Here, the agent of change is a facilitator of the process, not merely a transmitter of knowledge

and technologies. The topics for discussion are the producers' problems and needs, explored through a confrontation of ideas, where they seek alternatives that will be implemented as part of the operational methodological process of learning by doing. The way in which a problem-solving construct is appropriated should not create dependency or subordination in the adoption process, and when the development program or project concludes, the producer will have sufficient knowledge and framework, based on the development of their own capacities. This is what is referred to in the current educational process as learning for life, through the formation of analytical, critical, and thoughtful individuals with meaningful knowledge of multiple applications [6].

Andragogy is the discipline concerned with adult education and learning. Etymologically, the word "adult" comes from the Latin word "adultus," which can be interpreted as "has grown" [7]. After adolescence, the biological growth of human beings reaches its peak in physiological, morphological, and organic aspects; however, from a psychosocial perspective, human growth, unlike that of other species, is continuous and ongoing.

Andragogy requires reformulating concepts to recognize the particularities of human beings in adulthood and the specificity of their educational processes at each developmental stage [8]. Andragogy allows for the design of guidelines for an appropriate teaching methodology to establish formal and non-formal educational processes, both face-to-face and virtual [9].

According to [10], "...Andragogy is the discipline whose object of Conceptualization is the education processes of adults, aimed at continuing the development of their capabilities, updating or deepening their knowledge, appropriating and using new knowledge or technologies and, in general, maintaining or improving their quality of personal, work and social performance." The teaching-learning process, learning by doing, is part of the educational method for adults called Andragogy, which according to [11]; "...It is the science and art that, being part of anthropology and being immersed in permanent education, is developed through a praxis based on the principles of participation and horizontality; whose process, when guided with synergistic characteristics by the learning facilitator, allows increasing the thinking, self-management, quality of life and creativity of the adult participant, with the purpose of providing them with an opportunity to achieve self-realization" and the development of their capabilities.

Andragogy has undergone an evolutionary and dynamic process, which can be considered contemporary, since it gained significance within the field of education in the 1960s, alongside the agogic sciences. The concept refers to adult education in informal settings, in contrast to pedagogy, which focuses on the education of children with a differentiated formative foundation and with particular methods and techniques, as well as some pedagogical processes [12]. Andragogy, as part of the agogic sciences, is geared towards a specific age group, as are each of the other components of the agogic sciences [13].

The educational processes according to agogic sciences can be divided as fol-

lows:

- a) Paedagogy that is responsible for education at the preschool level, from 3 to 6 years old.
- b) Pedagogy, children's education and basic education.
- c) Hebegogy, middle and diversified adolescent education.
- d) Andragogy, adult education until maturity.
- e) Gerontology, education of older adults, of the third age.

Based on the above, if we consider that the age group of producers in Mexico corresponds to adults over 50 years of age [14], the technology transfer processes that entail educational learning processes would correspond to the andragogical education processes.

3. Theoretical-Methodological Aspects

This study presents a theoretical, conceptual, and methodological review of the concept of andragogy, supported by field data derived from the implementation of various programs (GGAVATT; Technical Support in Nicaragua and Belize). The scope of action for these programs is described within the text; specifically, the Technical Support initiative encompassed a total of 195,000 producers served over an average six-year period in Mexico.

Adults are individuals who already possess knowledge derived from their cognitive and sociocultural processes [15] [16]. Through andragogical processes, this knowledge can be modified through introspection and deconstruction of their own processes. As [17] mentions, learning processes that require a different approach (for example, changes in agricultural practices) require unlearning what has been learned or how it was learned in order to relearn it differently.

There is a direct relationship between a person's age and their resistance to change; specifically, the processes of deconstruction and reconstruction are dynamics in which the more deeply rooted a piece of knowledge is, the more difficult change becomes. This is directly linked to age: as knowledge becomes more entrenched a process that intensifies over time the pace of change slows down. This is where andragogy, as a theoretical-methodological strategy, comes into play, alongside methods such as "learning by doing" [18].

