Report on the biocultural relevance of Mexico's legislation and public policy on agriculture

The case of the "Sustainable Modernization of Traditional Agriculture" (MasAgro) program

CEMDA. 2016. **Report on the biocultural relevance of Mexico's legislation and public policy on agriculture:** The case of the "Sustainable Modernization of Traditional Agriculture" (MasAgro) program. Centro Mexicano de Derecho Ambiental, A.C., Mexico.

Document prepared with assistance from the Swift Foundation.

Originally published in spanish as *Informe sobre la pertinencia biocultural de la legislación mexicana y su política pública para el campo. El caso del programa de "Modernización Sustentable de la Agricultura Tradicional"* (MasAgro) by Centro Mexicano de Derecho Ambiental, A.C., México, 2016.

Authors: Francisco Xavier Martínez Esponda, Mariana Benítez Keinrad, Ximena Ramos Pedrueza Ceballos, Gisselle García Maning, Luis Bracamontes Nájera y Benito Vázquez Quesada

Translation: Tlatolli Ollin S.C., Jana Schroeder

Photographs: Luis Bracamontes Nájera

Centro Mexicano de Derecho Ambiental
CEMDA

www.cemda.org.mx

Design editor: Paulina Suárez Ruiz
Editor: Amapola Studio

First english edition, 2017

Printed in Mexico

CENTRO MEXICANO DE DERECHO AMBIENTAL
CEMDA

Report on the biocultural relevance of Mexico's legislation and public policy on agriculture

The case of the "Sustainable Modernization of Traditional Agriculture" (MasAgro) program

SwiftFoundation

With support from the Swift Foundation

Acknowledgements

This report is the result of the collaborative work of a diverse group of actors who reveal the country's biocultural wealth and who show us the path our steps should follow. We would like to express our appreciation to them for their invaluable, sincere participation as they offered guidance, asked questions and provided information that was indispensable in triggering our questioning process and lines of research. In particular we would like to thank the members of the Tosepan Titataniske Cooperative, the members of the Vicente Guerrero Group, ANEC, Eckart Boege, Miguel Ángel Escalona, Antonio Turrent, Alejandro Espinosa, María Isabel Noriega Armella, Manuel Llano and unnamed reviewers.

We would also like to express our appreciation to the Swift Foundation for its assistance. This collaboration is part of the process that Mexico's indigenous peoples and peasants have initiated to build a pluricultural State that guarantees the necessary conditions for peoples and communities to maintain cultural control over their territories and natural resources, thus enabling them to thrive.

Contents


LA

Acronyms

AMSAC	Mexican Seeds Association *(Asociación Mexicana de Semilleros)*
ASERCA	Agricultural Market Development and Commercialization Services Agency *(Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios)*
ASF	Superior Auditing Office of the Federation *(Auditoría Superior de la Federación)*
CA	Conservation Agriculture
CDI	National Commission for the Development of Indigenous Peoples *(Comisión Nacional para el Desarrollo de los Pueblos Indígenas*)
CIMMYT	International Center for Improvement of Maize and Wheat *(Centro Internacional de Mejoramiento de Maíz y Trigo)*
CONABIO	National Commission for the Knowledge and Use of Biodiversity (*Comisión Nacional para el Conocimiento y Uso de la Biodiversidad*)
CONEVAL	National Council for Evaluation of Social Development Policy *(Consejo Nacional de Evaluación de la Política de Desarrollo Social)*

CSO	Civil Society Organization
DGPDT	Department of Productivity and Technological Development *(Dirección General de Productividad y Desarrollo Tecnológico)*
DOF	Official Gazette of the Federation *(Diario Oficial de la Federación)*
FAO	UN Food and Agriculture Organization
IACHR	Inter-American Commission on Human Rights
INALI	National Institute of Indigenous Languages *(Instituto Nacional de Lenguas Indígenas)*
INEGI	National Institute of Statistics and Geographic *(Instituto Nacional de Estadística y Geografía)*
INIFAP	National Institute of Forestry, Agricultural and Fisheries Research *(Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias)*
LFVV	Federal Law on Plant Varieties (*Ley Federal de Variedades Vegetales*)
MasAgro	Sustainable Modernization of Traditional Agriculture (*Modernización Sustentable de la Agricultura Tradicional*)

NAFTA	North American Free Trade Agreement
NDVI	Normalized Difference Vegetation Index
PIDER	Integral Rural Development Program *(Programa Integral de Desarrollo Rural)*
PRONASE	National Seed Producer *(Productora Nacional de Semillas)*
PRONASOL	National Solidarity Program *(Programa Nacional de Solidaridad)*
SAGA	Genetic Analysis Service for Agriculture *(Servicio de Análisis Genético para la Agricultura)*
SAGARPA	Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food *(Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación)*
SEDESOL	Secretariat of Social Development *(Secretaría de Desarrollo Social)*
SEMARNAT	Secretariat of Environment and Natural Resources *(Secretaría de Medio Ambiente y Recursos Naturales)*
REU	Rural Economic Unit

I. Introduction

Mexico is a country characterized by an intense process of cultural violence triggered by the State itself.[1] In Mexico, indigenous peoples, and later comparable communities (peasants, for example), initiated and currently form part of a process of co-evolution with ecosystems that has led to various ways of being and existing in the world. It has also led to a remarkable biocultural landscape and outstanding agrodiversity.

What are referred to as traditional production methods have been recognized as "authentic examples of ecologically-managed agroecosystems" and as "models of sustainable agriculture" (Gliessman, 2002; Altieri & Trujillo, 1987). In Mexico it is because of peasants and indigenous peoples that our country is a center of origin and diversification for approximately 15.4% of the species used in the world's food system (CONABIO, 2006; Boege, 2008), and they have also generated an outstanding gastronomy. Specifically, the coevolution process between the various human groups settled in Mexico and Central America, and the resulting biological diversity has generated at least 100 cultivated species. Especially noteworthy is maize, due to its cultural, social and economic significance, but also worth mentioning are cacao, pa-

1 This cultural violence has been documented, for example, in a report entitled "Destrucción del patrimonio biocultural de México por megaproyectos y ausencia de legislación pública culturalmente adecuada para los pueblos indígenas y comunidades equiparables," presented at the 153rd period of sessions of the Inter-American Commission on Human Rights (IACHR), Washington, DC in 2014 (a video of the hearing is available at: https://www.youtube.com/watch?v=rSyQwi8RnmA).

paya, nopal, tomatoes, tobacco, vanilla, cotton, magueys, beans and green tomatoes, among many others (CONABIO, 2016b). It is also important to emphasize that these production methods contribute nearly 70% of humanity's food, even though they use only 30% of the world's water and arable land (De Schutter, 2014).

Nevertheless, for several decades now, Mexican authorities have adopted public policies for agriculture that are developed from a single cultural perspective, specifically the modern Western perspective, which is focused primarily on the country's production-exportation and comparative advantages. In other words, our authorities have opted to promote industrialized agriculture (also referred to as agro-industrial) that does not seem to be congruent with the methods of producing food, and being and existing that Mexico's indigenous peoples and peasants have been developing for centuries.

In this report we analyze the legislation and public policies created and implemented by the Mexican State, and particularly the Sustainable Modernization of Traditional Agriculture (MasAgro) program, with the aim of investigating whether they are sustainable and appropriate for Mexico's ecosystems and agroecosystems, and whether the MasAgro program respect and guarantees the human rights of indigenous peoples and peasants.

II. Objective

The objective of this report is to analyze the pluricultural State, agroecology and food sovereignty within a human rights framework; and to analyze whether Mexico's legislation and its public policies, particularly the Sustainable Modernization of Traditional Agriculture (MasAgro) program, fulfill and guarantee the rights of indigenous peoples and peasants, especially the rights to cultural identity, access to traditionally-managed natural resources and food.

Our research hypothesis is that the legislation and public policies issued by Mexican authorities in the area of agriculture do not guarantee these rights, nor do they respect the paradigm of the pluricultural rule of law.

III. Justification

Mexico is recognized as one of the world's 17 megadiverse countries. It occupies approximately 1% of the Earth's continental land surface, and is home to approximately a tenth of all species known to humankind and to 68 indigenous peoples (CDI, 2014). This partly explains why an acknowledgement of biocultural complexity in the country's legislation and public policies is indispensable for: (i) conserving Mexico's enormous biocultural patrimony; and (ii) guaranteeing the human rights of the country's indigenous peoples and comparable communities.

Because of the ongoing process of coevolution between peoples

and ecosystems—that continues today—Mexico is one of the most important centers of origin and domestication of plants, and is a vital territory for the conservation of flora and fauna. Maintaining this process poses a significant challenge given the socioenvironmental crisis currently experienced by humanity (Boege, 2008).

Mexico, according to its Constitution, is a democratic, guarantist, pluricultural State. These paradigms suppose that the source of legitimacy and the highest obligation for all the country's authorities is to respect, protect, promote and guarantee human rights [what Ferrajoli referred to as substantive democracy (2010)]. This supposes a fundamental need to establish a legal framework and implement public policies that permit the peoples and ethnic groups inhabiting national territory to thrive, thereby limiting the power of a single dominant culture. In other words, the Mexican State should take great care to enact legislation and implement public policies in the area of agriculture, because it is in the country's rural areas that the majority of Mexico's biocultural patrimony is found. To this end, the Mexican State should take special measures (IACHR, 2009), first of all, to ensure that indigenous peoples and peasants control their territories and their biocultural patrimony, and secondly, to implement legislation and public policies that promote and conserve traditional or small-scale agriculture.

As stated earlier, our aim in this report is to analyze whether these special protective measures are stipulated in legislation and public policies in the area of agriculture. The historic unrest and resistance expressed by Mexico's peasants and indigenous peoples clearly suggest that such protective measures do not exist. However, it is clearly necessary and justifiable to investigate and analyze the causes of the problem in order to outline potential paths for resolution, with the understanding that this may significantly contribute to building bridges for peace in a diverse society besieged by various forms of violence.

We are particularly interested in studying the program entitled Sustainable Modernization of Traditional Agriculture (MasAgro), since this is one of the federal government's most important agricultural programs at the scale of peasant producers. This program covers a period of years, and is not limited to a specific presidential term. It has been defined as strategic, and is not subject to rules of operation. As will be further explained in this report, MasAgro's primary objective is to increase the productive capacities of small-scale maize and wheat producers from 5 and 9 million metric tons, and to increase the sector's average yields from 2.2 to 3.7-4.5 metric tons per hectare by 2020, and to this end it promotes a cultural and ecological transition.

This study is based on an analysis of scientific articles and official documents available to the public or obtained by requesting information through the federal government's National Transparency Platform, and a series of interviews with some representatives of key players in the agricultural sector.

IV. Logical framework

This report has been developed around the concepts that are presented below and that we view as indispensable to a comprehensive analysis and assessment of the Mexican State's legislation and public policies in the area of agriculture.

4.1 Food sovereignty

The concept of food sovereignty is unique because it originated within a coalition of social movements with a call for productive restructuring and institutional innovation in unequal, fragmented and fragile societies (Carrasco & Tejada, 2008).

This concept was coined by Via Campesina, an international coalition bringing together organizations of small and medium-scale farmers, rural women, agricultural workers, indigenous peoples, youth and landless farmworkers. The coalition held a conference parallel to the World Food Summit in 1996, and the concept emerged in response to agricultural and neoliberal trade policies promoting industrial agriculture and free-trade markets for food. The term has changed over time, within social movements and civil society organizations (CSOs), and in the government sector, and especially at the subsequent World Food Summits, the CSO Forum on Food Sovereignty in Rome in 2002, and the

International Forum on Food Sovereignty in Nyéléni, Mali in 2007.

Food sovereignty is defined as the right of peoples to define their own agricultural policies and to control their own food systems, including the protection of their markets, natural resources, food cultures and modes of production (Via Campesina, 1996; Rosset, 2004; Chappell *et al.*, 2013). This sovereignty supposes the following:

- Prioritization of local agricultural production through peasants' access to sufficient land, water, credit and agricultural inputs. This implies the need to enact agrarian reforms favorable to peasants, expand unrestricted access to seeds and other inputs, and maintain water as a public good for sustainable use.El derecho de los consumidores a poder decidir qué quieren consumir, cómo y quién lo produce.

- Consumers' right to decide what they wish to consume, and how and by whom it is produced.

- Countries' right to protect themselves from food imports that suffocate local markets. This signifies policies that establish agricultural prices linked to real production costs, control over imports, and the promotion of local production and consumption.

- Participation by peoples in the definition of national policies in the areas of food, trade and natural resources.

- Recognition of the rights of women who play a fundamental role in the agri-food system.

- Emergence of new social relations free from discrimina-

> tion between men and women, against individuals, ethnic groups, and social and economic classes, and between generations.

The concept of food sovereignty promotes an ethical conceptual framework based on control over production and access to food as elements in which economic, social, cultural, political and environmental rights converge (Anderson, 2008). This ethical framework connects the right to food with the right to decide how and by whom our food is produced.

The concept of food sovereignty extends beyond the concept of "food security" defined by the FAO as when "all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2006).

While both perspectives focus on access to food, Eguren (2012) asserts that food security does not involve decisive support to peasant agriculture or local consumption, and may even enter into contradiction with them, since it could be achieved by importing cheap food, thus reducing the capacity of small-scale producers to access local and national markets. In addition, when a country opens up its markets through international free trade agreements, this severely limits the possibilities of governments and peoples to establish policies that allow farmers and consumers to control the agri-food system. Even more concerning are plant breeders' rights and rights to crop patents, which further limit small-scale producers' access to agricultural resources.

The concept of food security turns the food problem into a phytosanitary and/or trade problem instead of addressing it as a problem of access to and control over production and consumption systems (McMichael, 2004). It is based on individuals' right to food, but it takes away importance from communities' rights to decide how to produce food and to control local production

systems. Focusing food security on the individual dimension of human rights diverts attention away from concrete political and economic relations such as control by transnational corporations over agricultural inputs, knowledge and the economic policies structuring the current global food system (Mazhar *et al.*, 2007). Thus, some may begin to view food sovereignty as an emerging food regime that contrasts with the current neoliberal or corporate regime. The purpose of Table 1 is to contrast the two different food regimes, emphasizing the different strategies established by each of them.

Table 1. Comparison between corporate/neoliberal food regime and food sovereignty regime. Modified from Wittman (2011)

Areas	Corporate/ Neoliberal Regime	Food Sovereignty Regime
Food access and security	Food access and security through intensive production based on comparative advantage principle and distributed through market mechanisms.	Food access and security by prioritizing local agricultural production and protecting local markets from subsidized import prices.
Agriculture's role in national development	Increase positive trade balances by increasing exports of agricultural commodities. Developed communities should invest in infrastructure to improve their well-being (hospitals, schools, etc.).	Sustainable agriculture, as part of a diversified economy, will improve well-being by improving access to food and assuring a healthy environment. Fair trade will stimulate economic growth.
Technology's role in agricultural development	An increase in productivity will result from scientific innovation and technology adoption. Problem-solving is based on a compartmentalized approach in which each problem (soil fertility, diseases, pest infestations, etc.) is resolved separately.	Farmers become efficient by diversifying food crops, using alternative technologies and reducing use of agricultural inputs. Problem-solving is based on a comprehensive approach to adopting appropriate technologies, including agroecology.
Food production, conservation of the environment and biodiversity	Protected natural areas, national parks and environmental regulations will be promoted as long as they do not jeopardize the potential for expanding agricultural export crops.	Agriculture and environmental legislation cannot be separated. Sustainable agriculture protects biodiversity and leaves space for conservation areas.

As evident in Table 1, food sovereignty is not necessarily an anti-trade discourse, but is rather a food regime aimed at assuring that trade relations serve its objectives in social, economic, political and environmental aspects.

Also, food sovereignty is not a list of separate things to be done, but is rather the integration of multiple objectives that may vary among different organizations, localities, regions, countries or transnational contexts (Desmaris, cited in Boyer, 2010). Food sovereignty proposes that local and regional food regimes reach the level of sovereignty, but this depends on trade rules and a policy committed to assisting agriculture at the national level in order to promote the autonomy of local and regional production systems.

In this context, food sovereignty proposes agroecology as a mode of production that contrasts with the agroexport model, and argues that industrial agriculture generates social and ecological costs such as the displacement of the rural population, the monopolizing of lands, and the loss of ecosystem services and biodiversity (Chappell *et al.*, 2013). Specifically, an agroecological production model can make it possible to achieve the social, economic, political and environmental objectives proposed by food sovereignty.

4.2 Agroecology

There are many definitions of agroecology, emanating from different positions and a somewhat broad range of perspectives. Ferguson *et al.* (2009) states that agroecology may involve three different but closely interrelated meanings:

- Science that studies agriculture from an ecological perspective.

- Set of practices for food production based on scientific and traditional ecological principles.

- Social movement working for production systems and food distribution that are sufficiently fair and ecological.

As a scientific discipline, agroecology strives to encompass the ecological and social factors that are interwoven in the structure, function and coevolution of agricultural production systems (Altieri, 2002). Agroecology conceives of these systems as complex communities consisting of the interactions between different cultivated, associated species of plants, animals, microorganisms and human beings. These interactions maintain the biogeochemical and biocultural processes that lead to the generation and maintenance of agri-food systems as well as the existing agrobiodiversity (Jardón & Benítez, 2016).

Agroecology, in its different dimensions, represents an epistemic, technical, economic and political approach that contrasts with agroindustrial production (Jardón & Benítez, 2016, modified in Chappell *et al.*, 2013), as presented in Table 2.

Table 2. Comparison between agroindustrial and agroecological production systems

Area	Agroindustrial production	Agroecological production
Technology	Generic petroleum-based production based on use of external synthetic inputs.	Specific to each agroecosystem, based on biodiversity and with low use of external inputs.
Productivity	High yields by area, based on mechanization, irrigation, hybrid and transgenic seeds, external inputs and waged labor force.	High yields by area, based on locally-adapted varieties, knowledge and technology.
Logic of re-source use	Extractivist, with high energy demand. Burden of restoration and conservation is passed on to society at large.	Locally controlled, based on ecological conditions and their maintenance.
Agrobiodi-versity	Primarily monocultures	Diverse, multifunctional polycultures
Associated biodiversity	Excludes most local species.	Favors the temporary or permanent establishment of local species, favoring their conservation at landscape scale.
Cultural diversity	Tends toward homogenization. Application of generic protocols independently of social and cultural context.	Favors local and regional maintenance of biocultural diversity associated with agrobiodiversity and biodiversity in general.

Area	Agroindustrial production	Agroecological production
Knowledge base	Based on technical and scientific knowledge; unidirectional flow through extension services.	Epistemic plurality; combination of integral scientific knowledge with traditional knowledge; flow through networks of farmer-to-farmer exchanges.
Predominant scientific paradigm	Mechanicist and genetic reductionist.	Integral, systemic; acknowledges diverse sources of variation and inheritance of phenotypes.
Management and conservation unit	Single-specie population	Agroecological community

Source: Taken from Jardón and Benítez, 2016; modified from Chappell et al., 2013.

4.3 Biocultural patrimony

The way in which indigenous peoples and peasants manage natural resources and ecosystems on a daily basis within the territories where they are settled has generated, over centuries, what is referred to as biocultural patrimony. This refers, first of all, to cultural elements that are indispensable for the indigenous and/or peasant way of being and existing, and it also refers to an ancient process of coevolution with the ecosystems they inhabit. Argumedo (undated) has stated that through biocultural patrimony it is possible to bring light to the following: (i) that there are deep bonds between indigenous peoples and their environment; (ii) that indigenous peoples do not distinguish between biological and cultural resources, which they treat in a holistic manner; and (iii) that biological diversity depends directly on

the cultural practices of indigenous peoples and vice versa, or in other words, that culture and environment cannot be separated and converted into commodities.

According to Argumedo (undated), biocultural patrimony refers to "a complex system, made up of interdependent parts." The term is specifically focused on the reciprocal relationship between indigenous peoples and their environment. The components include biological resources, ranging from the micro level (genetic) to the macro level (landscapes), and ancient traditions and practices, also known as traditional knowledge, including knowledge associated with ways to adaptively manage a complex ecosystem and with sustainable use of biodiversity (for example, agricultural management practices). Boege (2008), for his part, has stated that this type of patrimony is reflected in community genetic banks of domesticated and semi-domesticated animals and plants, agroecosystems (biocultural landscapes), medicinal plants, (traditional) knowledge, rituals and symbolic ways of territory appropriation.

Biocultural patrimony also presumes what Bonfil (1988) has referred to as cultural control of natural resources and/or territory, specifically a "system according to which social decision-making capacity is exercised over cultural elements. Cultural elements[2] are all the components of a culture that must be at play in order to carry out each and every social action: maintain daily life, meet needs, define and resolve problems, formulate and attempt to fulfill aspirations." It is thus fundamentally necessary for other groups to refrain from interfering in the decision-making processes of indigenous peoples and peasants with regard to their biocultural patrimony. To speak of biocultural patrimony is to speak of an indispensable common good for the well-being and *buen vivir* of indigenous peoples and peasant communities. It is

2 According to this author, cultural elements may be material, organizational, knowledge-based, symbolic and affective in nature.

also a fundamental tradition of diversity that allows humanity to confront disruptions such as those expected with climate change (Boege, 2008).

Indigenous peoples and peasants have various human rights expressed or exercised in relation to their daily management of biocultural patrimony. These include the rights to autonomy, cultural identity, territory, and access to traditionally-managed natural resources, water, the environment and food (CEMDA, 2014). Human rights, as we will remember, constitute the modern foundation for equality, and the source of legitimization of authorities in a substantive democracy (Ferrajoli, 2010).

Therefore, human rights currently constitute the primary tool for indigenous peoples and peasants in protecting their biocultural patrimony, and consequently, their ways of being and existing in the world. Thus, to speak of biocultural patrimony is to speak of territories (biocultural landscapes-traditional agroecosystems[3]) and human rights.

