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Farmers' strategies for crop diversity management

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- 1 In this issue, we present a wide range of texts about the diversity of maize in Mexico in relation to peasant agricultural practices. The scientific debates on this theme form part of a line of reflection about the conservation of biodiversity that the *Revue d'ethnoécologie* has been featuring and fostering for some time. The authors of the present issue share the same research object, maize, which they examine on various scales and from a wide variety of observation points (direct experiences, national analyses, local studies): why and for whom should we conserve agricultural biodiversity (Bahuchet *et al.* 2000, Rodríguez 2011, Swart *et al.* 2018)? How can an object such as this one, which is in constant evolution, be studied and measured? (Aguirre Salcedo & Ceccon 2020, Nicholls *et al.* 2020, Iermanó *et al.* 2020) How can practices and phenomena that conserve this diversity, but at the same time transform it, be analyzed (Dumez 2010, Cunha Ávila *et al.* 2017)? The importance relevance of certain analytical categories, and the connections between biodiversity and cultural diversity (Virtanen 2019, Roué 2006), are also at the heart of these texts. In Mexico, these questions have aroused interest in the fields of anthropology and ecology. But they have also been studied by agronomists involved in research programs in support of peasant agriculture.
- 2 This collection of works began with gatherings organized in 2014: an international conference at the Muséum National d'Histoire Naturelle (MNHN) entitled *Regards croisés sur la biodiversité cultivée* (Intersecting perspectives on crop diversity) and two days of workshops in Aquitaine. During these days, some of the authors of these texts were welcomed there by AgroBio Périgord, an association of farmers who, for about twenty years, have been cultivating, breeding and conserving heterogenous maize varieties. In light of this precious contribution from the association, we wanted to include their viewpoint in this collection. These gatherings were made possible by the support of the

Action Thématique du Muséum (ATM) *Savoirs naturalistes, expertise et politiques de la biodiversité* (Naturalist knowledge, expertise and policies on biodiversity), the Red Patrimonio Biocultural de México,¹ and the AgroBio Périgord association. Finally, the Swiss Future Food Initiative project supported us in the final phase of editing and translation.

- 3 Reflection around geographical distribution, conservation and on-farm management of the diversity of Mexican maize constitute a thread running through all of the articles in this special issue. The body of research conducted on this species in its center of origin, Mexico, is quite extensive. Over the past twenty years it has given rise to many questions and controversies around issues such as the genetic erosion of maize (Dyer *et al.* 2014, Perales & Golicher 2014, Brush *et al.* 2015). Far from wanting to draw unequivocal conclusions about these issues, here we look back at these debates through the prism of the place of peasant agriculture and local varieties in Mexican agriculture. Through the broad array of ideas and approaches represented in this issue, and through local experiences and analyses based on national-level studies, we hope to have contributed to the development of new avenues for the study of maize conservation in Mexico. The Mexican case is particularly well suited to exploring the various issues that surround and depend on the legitimacy and specificities of crop diversity conservation, as opposed to so-called “wild” biodiversity, especially in institutional arenas.
- 4 The Convention on Biological Diversity (CBD), signed in Rio in 1992, greatly contributed to the formalization of a new governance on biodiversity. This new governance would no longer be structured exclusively around collections and gene banks, but around the identification and promotion of *in situ* practices. The latter approach is meant to allow for the evolution of populations in accordance with environmental changes (Bennett 1968, Bretting & Duvick 1997, Brush 1999). The Convention’s famous preamble thus specifies: “States are responsible for conserving their biological diversity and for using their biological resources in a sustainable manner [...] the fundamental requirement for the conservation of biological diversity is the *in-situ* conservation of ecosystems”². Despite changes in the field of conservation biology since the CBD, biodiversity is still often presented by scientific institutions and international organizations as an endangered stock of fixed resources. From this perspective, the purpose of conservation is to aim to make collections (in the form of physical objects or digital information) as exhaustive as possible, rather than intervene in the factors that generate biodiversity and enable it to adapt and evolve (Fenzi & Bonneuil 2016). In addition, *in situ* conservation remains marginalized and criticized as “an expensive distraction and a waste of funds”, which deprives *ex situ* conservation of resources (Sadras 2018).
- 5 In addition to this vision that opposes conservation *in-situ* and *ex-situ* (within gene banks), there is also the idea that biodiversity is linked to knowledge about nature that is included in agricultural activities understood not only as destructive, but also as productive of biodiversity (Bretting & Duvick 1997, Brush 1999, FAO 2019). Interest in these themes has mainly occurred in the last few years. After intense debates within international institutions, in particular the FAO, a resolution on the rights of peasants was finally adopted by the UN Human Rights Council on September 28, 2018: “Peasants and other people working in rural areas have the right to seeds, including: [...] The right to save, use, exchange and sell their farm-saved seed or propagating material. [...]

