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Ethnoagronomy and Knowledge: Supporting the Agricultural Development Model amid the Fourth Transformation in Mexico*

[English version]

Etnoagronomía y saberes: soporte al modelo de desarrollo agrícola ante la Cuarta Transformación en México

Etnoagronomia e conhecimento: apoio ao modelo de desenvolvimento agrícola em face da Quarta Transformação no México

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Abstract

Objective: To analyze ethnoagronomy as a discipline that re-values, rescues, and builds upon agroecological principles, knowledge, experiences, and productive practices of peasants and indigenous people, laying the foundations for rural development alternatives. **Methodology:** Hermeneutic in nature. Discussions on these topics with leading experts in the field aim to foster a discussion that enables a fresh perspective on the primary sector. **Results:** Discussions of the Green Revolution process promoted by the Mexican state introduced technological options distinct from the majority of productive strategies implemented by the producers. Alongside the neoliberal model, which has accentuated economic and social polarization over the years, agriculture has continued to experience a clear process of neglect and a departure from policies aimed at the primary sector. Worth noting, however, is the fact that a small group has been subsidized within this model. **Conclusions:** Given pressing national issues, including social and food crises, there is potential for generating dialogue and agreements, driven by both progressive governments and public educational institutions, to pave the way for a new productive scenario with social participation.

Keywords: Rural development; ethnoagronomy; knowledge; agriculture.

Resumen

Objetivo: analizar la etnoagronomía como una disciplina que revalora, rescata y construye en torno a los principios agroecológicos, saberes, experiencias y prácticas productivas de campesinos e indígenas; los cuales permiten sentar las bases para construir alternativas al desarrollo rural. **Metodología:** es de corte hermenéutico. Se reflexiona sobre los tópicos con los principales exponentes del tema, tratando de generar una discusión que permita una mirada renovada del sector primario. **Resultados:** se discute el proceso de la Revolución verde, que promovió el Estado en México, con opciones tecnológicas distintas a las lógicas productivas y reproductivas de la mayoría de los productores. Junto con el modelo neoliberal, que con el transcurso de los años ha acentuado una polarización económica y social, y mantiene la agricultura en un franco proceso de atraso y abandono de las políticas dirigidas al sector primario; aunque cabe destacar que se ha subsidiado a un pequeño grupo en el modelo referido. **Conclusiones:** ante los acuciantes problemas nacionales: crisis social y alimentaria, con visiones progresistas tanto de gobiernos como de instituciones públicas educativas,

es posible generar diálogos y acuerdos que permitan un nuevo escenario productivo, con participación social.

Palabras clave: Desarrollo rural; etnoagronomía; saberes; agricultura.

Resumo

Objetivo: analisar a etnoagronomia como uma disciplina que revaloriza, resgata e constrói os princípios agroecológicos, o conhecimento, as experiências e as práticas produtivas dos camponeses e dos povos indígenas, o que permite estabelecer as bases para a construção de alternativas para o desenvolvimento rural. **Metodologia:** é de natureza hermenêutica. Reflete-se sobre os temas com os principais expoentes do assunto, tentando gerar uma discussão que permita um olhar renovado sobre o setor primário. **Resultados:** discute-se o processo da Revolução Verde, promovido pelo Estado mexicano, com opções tecnológicas que diferem das lógicas produtivas e reprodutivas da maioria dos produtores. Juntamente com o modelo neoliberal, que ao longo dos anos acentuou a polarização econômica e social e manteve a agricultura em um processo de atraso e abandono das políticas voltadas para o setor primário, embora deva ser observado que um pequeno grupo foi subsidiado no modelo mencionado. **Conclusões:** diante de problemas nacionais urgentes: crise social e alimentar, com visões progressistas tanto dos governos quanto das instituições públicas de ensino, é possível gerar diálogos e acordos que permitam um novo cenário produtivo, com participação social.

Palavras-chave: Desenvolvimento rural; etnoagronomia; conhecimento; agricultura.

Introduction

The peasant farmers, who are the nucleus of the popular economy, are suffering a war of extermination promoted by transnational corporations and imperial governments. This is because once the small and medium-sized food-producing agriculture has been subdued, we will be at the mercy of capital. (Proyecto Alternativo de Nación, 2010, p. 183).