4.4 Pluricultural rule of law

One of the human rights that sustain the principle of universal dignity is the right to difference. This right justifies the establishment of public policy that recognizes what distinguishes us, one from another, and one people from another (Bonilla, 2006). The most important outcome of this type of public policy is the unrestricted exercise of the fundamental, collective right to autonomy. In this context a pluricultural State (as in the case of Mexico) has the obligation to make the adjustments necessary for the peaceful coexistence of different cultures, and to constrain the reach of a dominant culture.

3 Over time, these territories became and continue to be centers of origin, diversification and use for an enormous number of species in the planet's food and medicinal system.

In other words, authorities in a pluricultural State must guarantee the basic needs of all people (obligation of homogenization) and must guarantee full respect for the right to difference (obligation of dynamization), or in other words, the creation, conservation and application of collective rights on the basis of the group to which one belongs. A State that complies with the above is one that promotes "reciprocal interaction and interpretation between members of different cultures" (Olive, 2003). And the latter makes it possible to build bridges for achieving peace by protecting and guaranteeing the fundamental rights of all people, and in this way bring an end to cultural violence (Galtung, 1990).

In order to achieve peace in a pluricultural State, it is necessary to develop legislation and public policy that, as proposed by Dietz (2012), is focused on facilitating the construction of cultural identifies on the basis of territory, and at the same time, is designed to respect and protect landless identities, specifically migrants.

In practice this signifies that cultures are able to implement their own project without being subordinated to others. Villoro states it this way: "autonomy is the right to reach an agreement with the State regarding the conditions of one's own survival and the possibility for developing one's own collective project, within the framework of a genuinely multicultural State" (Villoro, cited in Olive, 2003).

V. Mexico's biocultural context: indigenous peoples and peasants

The way of being and existing in the world that is described as *traditional* is characterized by having originated nearly 10,000 years ago with the invention of agriculture in the Neolithic period, with adaptation to "a small scale, with high levels of ecological diversity, self-sufficiency and productivity, and based on the use of solar and biological energy (Toledo & Barrera-Bassols, 2008).

This extended biocultural process, expressed through various waves of diversification (biological, genetic, linguistic, cognitive, agricultural and landscapist), reveals that "indigenous (and peasant) societies have a repertoire of ecological knowledges that is generally local, collective, diachronic and holistic (...) transmitted from generation to generation. The transmission of this knowledge occurs through language, and it is thus generally unwritten knowledge. For this reason, memory is the most important intellectual resource among indigenous or traditional cultures" (Toledo & Barrera-Bassols, 2008).

Biocultural patrimony is the materialization of collective or biocultural memory through the daily exercise of the human rights of these peoples, and this supposes: i) intervention of natural biotic resources to different degrees, ii) the use of these natural

resources in accordance with cultural patterns, and iii) traditional agroecosystems, as the expression of domesticated biological diversity (Boege, 2008). In other words, the biocultural patrimony of Mexico's indigenous peoples and peasants is a common good[4] that is indispensable for their survival as a group.

In this sense indigenous and peasant territories are the most important laboratories for agriculture and biocultural patrimony. And thus, the establishment of any public policy that replaces or deteriorates the elements and/or variables making up these laboratories is unacceptable and unjustifiable from an ecological and cultural perspective. The only acceptable legal framework and public policy for these sites are those which facilitate, promote and protect indigenous peoples and comparable communities, their territories and their management of such territories. In other words, these laboratories require legislation and public policy that promote the horizontal collaboration between small-scale producers and the State's various bodies, as well as in-situ conservation.

As stated at the beginning of this report, peasants and indigenous peoples in Mexico are responsible for our country's amazing distinction, in terms of history and civilization, as the center of genetic origin and diversification of approximately 15.4% of the species used in the world's food system (CONABIO, 2006; Boege, 2008), and also for the development and implementation of diverse forms of agriculture (slash and burn, fallow land, *milpa*, *chinampas*), which are "sustainable agricultural models" (Altieri & Trujillo, 1987).

According to Boege (2009), the persistence of the traditional way of being is the reason that Mexico is classified as megadiverse, multicultural and a center of origin and diversification. In Mexico the traditional way of being and existing is expressed by

4 Common goods are those which "are produced, inherited or transmitted in a context of community. They are goods that belong to and respond to the interest of each and every member of a community" (Vercelli and Thomas, 2008:50).

the peoples who share what is referred to as the Mesoamerican matrix, specifically indigenous peoples, peasants and persons of African descent, who have developed a diversified strategy of resistance (Bonfil, 1989). Today, there are 25 million people in Mexico who identify themselves as indigenous and there are 1 million people who identify as of African descent, equivalent to 21.5% and 1.2% of the country's total population, respectively (INEGI, 2015). Another way to gain an appreciation of the cultural wealth we have in Mexico is through the following statistics: we have 11 linguistic families, 68 linguistic groups and 364 linguistic variants (INALI, 2008). Another important element in this regard is that the peasant groups in our country share a cultural matrix, specifically Mesoamerican, bringing together and providing meaning to the cultural elements indispensable to their cultural survival.

Therefore, Mexico cannot be considered as a single nation, but rather as a plurality of nations in which we can identify two civilizing matrices: the Western and the Mesoamerican (Bonfil, 1989). The first was imposed as the dominant culture and has thus controlled the Mexican State's design. The second is composed of the peoples and communities that express the cultural wealth mentioned in the previous paragraph. In order to survive culturally these peoples and communities have implemented a diversified strategy of resistance for the purpose of maintaining their control over the cultural elements of their identities. These two ways of seeing, being and existing in the world are at odds, and the dominant culture is fighting for modernization, while the other culture strives to conserve its identities, territories and natural resources.

According to Santos (2009), the paradigm of modernity is characterized by the generation of five logics or modes in which non-existence is produced, specifically: (i) the monoculture of knowledge and the rigor of knowledge, which transform modern science and high culture into the sole criteria of truth and aes-

thetic quality; (ii) the monoculture of linear time, according to which history has only one, known meaning and direction (for example, progress-development); (iii) the monoculture of the naturalization of differences, with populations distributed by categories that naturalize hierarchies; (iv) the logic of the dominant scale, with the scale adopted as essential (universal-global) determining the irrelevance of all other possible scales; and (v) the productivist logic founded in the monoculture of capitalist productivity criteria, under which economic growth is a rational, unquestionable objective, and as such, the productivity criteria that best serves this objective is beyond question.

The continuity and conservation of Mexico's biocultural patrimony depends directly on actions by the country's authorities to guarantee the human rights of peasant communities and indigenous peoples, as well as the development of institutions and legal frameworks that correspond to a pluricultural State. In other words, Mexico's biocultural patrimony will continue to exist only if indigenous peoples and comparable communities are guaranteed the right to continue to manage the natural resources, ecosystems and agroecosystems that they have traditionally used. The notion of pluriculturalism supposes the constraint of the dominant culture's powers and a redefinition of the national State's limits. The Constitutional reform conducted in 2001 in the area of indigenous peoples' rights was aimed at this objective. However, this profound transformation required in Mexico's legal system has not yet begun.

Along these lines, the resistance of Mesoamerican peoples has been founded on two cornerstones: maize and *milpa*. Maize is the main source of material sustenance for millions of people, and it is also the indisputable symbol of their cultural identity. As stated by Barros and Buenrostro (1997), the lives of peoples and maize "are interwoven." The bond between Mesoamerican peoples and maize led to the emergence of 62 native maize races

(CONABIO, 2012). In addition there are thousands of varieties adapted to all of the country's ecosystems, and thus the country's entire territory is considered to be the center of its origin and ongoing domestication and genetic diversification. Maize is also the country's most emblematic crop, and it is the foundation of the rural and peasant economy and of the nation's family diet. Fifty-three percent of calorie intake (carbohydrates) and 39% of protein intake in the Mexican diet originates in the direct consumption of maize as this nixtamalized grain in approximately 600 specialized dishes (Bourges, 2013).

Milpa, for its part, is both an agroecosystem and a unit of agricultural domestication, conservation and production that is a fundamental part of the multiple-use strategy for self-sufficiency and food sovereignty (Boege, 2008; Jardón & Benítez, 2016). *Milpa* is the primary focus of sustenance, around which a polyculture system of Mesoamerican peoples revolves, since it is also linked to the management of other production spaces, such as backyards, acahuales (secondary vegetation), coffee fields, vanilla fields, sugar cane fields, agave fields, etc. The Mesoamerican biocultural landscape is a mosaic composed of diverse spatial and symbolic territories for the building of a cultural landscape and a social and natural history (Boege, 2008).

Although cultivating and managing maize and *milpa*s may not be profitable in purely economic terms, Mexico's peasants and indigenous peoples are determined to continue their tradition of farming in this way. Their fierce determination can be explained by the fact that growing maize and managing *milpa*s allows them, in connection with their diversification strategy, to meet needs that are not necessarily economic in nature, such as maintaining their cultural identity and territory, producing healthy and culturally meaningful food, building community, maintaining their connection with the land and the daily reproduction of their cosmovision (Barkin, 2006; De Frece & Poole,

2008; Isakson, 2009). In fact Barkin (2006) has stated that the maize culture has allowed peasants and indigenous peoples to adapt to the constant ups and downs of national politics, while at the same time, conserving their production and way of living.

The alliance between maize and Mesoamerican peoples can be traced from different angles. For example, Ureta *et al.* (2013) found that the presence of ethnic groups is a critical variable in explaining the distribution of individual maize races, and also in defining potential areas of greater abundance of maize races in Mexico. These authors also found that maize races occupy 6.9% of national territory and are associated with areas where 40% of indigenous peoples are living. This information coincides with statements by Toledo *et al.* (2001) and Boege (2008, 2010), who recognize the importance of ethnic groups in the dynamics of creating, preserving and diversifying native maize varieties in Mexico.

VI. Mexico's agricultural issues

Currently, Mexico's biocultural patrimony and the human rights of indigenous peoples and comparable communities are at risk due to a series of significant threats (for example, contamination, climate change, migration, insecurity). Of particular relevance for this report is the role played by the legislation and public policy implemented by the Mexican State in the area of agriculture. For decades, the State has been withdrawing its involvement in agriculture, leaving the door open to the private sector and the paradigm of modernizing industrial agriculture. Historically speaking, the legal framework and public policies designed for Mexico's agriculture have been designed to respond to the values and logic of the dominant culture, with the exception of the initial versions of the Constitution's Article 27 and the Agrarian Law, since the latter were achieved by men and women who fought for the Plan of Ayala.

As governments distanced themselves from the vindications enshrined in the Constitution, the Mexican State transformed its legislation and public policies in the area of agriculture. Since the beginning of the Mexican State's neoliberal period, this legal framework has been reformed drastically in order to promote free enterprise and the business model needed for industrialized agriculture, downgrading traditional or peasant agriculture and classifying it as "backward."

Many of the structural reforms implemented in the agricultural sector came after the signing of the North American Free Trade Agreement (NAFTA). However, some authors such as Gordillo and Wagner (2004) identify significant changes in agricultural regulations years earlier, linked to a process of transition to the neoliberal capitalism model, referred to as "state corporativism." In fact, Gordillo and Wagner (2004) identify the period from 1975 to 2000 as the end of the State interventionist model, since it was during this time that the country liberalized its trade system and put an end to agrarian reform by modifying the Constitution's Article 27 and enacting the new Agrarian Law.

Another author, Rábago (2016), suggests the transformation did not begin with the signing of NAFTA, but rather with the General Agreement on Tariffs and Trade (GATT) in 1986. According to this author:

> This agreement—a forerunner to the World Trade Organization (WTO) and the current multilateral free trade system—signified important shifts in Mexico's economic policy, as well as a move away from a nationalist foreign policy concerned with Mexico's independence with respect to the United States. The transformation was later bolstered by other domestic measures, such as the privatization of public enterprises, administrative deregulation of trade activities, changes in monetary policy, and in general, a reduction in the State's presence in the national productive sector.
>
> Despite its importance, Mexico's entry into GATT represented only a prelude to the more fundamental geopolitical and economic decision made during recent decades: the negotiation of a free trade agreement with the United States and Canada. This decision involved the transformation of essential aspects of post-revolutionary political consensus, such as the development model based on the national mar-

> ket, and above all, the State's active presence in agriculture through the agrarian system. One of the pillars of this model, the Agrarian Law—which would be implemented in a similar or even more radical manner only in other revolutionary processes such as those in Cuba and Nicaragua—was modified beginning in 1992. The agrarian counter-reform represented the dismantling of the Mexican Revolution's economic model, because it allowed foreign investors to obtain land for participating in the agricultural, livestock and mining sectors (Rábago, 2016).

During this period the decision was made to reduce and modify the nature of State intervention in agriculture. To this end, the Mexican State cut and redirected subsidies, liberalized foreign trade, and dismantled or shut down public institutions designed for producers' training and technology transfer. This process reached a climax during the six-year presidential term of Salinas de Gortari, when the following actions were taken: i) reforms were made to the Constitution's Article 27, and thus, to land distribution; ii) the NEW Agrarian law was enacted; iii) NAFTA was negotiated and entered into effect; and iv) the National Solidarity Program (*Programa Nacional de Solidaridad*—PRONASOL) was created.

In 1996 the Federal Law on Plant Varieties (*Ley Federal de Variedades Vegetales*—LFVV) was established, permitting participation by private enterprise in the agricultural-seed sector. The new law signified the dismantling of the National Seed Producer (*Productora Nacional de Semillas*—PRONASE),[5] the institution responsible for research and improvement in crops, particularly maize, wheat and beans.

Fernando Rello states that, beginning in 1982, the Mexican

5 The National Seed Producer (PRONASE) was the successor to the Maize Commission of 1947, which was the primary promotor of improved seeds in Mexico during the 20th century, up until its definitive dismantling in 2009. It had been important in terms of the country's scientific development, and because the seeds that were researched, improved and created belonged to the Mexican State (see SAE report on accountability, 2006-2012).

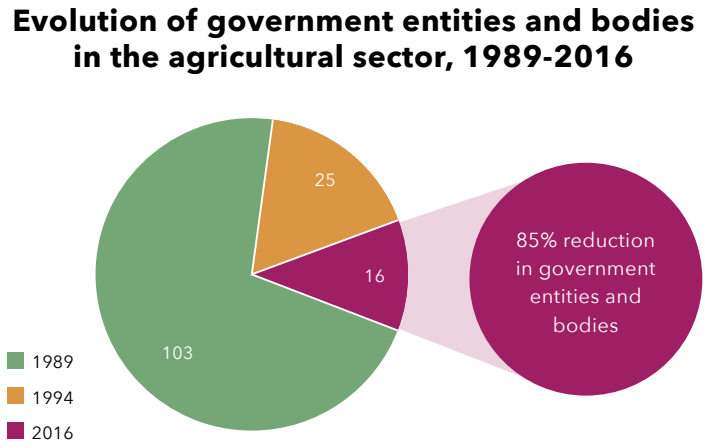
government agreed to implement structural adjustment programs promoted by the International Monetary Fund (IMF), thus initiating the era of the globalization of public policies in under-developed countries—a process in which sovereignty was lost in relation to instruments for economic regulation. Mexico abandoned the import substitution policy, based on protection of the national industry, and adopted an outward-focused strategy of growth based on invigorating exports. As a result, all of the economic and agricultural policy instruments applied during this period and to the present time adhered to the logic of this strategy (Rello, 2008).

According to this author, the objective of the structural reforms made during this period was, in the words of one of its promoters, Luis Tellez, to "diminish government intervention in diverse sectors, promoting participation by the private sector and removing market obstacles and distortions that were not permitting the full development of Mexico's agriculture." In order to achieve this objective, semi-official enterprises that intervened in agricultural production and distribution were privatized or liquidated. In the agricultural sector alone, there was a dramatic reduction in government entities and bodies: there were 103 in 1989, and by 1994 there were only 25. Currently, there are only 16,[6] taking into consideration that the fisheries sector was incorporated into SAGARPA in 2000.

The following scheme graphically illustrates the above:

6 These government entities and bodies are the following: 1) Apoyos y Servicios a la Comercialización Agropecuaria (ASERCA), 2) Comisión Nacional de Acuacultura y Pesca (CONAPESCA), 3) Comisión Nacional de las Zonas Áridas (CONAZA) 4) Colegio de Postgraduados (COLPOS), 5) Fideicomiso de Riesgo Compartido (FIRCO), 6) Instituto Nacional para el Desarrollo de Capacidades del Sector Rural A.C. (INCA RURAL), 7) Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), 8) Instituto Nacional de Pesca (INAPESCA), 9) Productora Nacional de Biológicos Veterinarios (PRONABIVE), 10) Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria (SENASICA), 11) Servicio de Información Agroalimentaria y Pesquera (SIAP); 12) Servicio Nacional de Inspección y Certificación de Semillas (SNICS); 13) Universidad Autónoma Agraria Antonio Narro (UAAAN), 14) Universidad Autónoma Chapingo (UACH), 15) Comité Nacional para el Desarrollo Sustentable de la Caña de Azúcar (CNDSCA), 16) Colegio Superior Agropecuario del Estado de Guerrero (CSAEGRO). Source: SAGARPA (undated). Available at:
http://www.sagarpa.gob.mx/lists/organismos%20del%20sector/allitems.aspx

Figure 1: Evolution of government entities and bodies in the agricultural sector, 1989-2016



Source: Developed by author, based on data from Rello (2008) and SAGARPA (undated).

Mexico's agricultural policy in recent times has translated into processes of importing large amounts of basic grains in exchange for the emigration of indigenous people and peasants from their communities (Fitting, 2006). Toledo *et al.* (2013) points to some of the effects of this policy:

> 1) Disruption in domestication of existing species,
>
> 2) Destruction of landscape mosaics that permit balanced forms of managing territories,
>
> 3) Devastation of indigenous and peasant knowledges regarding nature,

4) Disappearance of cosmovisions and unique relationships with the world,

5) Destruction of agroforest systems, hydraulic agriculture such as *chinampas*, river fisheries, etc.,

6) Destruction of all types of technologies: agricultural, livestock, fishery, hunting and collecting, hydraulic, etc.,

7) Destruction of handicrafts made with products from nature,

8) Devastation of herbolarias and pharmacopoeias

9) Disappearance of regional cooking and culinary arts of all types,

10) Disappearance of garments and textile techniques,

11) Devastation of collective forms of local and territorial government by usos y costumbres (indigenous customary law).

Bartra (2003) states that what neoliberal governments thought Mexico's agriculture needed was a lax population and strong doses of free enterprise.[7]

In summary, the above paragraphs indicate the country's socioenvironmental crisis and the inadequate state (in environmental and cultural terms) of the legal framework and public policy developed for agriculture. According to Boege (2016), the inadequacy of the framework is evident in the threats en-

7 A January 2014 interview on the initiative for agricultural reform with the former head of SAGARPA, Enrique Martínez, illustrates this vision. See http://archivo.eluniversal. com.mx/primera-plana/2014/impreso/-8220competitividad-necesaria-para-un-campo-productivo-8221-44071.html

dangering the country's biocultural patrimony, particularly: (i) territorial occupation with industrial agricultural systems and the consequent dispossession and replacement of indigenous agriculture; (ii) installation of industrial schemes in ancestral territories, for extractive and/or renewable energy activities; (iii) establishment of private water distribution systems, and water diversion and transfer in catchment areas; (iv) appropriation of biological resources for commercialization; (v) establishment of colonial-type public policies; (vi) migration processes; and (vii) arrival of organized crime in the communities safeguarding biocultural patrimony.

Along these same lines, but in the specific case of Mexico's native maize, Ortega-Packza (2003) has defined the following factors that are endangering diversity: i) State efforts to "modernize" agriculture; ii) process of adopting improved seeds; iii) farmers planting other more lucrative crops, or emigrating to other regions of Mexico or the United States; iv) natural and social catastrophes; v) NAFTA going into effect; and vi) government assistance to nixtamalized flours.

The erosion of biocultural patrimony is irreversible. The only way to conserve it, in the case of maize, in general and specific terms, is to promote its use and enjoyment. And this can only be achieved through participative improvement and in-situ conservation (Ortega-Packza, 2003). This type of conservation is fundamental because it is focused on the environments where the specific properties of each crop are developed (FAO, 2001), and on the continuity and strengthening of the dynamic, community processes that generate them (Ortega-Packza, 2010).

In other words, the conservation of Mexico's biocultural patrimony depends directly on broadly guaranteeing peasants and indigenous peoples their human rights to access to information and participation in decision-making. Efforts to the contrary will contribute to their silent destruction. It is also important to

mention here that those who are generating Mexico's biocultural patrimony have not been appropriately consulted with regard to the legal framework or public policy in the area of agriculture (SAGARPA, 2016c). In other words, Mexico lacks any *ad hoc* legislation or public policy for promoting peasant and indigenous agriculture and conserving the country's biocultural patrimony, given that the needs and concerns of this population have not been taken into account.

VII. Analysis of legal framework applicable to Mexico's agriculture

7.1 Analysis of legal framework

Although Mexico has defined itself as a pluricultural State since 2001, as discussed in the fifth section of this report, there is unrest and crisis in rural areas (Bonfil, 1989; Warman, 1988; Boege, 2008). This has translated into or has become evident in different forms of cultural violence (CEMDA, 2014). One of the causes that has historically triggered this problem is the legislation and public policy adopted by the Mexican State, generally developed and expressed from the dominant culture's logic.

This suggests there is a systematic pattern (IACHR, 1998), given that Mexican authorities adopt decisions that directly affect indigenous peoples and peasant communities without respect for the fundamental rights of these populations. The result is the destruction of Mexico's biocultural patrimony. Stated in another way, and as specified in previous sections of this report, we can easily identify two civilizing matrices in Mexico: the modern-Western, and the Mesoamerican. Each is defined by a series of distinguishing values and visions, and we will not discuss them

at length here except to underscore those particularly relevant for this report: (i) the mercantilization of nature, life and work, and (ii) the use of techno-science as the sole criteria for truth promoted by modernity, contrary to peoples' collective memory and *buen vivir*.

