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Science and Nature: positions and logics of discourse.

Political and sociological constructions of knowledge of maize seen in the prism of the "Global Project on primitive maize varieties" (Mexico, 2006-2010)

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Political and sociological constructions of knowledge of maize

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of the "Global Project on primitive maize varieties" (Mexico, 2006-2010)

Etienne Gérard[1]

Summary

This essay, based on a brief ethnography of a Mexican ministerial project on maize, deals with two major factors determining the treatment of the preservation and conservation of maize as a national resource. On the one hand this issue is a political construct; on the other hand it has been constrained by the organisation of science in Mexico; and the patterns of this organisation (its structure and hierarchies) have been determined by the orientations of the political construct. Our study shows that because of this dual conditioning, knowledge of maize produced within the framework of the ministerial project has undergone a quadruple deformation or "twist". Firstly, it is based (at least to some extent) on the positions occupied by stakeholders in the organisation that administers science and in the field of knowledge. Secondly, the hierarchy of knowledge is based on a segmentation of research processes: the knowledge of maize produced results first and foremost from technical operations and treatments, with its socio-economic and — even more so —symbolic dimensions being allowed at best to provide illustrations. Thirdly, this body of knowledge has undergone a ranking procedure: agronomy predominates; sociology, economics and anthropology have a secondary status. Last but not least, the knowledge produced has been formatted by the categorisation and segmentation of political ideas concerning maize, which assign to research the merely utilitarian functions of conservation (with maize being treated as a mere asset), and of improvement (of its varieties); no attention is paid to another function: that of understanding the socio-economic factors conditioning production and improvement maize, with a view to the future. In sum, an ethnological study of projects such as the *Proyecto global de los maíces nativos* shows that it is impossible for "scientific" and "traditional" knowledge to meet unless there is a dialogue between them; comprehension has always to be a political and sociological construct.

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« en sí no hemos hecho un programa así como para

atender definitivamente las necesidades más apremiantes de los agricultores (…)

los que están sufriendo más son los más pobres »

An agricultural scientist, project manager in the *Proyecto Global de los Maices nativos*

Numerous historical studies (in particular Moulinier, 2012) have shown the influence of the movement - between the so-called countries of the North and those of the so-called South - of information on the organisation in the "South" of systems of scientific knowledge and on the emergence of new fields and objects of scientific study. Studies with a more sociological oriented have revealed the existence of "knowledge-chains " (Gérard and Maldonado, 2009) gradually set up between countries and institutions that have encouraged this emergence thanks to e.g. the diffusion of schools of thought (Garcia, 2009). Links between researchers and institutions, both national and foreign, originate to a large extent from the training of Mexican researchers abroad (Gérard, 2013), which influences the legitimisation in Mexico of scientific knowledge and certain ways of producing it. Two linked processes are thus merit attention when one studies the process of producing knowledge and the knowledge produced. How do the ways in which scientific fields are set up and organised influence the acquisition of knowledge? And what effect does this organisational process have on the knowledge acquired? Apart from these issues, it is also worth examining the internal relationships between the components of a body of knowledge from this point of view: how do scientists accept so-called "traditional" knowledge and possibly integrate it into conventional "scientific" knowledge? Is this process conditioned by the way in which the existing field of scientific knowledge has already been configured, possibly by outside influences? Should the reception and treatment of "traditional" knowledge – and in particular knowledge of nature – not be re-examined and analysed anew in this light: that of the processes configuring the field of science?

In Mexico, the organisation of research is strictly hierarchical. The community of lecturer-researchers and researchers (the "*planta academica*") is divided into two main sections: those who are members of the meritocratic system (the "National Research System: *Sistema nacional de los investigadores*, SNI – Gérard, 2013), and those who are not. Each of these sections also has an internal ranking system.

Our hypothesis is that under this system, the knowledge produced concerning a particular object will probably be ranked in the same way as the scientific community, in accordance with its internal hierarchy. The divisions and hierarchy of the corps of researchers would thus play a part in the categorization of any particular corpus of knowledge. This would probably also be the case with the constitution of "sub-sets", in partially separate compartments that could possibly be made "watertight". This would mean that the relationship between scientific and "traditional" knowledge would be based on the principles of organisation, operation and legitimacy proper to the particular research field involved and its relationship to other sectors of society. These relationships would be "limited" and "constrained" by the dynamics and interests proper to the sector in question. Lastly, scientific knowledge would be a product of the relationships between the various institutions (political, scientific, and socio-economic), both national and international, that manage the issues of biodiversity and the environment.

In this survey we are testing these hypotheses by applying them to research into maize in Mexico, more specifically in an *ethnography* of a Mexican research *project*[2]: the *Proyecto Global de los Maíces nativos* (PGM). This project was implemented between 2006 and 2010 on the initiative of the secretaries of Agriculture and the Environment, mobilising under the aegis of CONABIO (*Comision Nacional para el Conocimiento y Uso de la Biodiversidad*)[3] most of the Mexican researchers working in that particular field. We will try to find out the extent to which in Mexico scientific knowledge of maize is the product of the structure of a "field of knowledge" of the environment (Kleiche-Dray, 2012) and of the organisation of the Mexican system of research. This concern stems from a central issue: the role and weight of various arrangements and organisations in the production of knowledge concerning a natural resource, in this case maize — at a time when, in a broader perspective, these variables are being queried: as regards the environment, the conservation of natural resources and the role of agro-diversity (*ibid.*)

In Mexico, maize always provides food for thought, constantly feeding into the Mexican imagination: "The can be no doubt about it: maize is an essential part of being Mexican. It would be no exaggeration to say that without maize Mexican nationality would be inconceivable. Maize is the grain that has given birth to our Nation and enabled it to flourish"[4] (Mayra de la Torre, 2008). E. Lazos and M. Chauvet, in an article on "The social and cultural context of collections of primitive maize in Mexico" remind us that in 2007 maize took up 28.7% of the surface cultivated in Mexico, and that 6 of the 44 million economically active Mexicans worked in agriculture (Lazos and Chauvet, 2011: 20).