5. States shall recognize the rights of peasants to rely either on their own seeds or on other locally available seeds of their choice, and to decide on the crops and species that they wish to grow. 6. States shall take appropriate measures to support peasant seed systems, and promote the use of peasant seeds and agrobiodiversity.”³
- 6 The expansion of the scope of the field of biodiversity management in some scientific and institutional arenas to include other elements (culture, food, etc.) and actors (farmers, local communities...) has not yet led in practice to a true renewal of how conservation and the use of crop diversity are conceived. The principal aim of most projects on plant genetic resources is to stock and understand agrobiodiversity through genotyping.⁴ The creation of such repositories is certainly an important step, but so far, neither farmers nor broader communities involved in dynamic crop conservation seem to have benefited from it. There is still much to be done in order to recognize the central role of farmers in the conservation and evolution of agricultural diversity. To do so, the 2018 resolution on peasants’ rights would have to be translated into public policies and national laws.
- 7 What, then, is keeping not biodiversity itself, but the conditions that enable it to persist – agricultural practices, the biological and cultural dynamics that underlie it— from being valued and supported?
- 8 The texts collected here identify certain trends and transformations, without limiting themselves to calculating the diversity of maize varieties and analyzing their distribution. They give a central place to farmers’ practices, and enable us to understand crop diversity as the result of farmers’ efforts to adapt simultaneously. The multiplicity and transformations of traditional agricultural systems are illustrated in these texts with the example of the “*milpa*”, an area of maize cultivation that is typical of the Mexican slash-and-burn agricultural system. In both scientific and popular literature, this system is described as characterized by the combination of maize, beans and squash. The reality, however, features a range of practices which are often not included in this pattern. In *milpas*, we can find commercial cultivations meant for sale. Often, *milpas* also appear in the form of a maize monoculture dedicated to self-consumption, which peasants who are busy with other activities, including non-agricultural ones, perceive as a means of profiting from the resources available to them. But attention to cultural practices must not be limited to the observation of work in the fields. Taking an interest in the diversity of maize will lead us to discover that the borders between *criollo*, native, modern and hybrid varieties of maize are made permeable by farmers’ practices and the constant circulation of seeds. These borders thus tend to fade or be erased by the inventive activity of farmers themselves, who often do not see their maize in terms of these categories, and who continuously create populations that are increasingly adapted to their needs. There thus tend to be significant discrepancies between widespread ideas about traditional peasant agriculture and the multitude of agro-ecologies in action in Mexico. In approaching questions of conservation, then, we must take into account a more complex and problematic socio-economic and ecological reality.
- 9 This collection aims to bring together highly varied experiences and analyses from researchers in various fields, farmers, and associations. This meeting of perspectives associated with the diverse epistemic, normative and technical trajectories within these various groups constitutes an opportunity to reconnect the subject of biodiversity with social, scientific and political identities. During the research days

organized with the support of MNHN, our purpose was to create the space for different actors' intentions and points of view to emerge, analyzing the practices, knowledge and visions of and around crop diversity deployed in each context.