In order to establish this systematic pattern, it is necessary to identify a plurality of actions and a pattern or similar patterns in the carrying out of actions, specifically behavior repeated over time. In the area addressed in this report, the plurality of acts can be found in the legislation and administrative acts (public programs) issued by authorities that interfere with the way of being and existing for peasants and indigenous peoples. This repeated behavior occurs in the manner and practice of Mexican authorities to enact legislation and carry out administrative acts from a hegemonic, monocultural perspective (CEMDA, 2014).[8] Given that Mexico is a pluricultural State, this pattern is unacceptable and all resulting acts are unconstitutional.

A pluricultural State, as the ideology of recognition of differences (Paradowska, 2013), involves a profound modification and resignification of the State and its relations with contemporary societies (Dietz, 2012). The aim of this paradigm is for non-dominant cultures to thrive by maintaining cultural control over their resources. It is thus characterized by building dams and barriers to the power exercised by the dominant culture and building bridges for intercultural dialogue. In a pluricultural State, unity is constructed through differences, and the vehicle for achieving this new correlation lies in "the extension of the human rights of people belonging to cultural minorities" (Bonilla, 2006). Along these lines, two fundamental values that explain the profound relationship between Mesoamerican peoples and nature are

8 In October 2014, the Centro Mexicano de Derecho Ambiental, A.C. (CEMDA), together with various Mexican indigenous peoples and civil society organizations, submitted at the IACHR a report entitled "Destrucción del patrimonio biocultural de México por megaproyectos y ausencia de legislación y política pública culturalmente adecuada para los pueblos indígenas y comunidades equiparables," at a thematic hearing at which it proposed the existence of this pattern for the first time.

reciprocity and respect. Legislation and public policy that is truly pluricultural should contain and develop these two values.

In the case of Mexico the principle of pluriculturalism is contained and developed in the country's National Constitution, the American Convention on Human Rights, San Salvador Protocol, ILO Convention 169, Convention on Biological Diversity, Nagoya Protocol, UN Declaration on the Rights of Indigenous Peoples, and the jurisprudences of the Inter-American Court of Human Rights and Mexico's Supreme Court of Justice. Nevertheless, this standard has not been sufficiently incorporated and developed in Mexico's legislation and public policy.

In this context, we will now briefly analyze the primary norms legally governing rural activity in Mexico, in light of the human rights regime and the principle of pluriculturalism. Our aim here is to demonstrate the pattern mentioned above and indicate the values promoted and dominant logic reproduced.

Table 3: Analysis of Agricultural Legislation in Mexico

Law (Ley)	**Dates of creation and reforms** (Fecha de creación y reformas)	**Human rights protected** (Derechos humanos tutelados)
Agrarian Law (*Ley Agraria*)	26 February 1992 Reforms (6): 09-07-1993 17-04-2008 03-06-2011 22-06-2011 17-01-2012 04-04-2012	Rights to life and property. This Law develops and regulates collective property (*ejidos*-communal property) in Mexico.
Sustainable Rural Development Law (*Ley de Desarrollo Rural Sustentable*)	10 December 2001 Reforms: 02-02-2007 18-06-2010 2 times 09-12-2010 3 times 27-01-2011 28-01-2011 26-05-2011 12-01-2012	Rights to life, food and the environment.

Description (Descripción)	**World vision** (Visión del mundo)	**Relation with Biocultural Patrimony** (Relación con el Patrimonio Biocultural)
Regulatory law for Constitution's Article 27 in the area of agriculture. Specifically, it regulates the country's collective property, divided into plots, communal use, parcels, etc. and individual small-scale property. It also establishes the corresponding authorities: Agrarian Prosecutor's Office (*Procuraduría Agraria*) and National Agrarian Registry (*Registro Agrario Nacional*).	Mesoamerican-Modern Western. This legislation captures one of the primary elements in the way of being and existing of indigenous peoples and peasants in Mexico, including collective property, and it reflects the value of reciprocity. In its 1992 version, it adopted modern elements such as the possibility of divesting and transferring property for any reason.	This Law allows direct cultural control by indigenous peoples and peasants over ancestral and non-ancestral territories. This is currently the basis for collective property in the country. This Law also makes possible and promotes bonds of reciprocity between members of a community and between the community and nature. While it was modified during the Salinas de Gortari presidential term to facilitate the incorporation of these lands into the private property regime, what is true is that its essence (collective property) has been maintained.
Regulatory Law for Constitution's Article 27, the purpose of which is to regulate the planning and organization of agricultural production, its industrialization and commercialization, and of other goods and services, and all actions designed to increase the rural population's quality of life. It also involves	Modern-Western. This Law is clearly focused on modern values such as productivity, competitiveness of the agricultural sector, food security and quality of life. It also lays the foundation for the optimal use of land by way of complementary assistance and investment. However,	While this Law recognizes the importance of the traditional knowledge and practices of peasants and indigenous peoples, and it generates some spaces for participation, legislators failed to include mechanisms for direct participation in decision-making, and

Law (Ley)	**Dates of creation and reforms** (Fecha de creación y reformas)	**Human rights protected** (Derechos humanos tutelados)
Federal Law on Seed Production, Certification and Trade (*Ley Federal de Producción, Certificación y Comercio de Semillas*)	15 June 2007 No reforms.	Right to property

Description (Descripción)	**World vision** (Visión del mundo)	**Relation with Biocultural Patrimony** (Relación con el Patrimonio Biocultural)
the government's development of the necessary infrastructure for rural development. The Law also establishes the corresponding authorities: Inter-Secretariat Commission (*Comisión Intersecretarial*), Mexican Council for Sustainable Rural Development (*Consejo Mexicano para el Desarrollo Rural Sustentable*), Rural Development Districts (*Distritos de Desarrollo Rural*) and the National System for Integral Rural Technical Assistance and Training (*Sistema Nacional de Capacitación y Asistencia Técnica Rural Integral*). It also determines the formulation of the Special Concurrent Program for Sustainable Rural Development (*Programa Especial Concurrente para el Desarrollo Rural Sustentable*).	the Law also states that it will seek to preserve traditional knowledge, peasant-to-peasant training, and peasants' participation in the sector.	thus the cultural control of their traditionally-managed natural resources is not in their hands. In other words, there is a break in reciprocity and respect between peoples and nature.
The purpose of this Law is to regulate the production of certified seeds, the rating of seeds, and the commercialization and placing into circulation of seeds. It is thus also involved in the planning and organization of agricultural production, its industrialization and	Modern-Western. This law, established on the basis of the private property paradigm (plant breeders' rights), and placing value solely on science as the criteria for establishing truth (not on the ecology of knowledges), promotes the development of and access to new seeds	This Law disregards peasant and indigenous systems for seed production and commercialization, to the degree that it does not promote or protect traditional production systems, and even less so, the associated knowledges and practices. The absence

Law (Ley)	**Dates of creation and reforms** (Fecha de creación y reformas)	**Human rights protected** (Derechos humanos tutelados)
Federal Law on Plant Varieties (*Ley Federal de Variedades Vegetales*)	25 October 1996 Reform: 09-04-2012	Right to property

Description (Descripción)	**World vision** (Visión del mundo)	**Relation with Biocultural Patrimony** (Relación con el Patrimonio Biocultural)
commercialization. It defines the Mexican State's policy on seeds (promote access to new and better seeds) and it creates the National Seed Inspection and Certification Service (*Servicio Nacional de Inspección y Certificación de Semillas*), Regional and State Advisory Committees on Seeds (*Comités Consultivos Regionales o Estatales de Semillas*) and the National Seed System (*Sistema Nacional de Semillas*).	(and thus the replacement of native and criollo seeds), with a focus on productivity, establishing a system for seed certification and labeling for commercialization.	of mechanisms for direct participation by peasants and indigenous peoples in decision-making processes is a significant omission. Another is the disregard for the ancestral tradition of exchanging seeds, since the Law requires a specific label for commercialization and sanctions the unrestricted exchanging of seeds. This Law deprives indigenous peoples and peasants of cultural control over some of the most important biocultural, symbolic and productive elements necessary for their survival as a group and their food sovereignty.
The purpose of this Law is to protect the rights of plant breeders as well as plant varieties in the public domain. It establishes the following authorities: Selection Committee for Plant Varieties (*Comité Calificador de*	Modern-Western. The purpose of this Law is to grant plant variety breeders with the priority for commercialization. Nothing of this nature exists in the indigenous-peasant cosmovision, as traditional systems are	In traditional agriculture, seeds are common property provided by nature, and are thus freely exchanged. The constitution of a system for plant breeders' rights has gradually constrained this ancient

Law (Ley)	**Dates of creation and reforms** (Fecha de creación y reformas)	**Human rights protected** (Derechos humanos tutelados)
Regulations for Federal Law on Plant Varieties (*Reglamento de la Ley Federal de Variedades Vegetales*)	24 September 1998	Right to property

Description (Descripción)	**World vision** (Visión del mundo)	**Relation with Biocultural Patrimony** (Relación con el Patrimonio Biocultural)
Variedades Vegetales) and National Registry of Plant Varieties (*Registro Nacional de Variedades Vegetales*).	based on reciprocity and solidarity.	practice that is fundamental for recreating biocultural patrimony. In short, this Law prioritizes private property over collective property in relation to seeds.
These Regulations further develop the regulating of breeders' rights. In this Law legislators designated the Executive in relation to the right of communities to their traditional varieties (varieties in the public domain). Regulations are limited to indicating in Section 5 that "rural communities will always have the right to use and commercially exploit the plant varieties resulting from their practices, usos y costumbres, and that research (private or public) should be permitted in the interest of protecting biodiversity.	Modern-Western	Especially noteworthy is the absence in both the Law and its Regulations of a framework that broadly protects and promotes varieties of common use and the people safeguarding such varieties. There is no justification for permitting unrestricted research on traditional varieties and not doing the same for varieties protected by breeders' rights.

Law (Ley)	**Dates of creation and reforms** (Fecha de creación y reformas)	**Human rights protected** (Derechos humanos tutelados)
General Law on Sustainable Forestry (*Ley General de Desarrollo Forestal Sustentable*)	25 February 2003 Reforms: 27-09-2005 16-10-2008 4-11-2011 6-11-2011 8-12-2012 10-05-2016	Rights to property, environment and access to traditionally-managed natural resources.
Law on Bio-security of Genetically-Modified Organisms (*Ley de Bio-seguridad de Organismos Genéticamente Modificados*)	18 March 2005 No reforms.	Rights to property, a healthy environment, and health.

Description (Descripción)	**World vision** (Visión del mundo)	**Relation with Biocultural Patrimony** (Relación con el Patrimonio Biocultural)
Regulatory Law for Constitution's Article 27, for the purpose of regulating and promoting the conservation, protection, restoration, production, planning, planting, managing and use of forestry ecosystems and their resources, with the aim of fostering sustainable forestry development. These regulations indicate that in the case of forestry resources belonging to indigenous communities and peoples, the State should guarantee the protection standard specified in the Constitution's Article 2. These regulations develop mechanisms for access to information and participation, and create the National Forestry Commission (*Comisión Nacional Forestal*), the National Forestry System (*Sistema Nacional Forestal*), and market instruments for environmental services.	Modern-Western, and in certain aspects, Mesoamerican. This Law concretely recognizes the right to free, prior, informed consent of peoples and communities as a mechanism for establishing intercultural agreements, as well as the right to participate in the benefits.	The Law facilitates community forestry management through a management program, or in other words, the collective management of common property: forests. Mexico has been internationally recognized for this management. As in the Law on Plant Varieties, unrestricted research on traditional varieties is permitted.
This Law establishes principles and jurisdictions in the area of biosecurity, and regulates the confined use, licenses and notifications for the liberation of genetically-modified organisms. The	Modern-Western. This Law regulates the introduction of genetically-modified organisms into the country, establishing industrialized agriculture as the first challenge for the	Genetically-modified organisms are totally unknown to indigenous people and peasants, and furthermore represent a substantial modification to the risk thresholds in which they live. The use of

Law (Ley)	**Dates of creation and reforms** (Fecha de creación y reformas)	**Human rights protected** (Derechos humanos tutelados)
Regulations for Law on Biosecurity of Genetically-Modified Organisms *(Reglamento de la Ley de Bioseguridad de Organismos Genéticamente Modificados)*	19 March 2008 Reform: 06-03-2009	Rights to property, a healthy environment and health.

Description (Descripción)	**World vision** (Visión del mundo)	**Relation with Biocultural Patrimony** (Relación con el Patrimonio Biocultural)
fact that it establishes a special system for protecting maize and transgenic-free zones is significant.	Mexican State with regard to agriculture. This Law also develops that associated with the establishment of centers of origin and diversification of domesticated species in Mexico. This law establishes a system for special protection of maize and transgenic-free zones, which have been demonstrated to be empty institutions in recent history. [9]	genetically-modified organisms supposes a radical transformation of biocultural landscapes, and thus, ancestral territories. Also, centers of origin and diversification were not developed in accordance with the state of the art, and the Law totally ignores centers of use. In other words, this Law completely erases the central role played by peasants and indigenous peoples in the conservation and promotion of biocultural patrimony, and it is therefore evident that the Law infringes upon the Constitutional principles of pluriculturalism and sustainability, and places the country's biocultural patrimony at risk.
It is particularly significant that these regulations develop a Special System for Protection of Maize, which should be the legal framework for conserving and promoting native maize, but it is not. As well, transgenic-free zones, as an institution, have turned out to be completely useless in achieving the proposed aim.	Modern-Western	Disregards the spiritual and material meaning associated with maize.

We can see in the Table above that Mexico's current legal framework for regulating agriculture is constructed on the basis of Modern-Western logic and expressed from the viewpoint of private property. A productive, mercantilist vision of nature prevails, and while some important aspects of the Mesoamerican logic are recognized in the legislation, it has not received sufficient recognition, development and protection. This suggests that cultural control of the important natural resources that indigenous peoples and peasants have traditionally managed has been transferred to modern actors who are unfamiliar with or undervalue traditional agriculture. The result has been discrimination against traditional knowledge and the replacement-destruction of Mexico's biocultural patrimony. In other words, the principle of pluriculturalism has not been duly or progressively developed in Mexican legislation, and consequently, the country's hegemonic culture controls, to a significant degree, the design of Mexican agriculture and the country's indigenous peoples and peasants.

Therefore, in order to conserve Mexico's biocultural patrimony and obtain respect for the human rights of indigenous peoples and peasants, it is necessary to modify and develop this legal

There are recognizable causes of the national syndrome of deterioration [...]. One, very crucial, is the Mexican government's error in excluding small-scale agriculture from its development programs. This error has been repeated unreflectingly over the last 30 years.

Antonio Turrent, in OXFAM, 2013.

9 Véase Martínez Esponda, Francisco Xavier (2014). Defensa del patrimonio biocultural de México: el caso del maíz nativo de la región totonaca de Veracruz, Tesis para obtener el grado de Maestro en Ecología Tropical. Universidad Veracruzana. Centro de Investigaciones Tropicales Xalapa, México, y Matos Paul Antoine, La Jornada Maya (2016) Decretan en Yucatán dos zonas libres de transgénicos, disponible en http://www.jornada.unam.mx/ultimas/2016/10/28/se-decretan-en-yucatan-dos-zonas-libres-de-transgenicos

framework with the aim of establishing a new balance between the current actors in rural Mexico.

7.2 Analysis of public policy on agriculture

Generally speaking, the study of public policies is focused on what governments do, why they do it, and the consequences (Dye, 1976 in Parsons, 2007). In our country these policies are sometimes misunderstood as simply the implementation of government programs, but they are actually much more than that. Aguilar Villanueva (1996) points to an entire process of resolving public problems in which the problem is sometimes the way in which the problem is defined. When there is a lack of consensus on the issues that policies are intended to resolve, it is more difficult to implement effective policies.

Public policies constitute a substantive aspect of democratic regimes, and human rights are themselves a form of conducting public policy (Ferrajoli, 2010). In order to be effective, public policies require government action in a plural environment characterized by diverse interests, given that problems are also plural and diverse, in line with people's interests and assessments. It is thus necessary to construct open, systematic processes of deliberation in order to reach consensus on problems that must be confronted and the way to do so, in order to then define the public policies to be developed (Arellano Gault & Blanco, 2013).

This work requires joint action by those who govern and those governed. An informed, active and participative citizenry is a distinctive component of public policies in a democracy. Such policies should include mechanisms for participation in equal conditions, to determine the problems to be addressed, to define and design the policies to adopt, to be informed of their implementation, and finally, to evaluate the results (Arellano

Gault & Blanco, 2013).

All the problems considered to be public in nature should be included in what is referred to as the public agenda. In our country this agenda is the National Development Plan. Based on the National Development Plan for 2013-2018, a broad range of sector-based programs has been created for the agricultural sector.[10] These public programs implemented by the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (*Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación*—SAGARPA) as well as by other government departments such as the Secretariat of Social Development (*Secretaría de Desarrollo Social*—SEDESOL) and the Secretariat of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*—SEMARNAT), plus other government departments at the state and municipal levels, constitute the government actions that, in line with the logic of a democratic system, should specify agreement on problems to be confronted and the ways to do so.

In the case of agricultural programs in our country, theory dictates that they should comply with the following scheme: i) they are to be designed on the basis of needs in rural areas and needs of the various actors such as producers, organizations and government departments, detected by way of annual diagnostic assessments; ii) a decision is then made whether to initiate a strategic program or a public program with its respective "Rules of Operation," which establish its general objectives, target population, contribution to national goals and objectives, activities, implementation period, and budget; and iii) lastly, programs are evaluated to determine whether the objectives for which they were created and the goals established were achieved.

10 Los Programas Sectoriales que tienen incidencia en el campo son: Programa Sectorial de Desarrollo Agrario, Territorial y Urbano 2013-2018; Programa Sectorial de Desarrollo Agropecuario, Pesquero y Alimentario 2013-2018; Programa Sectorial de Desarrollo Social 2013-2018; y Programa Sectorial de Medio Ambiente y Recursos Naturales 2013-2018.

According to the most recent evaluations of programs addressing rural areas, a problem of food insecurity has been detected, since:

> a) agricultural production by women and older adults in rural and peri-urban areas, and in backyards, is low; b) negative effects from natural disasters in Rural Economic Units (REUs) are high; c) organization of REUs is weak; d) investment, infrastructure and furnishings in arid areas are low; e) development of value chains is low; f) technical capacities of REUs are low; g) internal dynamics, training and operations of social organizations are weak; h) soil and water are not used in a sustainable manner; i) traditional agriculture is practiced in an unsustainable manner; j) agricultural, aquaculture and fisheries production of people in rural localities characterized by high and very high marginalization is low; and k) availability and access to food in rural localities of high and very high marginalization are low (CONEVAL, 2015).

Based on the above, government departments argue that the aim of programs addressing rural areas is to contribute to overcoming the problem of food insecurity (definition of problem), detected in a high percentage of the country's rural population and also in peri-urban areas. This is to be accomplished through sustainable food production, and this is the way that government authorities plan to assist people living in conditions of high levels of poverty and extreme poverty.

Based on these premises, SAGARPA viewed it as necessary to design and implement a strategic program entitled the Sustainable Modernization of Traditional Agriculture (*Modernización Sustentable de la Agricultura Tradicional*—MasAgro). In the following section we will analyze the relevance of this program and its congruence with the logical framework explained in the previous pages.

VIII. The case of the Sustainable Modernization of Traditional Agricultural (MasAgro) program

8.1 General characteristics

The Sustainable Modernization of Traditional Agriculture (*Programa Modernización Sustentable de la Agricultura Tradicional*—MasAgro) program was created through a collaborative agreement between the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (*Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación*—SAGARPA) and the International Center for Improvement of Maize and Wheat (*Centro Internacional de Mejoramiento de Maíz y Trigo*—CIMMYT) on October 15, 2010 (SAGARPA, 2010). Unlike Mexico's other public policy programs in agriculture, MasAgro was designed as a transversal project not limited to a particular presidential term (its duration is scheduled for ten years). Also, it does not have "Rules of Operation",[11] published

11 The Rules of Operation for any public program in Mexico contain minimally the following information: general and specific objectives, target population, program's contribution to national goals and strategies, activities, implementation period and budget.

annually in the Official Gazette of the Federation (Diario Oficial de la Federacion—DOF) as other public programs. MasAgro was one of the components of the Integral Rural Development Program (*Programa Integral de Desarrollo Rural*—PIDER) only during 2014 and 2015.

According to the agreement between SAGARPA and CIMMYT, these two institutions committed to cooperating, through joint programs, in the areas of scientific, agronomic and socioeconomic technology and innovation in relation to maize and wheat. Initially, the joint programs were conducted on the following topics: (i) Sustainable Development with Farmers; (ii) Discovering the Genetic Diversity of Seeds; (iii) International Strategy for Increasing Maize Yields; (iv) International Strategy for Increasing Wheat Yields; (v) Training for specialists and producers in agricultural sector development; (vi) Exchanging information on topics of mutual interest; (vii) Exchanging information among national specialists and experts in the scientific community, regarding maize and wheat crops; and (viii) any other topic agreed upon by the parties (SAGARPA, 2010).

The agreement specifies that SAGARPA will contribute the necessary financial resources for carrying out the projects, and to the degree possible, will facilitate physical installations and logistical support. Thus, this Secretariat has the responsibility to supervise and oversee the implementation of all the projects. CIMMYT, for its part, is responsible for administering the resources for achieving the project's objectives.

For the purpose of carrying out the specific projects, SAGARPA and CIMMYT formulate annual Technical Annexes to the collaborative agreement, specifying the type of cooperation from the various participating entities, the activities to be carried out, the purposes, goals, financial resources, indicators, implementation schedule, implementation mechanisms, evaluation mechanisms, expected outcomes, operational participation by collaborators,

and other conditions.

The program's general objective is "to strengthen food security by way of research, capacity-building, and transfer of technology to rural areas, and that small and medium-scale maize and wheat producers located in seasonal agricultural areas obtain high, stable yields, increase their income and mitigate the effects of climate change in Mexico," (SAGARPA, 2010).