According to these sociologists – but also to many agronomists – agro-biodiversity is being jeopardised by "serious erosion of the fabric of society". According to these authors, some 62.8% of the rural population of the country no longer work in agriculture. Various authors agree that among yet other factors that weaken agro-biodiversity are the ageing of the rural population and the emigration of young people.

At the same time, the authorities are safeguarding maize; its conservation and the improvement of existing varieties are a political issue, as is the introduction of transgenic varieties[5]:

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[2] This ethnography is by no means exhaustive. We have limited it to the study of this project, using an incomplete sample of the population (researchers, technicians, administrative staff, representatives of ministries) involved in the project. The research was carried out only in Mexico State, although many research groups worked in other states of the Mexican Federation. Lastly, this research was carried out after completion of the PGM, and not while it was in progress. These spatial and temporal factors limit the results proposed in this report.

[3] The project was financed by the SEMARNAT (*Secretaria del Medio Ambiente y Recursos Naturales*), the CIBIOGEM (*Comisión intersecretarial de Organismos Genéticamente Modificados*) and the SAGARPA (*Secretaria de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación*).

[4] « No hay duda que el maíz es parte esencial del ser mexicano, no exageramos si decimos que sin el maíz no es concebible la nacionalidad mexicana. El maíz es la semilla que dio origen e hizo florecer a nuestra nación ». Free translation by the author of the present article.

[5] As of 1992, an "Agreement on biological diversity" (*Convenio de Diversidad Biológica* -CDB) included biosecurity, seen as an obligation to conserve *in situ*, at national level, and mandated the parties to this agreement to apply the Cartagena Protocol in order to regulate the movement across frontiers of "living organisms modified by modern technology" (*organismos vivos modificados mediante la biotecnología moderna*) and to recognise the importance of "original centres of genetic diversity for humanity", reasserting the precautionary principle established in the Rio declaration (Conabio, 2011).

« Aquí la controversia es, que, las variedades mejoradas tienen sus nichos apropiados, yo tampoco puedo decir que si yo tengo tierras fértiles y con agua suficiente para regarlo, no voy a meter un material nativo que tiene un potencial de tres, cuatro toneladas por hectárea, cuando yo tengo un híbrido que puede dar, trece, catorce quince o hasta veinte toneladas. (...)entonces, cada uno de estos materiales tiene su lugar, tiene su ámbito donde se puede desarrollar, y aparte, este germoplasma nativo es el que dio origen a este mejorado y todavía puede dar más, entonces, si no lo conservamos, lo perdemos antes de saber qué es lo bueno que tiene (...) entonces, esa es la cosa, de buscar primero, el conservar el material, segundo, saber para qué sirve, qué características tiene, tercero, saber exactamente cómo podemos sacar lo bueno de este material, porque, habrá cosas que ahorita no son importantes para nosotros o el mercado no, nos lo está demandando, más sin embargo, no sabemos en un futuro qué es lo que nos vaya a mandar » (agronomist, INIFAP, 19 March 2013).

In 2002 the Secretariat of the Environmental Cooperation Commission[6] received a petition from 21 autochthonous local authorities in the State of Oaxaca and three groups of ecological advocacy (Greenpeace México, the *Centro Mexicano de Derecho Ambiental* and the *Unión de Grupos Ambientales*), with the subsequent support in more than 90 letters from institutions and organisations in the three countries that are partners of NAFTA, "requesting a study of the impact of the introduction of transgenic varieties on primitive varieties in Mexico". As of 2001, the introduction of GMOs was reported in Mexico (Secretariat of the Environmental Cooperation Commission, 2004).

Lastly, while primitive varieties (*nativos*[7]) are dealt with in several programmes - such as the *Proyecto Global de los Maíces nativos*, and the *Programa de conservación de maïz criollo*[8] (PROMAC) run since 2010 by the National Commission for Protected Areas (*Comisión Nacional de Areas Naturales Protegidas*) - the policies are being studied by researchers — and queried:

« No se puede pensar en una sola política para la conservación de los maíces nativos, disent en ce sens E. Lazos et M. Chauvet, précédemment citées. Es poner en la balanza nuestro futuro. ¿Queremos un país dependiente en la agroindustria transnacional?, o ¿queremos un país que construya procesos que apunten hacia una soberanía alimentaria? El primer camino será más fácil, pues el "tapete rojo" ya está puesto para las transnacionales, pero esto nos llevará a construir una sociedad de riesgo y de alta vulnerabilidad frente a la amenaza en la pérdida de la seguridad alimentaria y seguirá desplazando familias rurales hacia un éxodo sin frutos. El segundo es más difícil, pues lleva arduas negociaciones entre las políticas agrícolas,

[6] This commission was set up by the USA, Canada and Mexico, in 1994. Its overall mandate, according to the 2004 report, "consists in encouraging cooperation, protection and public participation in order to promote conservation, protection and improvement of the environment in North America for the benefit of present and future generations, within the context of increasingly numerous commercial and social links between the three countries".