Andragogical methods and techniques play a significant role in the change process, considering aspects such as the producer's way of being and doing, with processes learned throughout their life. This minimizes fear of change through synergistic strategies, where learning by doing is an essential part of andragogical practice. It is easier to demonstrate the benefits of changes to the producer through practical experience. For example, we will implement the proposed changes in one part of the plot and continue with the traditional methods in another. The producer will then put the changes into practice with the change agent, observe, analyze, compare, and make their own decisions. Through this exchange of ideas, if the change process is effective and the producer is convinced, they will adopt or adapt it; otherwise, they will reject it. The advantage of this adoption process is that,

even if the change agent is no longer present, the producer will have already acquired a new way of producing independently, based on the new knowledge gained and the experience gained.

a) Adults have a need and desire to learn, but greater risk leads to greater resistance to change. The adult producer's perspective may differ from the change agent's (Semiotics) perspective; for a technician, it may be seen as an opportunity, while for a producer, it may be seen as a risk.

b) Adult producers primarily learn through practical and operational means (learning by doing). Andragogical processes should combine the abstract and the concrete. A brief but substantive explanation of the principles of the proposed change and a practical demonstration (where appropriate) will make the process more efficient.

c) The change agent acts as a facilitator of the process, and the adult producer develops their own capabilities to take ownership of the process. There should be no constellation effect where one is the center and the other a satellite.

It must be taken into account what [19] mentions that adults are conscious, analytical, critical, responsible, creative and committed human beings, among other characteristics, and that they already have educational background that leads them to do things as they have been doing and that a change can awaken fears and rejection. Based on the above, Andragogy considers the humanistic part that the adult producer, like any human being, seeks his benefit and self-realization [20]. In conclusion, the andragogical process has a conceptual theoretical basis, with its own methods and techniques and principles that govern it, which are directed by the universal needs of producers or older adults. Andragogy is a concept that arises from agogic sciences for adult educational processes, but has an ad hoc application for knowledge and technology transfer processes with adult producers who work in the field and where the educational process takes on a different nuance from that of pedagogy, as it is carried out in informal settings (classrooms without walls) and with very particular methods and strategies.

4. Results

For over 40 years, the National Institute of Forestry, Agricultural and Livestock Research (INIFAP) has operationalized participatory and interactive strategies within the socioeconomic area, engaging knowledge-generating institutions with agricultural producers and technicians [21]. These strategies aim to disseminate knowledge and technologies resulting from research processes to users.

INIFAP generates knowledge and technologies for various types of agricultural producers across the country and employs different models for validating and transferring this knowledge and these technologies, such as the Livestock Groups for Validation and Technology Transfer (GGAVATT) model and Farmer Field Schools (FFS), among others [22]. This latter model is applied in areas of high and very high marginalization, with adult producers using andragogical teaching and learning processes, prioritizing the learning-by-doing method. To

put this in context, in Mexico there are 1.5 million small-scale producers in areas of high and very high marginalization, in production units of less than three hectares [23].

Among the experiences developed at INIFAP with andragogical methods are: the National Program for Validation and Technology Transfer (PRONAVATT), which since the 1980s has worked on different livestock product systems, mainly cattle, starting in the state of Veracruz and spreading successfully to different states of the Mexican republic. Through the technology transfer model called Livestock Groups for Validation and Technology Transfer (GGAVATT), widely discussed in [24], the strategy was disseminated with producers of different livestock species, mainly sheep and bees, achieving the dissemination of specific knowledge and technologies to producers who improved their production systems with significant increases in productivity, which in some cases exceeded 30%. Since its inception and for more than four decades, this transfer model has been the longest-running within INIFAP, and some outstanding results are worth highlighting: by 2006, 1165 GGAVATTs (Groups of Agricultural and Livestock Technology Transfer Agents) had been established nationwide, bringing together 17,095 producers and nearly 1000 change agents or Professional Service Providers (PSPs). These groups represented the main agri-food chains, such as: dual-purpose cattle, 41.1%; beef cattle, 22.8%; meat and milk goats, 10.7%; dairy cattle, 10.1%; poultry, 6.4%; meat sheep, 6.1%; swine, 2.1%; family poultry farming, 0.5%; and aquaculture, 0.2% [25].