This program is being developed as a hub or node of innovation, which is defined here as an area with agroecological conditions for engaging in a production system in which technologies classified as sustainable by CIMMYT are conducted, disseminated and improved, through the work of technicians, scientists, universities, private enterprise, communication media, government functionaries, and others.

Figure 2. Map of hubs in Mexico.

Source: CIMMYT, 2016b.

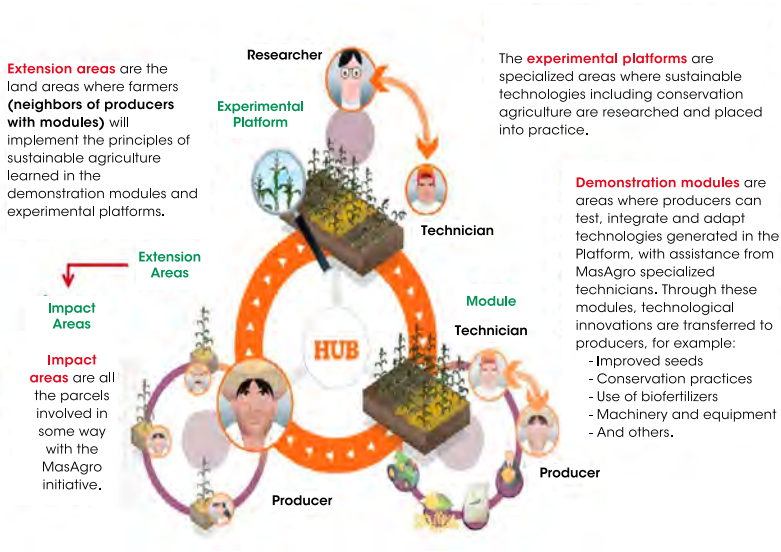
Within the hub, there are experimental platforms, which are specialized areas in which sustainable technologies, primarily conservation agriculture, are researched and tested (SAGARPA, 2016a).

Figure 3. Map of experimental platforms in 2016.

Source: CIMMYT, 2016b.

There are modules in these platforms in which producers can test, integrate and adapt the technologies generated in the Platform, with assistance from MasAgro's specialized technicians. The objective is to transfer technological innovation to producers, including improved seeds, conservation practices, and the use of biofertilizers and new machinery useful for the conditions specific to conservation agriculture. The information generated will then be transferred to other producers in the extension areas, that is, with the neighbors of producers who learned from the demonstration modules and experimental platforms (SAGARPA, 2016a).

Figure 4: Structure of a MasAgro HUB.



Source: SAGARPA, 2016a.

CIMMYT, as the entity responsible for operating the program, has reached collaborative agreements with State governments, specifically with their departments responsible for agricultural development. These agreements are focused on collaborating in developing and scientifically validating technological innovations such as seeds, water conservation, efficient management of fertilizers, and post-harvest technology (SAGARPA, 2016a).

Official information states that the projects carried out by CIMMYT and financed by SAGARPA since 2011 have been focused within four lines of action: a) Sustainable Development with Farmers), b) Discovering the Genetic Diversity of Seeds, c) International Strategy for Increasing Maize Yields, and d) International Strategy for Increasing Wheat Yields. The following budget has been disbursed:

Tabla 4. Presupuesto anual total y por línea de acción.

Year	Total amount (USD)	Lines of action			
		Sustainable Development with Farmers	Discovering Genetic Diversity of Seeds	International Strategy for Increasing Maize Yields	International Strategy for Increasing Wheat Yields
2011	$20,301,500	$3,325,000	$9,756,500	$6,270,000	$950,000
2012	$28,787,878.80	$10,303,828.30	$9,756,500	$7,627,550.50	$1,100,000
2013	$380,000,000	$136,010,533.40	$128,785,800	$100,683,666.60	$14,520,000
2014	$250,000,000	$105,000,000	$75,000,000	$60,000,000	$10,000,000
2015	$285,000,000	$113,400,000	$81,000,000	$64,800,000	$25,800,000
2016	$285,000,000	$113,400,000	$81,000,000	$64,800,000	$25,800,000

Sources: SAGARPA, 2016a; SAGARPA, 2016b.

The results highlighted by SAGARPA and CIMMYT include the program's quantitative scope, especially underscoring that it was operating in 592 municipalities in 30 Mexican states in 2015, with a focus on increasing seasonal maize productivity. Most of these municipalities are classified as having some degree of marginalization, and are included in the National Crusade against Hunger program.

In the "Sustainable Development with Farmers" line of action, 50 platforms and 243 modules are operating; 294 technicians have been certified; and 36,000 people have entered information in *MasAgro's Bitácora Electrónica* (Electronic Logbook).

For the International Strategy for Increasing Maize Yields, a total of 23 new hybrids were registered in the MasAgro Network, and 56.060 kg of pre-commercial seed and 11,800 kg de basic seed were delivered. Regarding results from the International Strategy for Increasing Wheat Yields, CIMMYT has reported that it launched this International Alliance with 750 people from 68

countries. Also, 2,500 wheat lines were characterized.

Lastly, the results from Discovering Genetic Diversity of Seeds include the generation of 6,800 genomic profiles of maize and 7,000 of wheat, as well as the identification of 128 drought-resistant maize lines.

The results presented in this section are those that SAGARPA and CIMMYT consider to be their most important achievements during the six years the program has been operating. However, they do not mention if the overall objective has been achieved or if it is in the process of being achieved, and even less is mentioned as to whether the program reflects a public policy that is culturally and environmentally suitable for Mexico's peasants and indigenous peoples.

Before presenting an analysis and critique of the MasAgro program, it is important to dedicate a few paragraphs to addressing the composition of Mexico's agricultural sector and the importance of family farming.

In 2010, there were 32.4 million Mexicans inhabiting communities with less than 5,000 inhabitants, and 10.3 million of them were indigenous (INEGI, 2010). This population manages 4,069,938 rural production units on 108.3 million hectares, cultivating 280 annual crops and 199 perennial crops (INEGI, 2007). Of these units, 68% consist of five hectares or less. Also worth including here is that the number of small production units increased from 332,000 to over 2.7 million in the period from 1930 to 2007, signifying a 709% increase.

Also important to mention is that 73% of the country's producers have less than five hectares of land for their operations, indicating that small-scale agriculture dominates and characterizes this sector (Robles, 2007). Generally, the land is suitable for seasonal agriculture (72%, according to INEGI, 2011), 62% is located on slopes with more than a 4% incline, and 63% is land characterized by shallow soil, with less than a meter depth (Tur-

rent *et al.*, 2014a).

Despite these limitations, small-scale producers (>5 ha) are those who produce 73.4% of the country's yellow maize, 70.5% of its white maize (of which 50% is planted with native races), and 60.6% of the country's bean production. Furthermore, these small-scale producers generate 63.4% of agricultural jobs, 73.1% of family jobs and 56.8% of work for hired hands (INEGI, 2007; Robles, 2007).

Since many national agricultural policies determine the amount of agricultural assistance and subsidies according to the amount of land area worked, we can assume that large-scale producers will obtain more of this type of income per capita than small and medium-scale producers. Along these lines, Robles (2007) points that large-scale producers with an average of 27.6 hectares receive 100,000 Mexican pesos annually from public programs for agriculture, while small and medium-scale producers with an average of 10.8 hectares receive only 19,000 pesos.

8.2 Analysis of production model proposed by MasAgro

Generally speaking, the world's agriculture shifts between two opposing production models. First of all, there is a tendency toward systems that are more technical, mechanized, dependent on synthetic inputs (primarily derived from petroleum), homogenous, corporatized, privatized and oriented toward the production of commodities. This tendency began in the 19th century and accelerated dramatically after the Second World War, with the so-called "Green Revolution" (Vandermeer & Perfecto, 2013).

Secondly, we have a set of traditional systems (originating at the beginning of civilizations) resulting from the co-evolution between social and ecological systems at the sites where they have

developed. These systems are adapted to local climate and soil conditions, with little or no dependence on external inputs, based on local knowledge, highly biodiverse and oriented toward the production of food and cultural use-values specific to the cosmovision of the peoples sustaining them (Altieri, 1999; Gliessman, 2002; Chappell *et al.*, 2013).

While industrial agriculture has increased the yields of certain crops, it has numerous negative impacts, particularly: (i) loss of agrobiodiversity; (ii) environmental degradation; (iii) erosion of traditional agricultural knowledge; (iv) increase in rural migration due to the relative loss in peasant productivity and the proletarianization of farmers; (v) loss of communities' autonomy to make decisions regarding the use of their territories, resources and food, that is, the dispossession of cultural control over natural resources and ancestral territories; and (vi) production of food with low nutritional quality, toxic residues and minimal diversity.

Agroecology, in contrast, is based on a recognition of the importance of traditional agriculture in the development of food systems that are sustainable, socially just and culturally appropriate, and emerges from a critique of the agroindustrial production model (Sevilla & Woodgate, 2013).

8.3 Critique of MasAgro program

Based on the characteristics of Mexico's agricultural sector and in light of the logical framework proposed, we will analyze and critique the MasAgro program in this section.

8.3.1 Use of suitable varieties of maize, wheat and associated crops

The varieties determined by CIMMYT to be suitable and then dis-

tributed to producers through the *MasAgro Productor* (Producer) component are those produced or identified by the MasAgro Diversidad (Diversity) component (Discovering the genetic diversity of seeds), which since the end of 2012, is under the leadership of the Genetic Analysis Service for Agriculture (*Servicio de Análisis Genético para la Agricultura*—SAGA) at the National Center for Genetic Resources (Centro Nacional de Recursos Genéticos—CNRG) (CIMMYT, 2015a). The process of generating improved varieties promoted by MasAgro is based on the genetic and agricultural characteristics of new additions to the germplasm banks operated by CIMMYT and the National Institute of Forestry, Agricultural and Fisheries Research (*Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias*—INIFAP). The aim is to identify high-performance characteristics and tolerance to adverse environmental conditions (heat, drought) as well as pests and diseases. When these lines have been identified, the generation of improved varieties is carried out through hybridization and breeding (to include hybrids, synthetic varieties and free-pollination varieties, for example), as defined by Chassaigne and Torres (2014).

> The success of this program would signify increased aggression against diversity and the loss of native varieties indispensable to confronting climate change.
>
> Dr. Alejandro Espinosa
> INIFAP-UNAM-UCCS, personal communication, 2016

The improved maize varieties developed by MasAgro are available for producers through the Collaborative Network of Hybrids Evaluation (Red Colaborativa de Evaluación de Híbridos) in the MasAgro Maíz (Maize) component, composed of 50 national, public seed companies (CIMMYT, 2015a), and through a collaborative agreement with the Mexican Seeds Association

(Asociación Mexicana de Semilleros—AMSAC), composed of the private companies that control 88% of the national seed trade, including Monsanto, Syngenta Agro and Dupont-Pioneer.

One of the explicit objectives of MasAgro's Maize component is to strengthen the national seed industry by suppling basic and pre-commercial seeds to companies associated with the program. Because the program is public, the hybrids generated from the seeds are independent from CIMMYT and can be sold and promoted in local and national markets (Chassaigne, 2015). In this way MasAgro intends to increase the average yields of maize in the subsector of small-scale, seasonal production units (<5 ha) by promoting the adoption of improved varieties (hybrids) and increasing the amount of land where these varieties are cultivated from 1.5 to 3 Mha.

If MasAgro is successful in this objective, it will signify the displacement of between 25 and 50% of the land on which native maize is currently planted, clearly endangering the diversity of this crop throughout national territory (Turrent *et al.*, 2014). This will constitute critical damage, given that Mexico is the center of origin and diversification for this grain (Doebley *et al.*, 1987; Matsuoka *et al.*, 2002; Ureta *et al.*, 2013).

The displacement of native varieties may also have negative consequences for productivity, since these varieties have been traditionally cultivated on lands with low productivity or considered marginal. Specifically, these lands may be characterized by limited soil depth, or they may have extremely limited rainfall, leading to a high drought risk. Native varieties have adapted to these difficult soil and agro-climatic conditions, while improved varieties perform poorly in areas like those described, due to their high demand for water and nutrients (Turrent, 2012). There is no doubt that a displacement of this type would have negative consequences for productivity.

MasAgro's proposal to introduce improved maize varieties

through seed companies as a way to resolve low productivity in production units with less than 5 hectares is not congruent with the historic adoption of this type of technology in Mexico. Espinosa *et al.* (2009) states that by 1963 INIFAP had released over 200 improved maize varieties adapted to local agro-climatic conditions in Mexico. However, the adoption never surpassed 30% over a three-decade period, suggesting that the maximum threshold for adoption of improved varieties had been reached (Turrent *et al.*, 2014).

The reasons suggested by Turrent *et al.* (2014) to possibly explain the low level of adoption is that small-scale producers: 1) experience more risks than expected benefits from adopting new technologies; 2) the quality of the improved varieties is generally unacceptable for their traditional family consumption; and 3) they have minimal capital available and no access to credit. Guillén-Pérez *et al.* (2002) attribute resistance to the use of improved varieties to the fact that peasants receive benefits from planting native maize that extend beyond a matter of yields.

The connection between generating improved hybrid seeds and the national and international seed industry is questionable since, as we have pointed out, MasAgro's target population consists of farmers with small production units (<5 ha). Given their economic conditions, these farmers will be unlikely to adopt improved hybrid seeds since the input/product price relationship is implicitly left to the market (CIMMYT, 2014a). In addition it is known that hybrids lose their vigor in the second and subsequent generations, making it necessary for farmers to buy new seeds each year indefinitely (Berlan & Lewontin, 1986; Japhether *et al.*, 2006; Espinosa-Calderón *et al.*, 2012), and to absorb additional costs of necessary inputs for their maintenance and machinery for their management.

Initially, MasAgro was proposed specifically as a program that promised to resolve the production deficit observed in the

seasonal agriculture sector with production units having less than 5 hectares or between 5 and 20 hectares (Turrent *et al.*, 2014). Currently, however, it is also promoting its technological developments (such as hybrid seeds and the adoption of conservation agriculture) in the medium and large-scale entrepreneur sector with irrigation systems (CIMMYT, 2014a). This may be due to the resistance in the seasonal sector to adopting these new technologies. However, it is still questionable since the initial agreement between SAGARPA and CIMMYT was to focus on production units with a nearly 50% production deficit (seasonal, with <5 ha) (Turrent, 2008; FAO *et al.*, 2012), and changing and expanding the target population does not improve prospects for increased production, since medium and large-scale producers with irrigation systems have already reached nearly 90% of their productive potential (Turrent, 2008).

CIMMYT claims that the use of its improved seeds has led to an average 20% increase in productivity per hectare of maize in comparison with local yields (CIMMYT, 2015a). However, it does not provide information regarding the conditions in which its testing was conducted, which is important given the expansion of its target population to large-scale producers, and given that most studies in which yield increases are noted have been conducted in favorable conditions that differ from those in small-scale seasonal agriculture (Turrent, 2012).

CIMMYT also claims that the national seed market has been strengthened through the consolidation of national seed companies. However, the MasAgro initiative has generated few new companies, and rather, has only signed collaborative agreements with private companies (AMSAC) and with already-existing national companies established as an initiative of INIFAP researchers in response to budget cuts, the dismantling of PRONASE, and the need to commercialize and distribute to small-scale producers the improved, yield-proven maize varieties produced with

public resources from INIFAP. Thus, MasAgro's achievements are questionable, as they represent SAGARPA's subordination and assigning of responsibility to CIMMYT, through MasAgro, in relation to activities associated with seed production and commercialization, despite INIFAP's capacities and actions spanning the last 70 years.

What is presented in this section refers to a public program that directly impacts one of the most important cultural elements for Mexico's indigenous peoples and peasants: maize. As already mentioned, MasAgro is focused primarily on operating in areas where seasonal agriculture is practiced, and this is very significant because these coincide with indigenous and peasant territories (Barkin, 2003). In other words, there is an overlap between a number of MasAgro hubs and peasant and indigenous territories.

It is important to emphasize the fact that MasAgro can displace native maize varieties, and thus trigger a significant impact for indigenous peoples' traditional ways of being and existing. According to Article 6 of ILO Convention 169, SAGARPA is required to consult with the indigenous people and peasants in the areas where MasAgro operates, given that such an action would represent an administrative measure that could directly affect them. And, we will repeat once again: this did not take place.

The next map illustrates the overlapping of regions where indigenous peoples reside in Mexico and the locations where MasAgro is being implemented:

Figure 5: MasAgro experimental platforms and indigenous regions

Source: Developed by authors with data from Boege, 2008, El patrimonio biocultural de los pueblos indígenas de México, INAH, CDI, Mexico; and SAGARPA, CIMMYT, 2015, Plataformas Experimentales, Mexico.

Now then, considering that maize "is the most diverse agricultural species, and a significant portion of Mexican territory forms part of its center of origin, and is one of its current centers of diversity" (CONABIO, 2006), and considering that in-situ conservation is required for its preservation, the state of Oaxaca is of particular interest in the case we are studying here, given that it is the Mexican state with the largest indigenous population and where native maize species are planted on 90% of the land dedicated to maize production (Moreno *et al.*, 2013). For this reason we

have prepared three maps of Oaxaca that illustrate the overlap between the MasAgro program and first, indigenous peoples, secondly, the country's land ownership, and thirdly, agricultural systems with irrigation, to allow readers to graphically observe the clear coincidences.

If the program is successful, native seeds will be displaced and peasants would have to buy inputs and seeds [...] soil would lose its fertility due to the monoculture system.

Representatives of the Vicente Guerrero Integral Rural Development project, personal communication, 2016

In some regions of Tlaxcala, [...] there are small demonstration plots on less than a fourth of a hectare, where the main actor is the extension worker or the technician, and you don't see participation by peasant farmers, because their experience is downplayed.

Representatives of the Vicente Guerrero Integral Rural Development project, personal communication, 2016

> MasAgro is attempting to impose the green revolution model, which constitutes the suppression/downgrading of the ancestral knowledge and practices of peasants and indigenous people.
>
> Víctor Suárez,ANEC, personal communication, 2016

Figura 6: MasAgro y pueblos indígenas en Oaxaca

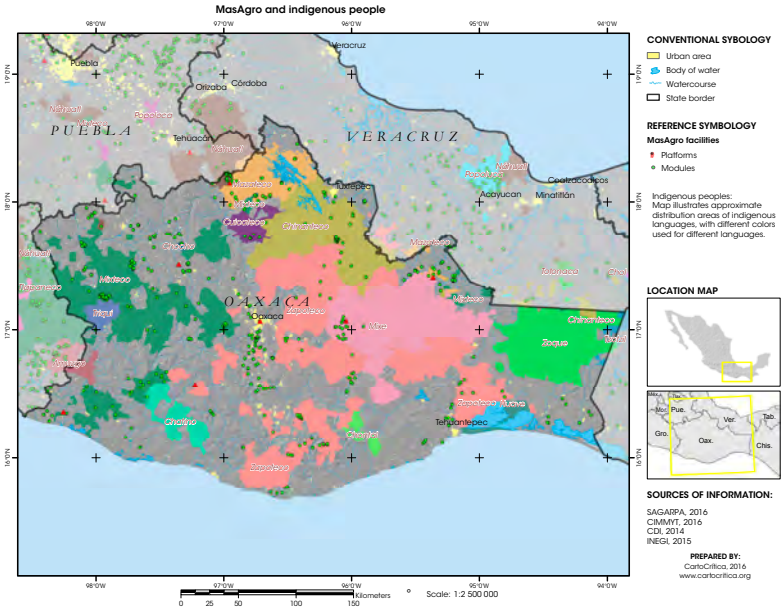


Figure 7: MasAgro and land ownership in Oaxaca

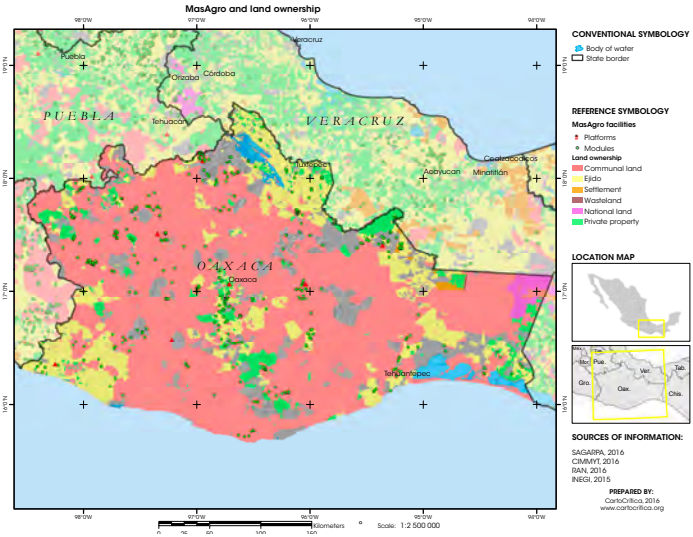
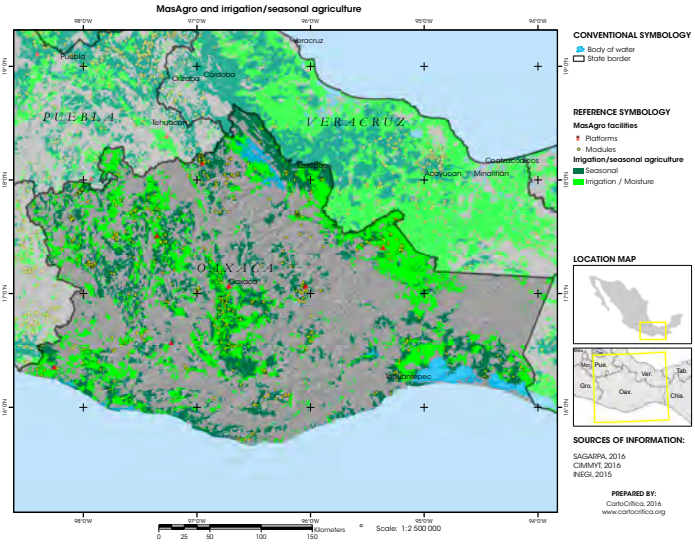


Figure 8: MasAgro and irrigation/seasonal agriculture



8.3.2 MasAgro's extensionist approach

> MasAgro teaches how to transfer packages, with more elements, but a package like those in the green revolution.
>
> Dr. Antonio Turrent, INIFAP-UCCS, personal communication, 2016

One of the aspects that makes MasAgro different from other programs previously implemented in Mexico is that it follows an extension or "innovation network" model organized around primary nodes or hubs (CIMMYT, 2014a). This scheme proposes a flow of information from an experimental platform toward technical modules, and from there to extension areas. While the scheme proposes a bidirectional exchange of information between these components of the extension model, we can see that the diagrams and activities described for each of the components make it clear that the main focus is on the role of *Formador MasAgro* and its technicians. Information, resources and experience are concentrated in this component and its technicians, and in the best of cases, are extended or disseminated to the producers associated with each hub, through demonstration plots and training workshops and courses (CIMMYT, 2014a).