[7] We are using here the original term in Spanish. The translation "related wild species" will be used in the rest of this article to translate this term whenever it appears in the texts consulted and interviews carried out. We will apply this rule to all specific Spanish terms, mentioning this practice only in the case of the first translation. The English term will thus always refer to the Spanish equivalent mentioned in the first occurrence of the translation.

[8] "Maïs nativo" or "primitive" is also known as "maïs criollo" (Creole). Rafael Ortega Paczka, who took part in the PGM, points out that he refers to "what are popularly known as *variedades criollas"* as "población local nativa" (primitive local population) (Paczka, 2011 : 123). As to the term "Creole", it refers historically to the descendants of Spaniards born in America, but this sense does not correspond to that of the populations of maize maintained by farmers, while, he asserts, the *Diccionario de la Lengua Española de la Real Academia* accepts a sense that he finds suitable: *Autóctono, propio, distintivo de un país hispanoamericano* (*ibid*.).

ambientales, educativas y de salud primordialmente para transformar la política económica de nuestro país. Muchas poblaciones rurales han sido marginadas, utilizadas, manipuladas, o peor aún, han caído en el olvido. Sin embargo, muchas otras han anclado alternativas a través de acciones colectivas que los han llevado a experiencias exitosas en la defensa de su agrobiodiversidad.

México es un gran mosaico de culturas, intereses, nichos ambientales, topografías, vegetaciones, redes políticas que nos obligan a pensar en políticas diferenciadas, pero integrales »

(Lazos and Chauvet, *op. cit.*, p. 486).

To sum up, maize raises an ensemble of political, environmental, social and economic issues. Because of this, it has become an important object of study in research into WP5 (Bekonal) carried out by the ENGOV consortium in Mexico (Katz *et al*., 2012 ; Kleiche-Dray, 2012).

In the framework of the present survey, maize has been taken as a prism through which the environmental knowledge of the main agents linked to it — the people growing it — can be studied. To what extent has the research on maize carried out in Mexico taken into account this particular body of knowledge? This is especially important in cases where the object of study is the "primitive", "local", or "Creole" maize. Just as "traditional" knowledge cannot be understood without analysing the role of agents such as NGOs and public organisations, national and international (*ibid*.), the interaction between researchers and farmers in producing knowledge of maize, including "traditional" knowledge, should also be taken into account.

Before dealing with these interactions between researchers and farmers, we will look into the relationship between "traditional" knowledge and the production of scientific knowledge in the framework of a project such as the *Proyecto Global*. The relationship can be conditioned by the organisation, structure and orientations and modes of execution of the project itself. Apart from this particular issue, to what extent does the system of research itself underlie (wholly or partly) the production of knowledge when it mobilises a community of researchers of differing status, functions and academic discipline? Lastly, what relationships involving knowledge of maize can be brought into being, mobilised and assessed in a project of this sort — and thanks to it? In other words, does a project of this sort concerning one of the main natural and environmental resources of Mexico show deep appreciation by researchers of farmers' "traditional" knowledge? These are the questions we will attempt to answer as fully as possible in the following pages.

After explaining our methodology and sampling procedures, we will explore these issues, following three lines of thought. Firstly, we will examine the *Proyecto Global*: the Global Project on Primitive maize varieties (PGM), its orientations, organisation and structures; secondly, the relationships between these characteristics and the Mexican system of research; and lastly, the impact of these characteristics and of the structuring of the system on the way in which the research workers involved in the PGM approach "traditional" knowledge of maize.

Methodology and sampling

Our survey was carried out in March 2013 in the State of Mexico. It adopted as a frame the *Proyecto Global de los Maíces nativos (PGM)*. Its aim was to gain understanding of the relationship between the "scientific" and "traditional" forms of the knowledge in question.

According to the initial postulate we adopted, all types of persons involved had to be interviewed, taking into account their professional status, functions and academic disciplines. This was to enable us to assess the extent interaction between "scientific" and "traditional" forms of knowledge in the course of a large-scale operation such as the PGM. This sampling was essential to an understanding of the project as a whole. It involved grasping the following: the organisation and functioning of the project; the data taken into account; and the relationship between these data and the issue of "traditional" knowledge. It was essential to examine the possible links between organisation and functioning on the one hand, and the results of the project on the other (data available on the Internet site of the PGM – see bibliography). But it was also important to reveal the linkage between two issues: that of the orientation of the project and that of the forms of knowledge involved. Seventeen persons (see appendix) were interviewed[9] to establish their status and their manner of involvement in the project[10] (project manager, assessor/adviser, or collaborator; or participant in preparatory operations such as bibliography, the collection of samples of maize on the terrain, and preliminary analyses).

Qualitative interviews followed three thematic lines:

- The participation and roles of the various agents (researchers, investigators, members of CONABIO, institutions) involved in the PGM; the functioning of the project; and the results obtained;

- The assessment by researchers of the knowledge of maize acquired in the PGM;

- The links that could (or could not) be established with "traditional" knowledge of maize; representations of this latter knowledge; and the bearing of these links on the controversy over transgenic and "primitive" maize;

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[9] Two sources made it possible to constitute the sample: firstly, the "list of participants in the project", available on the Internet site of the PGM

(http://www.biodiversidad.gob.mx/genes/pdf/proyecto/Anexo1_Participantes/Anexo%201_lista%20de%20participantes.pdf)

and secondly the data file on researchers in the *Sistema nacional de los investigadores* (SNI – see in particular Didou and Gérard , 2010). Many interviewees and members of the PGM, however, are not members of this System. They were contacted either by e-mail or directly at the workplace, and met by appointment.