A common denominator has prevailed in all the transfer models implemented by INIFAP: a PSP (Project Service Provider), a funding source, and a specialist from a research institution or a higher education institution, who contributes to finding solutions to the problems prevalent in each GGAVATT (Large Livestock Farming Area) [26]. In each operationalized case, andragogical methods have been used since the livestock population exceeds the average age indicated above.

Some results have also been implemented in other countries such as Nicaragua and Belize, in which the andragogic model has permeated to cushion the impact of the creation of ecotourism development poles and the population adjacent to said developments. Using the described methodology, groups of producers have been formed to produce *Musa* spp. banana chips; and groups of producers who have changed their local banana materials for varieties more resistant to nematodes. [27], these authors found that: it is important to identify the local potential of the natural resources held by producers, since, if the human capabilities of rural actors are improved and access to knowledge is facilitated, it is possible to achieve higher levels of competitiveness even in conditions of high and very high marginalization.

On the other hand, during the period 2009 - 2019, the international project “Diagnosis of the Sheep Sector and its Development in Belize” was carried out. Within the project, research activities and knowledge and technology transfer

were conducted at the international level, specifically with livestock producers dedicated to raising hair sheep. These activities were led by researchers from INIFAP (National Institute of Forestry, Agriculture and Livestock Research) in collaboration with technical staff from the Research & Development Center, Central Farm Cayo District, Belize. The work was funded by the Mexican Agency for International Development Cooperation (AMEXCID), which aims to contribute to national development by generating endogenous capacity that combines the resources offered by the international community with the resources and knowledge existing in public, private, and social institutions in Mexico. The project's objective was to characterize sheep producers in Belize and conduct a situational analysis. Technical staff were also trained in various disciplines such as animal health, nutrition, reproduction, and management. This approach was applied to hair sheep so that the researchers could replicate it among sheep producers in the Central American country and enhance their knowledge. The results obtained included a characterization of hair sheep farming in Belize, whose main characteristics were: a low level of technology in production systems, an extensive production system, and severe problems of inbreeding in flocks, as well as health problems and high lamb mortality rates. These issues were subsequently addressed through training, organizing groups to facilitate the knowledge dissemination process and employing learning-by-doing strategies with andragogical methods for working with producers. Among the results, significant development of the activity was achieved by preventing inbreeding in flocks through induced cryptorchidism techniques, at zero technological cost, improvements in livestock nutrition, better reproductive management, and other benefits.

The term “Field Schools” is based on the learning-by-doing approach, meaning that alongside theoretical information, great importance is given to fieldwork, where an exchange of experiences, knowledge, and skills takes place among the participants [28]. [29] refers to this phenomenon as a return to school...because of the process of learning new things and unlearning what has been learned, referring to new, more sustainable approaches. This is the case with the practical application of the field school model at different times and in various experiences at INIFAP.

According to [30], Field Schools were developed in the 1980s in Indonesia as a response to severe losses in rice cultivation caused by a pest and the elimination of natural enemies. Therefore, the Field Schools were implemented to improve the analytical and decision-making capacity of the producers, to break the dependence on pesticides, as well as a central element in the methodology, such as the training of promoters, to work with the producers in their communities.

In the case of Mexico's experience with the implementation of the Field Schools model, whose main component is the andragogical processes and methods in training and operation by INIFAP, different moments have been experienced that have determined various levels of impact, mostly positive as mentioned in **Figure 1**.