This scheme is certainly more inclusive than other extension models that do not include opportunities such as workshops or demonstration plots where producers can practice and compare MasAgro technologies with other production systems. Nevertheless, MasAgro technologies emerge from and are developed in experimental platforms in which only researchers and technicians participate, with perhaps some feedback received from observations in modules and extension areas. The main actors and those possessing scientific and local experience and knowledge in the MasAgro extension model are the technicians and trainers, not peasant farmers. Consequently, this network is not truly

a distributive system in which information and knowledge are generated and exchanged horizontally and collectively between producers and other actors.

As demonstrated in diverse areas of research, a distributive, horizontal, collective system would be much more resilient in the case of events such as environmental changes or catastrophes, the hubs' disappearance, or the absence of technicians and trainers (Anderies *et al.*, 2004; Marin & Wellman, 2011). Also, the MasAgro extension model does not acknowledge or create links with community institutions, such as assemblies or *tequio* systems (collective work for the community's benefit). Nor does it coordinate with local seed exchange networks, which have generated agrobiodiversity adapted to a great diversity of environmental conditions, with the potential to respond to anticipated climate change scenarios (Boege, 2008; Mercer *et al.*, 2010; Ruiz *et al.*, 2013; Ureta *et al.*, 2012, 2013). In short, the MasAgro program disregards and even hinders social reproduction of the cultural component of the biocultural patrimony associated with Mexico's peasant and indigenous communities.

As mentioned earlier, community institutions are vital to the reproduction of indigenous and peasant life, including food sovereignty and the generation and conservation of agrobiodiversity. According to Marielle (2008), "The key to sustainable management of territories and their resources [including agriculture] lies in communities' organizational and self-regulatory capacities, which depend on the strength of their own institutions and mechanisms for convoking efforts and resolving conflicts." Therefore, an approach focused on peasants without involving their community institutions (as proposed in the MasAgro program) is not only vertical in nature and not very democratic, but it is also inefficient in terms of communities' self-sustainable development.

Furthermore, peasants have their own forms of researching, experimenting and sharing knowledge. While these forms may

currently be limited in scope, they run deep in relation to their own planting systems, and they are nourished by traditional knowledge passed from one generation to another (Richards, 1985; Wilken, 1987; Grossman, 2003; Toledo & Barrera-Bassols, 2008). Peasants and indigenous peoples also have their own systems for exchanging knowledge. A peasant who experiments with a new crop and finds that it functions satisfactorily—resistant to pests, for example, or providing good yields—will share this with other peasants when they happen to meet in a public space, for example, at a local market (Vandermeer & Perfecto, 2013).

Agroecology is a science based on principles of knowledge construction not considered in conventional agricultural science. Agroecology is transdisciplinary, or in other words, it defines, addresses and seeks solutions to problems in reality without a specific discipline determining the path taken. This implies epistemic pluralism, with knowledge construction based on a dialogue of knowledges among various specialists, but with peasants and their traditional knowledge at the center, both instrumentally (in agricultural management) and espistemically (forms of peasant and indigenous knowledge) (Ruíz-Rosado, 2006; Floriani & Floriani, 2010).

The *MasAgro Productor* (Producer) component of the MasAgro program ignores the dialogue of knowledges and refers to centers of research, development, adaptation and "extension" of technologies, or the so-called hubs (CIMMYT, 2015a). The term "extension," according to Freire, involves "attempts to make them [peasants] change their knowledges associated with their action in reality, for others that are those of the extensionist" (Freire, 1973). Extensionists, assuming their knowledge to be the truth, "extend" and "deposit" such knowledge in farmers, thus transforming themselves into the subjects of the process, disregarding the horizontal dialogue that would emerge from each peasant's particular conditions.

The MasAgro extension model contrasts with experiences in Latin America and the rest of the world in which peasants are the main actors in production networks, the creation of knowledge and the exchanging of experiences. One of the experiences that has become a point of reference around the world is the "peasant to peasant" experience, which has very important antecedents in Mexico. It is based on the notion that farmers are the experimenters and they exchange their knowledge by way of direct dialogue and pedagogy based on examples (Holt-Giménez, 2006; Rosset *et al.*, 2011). This methodology facilitates social self-organization toward distributive, resilient systems for managing and creating resources and knowledge, and challenging political and economic programs and interests that impede farmers from access to the design and development of agri-food strategies at community, regional or national scales, or in other words, to transition toward food sovereignty.

Mexico, as a pluricultural, guarantist State, has adopted a series of international conventions that establish the standard of minimum protection for the rights of indigenous peoples and peasants. Concretely, traditional knowledge, traditionally-managed natural resources and community forms of work are protected by the Constitution, by ILO Convention 169 and the Convention on Biological Diversity. In the case we are studying here, our analysis on this point reveals, first of all, the undue risk that MasAgro has caused for traditional knowledge and traditionally-managed natural resources—and this cannot and should not be tolerated. Secondly is the omission of the State's responsibility to "respect the special relationship that members of indigenous and tribal peoples have with their territory in a way that guarantees their social, cultural and economic survival" (IACHR, 2009). We cannot yet identify where one might find special measures that permit indigenous peoples and peasants to thrive, together with the conservation of traditional knowledge and traditionally-managed natural resources.

8.3.3 Modernization of traditional agriculture

There is no recognition or appreciation or respect for the agricultural knowledges and practices of indigenous peoples and communities that have, for more than 8,000 years, enabled the continuous generation, safeguarding and diversification of the country's native agrodiversity.

Víctor Suárez, ANEC, personal communication, 2016

MasAgro's name is violent in nature. The word "modernization" is heavily charged and directly linked to assimilation processes, as laid out in Section 5 of this document, in which we cited Santos (2009). Thus, from its very name, MasAgro reveals the paradigm and the logic on which it is founded, specifically the modern Western way of being and existing, with traditional agriculture as the object of colonization. The question to pose to SAGARPA and CIMMYT is the following: why is it necessary to modernize traditional agriculture if, as already proven, it is what has generated and continues to generate a significant part of Mexico's biocultural patrimony, and is what constitutes one of the most significant cultural elements of indigenous and peasant identities, while making the largest contribution to food for Mexicans?

Modernization supposes a type of cultural assimilation and exclusion of peasants and indigenous peoples and their ways of practicing agriculture, by considering them pre-modern and backward. Of course, this position is not congruent with a dialogue of knowledges or a pluricultural State, and even less so with respect for the human rights of indigenous peoples and peasants to free determination, free, prior, informed consent, cultural identity, territory and access to traditionally-managed natural resources

(Olivé, 1991; ONU 2010; CEMDA, undated).

In the MasAgro program, the logic of cultural assimilation by way of so-called modernization is evident in basically three aspects: i) the lack of recognition and consideration for the biocultural processes that have permitted the emergence and evolution of the agrobiodiversity found in Mexico and the detachment of this agrobiodiversity from the peoples who have generated it; ii) the extension model and the concentration of resources in CIMMYT and of information through the MasAgro innovation network; and iii) the fact that this program is oriented primarily toward peasant farmers (many of them indigenous) and they have not been guaranteed their right to free, prior, informed consent.

In a guarantist State like Mexico, all acts of authority should originate from and be directed toward human rights. In addition the principle of pluriculturalism further requires acts of authority to permit and/or encourage indigenous peoples and comparable communities to thrive (the right to difference). Specifically, according to the Inter-American Court of Human Rights (IACHR), "the preservation of the particular connection between indigenous communities and their lands and resources is linked to the very existence of these peoples and therefore deserves special protection measures" (IACHR, 2009).

It is therefore necessary to consider whether MasAgro constitutes an appropriate, special means of protection for the rights of indigenous peoples and peasants. What has been presented thus far demonstrates the existence of an act of authority (MasAgro's implementation) that violates the rights of indigenous peoples and peasants. It is thus unreasonable that the profound relationship between peoples and maize is ignored in a State governed by the rule of law. In fact all government activity in a guarantist State must be directed toward eliminating all forms of cultural violence (physical, structural and symbolic, for example). In the case studied here, when MasAgro places native maize at risk, it

is establishing itself as a form of structural and symbolic violence that cannot and must not be tolerated.

Along these lines, it is vitally important to the construction of long-lasting processes of peace and the endogenous development of communities that when authorities formulate their public policies, that they guarantee the existence of extensive opportunities for access to information and effective mechanisms for participation, that will permit a reassessment of traditional knowledges, community institutions and local gastronomy.

In our opinion, by not guaranteeing the right to consultation and by not implementing all the appropriate measures for protecting native maize and the cultural identities associated with it, SAGARPA and CIMMYT infringed upon the fundamental rights to autonomy, access to information, participation in decision-making, and the cultural identity of indigenous peoples and comparable communities.

8.3.4 MasAgro's cultural relevance

In the official information obtained through transparency requirements, there is no indication that the MasAgro program was developed through dialogue and consultation with indigenous peoples, peasants and/or their authorities. This is very significant because, as mentioned in the logical framework section of this report, Mexico is a pluricultural State, and according to Article 2 of the Constitution and Article 6 of ILO Convention 169, these populations must be consulted regarding all legislative and/or administrative measures that may affect them. In this case, a government program with a direct impact on the most important Mesoamerican crop, symbolically and nutritionally speaking, was designed and implemented without allowing for direct participation by those safeguarding this indispensable element for Mexico's biocultural patrimony.

> I doubt they are considering traditional knowledges as a means for the reappropriation of these ancestral practices with today's peasants. Nevertheless, based on what I have read, I believe this research platform has attempted to extract knowledges from peasant communities that are the foundation for genetic maize resources.
>
> Leonardo Durán, personal communication, 2016

From our analysis of MasAgro, and as already presented here, it is clearly evident that this program does not correspond to the target population's way of being and existing. Concretely, it disregards this population's cosmovision, its traditional knowledge, agroecological practices (production systems), decision-making mechanisms, needs and wishes.

Illustrative of this finding is the fact that MasAgro's implementation and transfer of a predetermined package of technologies occurs from top down, instead of developing participative mechanisms with peasant communities and indigenous peoples for making decisions regarding technology, research and forms of communication. According to Altieri and Nicholls, (2000), "given the heterogeneity of natural ecosystems and agricultural systems, as well as the differentiated nature of Latin America's rural poverty, it is clear that a single type of intervention is insufficient; solutions must be designed in line with communities' needs and aspirations...".

De Schutter (2011) states the following in his Report to the UN on the Right to Food: "The participation of groups with food insecurity in the development and implementation of policies that will most affect them is also an essential dimension of the right to food."

The nature of MasAgro's "technological package" does not permit the flexibility necessary to adapt to the diverse conditions in

traditional agriculture. It is limited to the extension of technologies developed in international centers and foreign seed companies. In this regard Altieri and Nicholls (2000) have commented that technological packages "are homogenous, not adaptable to peasant heterogeneity, and only function in conditions similar to those in industrialized countries and those in experimental stations."

> MasAgro does not contribute to food sovereignty. We have had the opportunity to visit their experimental parcels in some communities in the state of Tlaxcala. We did not find any quelites or edible plants that families can use in their diet. From our experience, maize should be diversified with beans, squash, habas (fava beans), or accompanied by the components of the *milpa* system, and in this way contribute to food sovereignty.
>
> Vicente Representatives of the Vicente Guerrero Integral Rural Development project, personal communication, 2016

This ignores the local generation of technologies and intensifies dependence in peasant agricultural production on external inputs not suitable to local needs and whose market prices cannot be controlled by users, increasing the vulnerability of this sector.

Altieri and Nicholls (2000) also state that "Technological change [referring to conventional agriculture] primarily benefits the production of commercial and export agricultural commodities, mostly produced in the sector with large land plots, only marginally impacting the productivity of food products, which are largely grown by the peasant sector." This statement is relevant since the MasAgro model is oriented precisely toward increasing the production of crops important in agroindustry such as maize

and wheat, and is not aimed toward assuring the production of the various crops included in the peasant diet.

According to De Schutter (2011), "The multiplying effects [of rural development] are significantly higher when the mechanism for activating growth is an increase in the income received by small-scale producers, stimulating the demand for goods and services from those selling and providing local services."

Unlike the model of "technological packages" proposed by conventional agricultural science and which supposes a certain homogeneity in the conditions in production units, the agroecological scientific approach is based on knowledge of ecological and social dynamics that facilitate the functioning of specific ecosystems and it develops principles (not recipes, as in industrial technological transfer) for managing agroecosystems. Thus, technologies cannot be determined prior to observing conditions in a production unit, and instead, ecological and social conditions determine management strategies. Consequently, the approach proposed by MasAgro may be suitable for certain systems in certain conditions, primarily industrial systems [specific niches (Erenstein, 2002)]. But it is not suitable for the diverse peasant systems that, as stated by Wolf (1971), are focused not only on the market but primarily on the generation of goods that permit the reproduction of families and communities in specific ecological, social and cultural contexts. In short, the logic of a peasant economy is very different than that of industrial production.

Another point that demonstrates MasAgro's lack of cultural relevance lies in the fact that this program does not facilitate the reproduction of peasant logic. Specifically, given that the primary objective of traditional or peasant agriculture is to meet family and community needs, one of the primary characteristics of this production system is that it is structured by and for the conservation of agrobiodiversity (Vandermeer, 2011).

Indeed, this agrobiodiversity is multifunctional and operates

in a comprehensive manner among all the elements (Andow & Hidaka, 1989). This is the reason that Altieri and Nicholls (2000) state that "the optimal behavior of agroecosystems depends in the level of interactions between their various components (...) biodiversity can subsidize the functioning of the agroecosystem by providing ecological services such as the recycling of nutrients, biological control of pests, and water and soil conservation." In contrast the MasAgro program is focused on a few elements of the agroecosystem, and fails to address the relationship established between the elements.

It is not acceptable from the viewpoint of the indigenous and peasant way of being and existing that MasAgro is focused on increasing the productivity of one or another crop. In most polyculture systems managed by small farmers, productivity in terms of products harvested per area unit is greater than in monocultures with the same level of management (Francis, 1986). Increases in yields may range from 20 to 60% as a result of a reduction in pest damage or more efficient use of nutrients, water and solar radiation (Altieri, 2002). Consequently, a broad-based approach oriented toward the diversity of crops that maintain peasant life would be much more productive than one based on only two crops.

Another example of the omissions found in MasAgro, which will be explained below, is the fact that this program did not consider traditional uses of harvest residues, primarily as livestock feed in mixed systems. It was proposed that these residues be used instead for mulching, thus causing an imbalance in the availability of this resource.

In short, MasAgro is a public program that disregards the cultural identity of the population it seeks to benefit, calling into question whether it complies with the principle of pluriculturalism and respect for the human rights of indigenous peoples and comparable communities.

8.3.5 Conservation agriculture

The concept of Conservation Agriculture (CA) was coined by the UN Food and Agriculture Organization (FAO) in 2008, and is based on three necessary elements: i) minimal or no soil disturbance; ii) permanent organic soil cover using crop and harvest residues; and iii) diversified crop rotations.

This agricultural practice is aimed at enhancing sustainable agriculture by reducing erosion, increasing organic matter, improving the physical characteristics of the soil and the water cycle, and enriching the soil biota, as well as reducing agricultural machinery (Habblethwaite *et al.*, 1996; Steiner *et al.*, 1998; Fowler & Rochström, 2001; Derpsch, 1998; Dumanski *et al.*, 2006; Hobbs, 2007; Hobbs *et al.*, 2008; Saturnino & Landers, 2002; Lindwall & Sonntag, 2010). As already mentioned, CA is one of the main focuses of MasAgro.

According to the FAO (2008), the land surface on which CA was being implemented world-wide in 2008 was 125 million hectares. While CA principles may be applied by small, medium and large-scale farmers, most of those adopting this practice are large producers (Kassam *et al.*, 2009). This is because adopting CA de-

> When they say they intend to replace between 1.5 and 3 million hectares of native maize, this is an attack on biodiversity, and it is the same mistake made by the Green Revolution. They are aiming for homogeneity, for everyone to eat the same [...] This is colonialism, with a complete disregard for the culinary diversity associated with agricultural production. Yields are the only criteria for conventional agriculture, and no consideration is given to use-value or quality.
>
> Dr. Antonio Turrent, INIFAP-UCCS, personal communication, 2016

pends on certain agroecosystemic and socioeconomic conditions, or in other words, a specific niche (Erenstein, 2002).

CA depends on external inputs for its implementation. According to Turrent *et al.* (2014), eliminating soil disturbance signifies limitations on weed control as traditionally practiced, and thus weeds would need to be eliminated manually or by applying synthetic products. CIMMYT (2014a) reports that weed control is the technology most implemented by MasAgro nationally, and this suggests increased promotion and use of herbicides.

The implementation of CA requires specialized machinery and implements for planting, fertilizing and harvesting. While MasAgro (CIMMYT, 2014a) reports the design of 13 prototypes for the appropriate machinery, there are no reports indicating the necessary production and access to credit for acquiring these technologies, which are currently only manufactured outside the country.

In addition, the characteristics of smallholder farmers mentioned earlier point to certain barriers to adopting CA (Bolliger *et al.*, 2006; Bolliger, 2007; Wall, 2007; Kassam *et al.*, 2009; Giller *et al.*, 2009), specifically:

- *Low soil fertility, generally on slopes with more than 4% incline*

> *"The conservation agriculture proposed in the MASAGRO model is suitable for use on plains, on extended, level areas not characteristic of traditional agriculture; using very large machinery, large expensive tractors for planting without prior soil preparation; and using hybrid seeds from major corporations, since native maize does not function well in these conditions" (Dr. Alejandro Espinosa, INIFAP-UNAM-UCCS, personal communication, 2016)*

As referred to earlier, between 62 and 63% of seasonal

agriculture is located on slopes and in shallow soil areas. Since most small-scale production units are characterized by low soil fertility, CA would need to have a strategy to take this into account. Maize harvest residue has a high carbon-nitrogen ratio, and if applied to the soil, a certain amount of nitrogen would be required for its mineralization, making it more accessible to crops, except in the initial cycles of CA implementation. This could be provided by fertilizers, but if organic fertilizers are used, elevated doses would be required, with the consequent costs of production or purchase and application (Turrent *et al.*, 2014). If synthetic fertilizers are used, this would also imply additional costs that few small-scale producers could absorb without significant credit assistance (not included in the program). An additional disadvantage would be an intensified dependence on external inputs.

- *Alternative uses of harvest residue*

According to Beuchelt *et al.* (2015), who studied Mexico's central region, retaining harvest residue in the soil is not a viable short-term option for smallholder farmers, since this residue is used for livestock feed in mixed (agriculture-livestock) systems, or it is often sold. The authors propose a gradual adoption of CA, through its implementation in small areas of production units for a five-year period. However, they do not view this as a viable option for older-age farmers, due to the required transition time. In addition the authors offer data on the availability of livestock feed for two potential scenarios, specifically 30% and 100% residue retention, reporting deficits of 2,094,355 and 5,115,049 metric tons of livestock feed, respectively.

- *Uncertainty in land ownership*

  According to Sánchez (2009), 14% of land owners in Mexico rent part of their property for agricultural activities. Since most rent contracts are informal, it is difficult to estimate the number of farmers who rent land. Nevertheless, this figure reveals that at least a significant sector of production units are rented. In terms of CA implementation, the necessary period for the model to potentially represent an increase in farmers' income is estimated at five years (Govaerts *et al.*, 2005). Thus, the uncertainty involved in renting land could be an obstacle for adopting a medium-term strategy like CA.

- *Technological recommendations not site-specific, implemented as a technological package*

  "In addition, CA requires harvest residue to be left in the field, and most small-scale producers use this residue for feeding livestock. There is no mention of milpa as such in the program, even though it is one of the agricultural models most used by peasants. Lastly, within the CA model, MasAgro has promoted the sale and use of herbicides" (Agronomist who participated in the MasAgro research program, personal communication, 2016)

  In a study conducted in Puebla and published by Huesca (2015), only 7% of producers reported they did not find any deficiencies in the MasAgro program's proposal and implementation in their communities, and 18% expressed low levels of confidence in the program's promoters, given that the model has not been fully tested in the conditions currently experienced by producers. The latter ranked

second among the weaknesses expressed most often by those interviewed. In addition, 13% stated that the program is not appropriate for producers having less than three hectares, due to increased production costs resulting from increased use of external inputs, primarily seeds, herbicides and fertilizers. Also, 8% commented that the program promoted dependence on synthetic fertilizers, 7% stated that the technological menu was not appropriate for their land parcels, and 6% commented that the model was viable only for irrigated parcels with year-round production. The primary weakness detected by participants (35%) was the increase in production costs, and thus a total of 87% of participants reported weaknesses associated with the model not being suitable for producers' agroecological and socioeconomic conditions.