[10] All these persons were interviewed in Mexico State; we were not able materially to meet PGM participants from other regions. This restriction admittedly limits the validity of our study. However, the main sections of the PGM were nonetheless dealt with (*v. infra*), so that the sample selected is representative of the personnel involved in the PGM in terms of professional status, academic discipline, and the status and function in the Project. We were obviously not able to visit all the scientific institutions that undertake research into biodiversity, or even simply maize. But — pending a possible complementary investigation — the main interlocutors were INIFAP, the Colegio de posgraduados de Chapingo, the UAC of Chapingo, departments of the UAM (Azcapotzalco et Iztapalap), of the UNAM (Instituto de Biología, IIMAS). Several events affected the progress of the investigation initially planned: holidays, and a strike at the Universidad Autónoma de Chapingo. Apart from a manager at CONABIO, all interviewees contacted agreed to take part in our survey, except in cases where they were unavailable. I would like to thank them all here for making themselves available and also to thank Sandra Jaimes who helped me with this task and with the transcription of some 24 hours of interviews.

- Lastly, the professional record of the researchers and their scientific activities.

These interviews, complemented by the CONABIO documentation available on Internet, enabled us to collect data relevant to the three main undertakings of the PGM: revision of the scientific literature on maize; collection of maize samples; modes of treatment of the data collected and, lastly, the quantitative analysis of the data — in particular socio-economic — brought in by collection on the terrain[11]. The status of the persons interviewed (researcher, engineer, technician) and their academic subject (ethno-botany, biology, agronomy, sociology) provided invaluable information on the orientations of the PGM and its thematic priorities. The interviews also enabled us to define (in part) more closely the ways in which the agents involved in the project thought of maize in Mexico and of "traditional" knowledge (their "representations"). Possible links between status and subject matter on the one hand and on the other the agents' representations were also examined.

I – The Global Project on primitive maize varieties: a product of policies and the organisation of science?

The "Global Project on primitive maize varieties" was developed and carried out between 2006 and 2012[12], with a budget of 15 million pesos. It was intended to "update information on maize and related wild species [*parientes silvestres*] in Mexico, and to identify centres of genetic diversity in maize", as defined in the "Law on Bio-security and Genetically Modified Organisms" (*Ley de Bioseguridad de Organismos Genéticamente Modificados*, articles 86, 87 et 88) passed on May 4, 2005. Initiated and managed by CONABIO, the project was coordinated by INIFAP (*Instituto nacional de Investigaciones Forestales, Agricolas y Pecuarias*, Chapingo) and INE (*Instituto Nacional de Ecología*). With a view to updating this information on maize, CONABIO designed a project with a triple thrust, those of:

- producing a document on "the centres in which maize originated and genetic diversity" showed up;

[11] Two other researchers, who did not take part in the PGM, were interviewed because of their knowledge of the movement of country schools (*escuelas campesinas*) and the participative movement that seeks to involve farmers in the formulation of the regulations that apply to the production and commercialisation of their output. The *Escuelas campesinas* correspond to an local initiative activist movement dealing with education for farmers and "natives". It took shape in particular in 2003, reacting to TLCAN, the North American free-trade treaty, in the wake of the farmers' movement in 2003, when 100 000 people demonstrated in Mexico against the government's policies "*por el abandono el campo en cuanto a apoyos tecnicos, sericios sociales y falta de creditos*", and "*por la reniegociacion del capitulo agropecuario en el TLCAN*" (Mata Garcia, 2005 : 13). All training and empowerment initiatives for farmers were at the time called generically "*escuelas campesinas*". Mata Gracia defined them as "*una alternativa de capacitacion incluyente del saber de los hombres que 'cultivan la tierra', aplicando metodologias participativas y tratando de que los indigenas y campesinos sean sujetos activos de su propria vision de desarrollo*" (*ibid*., p. 14). The Autonomous University of Chapingo, acting through its department of rural sociology, has pursued work on this issue, in direct contact with the *escuelas campesinas*.

[12] Actual operations planned in the project (revision of the bibliography of work on maize, collection of varieties of maize, etc.) started in 2007, the year when CONABIO issued its call for tenders. According to an interlocutor who is a member of CONABIO, the project is still under way today; results of the gathering operations are subject to "an internal process of quality control".

- digitizing scientific collections of "primitive maize" (*maiz nativo*), zea (*teocintle*) and tripsacum[13]; and

- gaining a better understanding of the diversity and current distribution of "primitive maize" and its related wild species by means of collection operations to be carried out in 32 regions of the country.

Brought together by invitation and calls for tenders[14], 118 researchers from 34 academic and research institutions[15] took part in exploratory and gathering operations on maize varieties in 62% of the municipal areas of the country (1522 out of 2429)[16], defining samples, collecting and systematising data, and analysing it. Counting also the workshops organised by CONABIO, 235 people from 70 institutions took part in the project.

