

The study of agricultural knowledge as an alternative for the development of coffee communities

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Abstract

Agricultural knowledge is a background of ancestral knowledge generated by peasants; through time for the optimal use of its natural resources. Nowadays, in many regions of our country, where traditional agriculture is still practiced, the use of this knowledge can be observed. Given the public policy imposed by the modernization of agriculture, through technical assistance programs, promotion of technological packages and incentives to producers, the results show that the expected development has not been achieved and the farmers are getting poorer every day. The coffee sector is in this situation, despite producing a commercial crop. The driven strategies have focused on increasing yields, for economic improvement purposes; however, for small traditional producers, it has other meanings. With the intention of explaining this situation, this document aims to analyze documentation relevant to the search for alternatives to achieve agricultural development taking into account the specific needs, resources and vision of the producers. In contrast to the hegemonic thinking of Western science, a theoretical framework was built that founded the construction of proposals taking into account the epistemologies of the south. It is based on the premise that it is possible to develop successful alternatives for the field; through a dialogue of knowledge between the holders of local knowledge and scholars of modern science, to achieve agricultural development, community or ethnodevelopment.

Keywords: ancestral knowledge, dialogue of knowledge, ethnoagronomy, ethnoscience, ethnodevelopment.

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Background

Coffee rust disease (*Hemileia vastatrix* Berk & Br.) is a problem studied since its appearance in Mexico, attempts have been made to focus on the inhibition of the fungus as the main objective; through agronomic sciences, which focus their control on the replacement of current varieties with new ones that show resistance and control by chemical method, so production costs are increased, which is why it is not a solution for all coffee growers in the country, since coffee production is distinguished by being present in decapitalized units and with small surfaces.

It is known that a first attack by rust was recorded in Mexico in 1981 (Escamilla, 2016), however, in the first years the damages were imperceptible in production. Nowadays, *Hemileia vastatrix* is present in all the coffee states of the country with severe affectation in the four main producing entities of Mexico.

The damage caused by rust, together with the economic crisis prevailing in the sector, has led to the lowest harvests in the last fifty years; in the 2012-2013 cycle, 5.1 million bags (MS) were obtained, in 2013-2014 the production was 3.1 MS, for 2014-15 of 3.6 MS and, in the 2015-2016 cycle, only 2.3 MS (Escamilla, 2016).

Another indicator of the serious damage caused by this coffee disease is observed at the level of productivity per hectare, in 1976 the highest average was recorded in the history of Mexican coffee, with 16 quintals per ha. Subsequently, a sustained fall in the last two decades followed, with levels between 7 to 8 quintals per ha, in the 2014-2015 cycle the average was 7.5 and falls to 4 quintals per ha in the 2015-2016 harvest (Escamilla, 2016).

Since the coffee bean was subject to the free market, producers face an uncontrollable fluctuation of aromatic prices, from which they derive inaccessibility to markets, low technological index, poor technical advice, low labor, low yields due to the attack of pests and diseases and therefore, low income (Cardeña, 2017).

Knowledge and traditional agriculture play an important role in the construction of new development proposals. Farmers as coffee producers develop knowledge over time to adapt to changes, both environmental, economic and social (Beristain, 2001).

From the cultural point of view, the fact that around this crop there is a great wealth and diversity of values, beliefs and knowledge that needs to be recognized and studied (Moguel and Toledo, 1996), because such knowledge is the that have allowed to solve the problems that occur in production.

Ethnoagronomy is an ethnoscience that is responsible for the study of this knowledge that indigenous and mestizo farmers put into practice during the processes of natural resource use (Cruz *et al.*, 2015b) and the continuity in the construction of this discipline is focused to agricultural development.

In Mexico, coffee is mainly produced by small producers, usually from indigenous or traditional mestizo communities, the above is a result of the country's agricultural and cultural history, where indigenous wisdom literally appropriated an exotic crop, to adopt and adapt it to native agroforestry systems (Moguel and Toledo, 1996).

Therefore, coffee production and the indigenous population are closely linked, in the statistics indigenous people as coffee producers have a greater presence at the national level, hence the attention to coffee growers cannot be only from development policies rural, it should be considered that any policy aimed at the productive promotion of coffee must be associated with an indigenous policy (Robles, 2011).