Mexico and the world are in a process of social, political, and economic transition. This occurs due to the interest of its people in wanting a change, which seeks to modify a hegemonic neoliberal model imposed more than 40 years ago. This model, as a center of power, seeks to systematize, legitimize, and rationalize the regulation of the world system in a particular phase. Thus, it aims to give preeminence to global financial power (Dávalos, 2008) that economically satisfies only a minority of people. It leaves the rest of the marginalized population abandoned due to their limited capacity to cover their basic needs, especially economic, food, and quality of life.

The neoliberal model, imposed in the early 1970s, constructed an economic policy that, through corporate support, encouraged the development of the capitalist market economy. It restructured the state and legitimized government actions, facilitating the transition from the welfare state to the neoliberal state through social reforms that favored the holders of capital (Huerta, 2005). This means, according to Gudynas (2014), that large national and transnational corporations, which the State expected to promote development in return for their consideration, were protected:

As a set of ideas centered around continued growth, driven by the economy, and expressed especially in the material field [...] It is considered that this economic growth is possible in perpetuity, denying the existence of real limits, whether social or environmental. The continued progress would be fueled by science and technology. (p. 65).

The market imposes forms of development and modernity, based on fashions, models, quality certifications, full freedom to operate, and socioeconomic lifestyles typical of industrialized cultures (Lemus, 2021). In addition, the market plans and determines the prices of commodities and superfluous products, pushing them further away from the less well-off. This is due to its system of production and use of labor, situated on a global scale, which posits that nature is placed outside

of society, devoid of organicity, and is reconverted into a set of goods or services to be exploited by humans (Gudynas, 2014).

The neoliberal development model has entered into crisis. Since 1990, numerous critiques have questioned the category of development and its manifestations, as rooted in certain components that are replicated repeatedly (Gudynas, 2017). This is due to its extractive form of production, centered on the export of raw materials, which ignores or disregards the social impacts of its activities, including the effects on people's health, rights, quality of life, their communities, and the environment. (Domínguez, 2021). These impacts have caused serious damage to the country and the planet, modifying the climate, reducing biodiversity, and degrading the quality of life for inhabitants. As a result, socioeconomic, health, and nutritional disorders, as well as diseases such as cancer, diabetes, stress, and others, emerge.

These results and their critical approach have been taken into consideration by the current government. They are presented in a document—for public discussion—called the “Program of the National Regeneration Movement” (MORENA). This document consists of ten points that take into account biological diversity and indigenous peoples, given the biogeographic and cultural position of the country. Both are factors considered to be of great wealth by those who confirm that:

Mexico is among the three most culturally and biologically diverse countries in the world. The core of this dual wealth, a millennia-old heritage, lies in the indigenous peoples and agrarian communities, in their relationship with nature and in community life. Cultural colonialism has denied diversity, imposing a singular and exclusive national vision, much like agro-industrial models eradicate the vast variety of natural resources and the peasant way of life. (Proyecto Alternativo de Nación, 2010, p. 5).

In another aspect, the document addresses the issue of rural areas and food sovereignty, contending that the primary crops cultivated in Mexico are facing loss, including many domesticated varieties, along with the traditional knowledge held by farmers. This is due to several factors, with one of the main contributors being the intrusion of colonial, Europeanizing, and U.S. agricultural knowledge through extensionism. This practice is often conducted by universities, private companies, and governmental entities related to the countryside. These organizations view this form of education, training, and support as the sole economic development option available to them. They have effectively pushed farmers to the precipice by promoting it, thereby making them dependent on seeds and

technological inputs. This was the outcome of an agricultural policy promoted in Mexico between 1950 and 1960, which did not thrive as expected, nor did it address the issues of hunger. On the contrary, it propelled the peasantry toward national and international migratory flows (rural-urban, rural-countryside), leading to the modification of labor markets (Carton de Grammont, 2021).

In Mexico, agricultural education in the 20th century was dominated by a Western scientific vision that promoted the agricultural model known as the Green Revolution. The Universidad Autónoma Chapingo (UACH), the foremost agricultural education institution in Latin America, promoted education, research, and extension based on Western scientific canons. This advanced the knowledge of addressing the problems of large producers through technical assistance and high crop yields—benefiting the minority— while leaving the majority of producers without those opportunities.