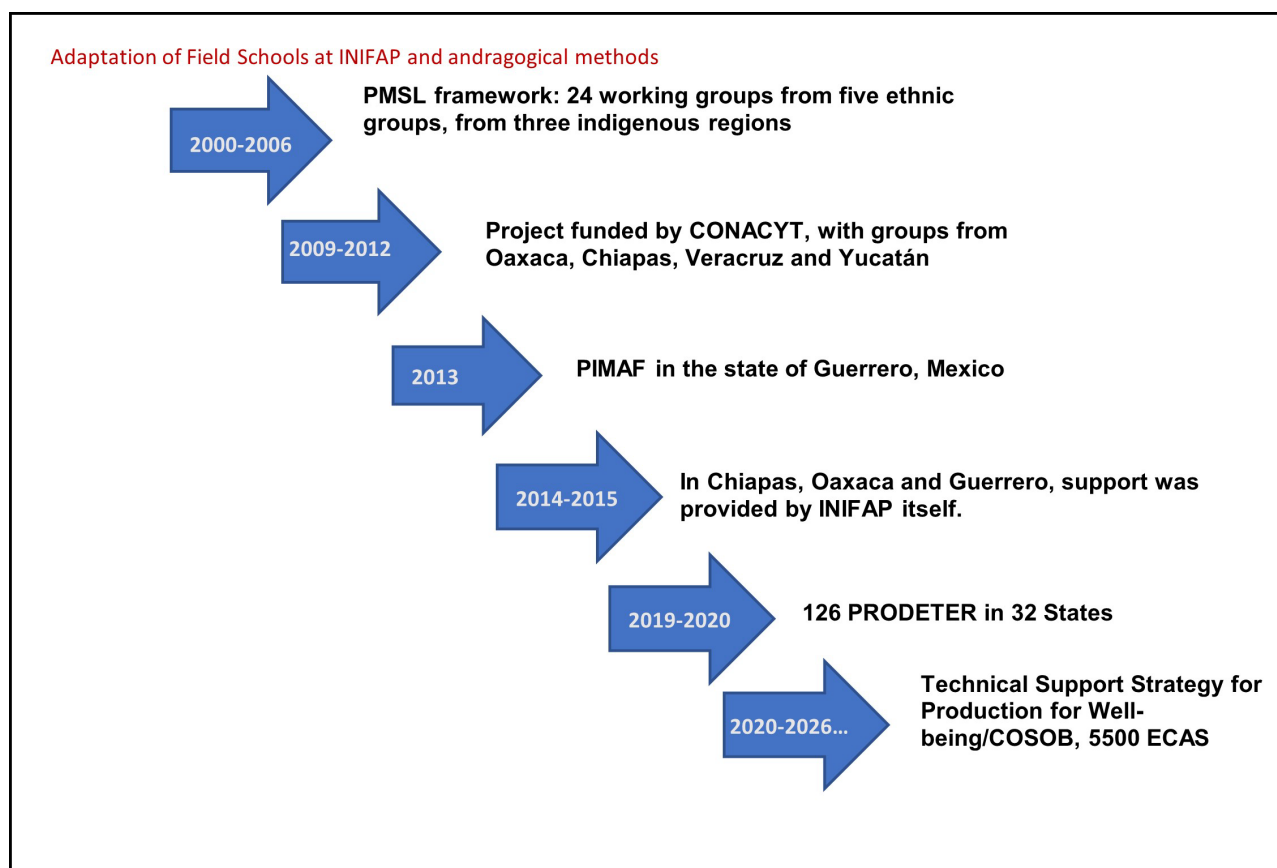