Farmers over time, have experimented with traditional empirical knowledge, obtained from their worldview and the observation of the components of their environment, to achieve a balance between the production and conservation of natural resources. In their traditional agricultural systems, particularly the coffee agroecosystem, it is characterized by having a knowledge application that has been transmitted from generation to generation, coffee farmers have created enough knowledge to deal with the problems that develop within their coffee plantations (Cruz and Torres, 2015).

Therefore, it is important to ask ourselves: what are the environmental and management factors of the plantations that are favoring the impact of coffee rust in the region of Huatusco, Veracruz, and which ones attenuate it? And what innovations can be applied through a participatory strategy, combining traditional technologies and scientific advances, to diminish the effects of this disease?

To answer these questions it is important to lay the foundations for a better understanding of the problem, therefore, this essay has the objective of constructing a theoretical framework that allows the foundation of the knowledge of farmers, as endogenous science, relevant to the management of coffee rust.

The context information of public policies related to coffee in Mexico, rust disease in the country and the results of research conducted by experts on the subject of local knowledge, also called endogenous science, its application and how they have been analyzed result in ethnodevelopment or agricultural development projects in the rural context, focused on coffee regions.

The decolonization and epistemology of the south

By the middle of the twentieth century some scholars of human sciences Levi-Strauss (1972) put on the table of debate of Western scientists, the existence of indigenous knowledge about nature and their societies. Given this evidence, some authors after Levi-Strauss have pointed out the need to legitimize, systematize, write, formalize, or validate traditional knowledge, assuming that Western science instruments are required for this (Pérez and Argueta, 2011).

Over the years this concept has evolved, in Mexico it has been called as popular wisdom, local knowledge, folklore, indigenous science, peasant knowledge (Pérez and Argueta, 2011) and with it, the struggle to achieve its recovery value of natural resources, which the current society with its

dominant western lifestyle will soon bring into ecological and civilizational collapse, which will have consequences for the environment and for the poorest and most vulnerable world citizens (Collado, 2016).

Since each form of knowledge simultaneously has a local, regional and global dimension, Delgado and Rist (2016) point out that the concept of local knowledge has no meaning or epistemological foundation, in addition to having an exclusive and discriminatory burden. Therefore, hereafter referred to the concept with its other denominations.

De Sousa (2011) addresses this idea from the epistemology of the South, states that this current is the demand for new production processes, for the valuation of valid, scientific and non-scientific knowledge and for new relationships between different types of knowledge, based on the practices of the classes and social groups that have suffered, in a systematic way, destruction, oppression and discrimination caused by capitalism, colonialism and all the naturalizations of inequality in which they have been unfolded.

The south is used here, as a metaphor for human suffering caused by colonialism and capitalism. It is a south that also exists in the global geographic north, the so-called third inner world of hegemonic countries. At the same time, the global geographic south contains in itself the local practices of complicity with those. Such practices constitute the imperial south. The southern epistemology south is the anti-imperial south (De Sousa, 2009).

This epistemological vision known as epistemology of the south is characterized by hosting a horizontal dialogue with the knowledge of colonized subordinates in an ecology of knowledge. Understand by ecology of knowledge an epistemological approach that encompasses the underlying non-scientific knowledge in ancestral cultures, indigenous wisdom, arts and other forms of knowledge organization that include the inter-retro-actions of the human race with itself, with the other, with nature and with the cosmic totality that sustains the sacred (Collado, 2016).

From this theoretical basis it is important to potentiate ancestral knowledge combined with scientific reason in the perspective of the development of rural communities where these spiritual, religious, emotional, rhetorical and artistic aspects are mostly present. Taking into account that the concept of development cannot be assimilated to the Western idea of continuous progress towards well-being, but rather to a way of living the present in harmony with nature, as the notion of Good Living puts it (Vanhulst and Beling, 2013).

Authors like Collado (2016), refer to the fact that dialogue with indigenous and aboriginal wisdom will allow us to develop new, more resilient epistemological horizons. In this regard, De Sousa (2011) says that, for the epistemologies of the south, the autonomous individual is a product of autonomous communities, and the autonomous communities do not affirm their autonomy by denying nature, but quite the opposite, assuming to be part of it, of that mother earth and in harmony with her, as a way of sustainability of life. On the other hand, the forced suppression of indigenous and ancestral knowledge carried out by European colonization, which still continues today with new neoliberal forms, is a form of 'epistemicide' that impoverishes the human being as a whole (Collado, 2016).