At UACH, the agricultural vision of the Green Revolution is promoted, emphasizing commercial production with the goal of obtaining merchandise and profits to achieve the agricultural development of the country. However, at the same time, agroecology is promoted, as it has scientific support. For producers, it represents an alternative form of sustainable, economic, and social production (Ferrer et al., 2022). In this regard, Gudynas (2014) notes, "development is desired and advocated by almost all partisan political actors, is generated and reproduced in academies and educational institutions, and is culturally disseminated to the great majorities" (p. 67). He further states that:

Post-development makes it possible to identify discussions that aim at transcending the development discourse, reveals hidden or subordinated knowledge and sensibilities, attends to previously dismissed critiques, particularly those coming from indigenous peoples, and encourages new hybridizations in the exploration of alternatives (p. 69).

This is closely related to agroecology, as it rescues the ancestral knowledge of producers who, through their practices, generate new forms of relationship between nature and humanity. This promotes food sovereignty and local economic development (Rivera, 2021).

Methodology

This work is of a qualitative nature. It is based on the results and reflections of a group of researchers from UACH who, for more than three decades, have conducted *in situ* research with peasants, indigenous peoples, and mestizos in the Mexican territory. The hermeneutic approach was privileged, starting from the idea that humans are in permanent dialogue with themselves and others. In that sense, “hermeneutics is conceived as a dialectical and dynamic method, linking text and reader in a flexible process of openness and recognition, construction, and deconstruction” (Rojas, 2014, pp. 42-43). In this way, the texts of the main exponents of the subject under discussion —ethnobotany— are interpreted, analyzed, and explained in a critical and proactive manner.

The primary documentary source supporting the recovery of traditional agricultural systems and their knowledge from an agroecological perspective is the work *Xolocotzia* by Master Efraín Hernández Xolocotzi. His experience in fieldwork with peasants in Mexico, Central, and South America is synthesized in what he called the *huarache research*. That is, to learn their knowledge, which is easily accessible but, due to acculturation issues, prevents them from recognizing it (Hernández, 2007).

Over time, this agronomic perspective has provided the foundation for a group of researchers to promote the ethnobotanical research line, which is included in some of the degrees and postgraduate programs offered by the UACH. The National Regeneration Movement 2018-2024 (MORENA) project is another important source of documentation for this study. It advocates for a change in the country where there is potential to improve the agricultural sector through scientific and technological innovations that take into account the social groups that have received the least protection from previous governments. The Strategic Restructuring Plan of the National Council for Science and Technology 2018 (CONACYT) states that there is an advocacy for science that is committed to society and the environment. Above all, there is an emphasis on supporting and strengthening the biocultural wealth and the dialogue of knowledge among vulnerable groups in the national territory. This situation calls for a fresh look at public policy and its connections to both public and private institutions of higher education, directing actions to preserve and restore the nation's social and economic fabric.

Alternatives to Development

The current development paradigm, which is thought to be in crisis, needs to be replaced with other pathways, according to questionings; endogenous models like the *Living Well* or "sumak kawsay" (Cuestas, 2019) provide a range of options for development. The significance of such models in indigenous communities is in posing alternatives to capitalism and Western-style development, and stems from the idea of achieving a post-developmental society. It feeds on indigenous knowledge and claims to be post-capitalist and post-socialist, oriented beyond modernity; therefore, it should be considered in constitutional debates, as this would recognize and value the contributions of indigenous and peasant knowledge (Gudynas, 2014).

The great majority of peasant production units in the country have little opportunity for access to land and funding. With these meager resources, they carry out an agriculture of self-sufficiency based on ancestral knowledge and an agricultural management style known as traditional agricultural technology (TAT), which refers to the agricultural implements, primarily manual ones, that indigenous and rural peoples possess, such as the pickaxe, hoe, shovel, axe, machete, hoe, and native seeds. Mechanized technology is weak or nonexistent. This is distributed throughout the country's center and south, where indigenous and poor farming groups predominate and account for around 80% of the nation's agricultural and forestry production units.

Agricultural Production Geared toward Commerce

During the last 50 years, through public policies, programs, and production-oriented projects, the State encouraged the establishment of commercial agriculture; in doing so, it sought to recover the invested capital. The producers that had the most level land, were in remote areas, and had the ability to buy industrial and biological inputs to boost their output and market share benefited from the policies that were put in place.

The term "small-scale landowner," which refers to those who use traditional technology, implies that those involved in agricultural activity are individual people, but in reality, these are family units (families of farmers with less than five acres) engaged in agricultural activity as well as other economic pursuits that are not necessarily agricultural. These units were forgotten from a production standpoint, and became objects—being a target of public policy—, not the same as being an object of social programming. The policies put into place only benefited a small number of farmers in the north and center of the country, where

the transportation, logistics, and service infrastructure needed for agricultural production were readily available. There is the marginalization of the small producers in the central and southern states of the country who typically have ties to community processes and call for institutional actions that support socially equitable development (Muñoz, 2021).