- *Risk aversion*

As already mentioned, a five-year transition period is necessary to obtain productivity increases with CA. In addition, the model proposed by MasAgro involves replacing local varieties of maize (adapted to agroecosystems, with various use-values, self-generated, and rooted in identity), and also adopting non-traditional agricultural practices requiring investment and specialized training. The benefits projected by the strategy (increased productivity) are not as attractive for small production units as for larger ones. Also, the model involves considerable risk for farmers who depend on agro-climatic conditions and a market in which they compete in unfavorable conditions, as in the case of small-scale agriculture in Mexico. An increase in productivity (which would not necessarily be reflected to the same degree in an increase in income) would have to

be much greater for small-scale producers—something difficult to achieve with only CA. Also, according to Turrent *et al.* (2004), it can be expected that during the transition from traditional agriculture to CA, a fraction of the units incorporated will report decreases in yields. It does not appear that MasAgro has information on preventing this, and it is even less likely that it has an insurance strategy to address this risk.

While CA minimizes erosion on level land and slopes with less than a 5% incline, it is not adequate for more inclined, extended slopes (over 20% of total). This should be taken into account when considering orographic conditions in Mexican states such as Oaxaca, Guerrero, Chiapas, Puebla and Veracruz (Turrent *et al.*, 2014).

- *Preferred management for selling in the market, not for food production*

SAGARPA (2013) reports the percentage of farmers who designate part of their production for family consumption at 74.2%. These production units depend on diverse agroecosystems, mostly *milpa* and backyard gardens. The primary MasAgro program objectives (CIMMYT, 2014a) are to increase production in maize and wheat, and do not include intervention in other strategic food crops such as beans, squash, chili peppers, quelites and fruit, to mention some of them. In short, the program does not include the Mesoamerican vision of food production, and to the contrary, only addresses a market logic.

Regarding the issue of assuring a supply of maize while following CA premises (particularly crop rotation), it is important to point out that small-scale producers generally use less land for planting beans than for planting

maize. If they would establish a rotation schedule with half of their land planted with beans and the other half with maize, to then rotate in the next growing cycle, they would have a surplus of beans and a deficit in the maize they are accustomed to harvesting (Turrent *et al.*, 2014).

- *Inadequate knowledge for CA implementation*

> *"The program is inadequate, since it is tested in an area with all the [desired] conditions (in CIMMYT parcels), and then they transfer it to regions where soil and rain conditions are different." (Representatives of Vicente Guerrero Integral Rural Development project, personal communication, 2016)*

The principle objectives for 2013 mentioned by MasAgro (CIMMYT, 2014a) are associated with establishing demonstration plots and providing training events and courses. According to interviews conducted by Huesca (2015), 35% of participating farmers state that the trainings are good but they understand only a little; 29% state that training facilitators are not available when needed; 10% state that trainings are inadequate; 7% comment that they receive too much information at each visit; and 5% report that they are charged for consultation received.

These interviews indicate obstacles, detected by the participants themselves, to developing their capacities in order to comply with the program's objectives. Also, as evident in the work by Huesca (2015), the technicians involved do not take into account traditional knowledge, the agroecosystemic and socioeconomic conditions experienced by farmers, and the risks involved in adopting new technologies.

8.3.6 Diagnostic tools for N, P and K, and integral fertilization

The cost of using synthetic fertilizers is estimated as high as 25% of total production costs (CIMMYT, 2011). However, their level of efficiency is barely 30-35%, signifying serious losses of nitrogen that generate environmental problems such as the eutrophication of waters, concentration of nitrates in groundwater reserves, and production of nitrous oxide and greenhouse gases. It is therefore important to use fertilizers as efficiently as possible, especially in systems highly dependent on these inputs.

CIMMYT (2014a) mentions in the 2013 results from the MasAgro program that two tools for monitoring nitrogen in crops were used. One was the Green Seeker (which measures the Normalized Difference Vegetation Index, or NDVI), and the other was Green Sat (also measures the NDVI, but at a satellite scale) (CIMMYT, 2014b). The use of the first tool made it possible to save 22,474,040 Mexican pesos, and the second tool was used with 130,000 hectares. However, these benefits correspond to agroindustrial systems (concretely, the Valley of Yaqui and southern Sonora) (CIMMYT, 2011 and 2014a).

It is uncertain whether these technologies can be used in small production units, since additional production costs would be involved (for example, the sale price for Green Seeker is US $495, or approximately 9,500 Mexican pesos, Trimble, 2012). Also, specialized training would be required for its use and appropriate calibration to management conditions and crop types.

Regarding "integral fertilization," MasAgro promotes inoculating seeds with nitrogen-fixing, phosphorous-solubilizing microorganisms (CIMMYT, 2015b), as well as composting. While compost can be generated by producers, the other inputs must be purchased, representing additional production costs. There is no record of efforts to create local capacities for producing these inputs, so producers will need to buy from the market, thereby increasing their dependence.

8.3.7 Diversification and access to new markets

MasAgro includes diversification and access to new markets. In the first case, it proposes diversification of crops with commercial value (soybeans, oilseeds, triticale), implemented instead of maize or wheat in the crop rotation required in Conservation Agriculture (CA). The selection of alternative crops is made according to their suitability in a given zone and the demand in the commercial market (Mata-García, 2015). To this end MasAgro proposes what is referred to as "smart commercialization" in which: i) producers view themselves as commercial partners, not as competitors, thus improving their negotiating capacities and market knowledge; ii) producers partner with each other and jointly plan their activities in order to strengthen the production and supply chain, resulting in more access to public and private assistance, better infrastructure and equipment, agricultural insurance and financing; iii) producers decide what to plant based on information on the market demand for different crops, and in this way homogenize their production and increase quality and quantity for the market; and iv) conscious of their role as sellers, producers strengthen their position and assure more stable sales in better conditions by signing contracts, thereby obtaining increased profits, through the elimination of intermediaries (CIMMYT, 2016a).

Secondly, access to new markets refers to partnering with public and private enterprises that require their products, or networking directly with producers in MasAgro's zones of influence in order to be supplied with agrochemicals, machinery, GreenSeeker™, courses, training and market information (Mata-García, 2015). For example, in 2014 yellow maize promoted by *MasAgro Guanajuato* was evaluated for its use in food industrial processes, by networking with the Kellogg's transnational company (Mata-García, 2015). Another example was a course entitled "Buen uso

y manejo de agroquímicos" (Using and managing agrochemicals correctly), organized by Pepsico México and *MasAgro Guanajuato*. In this case Pepsico México invested in Mexico's agriculture through a sales-by-contract scheme with producers in which it provided seeds to producers, transferred technology, and provided them with advice on implementing sound practices in water management, agrochemicals and soil conservation (CIMMYT, 2014c). Another initiative by *MasAgro Guanajuato* along these same lines is an agreement reached with the Agricultural Market Development and Commercialization Services Agency (*Agencia de Servicios a la Comercialización y Desarrollo de Mercados Agropecuarios*—ASERCA) through *MasAgro Móvil* (Mobile) designed to use text messages to advise producers of the indifference prices projected on the Chicago market for maize, wheat and sorghum, listed daily on the Chicago Commodity Market (Álvarez, 2014).

Regarding proposals in this *MasAgro Productor* (Producer) component, we would mention the following considerations related to small-scale farmers, who were initially MasAgro's target population:

- As mentioned, 74.2% of farmers in Mexico designate part of their production for family consumption. Consequently, any strategy for diversification and commercialization will need to maintain an adequate balance between food for families and market production.

- The promotion of export agriculture through "smart commercialization" ignores the needs and modes of traditional production, by acknowledging producers only as suppliers of raw materials for agroindustry. This implicitly assumes that their living conditions can only be improved through increased monetary gains. It fails to consider the cultural

and nutritional value of native varieties and the associations of traditionally-managed crops, placing them at risk of being displaced in the search for competitiveness on the international market.

- Small-scale producers are the most vulnerable in this scheme, since crops with greater international demand (soybeans, oilseeds, triticale) are not crops that contribute to the peasant diet. This signifies that the crops and varieties to be planted depend on the demand on the international market, thus promoting homogeneity in production and the displacement of native varieties, which as mentioned previously, are not in demand.

- -The sales-by-contract model between producers and major transnational companies associated with the food industry could further limit artisanal production of local varieties, since agreements are only promoted with farmers who have adopted the production scheme proposed in the technological package backed by MasAgro.

8.3.8 Post-harvest technologies

It is estimated that post-harvest losses in tropical areas may be as high as 40% (García-Lara & Bergvinson, 2007). This problem can be confronted through different strategies such as the use of resistant seeds as well as adequate structures and good storage practices. While the incorporation of this technology into the package is a significant achievement, this strategy is not new. In this regard, MasAgro (CIMMYT, 2014a) mentions the creation of 48 post-harvest platforms. The application of this type of strategy should not threaten producers' control over seeds through the replacement of varieties. And in the case of good storage practices

and structures, efforts should be based on traditional knowledge and local resources, with credit assistance for acquiring storage bins, etc. as well as the necessary training.

8.3.9 Economic benefits and connecting with markets

There is nothing in the MasAgro development strategy that proposes to generate favorable conditions for commercializing maize and wheat, nor does it propose guaranteed prices or adequate collection systems. Instead, the MasAgro development strategy is focused on increasing maize and wheat productivity (CIMMYT, 2015a). It assumes that farmers will eventually enter the market, and this will be something natural and advantageous, even though the market is outside their control and they will actually experience very disadvantageous conditions for competing in the market, given the disappearance of subsidies and tariffs as agreed in NAFTA.

Furthermore, economic benefits derived from increasing productivity in a single crop is not significant. The national average yield for seasonal maize in Mexico is 2.2 metric tons per hectare (Agroder, 2012). Assuming that the objective of increasing productivity in small-scale (>5 hectares) agriculture will be achieved at a level of 15% (CIMMYT, 2015a), the maximum increase would be 1.65 metric tons (for 5 hectares), signifying an extra profit of 4,560.16 Mexican pesos annually, assuming a price of 2,763.73 Mexican pesos per metric ton of maize (ASERCA, 2016), or the equivalent of 380 Mexico pesos a month.

There is no justification for proposing that indigenous people and peasants assume the risks involved in replacing their local native maize varieties, adopting a new production model (CA) and increasing their dependence on external inputs to only gain 5,000 extra pesos per year.

8.3.10 Conservation, study and use of biodiversity

One of the four MasAgro components is entitled *MasAgro Biodiversidad* (Biodiversity), and proposes to "discover the genetic potential in maize and wheat collections, to adapt seeds to changing climate conditions and to the increasing scarcity of water, nutrients and energy available in Mexico and around the world" (CIMMYT, 2014a).

As part of this component, MasAgro has established the Genetic Analysis Service for Agriculture (*Servicio de Análisis Genético para la Agricultura*—SAGA) at the National Center for Genetic Resources (*Centro Nacional de Recursos Genéticos*) of the National Institute of Forestry, Agricultural and Fisheries Research (*Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias*—INIFAP), in the state of Jalisco. As of 2013, it was reported that the genetic composition of 18,000 native maize varieties and 40,000 wheat varieties had been studied with the objective of generating seeds more resistant to heat, drought, pests and diseases.

In fact, a very significant percentage of MasAgro's budget has been dedicated to designing and implementing techniques for genetically classifying the maize and wheat samples in CIMMYT's collections, specifically 28.4% of the program's total budget for 2015 (Prasanna, 2012). In addition SAGARPA-CIMMYT have financed research projects designed to classify some of the samples safeguarded at CIMMYT according to molecular and phenotypic characteristics (see, for example, Miranda *et al.*, 2013).

Despite the progress reported in this regard, we have identified some significant limitations in the basic proposition for studying the adaptation of seeds to changing conditions or drought, as well as the implicit approach to conservation and use of agrobiodiversity.

In particular, we are referring to a genocentrist paradigm that uses genes and what they are composed of, DNA, as the main and

sometimes only explanation for the development, productivity and other attributes of organisms and plants in particular (Lewontin & Levins, 2007). This perspective dominates agroindustry's proposals, as evident in MasAgro's technical documents and program.

We know that an organism's phenotype (appearance, physiology, behavior, etc.) can be molded or shaped in accordance with the environment in which it grows and develops, without implying a change in its genetic material. The importance of organism-environment interaction has been emphasized for centuries. Nevertheless, developments in agronomy and biotechnology in recent decades have been inserted in an approach in which phenotypes tend to be fundamentally explained in terms of their genetic characteristics (Lewontin, 2000; Lewontin & Levins, 2007). While the environment's importance in the development and evolution of living beings is typically accepted, we find that ecological and biocultural contexts are seldom seriously considered in agronomic studies and applications.

> It is being proposed that 1.5 million hectares of native maize varieties be replaced with maize varieties from transnational seed companies that do not correspond to usos y costumbres, the destination or use of the native seeds used by producers.
>
> Dr. Alejandro Espinosa, INIFAP-UNAM-UCCS, personal communication, 2016

The appearance, flavor, yield and nutritional value of a cultivated plant thus depends on its genotype, on the soil type, moisture and temperature in the site where it grows, but also on ecological and sociocultural aspects. For example, its flavor may depend on whether its flowers were pollinated mechanically or by an insect, and whether it was planted surrounded by monocultures or polycultures (Chautá-Mellizo *et al.*, 2012; Poveda *et al.*, 2012). Thus, the domestication and

diversification of plants such as maize have not only occurred within a framework of the evolution of particular genotypes and agroecosystems, but rather have emerged and continue to emerge in the context of specific cultural identities.

MasAgro documents refer to peasant agriculture as a production model that must be modernized. However, the conservation and diversification of plants within agroecosystems are ongoing, current processes that depend on whether peasants are able to make decisions regarding territories and seeds, on the basis of local knowledge and the knowledge of community institutions, and in fact inseparable from the processes of diversification of hundreds of races and varieties of maize and other cultivated plants (Boege, 2010; Jardón & Benítez, 2016). These plants, domesticated and diversified in specific social and environmental contexts, are adapted to the most highly-contrasting environmental conditions and to interaction with insects and other organisms. These varieties and races will be fundamental in confronting climate change and situations characterized by uncertainty and risk (Boege, 2010), but their capacity for adaptation will not be maintained or understood by studying only their genotypes—a strategy to which a significant portion of MasAgro's budget has been dedicated. Rather, it is necessary to understand and facilitate ecological, social and cultural processes that have generated and continue to generate these varieties (Mercer *et al.*, 2010; Ureta *et al.*, 2012, 2013).

One of the most dynamic current lines of research in biology is the study of different types of transgenerational inheritance that may be relevant from an ecological and evolutionary perspective. One of these types is cultural inheritance, which considers the inheritance of organism-environment-society relations that contribute to the ongoing generation and reproduction of phenotypes (Jablonka & Lamb, 2005, 2007). An example of this is the inheritance of practices (gastronomic, agricultural, artistic,

etc.) that are continually transmitted among members of a social group and that involve the reproduction of certain characteristics of the group. In fact, a number of authors speak of networks of organism-environment interaction and networks of behaviors or practices that provide feedback to each other, are reinforced, are inherited by diverse manners, and are re-created in each generation, constituting a biocultural, ecological, evolutionary and conservation unit (Jablonka & Lamb, 2005; Laublicher, 2015; Jardón & Benítez, 2016).

Thus, in order to conserve agrobiodiversity, it is necessary to adopt a broader perspective than one oriented toward conserving only germplasm isolated from its biocultural environment. In fact, the origin, development, variation and inheritance of agrobiodiversity depends on both genetic sequences and changes in them, as well as interactions between organisms and environments and between sociocultural practices associated with agroecosystems. Thus, in order to conserve this diversity it is necessary to rethink agricultural production, management and conservation to discover the cohesion in these processes and thereby guarantee the biocultural reproduction of the processes that have generated and that maintain such diversity. MasAgro's theoretical framework does not consider this organism-environment-cultural integration, nor does it facilitate or connect with the biocultural processes behind agrobiodiversity.

8.3.11 Report by the Superior Auditing Office of the Federation regarding MasAgro

In 2013 the Superior Auditing Office of the Federation (*Auditoría Superior de la Federación*—ASF), as part of its activities in the oversight of 2012 public accounts, conducted a financial and compliance audit, No. 12-0-08100-02-0332, of the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food

(SAGARPA) with respect to the MasAgro program. This program began in 2010 with a budget of 380,000,000 Mexican pesos, and in 2012 received an expanded amount, 396,271,000 Mexican pesos, as a result of the S230 program entitled "*Programa de Apoyo a la Inversión en Equipamiento e Infraestructura*" (Assistance for Investment in Equipment and Infrastructure Program). The audit found problems in the lack of justification for missing funds, specifically money received but not paid out in relation to certain agreements with public and private, national and international institutions (ASF, 2013). The audit's most significant results were the following:

A. The Organization and Procedures Manuals of the Department of Productivity and Technological Development (*Dirección General de Productividad y Desarrollo Tecnológico*—DGPDT) are not updated, and it is thus recommended to facilitate the process of updating and distributing manuals.

B. Of the 380,091,200 Mexican pesos reported, CIMMYT disbursed 370,008,800 Mexican pesos for: supplies and services, personnel, administration, collaborators, workshops, conferences, training, infrastructure, equipment and travel. Here is where the problem lies, because it appears that the difference of 10,082,400 Mexican pesos corresponds to funds received but not paid out in relation to 27 agreements reached with private and public institutions—however, when these agreements were analyzed, it was determined that only 1,481,900 Mexican pesos were pending for payments as of December 31, 2013.

C. Supporting Documentation providing evidence of 8,600,500 Mexican pesos disbursed for 12 agreements was not found, although it was reported as pledged. Thus, probable damage or loss to the Federal Public Treasury is presumed in the amount of 8,600,540.29 Mexican pesos.

D. Regarding the 45,173,900 Mexican pesos recorded under the budget item "Collaborators," it was verified that this amount corresponds to payment for 128 agreements that CIMMYT reached with various public and private, national and international institutions in 2011, 2012 and 2013. ASF requested supporting documentation from CIMMYT for expenses for various Agreements with 22 institutions for a total amount of 20,185,600 Mexican pesos. However, supporting documentation was not provided for expenses in the amount of 4,162,300 Mexican pesos corresponding to 31 collaboration agreements. Consequently, probable damage or loss to the Federal Public Treasury is once again presumed.

E. It is mentioned that CIMMYT recorded 793,900 Mexican pesos corresponding to services associated with 12 agreements in 2012, however this is irregular, since in CIMMYT's report to SAGARPA, these funds were presented as pledged and they are currently held, and there is consequently no justification for this amount to have been covered with funds from 2013.

Although the results from this audit reflect damages to the Federal

Public Treasury, the budget granted to this program has not been reduced since the audit's publication. The degree of transparency in MasAgro's administration leaves a great deal to be desired, since because it is managed by CIMMYT (a nongovernmental entity), access to information is not adequately guaranteed.

The situation just described is inadmissible in a democratic country such as Mexico, which recognizes human rights and maintains results-based budgeting. Unfortunately, the current design of ASF's legal framework does not allow for the information presented by this entity to serve as timely input for the country's legislators to consider in budget allocations.

IX. Conclusions

What has been presented in this document refers to the existence of a systematic pattern of damage to the fundamental rights of indigenous peoples and comparable communities, and this must come to an end. This requires the consolidation of the human rights system and advancement in the pluricultural State since, as stated in previous sections, the country's legal framework should not and cannot respond solely to the dominant culture. It is also clearly necessary to profoundly reflect upon the measures adopted by the Mexican State in the area of agriculture in recent decades, in order to create horizontal spaces for participation, reallocate public spending and limit the generalized use of agrochemicals.

Thus, conserving Mexico's biocultural patrimony involves, first of all, recognizing and promoting traditional agriculture and the cultural control that indigenous peoples and peasant communities exercise over their natural resources and territories as common goods, and secondly, progressively guaranteeing their fundamental rights. This means that the Mexican State should, together with indigenous peoples and peasants, develop and harmonize the country's legislation and public policy, with the aim of protecting their cultural identity, their territories and biocultural patrimony as common goods.

Since Mexico is a megadiverse country, its legislation and public policy on agriculture should not be primarily focused on protecting individual rights to property, and should, to the

contrary, be founded and developed on the theory of common goods. The exercising of rights to access to information and participation in decision-making, illuminated by agroecology and food sovereignty, represents a viable path to achieve this end.

When MasAgro was designed, its primary objective was "to strengthen food security by way of research, capacity-building, and transfer of technology to rural areas, and that small and medium-scale maize and wheat producers located in seasonal agricultural areas obtain high, stable yields, increase their income and mitigate the effects of climate change in Mexico." It was not taken into consideration that the program's implementation could (as it currently is) involve the replacement of important elements of biocultural patrimony, the transfer of cultural control, and the violation of human rights. The program was created without considering traditional knowledges, the environmental and cultural conditions of small-scale producers (75% of whom are indigenous and peasant communities), or forms of recreating biocultural patrimony.

MasAgro represents an unprecedented government effort to transform the traditional subsistence agri-food system into an industrialized agri-food system oriented toward meeting the demands of markets and industrial agriculture through a program for the extension and modernization of agriculture in which peasants are not the main actors. This program's proposal to extend and build knowledge does not consider traditional knowledges, nor does it create links with the community institutions that have played a part in generating the country's agrobiodiversity. It must also be added that conservation agriculture does not correspond to agronomic or topographic characteristics. In other words the MasAgro program is not bioculturally relevant for the country's conditions, and consequently the Mexican State should consider suspending this program.

In short, to conserve Mexico's biocultural patrimony, we

need to place peasants and indigenous people at the heart of our legislation and public policy for agriculture. To this end Mexico needs a legal framework that reflects the country's pluricultural nature, and in the case of agriculture, this implies the need to protect the control that indigenous peoples and peasants have historically exercised over their natural resources and their territories. This signifies guaranteeing that peasants and indigenous peoples can produce and reinvigorate the country's biocultural patrimony. The peace we hope for, the peace that will come, can only result from intercultural dialogue, the ecology of knowledges and respect for human rights.