The CONABIO project was a landmark in maize research in Mexico. It followed some major sample-gathering operations that dated back to before the Green Revolution. These had been undertaken on the initiative of the Rockefeller Foundation and the Ministry of Agriculture, which operated through the Directorate of Experimental Fields (*Dirección de Campos Experimentales*) and the Institute of Agricultural Research (*Instituto de Investigaciones Agrícolas*[17]). During the 1980s and the 1990s, CIMMYT conducted operations in Chihuahua State. The results can be found in accounts by people the researchers met in the course of their work, such as Hernandez Xolocotzi, a veteran who pioneered maize research in the 1940s and 1950s[18], and many of whose students and intellectual heirs are research workers today, in particular in agronomy. The objective of the PGM was to resume and develop this research, and to use the results as a base, organising them more

[13] In particular the collection of "nativo" maize by CIMMYT (*Centro Internacional de Mejoramiento de Maíz y Trigo*) and by the INIFAP (*Instituto Nacional de Investigaciones Forestales y Agropecuarias*).

[14] As we were able to assess in examining our sample, Mexican specialists – agronomists, ethno-botanists, sociologists – were invited directly to take part in operations that we will describe infra as "meta-knowledge", i.e. revision and analysis of the bibliography of work undertaken in Mexico, classification by genotype of the maize collected, socio-economic analysis of surveys of maize farmers carried out at basic level on the terrain.

[15] The main institutions participating were the INIFAP and its Regional Centres, the *Universidad Autónoma Chapingo*, the Colegio *de Posgraduados*, the *Universidad de Guadalajara*, the *Universidad Autónoma Agraria Antonio Narro*, the *Universidad Autónoma de Tamaulipas*, the *Universidad Autónoma de Nuevo León*, the *Colegio de la Frontera Sur*, the *Centro de Investigación Científica* of Yucatán and the Centro *Internacional de Mejoramiento de Maíz y Trigo*. V. appendix 2 for the complete list of institutions involved.

[16] Source : " Cobertura de la exploracion y colecta de maiz", *Proyecto global de los maizes nativos*, appendix 12, p. 2. E. Lazos and M. Chauvet mention coverage of 36 % of 2 440 municipalities.

[17] Paczka reports that the collections of the INIFAP and the CIMMYT were constituted as of 1944, with the Oficina de Estudios Especiales (OEE), and with from 1944 to 1960 support from the Ministry of Agriculture of Mexico and the Rockefeller Foundation (Paczka, *op. cit*.). The work by Edwin John Wellhausen, Paul C Mangelsdorf, Lewis Melvin Roberts and Efraim Hernandez Xolocotzi, *Razas de maíz en México*, based on a 1951 collection, is still a landmark today.

[18] With in particular the Americans Wellhausen, Norman Eduard Borlaug of the Rockefeller Foundation, Bruce Benz of Texas Wesleyan University and Major Goodman of the University of North Carolina – who trained numerous Mexican maize specialists; Major Goodman was associated with the PGM as an evaluator of projects submitted in response to the call for tenders. Closer to our own time, several Mexican researchers who also took part in the PGM influenced the work of our interlocutors: Hugo Rafael Perales, of the Colegio de la Frontera Sur (ECOSUR), Flavio Aragon Cuevas and Juan Manuel Hernandez Cassillas, of the INIFAP, and Rafael Ortega Paczka, of the Universidad Autonoma Chapingo – to mention only some.

systematically (in particular by digital archiving) with a view - according to some of our interviewees – to countering the introduction of transgenic maize[19]:

« el propósito de este proyecto ha sido aportar elementos a las, a las dos principales secretarías del país, la del ambiente y la de agricultura, para la definición y determinación centros de origen del maíz, esto con base en lo que se establece en los, en dos artículos de la ley de bioseguridad, de los organismos genéticamente modificados»

(CONABIO personnel, México, March 21, 2013[20]).

A UMA sociologist specifies that:

« la pregunta de partida de esto era, cómo era el régimen de protección especial para maíz, lo que ellos buscaban era decir: qué tanta variedad existía en los estados para que no pudieran entrar los transgénicos, en relación a qué, en relación a la contaminación que se puede dar, entonces, lo que ellos buscaban era que se dijera y que se sustentara que era un país mega diverso, o sea, que era un país lleno de maíz y que no podía entrar lo que eran los maíces transgénicos porque si no podían acabar con esa diversidad »

(sociologist, collaborator, UAM-A, March 18, 2013).

Basically, the PGM set as an objective and obtained as a result an ensemble of data on the species (*razas*) and varieties (*variedades*) of primitive maize. Some 24,000 elements (three times the amount produced by the gathering operations carried out by CIMMYT) were recorded throughout the country. The phyto-genetic characteristics of these varieties, their distribution throughout the country, and the primary characteristics of the conditions under which they were produced (e.g. natural resources, agricultural operations, number of people engaged in the production of maize) formed the main part of the results obtained and characterised the approaches used.

The 118 researchers, engineers and technicians engaged in the PGM were mobilised for the most part for the gathering operation, in 11 regional sub-projects on "information on the diversity and current distribution of primitive maize and the wild species related to it" (*Conocimiento de la Diversidad y de la Distribucion Actual del Maiz Nativo y ses Parientes Sivestres*). To these were added a projected revision of the scientific literature and four projects on analysis of the data obtained[21].

To what extent was knowledge in the possession of the so-called "traditional" or "native" farmers taken into account in producing the data? To put this more simply and in more general terms: to what extent did the characteristics of the production of maize in Mexico and the social conditions under which it is produced affect the interpretation of the data collected? Analysing the

[19]« El objetivo de esta ley es regular las actividades de utilización confinada, liberación experimental, liberación en programa piloto, liberación comercial, comercialización, importación y exportación de organismos genéticamente modificados (OGMs), con el fin de prevenir, evitar o reducir los posibles riesgos que estas actividades pudieran ocasionar a la salud humana o al ambiente y a la diversidad biológica o a la sanidad animal, vegetal y acuícola », Mayra de la Torre, « Régimen de protección especial del maíz », Mayra de la Torre, 2008.