Given that it is difficult to produce on hostile soils with definite and time-bound deadlines, the role that agro-academic institutions have played in this context has been the development of human resources that can respond to these development policies and structures. Consequently, agricultural extension was designed based on a Western, modernist, and imposed framework.

The Green Revolutionary Model

Globally, the Green Revolution model is being seriously considered by social scientists because the unrestrained use of productive resources and highly polluting chemical intake has resulted in irreversible environmental and economic damage (Mirafuentes & Salazar, 2022). These are recognized as one of the primary contributing factors to the global warming associated with climatic change. However, politicians from highly industrialized nations often ignore the need to change the current contaminated farming practices and deny the negative effects on the planet.

The traditional agricultural producers who rely on ancestor-based knowledge and skills are represented throughout the country by 62 ethnolinguistic groups (Navarrete, 2008). Also included are mixed-race farmers, whose technological and productive characteristics include a number of traits linked to an agriculture that is more sensitive to environmental protection and is based on the rational use of natural resources and non-polluting low-impact technologies. In other words, environmentally conscious and capable of sustainability because they don't cause unbalances in the working environment.

It is undeniable and essential that President Andrés Manuel López Obrador's proposed policies and statements reflect a fresh perspective on the Mexican people and, above all, the rural sector. Ideas such as "the poor first," support for rural communities in terms of "autosufficiency" and "food sovereignty," guarantee prices, "word credit," a program to rehabilitate crops, one million acres of rural communities' agroforestral systems, temporary employment, and more illustrate future trends for the countryside and its inhabitants. In the creation and implementation of alternatives suited to the new agricultural, livestock, and forestry policies that are hoped to be implemented with a different perspective, the rescue and support of these small subsistence farmers' technology, production,

and vision represent an invaluable heritage. These small subsistence farmers were neglected by previous regimes.

Local Knowledge and Agriculture

As human processes and products, knowledge is embedded in the culture of the people. It is from this point that it is accepted and acknowledged that indigenous communities, small-scale farmers, and rural workers are the main carriers of this knowledge, having passed them down orally over many years and contributed to the variety of traditional production methods and local innovations that are still used in conventional agriculture.

Local knowledge is difficult to generalize since it implies the existence of an active player. It can be described as a specific strategy that enables achieving a high level of control and dominion over a highly varied local situation (Van der Ploeg, 2000). In response to this, Gómez (2006) examines the prevalence of a wealth of traditional agricultural knowledge in rural communities and regards it as practices, techniques, knowledge, and worldviews that address issues with agricultural production. Toledo (2005) classifies it as local knowledge and explains that it is a variety of empirically based understandings that are transmitted verbally and are a result of non-industrial forms of nature appropriation.

Understanding local knowledge necessitates both an analysis of practical relationships and the belief system of the culture or group to which the relationships belong. It is situated geographically because it depends on deeply ingrained cultures in the environments and is based on an emotional and direct relationship with nature (Toledo & Barrera-Bassols, 2008).

In this sense, one might think of "local knowledge" as a cultural heritage because it encompasses practices, representations, expressions, skills, instruments, artifacts, objects, and all kinds of working tools. Additionally, there are communal cultural spaces where the social groups and individuals that make up that cultural wealth can grow and maintain a close relationship with nature.

Knowledge related to agriculture involves a process of passing down productive usages and practices that have been perfected over time by farmers in rural and indigenous communities. This is a delay from the western perspective that is based on modern scientific rationality, especially since the dominant agricultural vision has promoted the use of agricultural technologies and inputs produced by western science, which are seen as the foundation for the growth of agriculture (Cruz et al., 2015).

Traditional agricultural technology and its associated knowledge continually evolve, benefiting both indigenous communities and mestizo farmers, as time has

demonstrated their efficiency in terms of cost, economics, and the utilization of natural resources. Although it is understood that not all agricultural practices are appropriate and social relationships between farmers are not always healthy (Bartra, 2003; 2010), Bartra asserts that indigenous and mixed-race farmers produce more than just corn, chili, and beans. They also produce a variety of agrobiologically diverse social and cultural landscapes, a variety of odors, tastes and textures, and clean air, among other things. The rural world is not only about the production of commodities but also about the conservation of nature and culture.