X. Recommendations

In this document we have comprehensively analyzed Mexico's existing legal framework for agriculture, and especially, the MasAgro program. In particular we have stated that the country's legal framework for agriculture and its public policies are not culturally acceptable for peasants and indigenous peoples since they violate their fundamental rights. We have also pointed out that this legal framework is incapable of conserving and promoting Mexico's great biocultural patrimony, quite simply because it was not designed in accordance with the values and rationale of the traditional way of being.

Mexico's legislation and public policy on agriculture have been developed in recent decades from a business rationale and from a monocultural perspective, not from the rationale that generated the country's biocultural patrimony. As Barkin (2003) argues, "today's scientists, those responsible for defining the path to modernization and integration, have explicitly expressed their disdain for the crop and for the culture they are trying to cast aside. For them, maize is a commodity, and its unique characteristics are a thing of the past. For them, maize is the crop of the poor, a grain for the marginalized and for indigenous people, a luxury for wealthy consumers with an appreciation for tradition. They perceive maize as something inherited from an overrated past, which does not merit subsidies and even less so, political sup-

port, since it is a social and cultural structure that hinders the country's modernization."

This type of position has no place in a pluricultural, guarantist State with the rule of law, such as ours. Protecting the link that indigenous peoples and peasants maintain with the Earth is so important that, as indicated by the Inter-American Court of Human Rights, it should be protected through the adoption of special or *ad hoc* measures for the characteristics of peasants and indigenous peoples.

We have formulated the following recommendations for the Mexican State to progressively protect and guarantee the human rights of indigenous peoples and comparable communities:

1. Together with small-scale producers, design, implement and evaluate legislation and public policy which—linked with traditional values such as reciprocity, solidarity and respect—promote, foster and conserve Mexico's biocultural patrimony, while respecting, protecting, promoting and guaranteeing the fundamental rights of indigenous peoples and peasants. In other words, design legislation and public policy that allow and promote the autonomy of indigenous peoples and peasants, the promotion and protection of traditional agriculture, and in-situ conservation.

2. Protect Mexico's biocultural patrimony by developing and harmonizing a legal framework and public policy. In particular this patrimony should be recognized as a common good of Mexico's indigenous peoples and comparable communities.

3. Comprehensively review Mexico's current legislation and public policy on agriculture, with the aim of efficiently protecting and promoting: (i) the link between the Earth

and indigenous peoples and peasants; (ii) the sociocultural forms and mechanisms that generated Mexico's biocultural patrimony; and (iii) the fundamental rights of these human groups.

4. Given the symbolic, nutritional and ecological importance of maize, as well as ASF observations, SAGARPA and CIMMYT should suspend the implementation of the MasAgro program and reconsider its biocultural relevance. Also, SAGARPA and SEMARNAT should review and give new meaning to the special system for protecting maize regulated in paragraph XI of Article 2 of the Law on Biosecurity of Genetically Modified Organisms.

5. In accordance with the human rights system and the principles of pluriculturalism and prevention, SAGARPA should review, and if appropriate, limit the use of agrochemicals (for example, herbicides, insecticides, fungicides, nematicides) in national territory.

6. SAGARPA should promote the distribution of information in an appropriate, complete manner and should develop horizontal mechanisms (participative democracy) that facilitate the inclusion of indigenous peoples and peasants in the design, implementation and evaluation of its public programs, enforcing for this purpose the protection standard established for the right to free, prior, informed consent.

7. The Mexican State should reorient public spending toward programs that promote and develop food sovereignty and closer relationships between producers and consumers, while at the same time protecting our biocultural patrimony and our gastronomy.

XI. Glossary

Agricultural Production Unit: An economic unit of single-management agricultural production. Includes all livestock contained therein and all the land dedicating completely or partially to agricultural production, independently of size, title deed or legal status. The single management may be exercised by a person, a household, two or more people or households jointly, a clan or tribe, or a legal entity, such as a company or an agricultural collective such as a cooperative.

Biocultural axiom: The traditional way of being reveals what is referred to as the "biocultural axiom," for which it is said that "biological and cultural diversity are mutually dependent and geographically coexistent" (Toledo, *et al.*, 2001).

Biocultural patrimony: According to Boege (2008), the elements making up this type of patrimony are: (i) natural biotic resources in which intervention has occurred at varying degrees of intensity, through differentiated management and use in accordance with cultural patterns, (ii) traditional agroecosystems, and (iii) domesticated biological diversity with its respective phytogenetic resources that have been locally developed and/or adapted. Biocultural patrimony is the most important expression of indigenous and peasant ways of being and existing. It closely

linked with territories (biocultural landscapes), and in order for it to be conserved, States must guarantee indigenous peoples and peasants unrestricted respect for their human rights. Boege states that in this way, indigenous peoples and peasants are key actors whose value should be recognized as vital for the transformation of our societies, and for confronting the crises we are facing in our civilization and environment.

Buen vivir: Refers to an indigenous and peasant cosmovision on the relationship with oneself, with other people, and with the territory and nature.

Center of Diversity of the Domesticated: The area or areas where plants acquire genetic and phenotypic diversity following domestication. These areas are closely related to the diversity of customs and practices in management associated with human groups. It is important to consider that a center of origin may be different than the centers of domestication due to human transportation and trading in animals and seeds (Alavez & Weiger, 2016).

Center of Domestication: Defined as the biocultural area where wild progenitor populations and those under artificial selection are genetically and phenotypically differentiated, or in other words, where a domestication process occurs (Alavez & Weiger, 2016).

Center of Origin: Can be defined as "a geographic space where the origin or differentiation of a particular species or population occurred." This process of differentiation occurs in geological time due to varying natural events, including continental drift, reproductive isolation and local adaptation (CONABIO, 2016a).

Domestication: The origin of cultivated plants is in wild plants, but through human intervention, they have been selected and

modified in such a way that many of them have lost their capacity to survive in wild conditions, and therefore require ongoing assistance from human groups for their maintenance and reproduction (Santilli, 2012). This process is known as domestication, and refers to the management, use, orientation, facilitation, maintenance and protection (artificial selection) of certain groups of plants with useful characteristics (CONABIO, 2016b). The domestication of plants can be traced back to the transition of human groups from hunters-gatherers to farmers approximately 10,000 years ago. Since that time, diverse human groups have developed and maintained a large number of domesticated plants, accumulating a great wealth of traditional knowledge regarding their management and specific characteristics, with the aim of contributing to their own social, cultural and economic subsistence and maintenance as a group.

Ejido: Traditional regime of distribution and use of communal land in Mexico.

Ex-situ conservation: Conservation of components of biological diversity outside their natural habitats (CBD, 1992).

Food security: Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2006).

Food sovereignty: The right of peoples to define their own agricultural policies and control their food systems, including the protection of their markets, natural resources, food cultures and modes of production (Vía Campesina, 1996).

Free pollination variety: Variety produced by crossing not

genetically pure plants, but rather those sharing similar characteristics but a certain variability between them (Chassagne & Torres, 2014).

Genotypification: Process through which a genotype, that is, the total number of genes, is determined (Nature, 2016).

Germplasm:

1. Genetic material that forms the physical basis of inheritance and which is transmitted from one generation to the next by means of germ cells.

2. An individual or clone representing a genotype, species or culture that can be preserved in a collection for agronomical, historic or other reasons. (FAO, 2001)

Hybrid variety: Produced by crossing genetically dissimilar parents that, when brought together, complement each other and allow for obtaining a seed with the best of each parent. When only one set of parents intervenes, it is a simple hybrid, and when three parents intervene, it is a triple hybrid, and when four parents intervene, it is a double hybrid (Chassagne & Torres, 2014).

Industrialized agriculture: characterized by promoting monocultures, the use of agrotoxics, advance purchase of production by major food corporations, and in many cases, the use of transgenics.

In-situ conservation: Conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties (CBD, 1992).

Milpa: According to the Diccionario Breve de Mexicanismos, this is a word from the Nahuatl language that means "the place of seedplanting" (from milli or "seedplanting, planted field" + pan or "place"). Academics (Isakson, 2009; Kato *et al.*, 2009; Aguilar *et al.*, 2003) describe *milpa* in the same way, as a polyculture system with maize as its primary structuring element, planted in association with various species of beans, squash, chili peppers and arvenses.

Small-scale agriculture: Small-scale or family agriculture refers to producers who are involved in crop production, livestock, forestry, artisanal fisheries or aquaculture, and who have limited access to land and capital, and who primarily use a family labor force. In the specific case of Mexico, we are referring to producers who have five hectares or less of land (FAO, 2001).

Sustainability: Improving the quality of human life while living within the carrying capacity of supporting ecosystems (IUCN, UNEP & WWF, 1991).

Synthetic varieties: Varieties produced by crossing various pure progenitors (usually between five and nine) that have been selected because high-performance seeds are obtained from them. The same parents may be maintained, and the variety may be synthesized (created) again (Chassagne & Torres, 2014).

XII. Bibliography

Aguilar, J. et al. (2003). "Los sistemas agrícolas del maíz y sus procesos técnicos" in Esteva, G. (et al.) (2003), Sin maíz no hay país, Mexico: Consejo Nacional para la Cultura y las Artes – Dirección General de Culturas Populares e Indígenas. Available at: http://www.culturaspopulareseindigenas.gob.mx/cp/pdf/sin_maiz_no_hay_pais.pdf

Aguilar, L. F. (1996). El Estudio de las Políticas Públicas. Estudio introductorio y edición, Ed. Miguel Angel Porrúa, Mexico.

Alavez, V. & Wegier, A. 2016. Box 1: A Conceptual Framework for Conservation and Biosafety at Mesoamerican Crop Centers of Origin and Domestication, in: Acevedo F., E. Huerta & C. Burgeff. Chapter 21 Biosafety and Envi-ronmental Releases of GM Crops in Mesoamerica: Context Does Matter. In: R. Lira et al. (eds.), Ethnobotany of Mexico, Interactions of People and Plants in Mesoamerica. Ethnobiology, Springer-Verlag, New York.

Altieri, M. (1999). Agroecologia: Bases Científicas para una agricultura sustenta¬ble. Available at: http://agroeco.org/wp-content/uploads/2010/10/Libro-Agroecologia.pdf

Altieri, M. (2002). Agroecology: the science of natural resource management for poor farmers in marginal environments. Agriculture, Ecosystems and Enviroment 93: 1-24.

Altieri, M. & Nicholls, C. (2000). Agroecología, teoría y práctica para una agricultura sustentable. UNEP. Mexico. 257 pp.

Altieri, M. & Trujillo, J. (1987). "The Agroecology of Corn Production in Tlaxcala, Mexico," in Human Ecology, Vol. 15, No. 2, Plenum Publishing Corporation.

Álvarez, J. C. (2014). Precios proyectados para los agricultores de Guanajuato: nuevo servicio de MasAgro móvil. Available at: http://conservacion.

cimmyt.org/index.php/es/noticias-pacifico/1913-precios-proyectados-para-los-agricultores-de-guanajuato-nuevo-servicio-de-masagro-movil Acceso: 19 de octubre 2016.

Anderies, et al. (2004). A framework to analyze the robustness of social-ecological systems from an institutional perspective. Ecology and society, 9(1):18.

Anderson, M. (2008). Rights-based food systems and the goals of food systems reform. Agriculture and human values, 25(4): 593-608.

Andow, D. & Hidaka, K. (1989). Experimental natural history of sustainable agriculture: syndromes of production. Agriculture, Ecosystems and Environment, 27:447-462.

Arellano Gault, D. & Blanco, F. (2013) Políticas Públicas y Democracia. Institu¬to Federal Electoral. Mexico. Available at: http://www.ine.mx/ docs/ IFE-v2/DECEYEC/EducacionCivica/CuadernosDivulgacion/ Cuad-ernosDivulgacion-pdfs/CUAD_30_definitivo.pdf

Argumedo, A. (undated). Territorios Bioculturales Indígenas: una propuesta para la protección de territorios indígenas y el Buen Vivir. Asociación ANDES. Available at: http://www.internationalfunders.org/docu-ments/ TerritoriosBioculturalesIndigenas.pdf

ASERCA. (2016). Coberturas. Maíz. Available at: http://www.infoaserca.gob.mx/coberturas/maiz.asp.

ASF. (2013). Auditoría Financiera y de Cumplimiento: 13-0-08100-02-0300 DE-007 al Programa de Modernización Sustentable de la Agricultura Tradicional "MasAgro." Available at: http://www.asf.gob.mx/Trans/ Informes/IR2013i/Documentos/Auditorias/2013_0300_a.pdf

Barkin, D. (2003). "La soberanía alimentaria; el quehacer del campesinado mexicano." Honorable mention, III Premio de Estudios Agrarios 2002. Mexico, 2003. Available at: http://www.pa.gob.mx/publica/ rev_22/ David%20Barkin.pdf

Barkin, D. (2006). "Reconsiderando las alternativas sociales en México rural: Estrategias campesinas e indígenas," in Polis, Vol. 5, No. 015, Chile: Revista de la Universidad Bolivariana.

Barrera-Bassols, et al. (2006). Saberes locales y defensa de la agrodiversidad: maíces nativos vs maíces transgénicos en México,", in FUHEM CIP Ecosocial, Spain: Centro de Investigaciones para la paz, available at: http://www.fuhem.es/media/cdv/file/biblioteca/Sostenibilidad/ Saberes_locales_defensa_agrodiversidad.pdf , consultado el 1 de junio de 2013.

Barros, C. & Buenrostro, M. (1997). "El maíz, nuestro sustento," ei Arqueo¬logía

Mexicana. El maíz, Vol. V, No. 25, Mexico: Editorial Raíces, S.A. de C.V.

Bartra, A. (2003). "Del teocintle a los corn pops," in Esteva, G. (et al.) (2003), Sin maíz no hay país. Mexico: Consejo Nacional para la Cultura y las Artes – Dirección General de Culturas Populares e Indígenas. Available at: http://www.culturaspopulareseindigenas.gob.mx/cp/pdf/sin_maiz_no_hay_pais.pdf

Berlan, J-P y Lewontin, R. (1986). The Political Economy of Hybrid Corn. Monthly Review 38:35-47.

Beuchelt, T. et al. (2015). Social and income trade-offs of conservation agriculture practices on crop residues use in Mexico's central highlands. Agricultural systems, 134: 61-75.

Boege, E. (2008). El patrimonio biocultural de los pueblos indígenas de México: hacia la conservación in situ de la biodiversidad y agrodiversidad en los territorios indígenas (No. Sirsi i97896803854). Available at: http://www.cdi.gob.mx/biodiversidad/biodiversidad_0_prelimina¬res_1-31_eckart_boege.pdf

Boege, E. (2009). "Centros de origen, pueblos indígenas y diversificación del maíz," in Ciencias, No. 92-93, pp. 18-28. Mexico: Universidad Na¬cional Autónoma de México.

Boege, E. (2010). El patrimonio biocultural de los pueblos indígenas de Méxi¬co (Mexico: INAH, CONACULTA, CDI). Accessed October 20, 2010.

Boege, E. (2016). Patrimonio biocultural y los derechos culturales de los pueblos indígenas, comunidades locales y equiparables. Presented for publication on 3-10-16.

Bolliger, A. (2007). Is zero-till an appropriate agricultural alternative for disadvantaged smallholder sensitivities and glycoproteins? PhD. Thesis. University of Copenhagen, Copenhagen. 67 pp.

Bolliger, A. et al. (2006). Taking stock of the Brazilian "zero-till revolution": a review of landmark research and farmers' practice. Adv. Agron., 91:47-110.

Bonfil, G. (1988). Teoría del Control Cultural en estudio de procesos étnicos. Available at: http://observatoriocultural.udgvirtual.udg.mx/repositorio/bitstream/han dle/123456789/217/TeoriadelControl.pdf?sequence=1&isAllowed=y

Bonfil, G. (1989). México profundo: una civilización negada, Mexico: Grijalbo.

Bonilla, D. (2006). La Constitución multicultural, Colombia: Siglo del Hombre Editores.

Bourges, H. (2013). El maíz: su importancia en la alimentación de la población

mexicana. In Álvarez Buylla, E. & Piñeyro, N. A., Coordinators, El maíz en peligro ante los transgénicos. Un análisis integral sobre el caso de México, p. 231–247. UNAM. Unión de científicos comprometidos con la sociedad, Universidad Veracruzana, Mexico.

Carrasco, H. & Tejada, S. (2008). Soberanía Alimentaria: la libertad de elegir para asegurar nuestra alimentación. Peru: Intermediate Technology Development Group (ITDG).

CBD. (1992). Convention on Biological Diversity. Secretariat of the Convention on Biological Diversity, Montreal, Canada.

CDI. (2014). Programa Especial de los Pueblos Indígenas 2014-2018. Available at: http://www.cdi.gob.mx/programas/2014/programa-especial-de-los-pueblos-indigenas-2014-2018.pdf

CEMDA. (2014). Informe sobre la "Destrucción del patrimonio biocultural de México por megaproyectos y ausencia de legislación y política pública culturalmente adecuada para los pueblos indígenas y comunidades equiparables," reason for thematic hearing held at 153th period of sessions. Available at: http://www.cemda.org. mx/wp-content/uploads/2015/09/Informe-CIDH-PatBio.VF_.pdf

CEMDA. (undated). El buen vivir frente a los paradigmas del progreso y desarrollo. Available at: http://www.cemda.org.mx/el-buen-vivir-frente-a-los-paradigmas-del-progreso-y-desarrollo/

Chappell, M. J. et al. (2013). Food sovereignty: an alternative paradigm for poverty reduction and biodiversity conservation in Latin America. F1000Research: 2:235.

Chassagne, A. (2015). Contribuye el CIMMYT a la seguridad alimentaria en México con semillas mejoradas. EnlACe, No. 25. Available at: http://conservacion.cimmyt.org/index.php/es/component/docman/cat_view/16-revista-enlace

Chassagne, A. & Torres, J. (2014). Diferentes tipos de semilla. Revista EnlACe, No. 20. Available at: http://conservacion.cimmyt.org/index.php/es/component/docman/cat_view/16-revista-enlace

Chautá-Mellizo et al. (2012). Effects of natural and artificial pollination on fruit and offspringquality. Basic and Applied Ecology, 13: 524–532.

CIMMYT. (2011). La importancia de la nutrición vegetal en la calidad del trigo. Available at: http://conservacion.cimmyt.org/index.php/noticias/208-sensor-green-seeker. Consulted September 14, 2016.

CIMMYT. (2014a). Official document. "Oferta disponible para implementar tecnologías MasAgro." Available at: http://conservacion.cimmyt.org/index.php/es/component/docman/doc_view/1618-libro-de-oferta-

tecnologica-maagro

CIMMYT. (2014b). MasAgro y el uso de la teledetección o detección remota (RS). Available at: http://conservacion.cimmyt.org/index.php/eventos-vagp/887-masagro-y-el-uso-de-la-teledeteccion-o-deteccion-remota-rs. Consulted September 4, 2016.

CIMMYT. (2014c). Productores de trigo participan en curso sobre uso y manejo de agroquímicos. Available at: http://conservacion.cimmyt.org/ index.php/es/promaf/1583-productores-de-trigo-participan-en-curso-sobre-uso-y-manejo-de-agroquimicos

CIMMYT. (2015a). Resultados MasAgro. Redacción, EnlACe, No. 25. pp 14-17.

CIMMYT. (2015b). Agricultura de Conservación y fertilización integral: una com¬binación sustentable para producir en Jalisco. Available at: http://conservacion.cimmyt.org/index.php/es/noticias/1810-agricultura-de-conservacion-y-fertilizacion-integral-una-combinacion-sustentable-para-producir-en-jalisco. Consultado el 14 de septiembre de 2016.

CIMMYT. (2016a). Infografía "Comercialización inteligente. De la competencia a la competitividad". Available at: http://conservacion.cimmyt.org/ index.php/es/component/docman/ doc_view/1604-comercializacion-inteligente. Acceso: 19 de octubre de 2016.

CIMMYT. (2016b). Conservation Earth. Available at: http://gismaps.cimmyt.org/. Accessed October 7, 2016.

CONABIO. (2006). Capital natural y bienestar social. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Mexico.

CONABIO. (2006). Elementos para la determinación de centros de origen y centros de diversidad genética en general y el caso específico de la liberación experimental de maíz transgénico al medio ambiente en México. Available at: http://www.biodiversidad.gob.mx/genes/ pdf/Doc_CdeOCdeDG.pdf

CONABIO. (2012), Documento base sobre solicitudes de liberación comercial de maíz genéticamente modificado en México, available at: http://www.biodiversidad.gob.mx/genes/pdf/ConsideracionesGra-lesMaizGM-Comercial_fin.pdf

CONABIO. (2016a). Centros de origen y diversificación. Available at: http://www.biodiversidad.gob.mx/genes/centrosOrigen/centrosOrig.html. Consulted October 5, 2016.

CONABIO. (2016b). Centros de plantas cultivadas. Available at: http://www.biodiversidad.gob.mx/genes/centrosOrigen/centrosPlantas.html. Consulted October 5, 2016.

CONEVAL. (2015). Evaluación de Diseño del Programa Integral de Desar-

rollo Rural. Available at: http://www.sagarpa.gob.mx/programas2/ evaluacionesExternas/Documents/Evaluaci%C3%B3n%20de%20Dise%C3%B1o/S-258%20Programa%20Integral%20de%20Desa¬rrollo%20Rural.pdf

Corte IDH. (1988). Caso Velásquez Rodríguez contra Honduras, Sentencia de fondo 9 de julio de 1988, paragraph 188.

De Frece, A. & Poole, N. (2008). "Constructing Livelihoods in Rural Mexico: Milpa in Mayan Culture," in The Journal of Peasant Studies, April, Vol. 35, No. 2, pp. 335-352, United Kingdom.