[20] For each extract from an interview we will indicate the author's qualifications, the part he/she played in the PGM, his/her academic discipline, the institution to which he/she belonged, and the place and date of the interview.

[21] A detailed description of the composition of the research teams will be found in the appendix.

interviews, four things seemed determinant: the problematic orientations of the *Proyecto*, its structure, the ways in which it was implemented and, lastly, the analyses and valorisations it made.

As was pointed out by our previous CONABIO interlocutor, the discipline mainly referred to in the studies was

« básicamente agronomía, porque, pues, se conoce que, o sea la investigación que ha habido en estos estudios ha sido llevada a cabo básicamente por las instituciones agronómicas. Mucha gente que tiene formación en agronomía, en biología y que ha participado o tiene experiencia en el tema pues fueron los que participaron en el proyecto »

(CONABIO staff, México, March 21, 2013).

To identify the varieties of maize, the centres in which it originated, the natural conditions under which it was produced, and its diversification, operations consisted basically in collecting samples in the different regions of the country, in analysing their morphogenetic characteristics, in ensuring their conservation (at the INIFAP), and in setting up data banks in both material and digital form for the elements collected:

« *Entonces cuando se propone el proyecto se plantean tres líneas de trabajo, una es la que usted menciona, la que trabajó el Dr. Kato y el Dr. Bye que es, este, primero reunir todos aquellos elementos, conocimientos que hay sobre el origen y diversidad del maíz, entonces fue una de las líneas y el resultado fue esta publicación que está en línea, una publicación pues, que no se había hecho desde México, es uno de los grandes aportes del proyecto. En ese sentido el proyecto tiene ese, ese, ese valor, pues de, de hacer un aporte muy grande al conocimiento que ya había sobre maíces nativos y hay que recalcar aquí que en el proyecto de maíces nativos no solamente es el maíz en sí, sino también sus parientes silvestres, teocintles y otros. Entonces, además del maíz también se reúne, se recopila y se aumenta el conocimiento en diversidad deseos dos parientes silvestres. Y por ejemplo en parientes silvestres, pues se detectan nuevas poblaciones de teocintles perennes, que no se tenían reportados anteriormente, entonces es uno de los grandes aportes también de, para la ciencia »*

(*ibid*.)

However, as this interlocutor himself pointed out: “the information gathered is defective in some respects”. As one of the researchers involved in the critical review of the bibliography noted:

« lo que hicimos fue enfocar a la lectura básica y desde el punto de vista interdisciplinario, no nada más desde el punto de vista genético. Entonces tratamos de incorporar los elementos de los valores culturales y cosas así, tanto la parte molecular, la parte psicométrica y cosas de esta naturaleza. Pero fue nada más un trabajo de gabinete, no fue un trabajo donde fuimos a consultar con grupos indígenas de México.

Esta fue una propuesta que quisimos hacer, es, por un lado, hacer un recurrido por todo México, entrevistando. Y también la otra cosa fue de trabajar más a fondo restos arqueológicos y vincularlos con tiempo y con espacio, pero no hubo dinero, no hubo tiempo para hacerlo, entonces varios elementos tuvimos que eliminar con este proyecto ideal »

(an ethno-botanist, researcher at the Institute of Biology, Botanical Garden, UNAM, March 4, 2013).

The sociologists E. Lazos and M. Chauvet, who analysed the socio-cultural data, noted that

« El análisis de los aspectos sociales que proporcionaron los cuestionarios nos permite sugerir que para futuras colectas éstas sean organizadas con criterios múltiples más allá de los objetivos agronómicos o biológicos. Por ejemplo, incluir alguna pregunta sobre la incidencia de las remesas en la producción de maíz o de Procampo, ya que estos dos fenómenos han influido el cultivo de maíz, que de otra manera quizás no se hubiera hecho » (Lazos and Chauvet, 2011 : 487).

Various partners pointed out these weaknesses. How can they be explained? They appear to be due to the political calendar of the project, to its orientations, to its structure and to its modes of execution.

Political urgency and the production of knowledge: two differing calendars

The orientations of the project have been set out clearly by CONABIO. The aim was to make a survey of the species and varieties of primitive maize and its wild ancestral relatives, describing them from a morphogenetic point of view and mapping their distribution in Mexico. All of this with a view to ensuring their conservation and accomplishing the best improvements possible:

« no solamente tenemos información de distribución sino también de caracterización, características morfológicas que son de utilidad tanto para, para, sobre todo para el mejoramiento (…) el hecho de que se maneje esta diversidad es que, este, pues tiene un valor para las comunidad y tiene aún mucho valor por aprovecharse, de hecho muchos de estos materiales ha sido fuente de materiales mejorables que actualmente se utilizan, el hecho de que la mayor diversidad de maíz que se cultive en el mundo proviene de toda esta diversidad que actualmente hay en México »

CONABIO staff, México, March 21, 2013).