The previous section includes a millennial-scale productive activity called agriculture. Mexico is recognized as one of agriculture's seven origin countries (Vavilov, 1931). It is believed that this activity was discovered or invented there at least nine thousand years ago. The authors of this article understand agriculture as the "art of cultivating the land." It is both a science and an art, and both ideas imply the production of necessities for societies (Hernández cited by Mariaca, 1997). Knowledge primarily refers to the ability to perform tasks with skill and elegance. In the context of science, it involves the search for and definition of the laws governing the behavior of the phenomena involved in the production and survival of those who manage them. Traditional agriculture draws from traditional and fungicide knowledge. Their characteristics and peculiarities, according to Hernández (1985), imply:

Long-term empirical experience that has helped to shape the current production processes and management practices based on producers' intimate knowledge of the physical and biological nature of the environment. Non-formal education for the transmission of the necessary knowledge and skills.

A cultural awareness in the agricultural population's minds. As it happens with modern or commercial agriculture, the knowledge is based on Western sciences, in what is produced in laboratories and experimental fields of private institutions and universities dedicated to agricultural research; whose products are transferred in technological packages, making them dependent peasants and producers who have the need to use them. (p. 420).

It is considered that the generation of both types of knowledge, traditional and modern, can be functional in both cases despite the origin. The problem is the generation of technological dependence, economic controls, and inadequate public policies applied to the field by institutions or governments in turn.

It is important to establish connections with agricultural research institutions to engage in knowledge dialogues, and not to neglect contemporary

scientific and technological knowledge or traditional knowledge. This statement, of course, demands an integration compatible with social, physical and economic reproduction of traditional agricultural production systems. They are based on local practices of use and exploitation of resources and traditions and customs within communities. It also involves eradicating predatory impositions that affect the soil and the planet (Ochoa, 2022).

Within this social and institutional context, local knowledge-bearers interact with other subjects, social actors, public and private institutions. These can act as articulating axes of alternatives to rural development, that from Escobar's perspective (2012), arise from indigenous struggles that links with other movements: environmentalists, students, Afro-descendants, as well as women and young people.

“Living Well” presents itself as a new way of thinking and a lifestyle of individual, community, and social life, since it is in constant search for the balance among nature, what humans are and the place they inhabit (Rengifo et al., 2022). In short, it is a crossroads of knowledge that aims to improve living conditions from the local level without neglecting the global, and to address problems such as national and global food shortages. The latter is not the result of lack of production, but of neoliberal policies that have left food distribution in hands of free trade, and that are putting food self-sufficiency at risk.

It is important not to depend mainly on imports of basic cereals, meats, and other food products that can be produced—and very well—in Mexico. This would mean moving away from the global market for agro-food products from the Green Model (GM) seeds without enough information on the impact of consumption on human health, and consequently make them a serious problem for human health and biodiversity.

Ethnoagronomy as a Tool and Alternative for the Agricultural Development of Mexico

The research on ethnoagronomy originates at the Universidad Autónoma Chapingo, and it is getting importance from visions promoted by their social scientists who were trained from the academic perspective of Efraín Hernández Xolocotzi in the exploitation of natural resources and traditional agricultural technology.

Although the concept of “ethnoagronomy” is new, its foundations go back to the origins of agriculture. It brings a background of over thousands of years; however, as a result of the conquest of Mexico and other countries of the Americas, a capitalist system of production and control over national knowledge

was imposed. Therefore, it is sought to reconsider its possible generation and growth, and its techno-productive legacy; because in Mexico there is enough technology to develop its own type of agriculture, as well as universities able to train technical personnel to respond to this proposal, integrating and improving the knowledge owned by national farming.

If in Mexico more than a hundred food and utilitarian plants were domesticated, why not create the country's own technologies by recovering traditional knowledge? The producers of modern technology are classifying us with their products. The roots of these products belong to Mexico and were extracted from the country without consent. This is a situation that must be taken advantage of now that the Western capitalist development model, as well as the socialist model, have entered a crisis, and also now that these models' efficiency and social quality are being discussed.

To summarize, there is a global development crisis facing cultural, civilizational, ecological, and food production. The alleged modernization of the Mexican countryside has shown to be ineffective. In 1910, agriculture was in hands of farmers; with Lázaro Cárdenas (1936-1940), a larger part of the peasantry had access to land, which meant a boost in agricultural production.