Traditional knowledge, understood as the knowledge that has been generated, preserved, applied and used by traditional communities and peoples, such as the indigenous groups of Latin America, constitutes a core part of the cultures of these peoples and has enormous potential for understanding and solving different social and environmental problems.

This is not characteristic only of our continent, in Africa, Asia and in Europe itself, there is a huge reservoir of traditional knowledge, so all countries, even the most advanced as Europeans would do well to review their policies with respect to traditional knowledge, to boost its preservation and social use, for example, those related to agriculture (Olive, 2009).

The existence of knowledge and knowledge of indigenous people and farmers

In Mexico, coffee areas coincide with the territories of several indigenous groups and where small-scale peasant agriculture is practiced, González (2006) described an exemplary case of small-scale coffee production in the highlands of Chiapas, which, began in the 1960s as a result of the abandonment of sugarcane cultivation.

These indigenous farmers cultivate coffee while preserving natural vegetation, that is, in interaction with the deciduous forest, consisting of pines, oaks (*Quercus Skinnerii*, *Q. acatenangensis*, *Q. candicans*, *Q. oocarpa*, *Q. corrugata*) and sweet gum (*Liquidambar*). As part of their ancestral knowledge, they simultaneously conserved corn as a polyculture, where they obtained beans, squash, chili and beans, as well as other edible and medicinal plants (González, 2006).

In Mexico, more than 98% of the area occupied by coffee is grown under shade trees: specialized system, traditional and commercial polyculture and mountain system (Escamilla and Díaz, 2016). Which means that the culture of crop diversification also prevails in order to obtain different products from the plots, in addition to the main crop, and that it has been a survival strategy for families to stock up on food throughout the year.

However, the element that supports the marked difference in cultivation systems is the polarization in the size of the farms per coffee grower. Thus, 92% of the producers have up to 5 ha in production; while at the other extreme, 0.1% of more than 50 ha, constitute the small group of large farmers. It should be clarified that the relationship is not directly proportional, in the sense that, the larger the size of the land, the more intensified agricultural practices in all cases. There are small plantations, intensive in the use of labor, with interesting results, the production of organic coffee in Mexico, for example (Escamilla and Díaz, 2016).

This demonstrates that, even in these days, in the coffee sector, small-scale aromatic cultivation predominates, and the production units use mostly family labor, using technologies that have been part of the daily life of these coffee families, practiced since the introduction of the crop in Mexico.

According to the Agricultural, Livestock and Forestry Census (CAGF, 2007), in the coffee states of Chiapas and Veracruz, a total of 780 979 coffee production units, 15% of them were located as mechanized, while 67% of them only use hand tools (INEGI, 2009). There is a crop based on labor,

because the mechanical traction in the production units, explainable in terms of the crop management requirements, the abrupt conditions in which it is carried out and that the production units are small that they are in conditions of poverty.

Derived from the problems caused by the coffee rust disease, the measures implemented by the Mexican government point to the renewal of coffee plantations with rust-resistant varieties, in addition to the excessive use of agrochemicals, mainly fungicides.

The response of the producers has been positive, as they are promoted as varieties, resistant to disease, high yields and low shade requirements; situation that has not valued traditional coffee plantations as biological corridors and biosphere reserves and given the change of varieties would cause the disappearance of species of flora and fauna that interact naturally within shaded coffee plantations (Escamilla, 2016).

The varieties resistant to rust that are cultivated in most of the producing countries, start from the Timor hybrid as a genetic material, which is a natural hybridization between *Coffea arabica* and *Coffea canephora*. According to Arrieta (2015), this hybrid has been used in the main genetic improvement programs of coffee worldwide.

Currently, these new varieties are losing resistance against rust, in addition to generating lower quality grains in the beverage compared to traditional varieties (Typica, Bourbon, Caturra) and are responsible for the spread of new diseases in coffee plantations than before they didn't have each other.

In this regard Pérez and Ruiz (2017) believe that, by betting on the change of variety, that is, the planting of Catimores and species from Costa Rica and Colombia, social problems are also generated such as: hoarding the best lands by transnational companies when producers no longer have income for their survival, migration, family disintegration, increased insecurity, and crime rates and production of illicit crops.