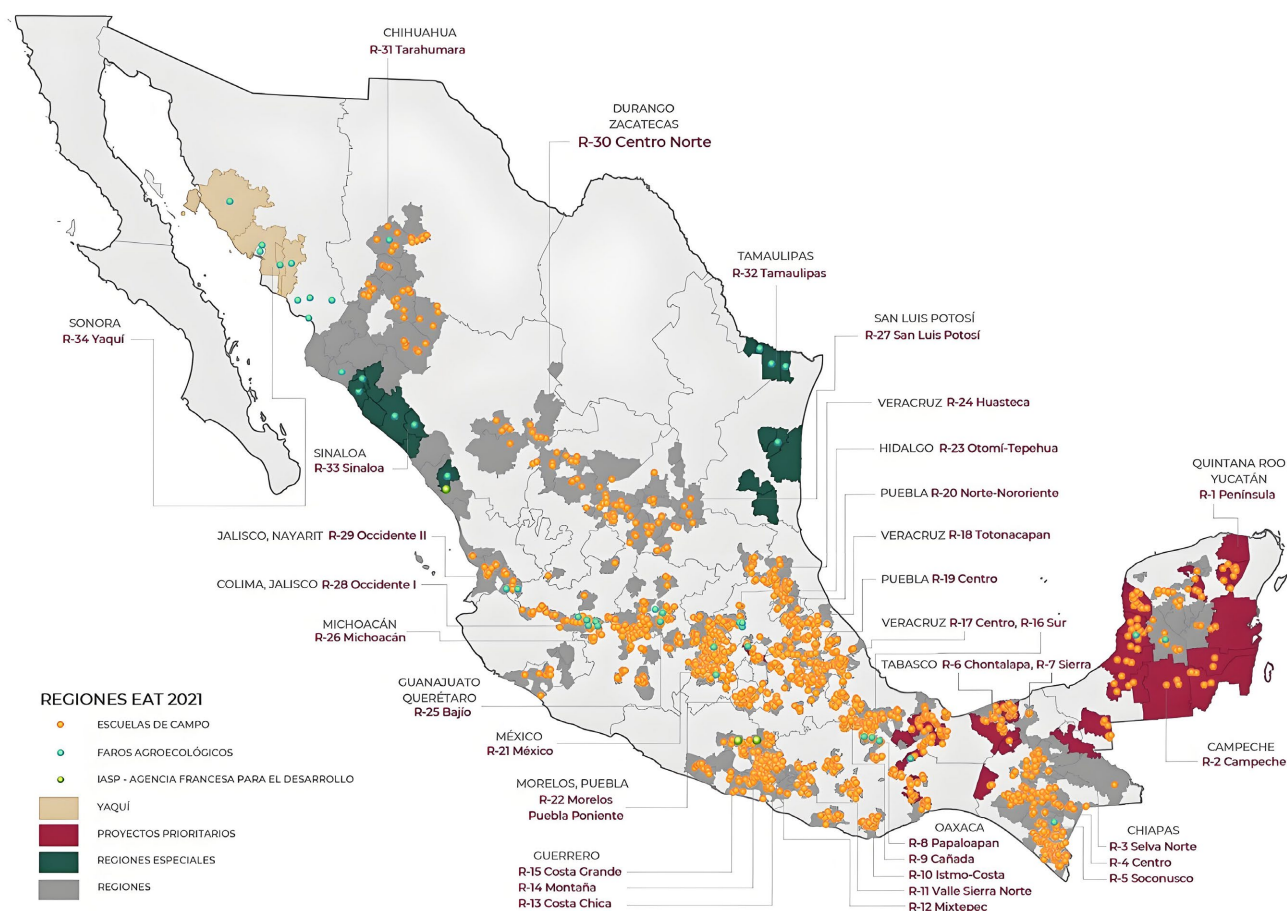