Between 1960 and 1970, national agricultural censuses show that small-scale producers lacked modern technology, were self-sufficient, and had scarce subsidies for seed and fertilizer production, or for machinery, among other elements. Large producers dominated the consumption of those resources as if they were their right exclusively for several years. Since 1990 the Secretariat of Agriculture, Fisheries, and Natural Resources (SAGARPA) only funds this type of producers (Cervantes-Herrera et al., 2016).

Small producers have become aware and support the country's food security. They have shifted from being objects to becoming development subjects and forgers of their own destiny. This feature or general fact in the spaces occupied by small producers forces a redefinition of the concept of "development" and its various denominations (rural, sustainable, sustained, economic, and social, among others). It tends toward post-development. Concepts such as "*Buen Vivir*" (Good Living) are an intrinsic quality of every Mexican. This concept also implies the protection of culture, nature, and food sovereignty; but mainly, it encompasses the survival of the human race and the planet's animals and plants.

In this regard, and in the face of the decline in the quality of life in the countryside, international organizations such as the World Bank (2008) have pointed out the importance of traditional agriculture in the production of safe food and in creating income for the maintenance of peasant unity.

Results

In Mexico, industrial agricultural production is based on the use of technological innovations that are generally controlled by large agro-industrial corporations that leave small production units unprotected. Most of these small production units are managed by peasants and indigenous peoples who share worldviews and experiences of long history in their territories.

Out of 112.3 million people, the total population of the country, 15.7 million are officially indigenous (13.98%). Most of them reside in the states of Chiapas, Oaxaca, and Guerrero (INEGI, 2010), regions with cultural richness, biodiversity, knowledge, and technologies related to the management of natural and environmental resources: flora, fauna, medicinal plants, soil, water and domestication of plants in inhabited places (Cervantes-Herrera et al., 2015).

Within this scenario, the persistence and importance of peasantry and indigenous groups in Mexico is crucial in these times. A new economic vision of production is needed to rescue the Mexican countryside. Especially because the countryside is being abandoned because of the lack of guarantees for employment. This phenomenon is akin to the loss of a right and to the loss of labor sovereignty. The country is slowly being destroyed due to the inability of its politicians to provide dignified and well-paid activity to peasants of the countryside.

A solution to this problem will not be achieved by itself. It demands a genuine and complete agricultural reform that considers ecosystems, the disparity of regions, crops, food necessities, knowledge, and the population of communities. But mainly, the solution should propel a total revival of internal markets with domestic products, and thereby a revival of rural development that restarts peasant agriculture, food production, and also guarantee prices and promote crops that reduce the uncontrolled use of fertilizers. "Foundations should be established for equitable development in the countryside over the medium and long term through a comprehensive development and institutional coordination plan" (Vilaboa-Arroniz et al., 2022, p. 432).

An unmistakable fact is that the transformations that have taken place in agriculture, based on cutting-edge technologies, have their support in Western sciences. They obey productive practices completely different from the local production in the Mexican territory. For example, in the United States, with the promotion of the technological package of the Green Revolution (abundant soil and water, improved seeds, uncontrolled use of fertilizers and chemical inputs and machinery) there was an agricultural boom between 1950 and 1960.

However, the uncontrolled use of this type of agriculture has caused a serious deterioration of natural resources due to the technological inputs it

uses. This in addition to the cost that it implies for small producers who are left out of the use of these technologies. Cervantes-Herrera et al., (2016) state “The Mexican government has made increasing investments to modernize the Mexican countryside, however, from 1950 to 2007, a healthy number of peasant family farming units have not been incorporated into modern technology” (p. 137). These family farming units use traditional agricultural technology, that is understood as:

The knowledge necessary for the exploitation of natural resources used by the peasant population, many of them indigenous, belong to any of the more than 50 ethnic groups that survive in our country. This knowledge is an independent manifestation of the vision of Western science, and that results in a knowledge of its own. The existence of another way of generating knowledge is accepted, the existence of another science, based on the peasant vision that has enabled the survival and development of different civilizations in our country and elsewhere in the world: the ethno-science that, applied to agriculture, is called ethnoagronomy. (Cruz, 2008, p. 117).

In Sinaloa, Sonora, Jalisco, Guanajuato and other states, certain producers who own flat land, water, and economic resources use agricultural infrastructure with cutting-edge technologies:

In 2011, Sinaloa was the state of the country with the largest number of hectares with machined agriculture, the use of agrochemicals, GM seed, irrigation, phytosanitary techniques, and technical assistance. Of the 1,626,551 planting hectares, 99% was machined and 94% had agrochemicals used on them. (Chauvet & Lazos, 2014, p. 10).