This is the reason to achieve new rural development projects with the participation of the peasant communities, attending to the specific needs of the producers by coffee regions, resulting in an improvement of living conditions, therefore, in the well-being of coffee-growing families.

Since the farmers appropriated coffee cultivation more than two hundred years ago, this productive activity, which includes the cultivation and organization of work, implies a cultural dimension. Ejea (2009) says that even when all coffee producers share the same general processes; that is, technical conditions of coffee production, subject to a fragmented productive chain and fluctuations of the world market, there are differences in particular contexts and ways of appropriating it and incorporating it into the social and economic dynamics of the immediate environment.

Above all, it varies from region to region and even from community to community, so that projects aimed at small coffee producers would have better effectiveness if they take into account these differences, mainly from traditional management and worldviews regarding the link between cultivation with producers and their interests.

From ethnicities to endogenous sciences

Traditional knowledge, also called popular wisdom or peasant knowledge (Argueta, 1997), are all those knowledge acquired empirically; through thousands of years by the ancient peoples for the optimal use of the resources available in their environment, from the domestication of plants and animals, invention of work tools, to the selection of varieties, which was achieved with the observation and experimentation based on its nutritional, medicinal or clothing usefulness.

The study of traditional knowledge is in charge of the discipline named ethnocience, which has the objective of studying ideas, processes and forms of relationship, under the dimensions of time and space between human peoples or populations and species and ecosystems (Pérez and Argueta, 2011). Science for centuries ignored the existence, characteristics and potential of the wisdom of indigenous peoples in America.

Latin and the Caribbean and ethno-sciences have formulated a theoretical-methodological proposal to study and analyze knowledge. Therefore, it is based on the fact that there is a deep knowledge about the productive processes, which shows itself, the peasant wisdom. In the case of coffee producers, it is expressed in the recognition of the peculiarities of the climate and its effects on plantations in their different stages.

The techniques developed in years by the indigenous peasants, are part of what Hernández X. named as traditional agricultural technology and defined as those cultural elements emanating from the empirical knowledge accumulated by the rural ethnic groups for thousands of years, in their attempts to use the renewable natural resources through agricultural, livestock, forestry and wildlife farms to obtain anthropocentric satisfactory for their subsistence and social and economic development (Hernández *et al.*, 1976).

There is evidence about the implementation of these technologies in rural areas; in the case of coffee cultivation, in a study carried out in the Sierra de Zongolica, Veracruz, it was found that in the coffee plantations the instruments used are simple and manual, some are adaptations of those introduced by the Spaniards and others are modified Mesoamericans, such as the digger. The soils for coffee plantations are prepared by roza-tumba-quema or its variations, that is, plots were found in which it was only rozo-tumbo, corn was sown and between the rows of this cereal coffee seedlings were transplanted (Dzib, 1994).

In many coffee regions of the country these practices are still in force, also the use of hand tools as mentioned by the authors, such as the machete or 'moruna', hoe, shovel, choking and other instruments adapted and modified by the producers for their usefulness, also named locally. These technologies form the field of study of ethnoagronomy, understood as ethnocience that bases its studies on the visions and aspirations of producers with persistence in traditional knowledge related to knowledge of natural resources, the diversity of crops, exploited wild species, management technologies, traditional tools, rituals, agricultural calendars and forms of knowledge transmission (Cruz *et al.*, 2015a).

It is necessary to think about a development based on the peoples and the people that integrate them, different from the western development, where the indigenous peoples design, from their concrete reality, available resources and aspirations, processes of improvement of their living conditions. The foregoing is closely related to the proposals of 'good living', prepared based on the practices of the Andean region of Latin America (López, 2013).

The possibility of exchanging this knowledge with the students of modern science occurs through the dialogue of knowledge and the construction of the dialogue of knowledge, implies a diversity of beliefs and values among the peasants and is expressed as respect, recognition of their experiences of life and mutual interest in understanding their reasons (Argueta, 2016).

The effort to create bridges of dialogue between different knowledge systems, where modern western knowledge is one more and the ancestral knowledge of peoples and nations that have not been part of the development of modern western science are fundamental, today they are recognized for their contributions to food sustainability and for being a source for the emergence of new development paradigms. In this perspective, 'live well' (in Bolivia) or 'good live' (in Ecuador) are considered as alternative paradigms to the capitalist development prevailing in the world (Delgado and Rist, 2016).