Figure 1. Different stages of implementation of the Farmer Field Schools strategy in Mexico. Source: Prepared by the author based on the operation of projects and programs, INIFAP.

The above indicates that the implementation of the strategy at the institutional level begins in 2000 and it is from 2019 that the strategy is consolidated and scales in the country as a transfer model to massify knowledge and techniques through the technical support strategy, carried out between the Ministry of Agriculture and Rural Development and INIFAP.

Another significant impact of implementing the andragogical model within INIFAP—as part of its mandate to meet the demand for institutional knowledge and technologies—is the use of the “field school” model. Over a six-year period, support and training have been provided to 1245 Mexican technicians; these technicians, in turn, have provided technical support—employing the field school methodological model and andragogical processes—to train more than 195,000 producers across 1050 municipalities in 28 Mexican states. The initiative primarily focused on 14 product systems, including: maize (*Zea mays* L.), common bean (*Phaseolus vulgaris*), rice (*Oryza sativa*), and wheat (*Triticum aestivum*), amaranth (*Amaranthus* spp.), chia (*Salvia hispanica*), and coffee (*Coffea arabica*). cocoa, (*Theobroma cacao*); sugar cane, (*Saccharum officinarum* L.); onion (*Allium sepa*); tomato (*Solanum lycopersicum*); chili (*Capsicum annuum*); honey bee, (*Apis mellifera*) and (*Apis beecheii*); and family dairy based on European cattle and Zebu (*Bos taurus* and *Bos indicus*); (**Figure 2**) [31].



Source: [31].

Figure 2. Field Schools with Andragogical model. Field schools in different states of the Mexican Republic where the andragogical strategy is implemented.

The andragogical model has been implemented from 2018 to 2026 expanding from 1500 Field Schools in 2018 to 5500 by 2026 across 28 Mexican states [32] following an agroecological transition strategy that seeks to minimize agrochemical use and prioritize environmental friendliness through good production practices. This transition entails andragogical educational processes aimed at fostering change and innovation toward agroecology; these processes are carried out through support strategies and collaborative “learning-by-doing” activities involving Field School members, technical staff (or professional service providers), and researchers.

The field schools were integrated into the territory through promotion and their establishment based on a production chain. Once established, a needs assessment was conducted where producers analyzed and identified their requirements, thus integrating the agroecological transition plan. Throughout a production cycle, practices are implemented that, together, shape this transition toward more environmentally friendly and healthier production processes for consumers. Through interactive work between technicians and producers, the exchange of ideas and knowledge, and planned work for each stage of crop or livestock pro-

duction, producers have developed their capacities, embracing change without fear. Of the 195,000 producers—figures accumulated over six years of work—almost all have adopted at least two agroecological practices [32]. Among the most common practices are the use of biofertilizers and bio-inputs, which they produce themselves on their plots, biological pest control, and other practices and management of production chains based on agroecological principles. Similarly, in the livestock sector, such as beekeeping, the adoption of good production practices and the utilization of hive byproducts beyond honey, such as propolis, or the value-added processing of beeswax, are all important. This is accompanied by self-managed processes for marketing agroecological products.

One of the main barriers to applying andragogical methods within the Mexican context relates to the observation made by Everett Rogers (1963)—cited in [33]—that age posed an impediment to the adoption of and reaction to change. It was initially assumed that the technological packages developed by experimental stations were of sufficient quality to be adopted or adapted to the producers' circumstances; however, despite the diversity of producer types (large-scale, small-scale, landless, etc.), the reasons why these—ostensibly excellent—technologies were not being utilized remained unclear. Consequently, in 1987, The Consultative Group on International Agricultural Research (CGIAR)—specifically through the International Maize and Wheat Improvement Center (CIMMYT)—initiated a shift in perspective regarding how to deliver technologies (or their components) to various types of producers. Recognizing that age and varying levels of illiteracy were the primary barriers to knowledge acquisition, initial efforts focused on research conducted directly in producers' fields. Subsequently, attempts were made to introduce these technologies to older adults using non-formal methods, eventually leading to the adoption of Farmer Field Schools—originally developed in Indonesia and adapted to the Mexican context—which incorporated andragogy as a working method within non-formal settings [34]–[41].

5. Conclusion

The andragogical model applied in field schools in Mexico, Nicaragua, and Belize has enabled the development of a participatory training process with agricultural producers who, through strategies such as learning-by-doing, have innovated actions for an agroecological transition. In addition to technological advances, processes, and the exchange of experiences, the model has allowed both Professional Service Providers and staff from higher education and research institutions in Mexico to use this working model to improve knowledge exchange and contribute to the blending of empirical and technical knowledge that primarily benefits the rural population and impacts the society that consumes products from the primary sector.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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