In the state of Sinaloa, there is also another reality:

The watering hill slopes and plains, populated by indigenous Mayan and poor Mestizos, are still cultivated by native Mayans. In the study by the National Commission for Knowledge and Use of Biodiversity (CONABIO), nine races of native corn are reported: Tabloncillo, Tabloncillo Perla, Tuxpeño, Elotero, Blando de Sonoran, Onaveño, Vandeño, Reventador, and Jala. (Chauvet & Lazos 2014, p. 12).

From the study by Chauvet and Lazos (2014), it is important to highlight that the main problem detected with Sinaloa producers is the introduction of inappropriate technology—the study deals with the commercial planting of transgenic corn—due to the involved economic costs; above all, due to the social, environmental, and cultural repercussions that its implementation represents.

The biggest problem for large and medium producers is the marketing of grains. Worth highlighting is the fact that production by small producers for personal consumption contributes to the preservation of native corn, due to agricultural practices they use and the adaptation to the environmental conditions that they have developed. Implicit in this situation is the recognition of local knowledge, which is emphasized in this work.

In addition to this, production based on the use of scientific and technological innovations affects the food chain. Due to changes in the use of technologies and the division of labor, there is an increase in the flows of trade in goods, services, investments, and financial capital, as well as changes in consumer preferences, the emergence of new products, technological developments, and changes in the forms of relationships amongst countries (IICA, 2001).

Linked to this, new relationships are established between producers and consumers, as a result of the specifications in the demand for products. These products have to meet certain standards related to health, better taste or dietary quality, including productive systems with certain ethical values, which imply specific production negotiations (Lamine, 2005). The new scenarios for agricultural producers require different assessments from the existing ones about the role that production and technology should play in the construction of development alternatives. This context demands a new productive behavior related to quality and market demand, increasingly more careful of diet and the consumed products. Barkin (2001) states that:

For them to be efficient productive systems, they have to be complemented with other activities that add value, and at the same time prevent exploitation from becoming another mechanism of destruction of nature, the sources of wealth and environmental and life quality, that is: healthy, sustainable, and accessible to all. (p. 13).

In this perspective, ecosystems and natural regions, as shared social spaces, play a fundamental role in rural studies. Especially when betting on alternative development in which local actors are the protagonists of the definition, execution, and control of development strategies. In it, the sense of belonging and cultural identity gain strength as factors of social, economic, and institutional transformation in the mid and long term (Vázquez, 2005).

It must be kept in mind that peasants, whether small farmers or associations, are the core of the popular economy and suffer a war of extermination driven by transnational corporations and imperial governments. Once medium and small agriculture (which produces food) collapses, human beings will be at the mercy of capital. From that point, the interest in recovering traditional knowledge—Mexican technological knowledge—made by Mexicans for anyone to whom it may be useful arises. This knowledge must continue to be developed, promoted and placed at the same level as Western knowhow, to demonstrate that we are capable of conducting science using Mexican resources and philosophical concepts. This knowledge, when interspersed in a dialogue of general knowledge, is enhanced through the methodological contribution offered by other of knowledge areas.

Ethnoagronomy, as a synthesis of knowledge, gains relevance and validity because it offers a new look at the pressing problems of the primary sector in Mexico. Since, from the existing commercialized and utilitarian education, it is difficult to find guidelines for its redirection. However, given the change of government, the public policy of the National Council of Science and Technology (CONACyT) recognizes the creation of a new national project, where the development of an endogenous national science with social and community awareness is proposed, as highlighted in the third guiding principle, which says:

Planning for long-term national scientific development, guiding national science: (i) to combat social lags, (ii) to eliminate the gender gap, (iii) for environmental restoration, (iv) to create a true dialogue of knowledge and foster the protection of community territories and their biocultural wealth, (v) the prevention of natural disasters and a response to them,

(vi) to the promotion of systemic and preventive health approaches, (vii) to create frontier biomedical research to mitigate the impacts of the diseases that most afflict our population, (viii) to promote the agroecological production of healthy, diverse foods, sufficient, and culturally appropriate, (ix) to care for water, (x) to evaluate the impacts of extractivism and various industries, (xi) to promote the creation of clean national industries and environmentally friendly energies, (xii) and to promote social research to prevent violence, among others. (Álvarez-Buylla, 2018, pp. 2-3).