- 10 Our hope is for this collection of texts to highlight the existence of multiple sources of maize crop diversity. Each article analyses different factors that explain the presence of heterogenous maize varieties in farmers' fields. We will see the founding elements of the diversity of Mexican maize in the work of over two million farmers using seeds that they bred themselves, and who cultivate over half of the eight million hectares dedicated each year to maize cultivation (Lazos & Chauvet 2011, Perales 2017). We will also see, in France, in a completely different situation (notably within associative networks such as AgroBio Périgord), that there too farmers have implemented a system that generates maize diversity.
- 11 The importance of maize in peasant agriculture in Mexico is presented first by Rafael Ortega Paczka, agronomist and representative of the Red Patrimonio Biocultural de México (Biocultural Heritage Network of Mexico). He specifically analyzes the historical and technical trajectory of maize breeding in Mexico through the prism of different epistemologies, where scientific and peasant knowledge blend together. His experience highlights farmers' crucial role in efforts to improve maize in Mexico, encouraging participatory approaches. He takes as a model what is known as "*Selección Masal Visual Estratificada (SMVE)*" (stratified visual massal selection), describing how it creates a dialogue between the respective forms of ecological knowledge of farmers and breeders.
- 12 The issue continues with various analyses drawn from the 2006-2010 Proyecto Global de Maíces nativos⁵ (Global project on indigenous maize) of the Comisión nacional para el conocimiento y uso de la biodiversidad (CONABIO).⁶ Probably the most exhaustive project on indigenous maize distribution in Mexico ever implemented, its purpose was to document the geographical distribution of maize throughout the country, in order to establish the country a whole as the center of both the origin and the diversification of maize. Elena Lazos Chavero and Michelle Chauvet were charged with interpreting the results from a social-scientific angle. Taking a broad socioeconomic perspective, they analyze the diversity of agricultural mosaics in the north, center, and south of the country. Their contribution surveys a range of questions around maize as bio-cultural heritage, and highlights the risks of considering maize solely as a form of natural capital. Cecilio Mota, who was involved in the implementation of the Proyecto Global, provides a particularly lucid analysis of the work of data collection and systematization within it. He presents surprising details about maize's varietal diversity, examines the associated symbolic values, and documents the uses of different varieties in food practices. In another article drawing on data from the Proyecto Global, but also from other sources, Hugo Perales sets out the factors that structure the varietal landscape of maize. He interprets the case of maize in Mexico as an example of the evolutionary improvement of a plant (through both natural selection and farmers' selection on a broad genetic base) which is able to meet specific requirements in the context of the pursuit of food safety. His argument is built around the idea of de facto conservation of maize, which, he argues, remains very extensive and dynamic in Mexico. He shows that breeders' use of genes cannot be considered the main goal of in situ conservation.
- 13 Jean Foyer and Marianna Fenzi combining multiple conceptual and empirical resources from the sociology of public policy to explore the issue of conservation. To do so they

examine studying institutional policy instruments, and the associated mobilization and implementation of various types of knowledge, within the Programa de Conservación de Maíz Criollo (PROMAC). They show how these different types of knowledge are mobilized—or, on the contrary, marginalized—in aim of making an object (maize conservation) governable. They catalogue the various forces that have shaped the implementation of the program, from the definition of its goal at the level of national institutions to its implementation at the local level.

- 14 The text of Quatzalcoatl Orozco-Ramírez and Brush explores the role of culture in agricultural landscapes. In particular, they present the influence of local languages in the management of maize diversity. In Oaxaca, the Mixtecs and Chatines share the same ecosystem, but are distinguished by cultural particularities, including language. These particularities constitute lines of demarcation between the two peoples, so that, for instance, although they may be neighbors, they do not share the same seed lots. Behind the names given to local varieties lie the knowledge and practices transmitted in each language, whose subtleties may be difficult or impossible to translate. This case study highlights the forces that constitute bi-cultural diversity in the region, and shows how they can influence the evolutionary dynamics of this crop.
- 15 Taking an interest in the cultural aspects involved in the conservation and evolution of crop diversity in the field, Alvaro Salgado's article analyzes the characteristics of maize other than yield that are enhanced by peasant and indigenous communities, as well as the effects that result from these choices. In his text, Salgado, agronomist and representative of the Centro Nacional de Ayuda a las Misiones Indígenas (National Center for the Assistance of Indigenous Missions, or CENAMI) and the Red en defensa del maíz (Network for the defense of maize), reflects on the cultural systems that surround conventional and peasant agriculture, as well as on the goals that guide the types of exploitation practiced in each case. He shows that various types of selection and conservation practices create different results in maize populations, but also in cultural reproduction and the autonomy of rural communities. The contribution of Pánfilo Hernández Ortíz, farmer and representative of the Grupo Vicente Guerrero (an association of farmers), documents the experience of the defense and protection of seeds in the Tlaxcala region. He retraces the strategies of struggle that farmers and their organizations have engaged in over time, and the successes of this movement. He shows how the struggle against transgenic maize not only led to the creation of a law to ban its use in the Tlaxcala state,⁷ but also encouraged the reevaluation of peasant agriculture and galvanized the exchange of farming seeds in the region.
- 16 The final contribution is that of the AgroBio Périgord association, which, along with the Muséum National d'Histoire Natuelle, hosted the exchange days that made this special issue possible. The article narrates the historical and technical trajectory of this program of networking of knowledge and practices on maize in France. In a homogenous varietal context, as in the European case, the adoption of heterogenous varieties has made an important contribution to the development of diversified agricultural systems. Farmers' need to have their own seed thus reflects their concern with investing in more autonomous models, shaped by new forms of socialization around crop diversity in Europe (Fenzi & Couix 2021). Although their context differs from those in Mexico, these farmers share struggles in the aim of ensuring that crop diversity is valued.