Beyond this, the objectives became part of the preservation and defence of the Mexican heritage of natural resources, which had to be protected from the intrusion of genetically modified organisms[22]. As one of the participants in the project explained, when asked about the starting point of his statistical analyses of the data gathered from the questionnaires submitted to farmers:

« lo que se presentaba es la problemática general. Ok estas políticas de estas empresas transnacionales de sembrar maíz en toda la extensión, argumentaban que no había uso tradicional de maíz, entonces parte del estudio fue comprobar que sí había un uso tradicional del maíz, y el meter o destruir todas esas variedades iba a destruir mucho conocimiento en cuestiones locales, sí porque esta compañía argumentaba que no había »

[22] In 2008 introduction of these species was limited by a moratorium.

(Statistics technician, data analysis group, IIMAS, March 5, 2013).

The gathering of maize specimens, like the survey of farmers' opinions, was undertaken in response to a political emergency. It was urgent to certify that these resources existed if the intrusion of genetically modified organisms was to be countered. One of the researchers involved in analysis of the socio-economic data in the Project told us that incomplete questionnaires submitted to farmers were nonetheless important:

« (…) Tantos huecos, sí porque había una prisa política y la prisa política era entregar el reporte antes de que se autorizaran las siembras a nivel piloto, entonces ellos querían, eh, a los financiadores de las colectas decirles: acá están las colectas pero además les estamos dando la información social y les estamos dando la información que hizo Hugo Perales[23] sobre, como la evolución de las razas, que llega a la conclusión de que no se ha perdido ninguna raza afortunadamente (sociologue, responsable analyses socio-économiques »,

*(*sociologist, in charge of socio-economic analysis, UAM-A, Marche 20, 2013).

These objectives determined to a large extent the configuration and structuring of the project. Priority was given to the collection of maize and of related species with a view to mapping their distribution and defining their morphogenetic characteristics. Less importance was attached to analysis of the social and economic conditions of production, and even less to the study of social customs and agricultural practices. We will return to this point at greater length below. For the moment we note the importance of these orientations, and particularly the way they weighed politically in the hierarchical organisation of categories of knowledge: details concerning the human environment of production we relegated to a secondary level of importance. The design of the questionnaire submitted to farmers (see appendix) was clearly affected by this; very few items concern socio-economic data on the production and cultivation of maize, and none whatever on the usages linked to its consumption and commercialisation, not to speak of its symbolic importance.

« Básicamente gente que había trabajado agronomía, biología, en ese sentido, si, o sea, hay aspectos que no se consideraron, digo el, pues el propósito era cumplir esos objetivos, reunir esa diversidad y para eso, este, se basó en la información y en la experiencia que ya había y adicional a eso se incluyeron aspectos que nosotros veíamos susceptibles de… análisis o que abarcaba algunos aspectos económicos, por eso se contempló este tipo de análisis ¿no?. (…) diseñar una entrevista socioeconómica sin duda nos llevaba más tiempo y llevaba un mayor trabajo de capacitar a gente para ese, para reunir esta información, y llevaría un tiempo que no podíamos acabar en un, en un lapso que seguramente en este sentido, el proyecto tiene también ese logro de que en un tiempo relativamente corto tenemos una cantidad de resultados impresionante, o sea, más de, tenemos, se han subido a la página más de veinticuatro mil registros de maíces nativos (…) »

(CONABIO staff, México, March 21, 2013).

[23] Hugo Perales, agronome (agro-écologue et ethnobotaniste, formé à l'Université de Californie), chercheur à El Colegio de la Frontera Sur (ECOSUR), Unidad San Cristóbal de las Casas, a eu la fonction d'évaluateur dans le projet.

As a result, the orientations of the project dictated its configuration, and in particular the design of certain gathering-tools. To what extent does the very structure of the project bear the mark of these objectives and thematic priorities?

The functioning of the PGM: institutional and scientific hierarchy, and categorisation of information

To attain its objectives, CONABIO brought in 118 researchers, dividing them into different groups (partly on a regional basis), to work on three subjects: a critical survey of existing scientific literature on maize; collection on the terrain of samples of maize cobs and seed cultivated by farmers, and a morphogenetic analysis of these materials; and analysis of the socio-economic contexts of maize production. A questionnaire (see appendix) was sent out to farmers by the 11 groups gathering maize species in order to identify the varieties cultivated and some characteristics of their production (localisation and surface of land cultivated, timing of sowing and harvesting, etc.), together with some basic sociological and demographic data on the farmers concerned (age, gender, ethnic origins, and domiciliation).

The organisation of the project was thought out in a manner that was segmented, compartmentalised and also pyramidal. The different groups were largely autonomous in their activities ("each leader [of a sub-group] proposed a team (…) and was free to set up his team to do the work"). However, the analysis of the results of this work was made - in particular in the case of socio-economic data – by researchers who had little access to the basic data procured by the teams engaged in collection on the terrain. Lastly, the various sections of the project (agronomic on one hand, socio-economic on the other) were carried out and treated in a manner that was both sequential and separate (prior preparation of the questionnaire by one group of researchers, application by another group consisting of investigators, treatment and analysis of data by yet other groups of researchers, all with agronomists to one side and sociologists to the other). These varied investigations, moreover, were not kept distinct from one another, but merged in a single questionnaire. This entailed the existence of a gap that came in addition to the segmentation of the operation and defective structuring of the project. One of the end results was that certain types of data — in particular, socio-economic and cultural data — were not taken into account. This vitiated the process as a whole (v infra).