In what is proposed, the task of ethnoagronomy is established, in the sense of promoting traditional social research combined with modern research, which has been subjugated by the supremacy of biased, commercialized, and utilitarian knowledge. So, the horizontality and verticality of the sciences are necessary in order for them to meet and establish a dialogue. A recognition process is necessary

through an interdisciplinary, transdisciplinary, and intercultural scientific combination and complementation. The challenges that this new vision implies must be supported by processes of social participation actions.

Educational institutions play a determining role. Therefore, some principles of attitude, behavior, and commitment, both of technicians and facilitators (social scientists), are taken from the AGRUCO Program, of the Universidad Mayor de San Simón in Cochabamba, Bolivia. This, due to the relevance that in this collegiate body of researchers, studies on the dialogue of knowledge, revaluation of indigenous peasant wisdom, agroecology as an alternative for development and the revaluation of local technological innovations have, which are closely related to ethnoagronomy. These principles (Villarroel & Mariscal, 2010, p. 11) are a starting point for achieving alternative development projects in different modalities, and consist of:

- Respecting and valuing local wisdom and the knowledge of men and women.
- Promoting complementarity between local wisdom and scientific knowledge.
- Not imposing rules, but rather promoting agreement, dialogue and mutual respect.
- Focusing attention on people and nature; not just on economic development.
- Building before displacing and/or replacing.
- Facilitating, not managing, local self-managed processes.
- Contributing to the change processes; not taking responsibility for the changes.
- Participating in the processes of local development and sustainable endogenous development.
- Promoting social learning and the reflection-action (learning by doing).

The top-down view is largely in the past. Currently, the role of agriculture and food production is strategic in the face of eventual climate change. Peasants and indigenous people require productive strategies based on their conditions of social reproduction, assumed and shared by the residents. Knowledge (folk knowledge) arising from their own experiences, accompanied by local and scientific knowledge, is essential. Therein lies the importance of ethnoagronomy, which systematizes the knowledge used by mestizo and indigenous peasants. Cruz (2008) states that: “with this, we would be on the path proposed by the search and systematization of the knowledge of peasant communities for its registration, assessment and possible use in sustainable development proposals” (p.125). In a recent publication, titled “Ethnoagronomy: Utopia and Alternatives

to Development,” Cruz and Franco (2021) compile 16 works that deepen the theoretical vision, community work, and the construction of alternatives to develop from this perspective.

Conclusions

Ethnoagronomy is a great challenge for Mexico. Especially when, in the last four decades, agricultural public policy has been directed at the global market. For its part, agronomic education must be directed to the change processes in Mexico. Therefore, it is necessary to promote primarily agricultural education that breaks with traditional teaching-learning schemes and integrates situated knowledge; this is starting point in new teaching practices. The decolonization of the Mexican educational system is required, which implies “an educational revolution that [must be supported] by a double investment: a new orientation of research work and a new understanding of the educational style of an emerging counterculture” (Illich, 1985, p. 55).

For the Universidad Autónoma Chapingo, reorienting its teaching-learning processes with attachment to ethnosciences is a challenge and a great opportunity, understanding these processes as the set of disciplines that account for indigenous, peasant, and popular wisdom, and that have contributed to an assessment in the field of scientific knowledge (Argueta, 1997; Pérez & Argueta, 2022). According to the Law that creates it, it mainly receives young people from rural Mexico. Therefore, putting the teaching-learning of ethnoagronomy into practice brings them closer to its reality.

This presents institutional difficulties, which involve reforming study plans and programs, and adjusting them to a perspective that prioritizes local knowledge, innovations, and technologies. The starting point could be the reformulation of a liberating and creative pedagogy of a new style of development, compatible with the government program that is currently promoted, in which the foundations are being created for the achievement of food self-sufficiency and education with quality and coverage, at the middle school and high school level in Mexico, in which prevails:

An educational practice in accordance with the country's transformation program, with the necessary flexibility to be enriched and modified to incorporate a sustainable perspective, based on plural, diverse, inclusive coexistence, with a clear identity, with historical memory and founded on the incorporation of knowledge and supportive relationships with other peoples, in a true practice of

interculturality [...] an educational transformation that involves authorities but also teachers, directors, students, parents, and communities to achieve quality education with humanistic and supportive values. (PAN, 2018, p. 23).

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