- 17 We thought it would be useful to complete this special issue on the management of maize diversity in Mexico with two documents related to the activities of the Museum's eco-anthropology laboratory. During the last six years, the researchers and students of this laboratory have carried out field studies in Mexico, which allowed them to gather collections of objects. Many of these objects are related to maize and its place in Mexican agriculture, food and daily life. We offer in the appendix of this issue, resulting from the 2014 meetings, a catalog of 72 objects related to maize in agriculture. A selection of these objects had been presented in an exhibition realized in 2019 with the Cultural Institute of Mexico in Paris; we describe it in this issue of the *Revue d'Ethnoécologie*.
- 18 In conclusion, this issue seeks to highlight the interest of acknowledging the central role played by smallholder agriculture: in Mexico, central in terms of demography, total production, and cultivated area. Most previous research in this field has emphasized the consequences of the agro-industrial model and the erosion of crop biodiversity. In this issue, we focus instead on demonstrating the scale of the diversity and evolution of maize. This adaptive and dynamic diversity reflects great resilience, in the face of an institutional context that neglects it when it does not directly affect it. Although Mexican farmers work *de facto* on maize conservation in their fields, it seems essential that their practices be supported by the revitalization of conservation strategies on a cross-disciplinary basis, considering a diversity of actors. The contributions in this issue have the merit of encouraging reflection on the culture and cultivation of maize in Mexico in the hopes that it can finally be considered, not as a residual space that can serve as a “gene reservoir”, but as a social and ecological space that is fully active in its own right—one that is crucial for the country’s agricultural future.

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NOTES

1. The *Red Patrimonio Biocultural de México* is a network of institutions and researchers founded in 2011 with the support of the CONACyT (), whose purpose is to conduct studies on the country's biological and cultural diversity, and to support the various stakeholders who make it possible on the field and on the institutional level, see: <https://patrimoniobiocultural.com>
2. Preamble, Convention on biological diversity. <https://www.cbd.int/doc/legal/cbd-en.pdf>
3. *United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas A/HRC/RES/39/12*, (Article 19; 1d, 5,6). <https://digitallibrary.un.org/record/1650694?ln=en>
4. The CIMMYT, for instance, presents some of these activities as contributions to a “genetic library” that gives access to a “platform for the utilization of genetic resources”: “The CIMMYT germplasm bank is the lifeblood of many Seeds of Discovery (SeeD) activities, preserving the genetic diversity that is necessary to develop improved maize”. <https://seedsofdiscovery.org/>
5. https://www.biodiversidad.gob.mx/media/1/genes/files/InformededeGestion_V1.pdf
6. The *Comisión Nacional para el Conocimiento y Uso de la Biodiversidad* (CONABIO) is a governmental agency created in 1992, meant for the study, conservation and sustainable use of biological diversity, see: <https://www.gob.mx/conabio>
7. *Ley de Fomento y Protección al maíz como patrimonio originario, en diversificación constante y alimentario, para el estado de Tlaxcala*, published in the *Periódico Oficial* of the State of Tlaxcala on January 18, 2011. <http://periodico.tlaxcala.gob.mx/indices/2Ex18012011.pdf>

AUTHORS

MARIANNA FENZI

Laboratoire d'Histoire des Sciences et des Techniques, École Polytechnique Fédérale de Lausanne, Lausanne, Suisse - Centre Alexandre-Koyré (EHESS/CNRS/MNHN), Campus Condorcet, Aubervilliers, France

MARIA GABRIELA ZURITA-BENAVIDES

Grupo de Ecosistemas Tropicales y Cambio Global - Universidad Regional Amazónica Ikiam

JORGE QUETZAL ARGUETA PRADO

Postdoctorant Programa Interinstitucional de Especialidad en Soberanías Alimentarias y Gestión de Incidencia Local Estratégica - CIATEJ-CONACYT - México