Desmaris, A. (2007). La Vıa Campesina: globalization and the power of peasants. Halifax & London: Fernwood Publishing and Pluto Press, in Boyer, Jefferson. Food security, food sovereignty and local challenges for transnational agrarian movements: the Honduras case. Revista "Pea¬sant Studies," Vol. 37, No. 2, April 2010,pP. 319-351. Available at: https://www.sfu.ca/cmns/courses/2012/801/1-Readings/Food%20Sovereignty/Boyer%20Food%20Sovereignty.pdf

Derpsch, R. (1998). Historical review of no-tillage cultivation of crops. Proceedings, the 1st JIRCAS seminar on soybean research. Notillage cultivation and future research needs, March 5-6 1998. Iguassu Falls, Brazil, JIRCAS Working Report No. 13. 1:18.

De Schutter, O. (2011). Informe del Relator Especial sobre el derecho a la alimentación. ONU.

De Schutter, O. (2014). The transformative potential of the right to food, Fi¬nal report drawing conclusions from his mandate, presented to the 25th Session of the UN Human Rights Council. (http://www.srfood. org/en/official-reports).

Dietz, G. (2012). Multiculturalismo, interculturalidad y diversidad en educa¬ción. Una aproximación antropológica. Mexico: Fondo de Cultura Económica.

Dumanski, J. et al. (2006). The paradigm of conservation agriculture. Proc. World Assoc. Soil and Water Conservation. PI: 58-64 pp.

Doebley, J. et al. (1987). Patterns of isozyme variation between maize and Mexican annual teosinte. Econ. Bot. 41:234-246.

Dye, T. (1976). Policy analysis: what governments do, why they do it, and what difference it makes, in Parsons, W. (2007). Políticas públicas: una introducción a la teoría y la práctica del análisis de políticas públicas: FLACSO. 815 pp.

Eguren, F. (2012). ¿Soberanía alimentaria o seguridad alimentaria? In Hernández, C. (Comp.), Soberanía alimentaria. Selección de lecturas.

Editorial Caminos. La Habana, Cuba. 322 pp.
Espinosa A. et al. (2012). Rendimiento de las generaciones F1 y F2 de híbri¬dos trilineales de maíz en los Valles Altos de México. Universidad y Ciencia, 28:57-64.
Espinosa et al. (2009). El potencial de las variedades nativas y mejoradas de maíz. Ciencias 92-93: 118-125.
Erenstein, O. (2002). Crop residue mulching in tropical and semitropical countries: an evaluation of residue availability and other technological implications. Soil Till Res. 67:115-133.
FAO. (2001). Glossary of Biotechnology for Food and Agriculture - A Revised and Augmented Edition of the Glossary of Biotechnology and Gene¬tic Engineering. Available at: http://www.fao.org/DOcREP/003/ X3910E/ X3910E10.htm
FAO. (2006). Seguridad alimentaria. Informe de políticas. June 2006, No. 2, 4 pp. Available at: ftp://ftp.fao.org/es/esa/policybriefs/ pb_02_es.pdf. Consulted June 20, 2016.
FAO. (2008). Conservation agriculture. http://www.fao.org/ag/ca/index.html.
FAO & World Bank et al. (2012). Sustainable Agricultural Productivity Growth y Bridging the Gap for Small Family Farms: Interagency Report to the Mexican G20 Presidency. Food and Agriculture Organization (FAO), Organization for Economic Co-operation and Development (OECD), Rome, Italy.
Ferrajoli, L. (2010). Derechos y garantías. La ley del más débil. Spain: Trotta.
Fitting, E. (2006). "Importing corn, exporting labor: The neoliberal corn regime, GMOs, and the erosion of Mexican biodiversity," in Agriculture and Human Values, No. 23, pp. 15-16, Holland: Springer.
Fowler, R. & Rockström, J. (2001). Conservation tillage for sustainable agriculture-an agrarian revolution gathers momentum in Africa. Soil Till. Res. 61:93-107.
Ferguson, B. G. et al. (2009). La soberanía alimentaria: cultivando nuevas alianzas entre campo, bosque y ciudad. Revista Agroecología 4:49-58. Available at: https://agroecochiapas.wordpress.com/novedades/
Floriani, N. & Floriani, D. (2010). Saber ambiental complexo: aportes cognitivos ao pensamento agroecológico. Rev. Bras. Agroecol. 5: 3-23.
Francis, C. A. (1986). Multiple cropping systems. New York, NY, US, MacMillan Press.
Freire, P. (1973). ¿Extensión o comunicación? Editorial Siglo XXI. 95 pp.
Galtung, J. (1990), "Cultural Violence," in Journal of Peace Research, Vol. 27,

No. 3, USA: University of Hawaii.

García-Lara, S. & Bergvinson. D. (2007). Programa integral para reducir pérdidas poscosecha en maíz. Agricultura Técnica en México, Vol. 33, No. 2. Available at: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0568-25172007000200008

Gliessman, S. (2002). Agroecología. Procesos Ecológicos en Agricultura Sostenible, Costa Rica: CATIE.

Guillen-Pérez, L. A. et al. (2002). Causal Attribution Analysis for the Use of Local and Improved Maize Seed. Agrociencia, 36: 377-387.

Giller, K. E. et al. (2009). Conservation agriculture and smallholder farming in Africa: the heretics' view. Field Crops Res. 114:23-34.

Govaerts, B. et al. (2005). Stable high yields with zero tillage and permanent bed planting? Field Crop. Res. 94:33–42.

Gordillo, G. & Wagner, R. (2004). Las reformas titubeantes. El campo mexicano, 1975-2000. Economía UNAM, Vol. 2, No. 5, pp. 23–40, p. 23.

Grossman, J. M. (2003). Exploring farmer knowledge in organic coffee systems in Chiapas, Mexico. Geoderma 111: 267–287.

Hablethwaite, J. et al. (1996). Do-till and reduced tillage for improved crop production in sub-Saharan Africa. Achieving greater impact from research investments in Africa. In ADDIS ABABA. Proceedings of the workshop developing African agriculture: achieving greater impact from research investments. Ethiopia, September 26-30. 195-199 pp.

Hobbs, P. R. (2007). Conservation agriculture: what is it and why is it important for future sustainable food production? J. Agric. Sci. 145:127-137.

Hobbs, et al. (2008). The role of conservation agriculture in sustainable agriculture. Phil. Trans. R. Soc. B12. 363-555 pp.

Holt-Giménez, E. (2006). Campesino a campesino: voices from Latin America's farmer to farmer movement for sustainable agriculture. Food First books.

Huesca, J. (2015). Desarrollo agrícola regional, un análisis comparativo entre las estrategias del Plan Puebla y la iniciativa MasAgro. Doctoral dissertation , Colegio de Posgraduados. 155 pp.

IACHR. (2009). "Derechos de los pueblos indigenas y tribales sobre sus tierras ancestrales y recursos naturales." Normas y jurisprudencia del Sistema Interamericano de Derechos Humano, December 31, 2009, in OEA/Ser.L/V/II. Doc.56.09, CIDH. http://www.oas.org/es/cidh/indigenas/docs/pdf/Tierras-Ancestrales.ESP.pdf

INALI. (2008). Catálogo de las Lenguas Indígenas Nacionales: Variantes Lingüís-ticas de México con sus autodenominaciones y referencias

geoestadísti¬cas. Available at: http://www.inali.gob.mx/pdf/CLIN_completo.pdf

INEGI. (2007). Censo Agrícola Ganadero 2007.

INEGI. (2010). Censo General y de Vivienda 2010.

INEGI. (2011). Información nacional, por entidad federativa y por municipios. Available at: http://www3.inegi.org.mx/sistemas/mexicocifras/ default.aspx. Consulted September 12,, 2016.

INEGI. (2015). Presentation at Encuesta Intercensal- Principales resultados. Available at: http://www.inegi.org.mx/est/contenidos/proyectos/ encuestas/hogares/especiales/ei2015/doc/eic_2015_presentacion.pdf

IUCN, UNEP, WWF. (1991). Cuidar la tierra, Estrategia para el futuro de la Vida. Gland, Switzerland.

Informe del SAE sobre la Rendición de Cuentas 2006-2012: Productora Nacional de Semilla (PRONASE). Proceso concluido alimentación. [Consulted: August 3, 2014] [Free access] <http://www.sae.gob. mx/procesos/ Empresas/Liquidaci%C3%B3n%20de%20Empresas/ Entidades/ Documents/06%20Productora%20Nacional%20de%20 Semillas%20_PRONASE_.pdf>

Isakson, S. R. (2009), "No hay ganancia en la milpa: the agrarian question, food sovereignty, and the on-farm conservation of agrobiodiversity in the Guatemalan highlands," in The Journal of Peasant Studies, Vol. 36, No. 4, October 2009, 725–759, USA: Routledge.

Jablonka, E. & Lamb, M. J. (2005). Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic Variation in the History of Life. MIT press, USA.

Jablonka, E. & Lamb, M. J. (2007). Précis of Evolution in Four Dimensions. Behav Brain Sci, 30(4), 353–389.

Japhether W. et al. (2006). Recycling Hybrid Maize Varieties: Is It Backward Practice or Innovative Response to Adverse Conditions in Kenya? International Association of Agricultural Economists Annual Meeting. Queensland, Australia.

Jardón-Barbolla, L. & Benítez, M. (2016). La comunidad agroecológica como unidad ecológica, de domesticación y de conservación. In: Fabrizzio Guerrero McManus, Octavio Vizcaya Xilotl (Eds.) Ed. Copit-Arxives.

Kassam, A. et al. (2009). The spread of conservation agriculture: justification, sustainability and uptake. Int. J. Agric. Sust. 7:292-320.

Kato, T. A. et al. (2009). Origen y diversificación del maíz: una revisión analítica. Universidad Nacional Autónoma de México, Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. 116 pp. Mexico City.

Laubichler, M. D. & Renn, J. (2015). Extended evolution: A conceptual framework for integrating regulatory networks and niche construction. Journal of Experimental Zoology Part B: Molecular and Developmental Evolution, 324(7), 565-577.

Lewontin, R. C. (2000). The triple helix. Gene, organism and environment. Cambridge, MA: Harvard University Press.

Lewontin, R. & Levins. R. (2007). Biology under the influence. Dialectical Essays on Ecology, Agriculture and Health. Monthly Review Press. New York. 654 pp.

Lindwall, C. W. & Sontag, B. (2010). Landscape transformed: the history of conservation tillage and direct seeding, knowledge impact in society, Saskatoon, University of Saskachewan. 219 pp.

Marielle, C. et al. (2008). ¡SAS! Una experiencia campesina hacia sistemas alimentarios sustentables.

Marin, A. & Wellman, B. (2011). Social network analysis: An introduction. The SAGE handbook of social network analysis, 11-25.

Mata-García, M. G. (2015). Visión compartida y con resultados en Guanajuato. EnlACe la revista de la Agricultura de Conservación, No. 25. CIMMYT, Mexico.

Matsuoka Y. et al. (2002). A single domestication for maize shown by multilo¬cus microsatellite genotyping. Proc. Natl. Acad. Sci, 99:6080-6084.

Mazhar, F. et al. 2007. Food Sovereignty and Uncultivated Biodiversity in South Asia, Academic Foundation: New Delhi: International Development Research Centre: Ottawa, 2007 pp. 3-4. Available atDisponible en: <www.idrc. ca/openebooks/337-9/>.

McMichael. (2004). “Global development and the corporate food regime,” XI World Congress of Rural Sociology, Trondheim. July.

Mercer et al. (2010). Evolutionary response of landraces to climate change in centers of crop diversity. Evolutionary applications, 3(5□6), 480-493.

Miranda, A. et al. (2013). Influence of genotype and environmental adaptation into the maize grain quality traits for nixtamalization. CyTA-Journal of Food, 11(sup1), 54-61.

Moreno-Calles A. et al. (2013). Los sistemas agroforestales tradicionales de México: una aproximación biocultural. Botanical Sciences 91. Available at: http://www.scielo.org.mx/pdf/bs/v91n4/v91n4a1.pdf

Nature. (2016). Genotype, Scitable by Nature Education. Available at: http://www.nature.com/scitable/definition/genotype-234

Olivé, L. (1991). “Conciencia étnica y modernidad,” Conciencia étnica y modernidad. Etnias de oriente y occidente. Coincidencias. Mexico: Gobierno

del Estado de Nayarit/INI/CONACULTA,

Olivé, L. (2003). Multiculturalismo y pluralismo. Mexico: Editorial Paidós Mexicana, S.A. & Facultad de Filosofía y Letras de la Universidad Nacional Autónoma de México.

ONU. (2010). United Nations Permanent Forum on Indigenous Issues. La situación de los pueblos indígenas del mundo.

Ortega-Paczka, R. (2003). "La diversidad del maíz en México," in Esteva, G. et al. (2003), Sin maíz no hay país. Mexico: Consejo Nacional para la Cultura y las Artes – Dirección General de Culturas Populares e Indígenas. Available at: http://www.culturaspopulareseindigenas.gob.mx/cp/pdf/sin_maiz_no_hay_pais.pdf

Ortega Paczka, R. (2010). "Hacia la conservación y mejoramiento in situ de la diversidad del maíz en México," in Agricultura, Ciencia y Sociedad Rural: 1810- 2010, Vol. I, Recursos Naturales y Sociedad Sustentable. Mexico: Universidad Autónoma Chapingo.

OXFAM, (2013). El Derecho a la Alimentación en México: Recomendaciones de la sociedad civil para una política pública efectiva. Available at: http://oxfammexico.org/crece/wp-content/uploads/2013/10/ el-derechoaalimentacion.pdf

Paradowska, K. (2013). Diálogo de saberes para el replanteamiento teórico de la restauración ecológica con enfoque biocultural. Mexico: Centro de Investigaciones Tropicales de la Universidad Veracruzana.

Poveda, K. et al. (2012). Landscape simplification and altitude affect biodiversity, herbivory and Andean potato yield. Journal of Applied Ecology, 49(2), 513–522.

Prasanna, B. M. (2012). Diversity in global maize germplasm: characterization and utilization. Journal of biosciences, 37(5), 843-855.

Rábago, M. (2016). ¿Estar en contra del TLCAN nos hace "malos mexicanos"? Revista Horizontal. Available at: http://horizontal.mx/estar-en-contra-del-tlcan-nos-hace-malos-mexicanos/#sthash.mu3QwXY6.zLL9LJPz.dpuf

Rello, F. (2008). "Inercia Estructural y Globalización: La Agricultura y los Campesinos Más Allá del TLCAN," Working Group Discussion Paper DP20. Available at: http://ase.tufts.edu/gdae/Pubs/rp/DP20Re¬lloJuly08.pdf

Richards P. (1985). Indigenous agrarian revolution. Boulder, CO: Westview Press.

Robles, H. (2007). El sector rural en el siglo XXI. Un mundo de realidades y posibilidades. Cedrssa. Mexico.

Rosset, P. (2004). Soberanía alimentaria: reclamo mundial del movimiento campesino. Institute for Food and Development Policy Backgroun¬der, 9, 4 pp.

Rosset, P. et al. (2011). The Campesino-to-Campesino agroecology movement of ANAP in Cuba: social process methodology in the construction of sustainable peasant agriculture and food sovereignty. The Journal of Peasant Studies, 38(1), 161-191.

Ruiz, C., J. A., J.M. Hernández C., J.J. Sánchez G., A. Ortega C., G. Ramírez O., M.J. Guerrero H. & F. Aragón C. 2013. Ecología y distribución actual y potencial de razas mexicanas de maíz. Libro Técnico Núm. 5. INIFAP-CIRPAC-Campo Experimental Centro Altos de Jalisco. Tepatitlán de Morelos, Jalisco, 149 p.

Ruiz-Rosado, O. (2006). Agroecología: una disciplina que tiende a la transdisciplina. Interciencia 31: 140-145.

SAGARPA. (2010). Acuerdo de colaboración celebrado entre la Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA) y el Centro Internacional de Mejoramiento de Maíz y Trigo. Response to request for information, No. 00008000035714. Available to consult at: https://www.in-fomex.org.mx/gobiernofederal/moduloPublico/moduloPublico.action

SAGARPA. (2013). Agricultura familiar con potencial productivo en México. 537 pp. Available at: http://www.sagarpa.gob.mx/programas2/ evaluacionesexternas/lists/otros%20estudios/attachments/42/agri-cultura%20familiar_final.pdf. Consultado el 12 de septiembre de 2016.

SAGARPA. (2016a). Response to request for information,No. 0000800025616. Available to consult with at: https://www.infomex. org.mx/gobiernofederal/moduloPublico/moduloPublico.action

SAGARPA. (2016b). Response to request for information, No. 0000800216016. Available for consulting at: https://www.infomex. org.mx/gobiernofederal/moduloPublico/moduloPublico.action

SAGARPA. (2016c). Response to request for information, No. 800191916. Available for consulting at: https://www.infomex.org.mx/ gobiernofederal/moduloPublico/moduloPublico.action

SAGARPA (undated). List of Organizations in sector. Official webpage.. Available at: http://www.sagarpa.gob.mx/lists/organismos%20del%20sector/allitems.aspx

Sánchez, V. (2009). Determinantes de la renta de tierra agrícola en México. Revista Mexicana de Economía Agrícola y de los Recursos Naturales, 2: 53-80.

Santos, B. (2009). Una epistemología del sur: la reinvención del conocimiento y la emancipación social. Mexico: Siglo XXI – CLACSO.

Santilli, J. (2012). Chapter 8: Farmers Rights. In: Santilli, J., Agrobiodiversity and the Law: regulating genetic resources, food security and cultural diversity, Earthscan, London.

Saturnino, H. N. & Landers, J. N. (2002). The environment and zero tillage, APDC-FAO, Brasilia, Brazil, UDC, 139 p.

SevillaGuzmán, E. & Woodgate, G. (2013). Agroecología: Fundamentos del pensamiento social agrario y teoría sociológica. Available at: http://revistas.um.es/agroecologia/article/view/212161

Steiner, K., et al. (1998). Sustainable management of soil resources through zero tillage. Agric. Rural Dev, 5:64-65.

Toledo, V. et al. (2001). "Atlas Etnoecológico de México y Centroamérica: Fundamentos, Métodos y Resultados," in Etnoecológica, Vol. 6, No. 8, pp. 7-41, available at: http://ccp.ucr.ac.cr/bvp/pdf/cambio-demografico/atlas_etnologico.pdf consultado el 16 de junio de 2014.

Toledo, V. & Barrera-Bassols, N. (2008). La memoria biocultural: la importancia agroecológica de las sabidurías tradicionales. Barcelona: Icaria.

Toledo V. et al. (2013). Los sistemas agroforestales tradicionales de México: una aproximación biocultural. Botanical Sciences 91. Available at: http://www.scielo.org.mx/pdf/bs/v91n4/v91n4a1.pdf

Toledo, V. & Barrera-Basols, N. (2013) Conflictos socioambientales, resistencias ciudadanas y violencia neoliberal en México. Available at: file:///C:/Users/Usuario/Downloads/Dialnet-ConflictosSocioambientalesResistenciasCiudadanasYV-4548815.pdf

Trimble. (2012). Trimble introduces Green Seeker handheld crop sensor for agriculture. Available at: http://investor.trimble.com/releasedetail.cfm?releaseid=698155. Consulted September 14, 2016.

Turrent A. (2008). Producción bajo temporal. El Cultivo de Maíz en México. Temas selectos. Ed. Rodríguez Montessoro R & C. de León. Mexico City, Colegio de Postgraduados y Mundi-OPrensa. Mexico, 1: 107-113.

Turrent, A. (2012). Estrategias científicas y tecnológicas para reforzar la productividad agrícola de México ante el cambio climático. In Resumen de Congreso Ciencia y Humanismo, Agrociencias. Academia Mexicana de Ciencias, Mexico.

Turrent, A. et al. (2014) . Análisis de la estrategia MasAgro Maiz. Revista Mexicana de Ciencias Agrícolas, 8:1531-1547.

Ureta, C. et al. (2012). Projecting the effects of climate change on the distribution of maize races and their wild relatives in Mexico. Global Change

Biology, 18(3), 1073-1082.

Ureta C, et al. (2013). Environmental and social factors account for Mexican maize richness and distribution: A data mining approach. Agriculture, Ecosystems and Environment, 179:25-34.

Vandermeer, J. (2011). The ecology of agroecosystems. Jones and Bartlett Publishers. 405 pp. Available at: http://www.jblearning.com/catalog/9780763771539/

Vandermeer, J. & Perfecto, I. (2013). Tradiciones complejas: intersección de marcos teóricos en la investigación agroecológica. Revista Agroecolo¬gía 8 (2): 55-63. Available at: http://revistas.um.es/agroecologia/ article/viewFile/212191/168411

Vercelli, Ariel & Thomas, Hernán. (2008), "Repensando los bienes comunes. Análisis socio – técnico sobre la construcción y regulación de los bienes comunes," in Helfrich, Silke (comp.), Genes, bytes y emisiones: bienes comunes y ciudadanía. Mexico: Ediciones Böll.

Vía Campesina. (1996). Declaración sobre la soberanía alimentaria de los pueblos." Available at: http://viacampesina.org/es/. Consulted June 20, 2016.

Wall, P. C. (2007). Tailoring conservation agriculture to the needs of small farmers in developing countries: An analysis of issues. Journal of Crop Improvement. Vol. 19, No. 1-2.

Warman, A. (1988). Y venimos a contradecir. Los campesinos de Morelos y el estado nacional. Mexico: Secretaría de Educación Pública y Centro de Investigaciones y Estudios Superiores en Antropología Social.

Wilken, G. C. (1987). Good farmers: Traditional agricultural resource management in Mexico and Guatemala. Berkeley, CA: University of California Press.

Wittman H. (2011). Food Sovereignty. A new rights framework for food and nature? Environment and Society: Advances in Research. 2:87-105.

Wolf, E. (1971). Los campesinos. Editorial. Labor. 159 pp.

This printing of this copy was completed
in September 2017 in Mexico City.

Typefaces used were Georgia designed by
Matthew Carter, and Avenir Next designed
by Adrian Frutiger.

This edition consists of 50 copies.