Gudynas and Acosta (2011) propose good living as an opportunity to build another society based on the coexistence of human beings in diversity and harmony with nature, based on the recognition of the diverse cultural values existing in each country and in the world. The range of imaginary behind the elusive 'live well' is quite broad and in general is not debated. The basic problem of 'living well' is that its broadcasters have failed to link a program that supposedly arises from indigenous worldviews with the vital experiences of indigenous people and really existing communities (Stefanoni, 2012).

From this perspective, it is necessary to redouble efforts to make possible the construction of alternatives to agricultural development, sustainable development, community development or also called ethnodevelopment (Cruz *et al.*, 2015). The continuity of the implementation of agricultural knowledge in production systems can be a sustainable alternative for farmers.

Endogenous knowledge and development

The small producer, named for the extension of their plots (2 ha on average nationwide) has the knowledge and ability for agricultural production (INIFAP, 2013). For this reason, it only takes the momentum to build along with it, an agricultural development in the coffee sector based on the knowledge, resources and perspectives of coffee growers.

Above all, because due to their conditions, they form a very vulnerable and disadvantaged sector. In a study carried out by Cardeña (2017) in a poblana region, it was found that coffee producers are mostly aged between 41 and 60 years, which limits them to join other labor activities, also negatively influences the obtaining support, either for production or financing. Farmers incorporate coffee into their social and productive life in various ways, not just one, even when they are small producers who share similar production conditions. And their responses to events are also diverse.

No reference can be made to a homogeneous culture. It is important to locate ourselves in the local dynamics, those of each town, within the region and in the relationship that the producers and their families establish with the product, with other crops and economic activities, with the groups involved in the coffee activity, other farmers, buyers, industrializers and government officials (Ejea, 2009).

The participation of rural communities and the use of knowledge recognition have resulted in successful ethnodevelopment projects. According to Bonfil (1995) any ethnodevelopment project consists of an extension and consolidation of the fields of one's own culture; that is to say, in the increase of the capacity of decision of the own social group, as much on its resources as on foreign resources of which it can be appropriated.

This reservoir of traditional knowledge, which includes agricultural technologies, forms a production system called traditional agriculture, which has its beginnings with the domestication of the first plants grown in Mexico, approximately nine thousand years ago and which was disturbed with the Spanish conquest in the 16th century. Despite this interference, traditional agriculture is still maintained as a dominant form of production (Cruz *et al.*, 2016).

In the case of coffee, as it is a commercial crop, the traditional agricultural system has been displaced by the actions of the new neo-liberal policies, so there is a lag in the development of the production units, because these actions, not they are adapted to the local conditions of production, nor to the needs of the producers.

Given this situation, it is important to develop a proposal for crop management, combining agricultural knowledge or knowledge, also called endogenous science, which responds to the interests, knowledge and technologies of producers, with Western science, of knowledge dialogue and trans discipline.

Conclusions

The study of the traditional knowledge that initiated the ethno-sciences, now through the endogenous sciences is in line with the dominant national agriculture in the country, allows to know the needs and aspirations of the producers and based on it, propose viable solution alternatives for solve the problems of the field.

In the case of small coffee producers, there is a baggage of traditional ancestral knowledge that is relevant to retake and combine to achieve sustainable agriculture in the medium or long term with greater benefits at the level of production and quality of life of producers and their families, which translates into well-being and development at the level of coffee regions in Mexico.

This implies the use of knowledge dialogue between modern science and agricultural knowledge, to develop alternative proposals, improve production systems, achieve the welfare of small producers and environmental conservation.

Under the perspective of good living, contributed by the native peoples of South America, the recovery of indigenous knowledge is involved and the vision of development is separated from the conventional western ideas of progress and points towards the construction of an idea of development, based on ancestral knowledge, based on knowledge of agricultural practices carried out in production plots where they have obtained livelihoods for thousands of years.

With the analysis of the aforementioned research, it is possible to know and understand that there is an ancestral knowledge about the traditional agricultural practices that have maintained the production plots for years and that have supplied food to the indigenous communities. Perpetuate this knowledge and put it into practice with an alternative methodology that includes scientific knowledge and advances in search of a sustainable solution.

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