Each of the different groups was autonomous, producing its data separately, without much interaction. Looking at this at an overall level, an ethno-botanist from the UAM, coordinating a work group, mentions that:

« cada quién tuvo, recibió su financiamiento de su proyecto, cada quien desarrolló su investigación y al final la CONABIO lo que hace, es como, concentrar la información de todos los proyectos en bases de datos ¿si me explico? Nunca hubo, o sea digamos, nunca hubo una reunión, una sesión, o algo así… Bueno, al menos que yo esté enterada no, de que nos juntaran a todos para discutir y demás; sino simplemente la CONABIO lo que hace es condensar la información y la CONABIO es la que se responsabiliza de publicar el famoso mapa que sacó de diversidad ¿si me explico?, o sea, pero que entre nosotros hayamos compartido experiencias, no »

(ethno-botanist, researcher, group leader, UAM-I, March 7, 2013).

At the level of groups representing the three thrusts of the project, the coordinator of the group dealing with bibliographical research opined that:

« bueno, sería interesante que los tres sub-proyectos tuvieran una unión y discutir puntos en común, pero nunca tuvimos esta oportunidad, siempre estamos aislados »

(ethno-botanist, researcher, group leader, UNAM, March 4, 2013)

A female collaborator working with a group on socio-economic aspects of maize production described the separation in the following terms:

« (…) nos conjuntábamos no directamente con todos los grupos que trabajaron en las encuestas, no, porque pues cada uno estaba en su estado, cada uno era parte, por ejemplo, de una universidad, de un instituto, así era y no se podía hacer en la conjunción de todos, o sea, jamás trabajamos todos, porque fue mucha gente la que trabajó en, en la aplicación de esta, de esa encuesta, entonces con quienes más trabajábamos era con CONABIO, directamente. (…) No, no teníamos así contacto directo con ellos, no, si sabíamos en lo que estaban trabajando y en lo que se estaban basando, porque de hecho como que este proyecto fue un… una integración de todos, por ejemplo, uno de ellos no me recuerdo quién, estaba trabajado mucho la cuestión técnica, superficie, la parcela, qué tanto era la altura de la planta, que eso no nos, nosotros no, nos metíamos porque no era cuestión de nosotros, o sea, era más técnica la cuestión que eso lo hacía uno de eso doctores. Nosotros, por ejemplo, nos enfocamos mucho en la cuestión social, otro se abocó mucho en la cuestión de variedades, o sea, la variedad tal qué tanto rendimiento tenía… qué tanta densidad tenía, todo eso, o sea como que fue un trabajo integrado, por eso es que nosotros, por ejemplo, yo nunca tuve contacto con ellos (…) cada quien yo creo que se especializaba en el área que, que más tenían conocimiento ¿no? Era así »

(sociologist, collaborator, UAM-A, March 18, 2013).

Gathering operations also followed this rule (we will come back to this point later). Though all groups shared the same objective, each had its own particular methods. Coordination — when it actually did take place — was ensured at the level of "re-collection" (so to speak) by INIFAP of the samples gathered — and, to go by the opinion of an agronomist involved in this operation, only at this stage:

« Sí. Esto tuvo que hacerse en coordinación, principalmente porque aquí [INIFAP, Chapingo] es donde tenía que llegar todo el germoplasma, esa fue una de las razones principales. Y cómo nos comunicábamos, bueno, sabiendo oye: en qué fase andas, en qué fase estás, ya tienes todas las colectas, ya exploraste todos los estados que te tocaron o cómo andas: no pues fíjate que como estos son diferentes ciclos en cada región, unos son de otoño-invierno, otros son de primavera-verano, y en fin, ese tipo de cosas los, los intercambiábamos de tal forma que si nosotros no, si yo no hubiera conocido las regiones geográficas del país antes pues ahí me hubiera enterado que existen diferencias en periodos de cultivo del maíz a lo largo del territorio ¿no? Entonces, pues las conversaciones eran más que nada: oye cómo andas, cuándo

crees terminar para poder ir programando aquí la recepción de los materiales, cómo los vas a mandar si por paquetería o va a venir algún vehículo, que si hace mucho calor, nos decían: acá está haciendo un calorón y no tenemos las instalaciones adecuadas ¿qué hacemos?, bueno, pues tienen que mandarlo lo antes posible y ¿cómo lo mandamos? pues mándenlo en mazorca como, como puedan ¿no?, y ese tipo de enlaces fueron los que establecimos nada más para poder estar comunicándonos de cómo iba a llegar, cuándo iban a traerlo y las características que iba a tener »

(agronomist, engineer, INIFAP, Chapingo, March 14, 2013).

The pyramidal segmentation into sub-projects led to a significant absence of communication between groups and between researchers. Though of course CONABIO did organise workshops and meetings, many participants, including many project managers, were not involved in these. This lack of structural coordination between sub-projects apparently marked the project as a whole. It characterises the way in which some sections of the project were implemented, e.g. that on sociological and population data. This particular section went through three stages, each with a different set of operators: data were collected by different teams on the terrain by means of questionnaires submitted to farmers, as we have already mentioned. Statistical treatment of the data collected was made by statisticians of IMASS. Subsequently sociologists of UNAM and UAM analysed these results. All of these operations were carried out separately; yet each was integrated into an overall scheme in which all participants should have been involved at all stages. The investigators who put the questionnaires to farmers submitted them to CONABIO; the statisticians who treated the resultant data gave the results to CONABIO; but the sociologists who subsequently analysed the whole had taken part neither in drawing up the questionnaire nor in collecting the data. One of these statisticians mentions that some 16,000 questionnaires were treated, but then adds:

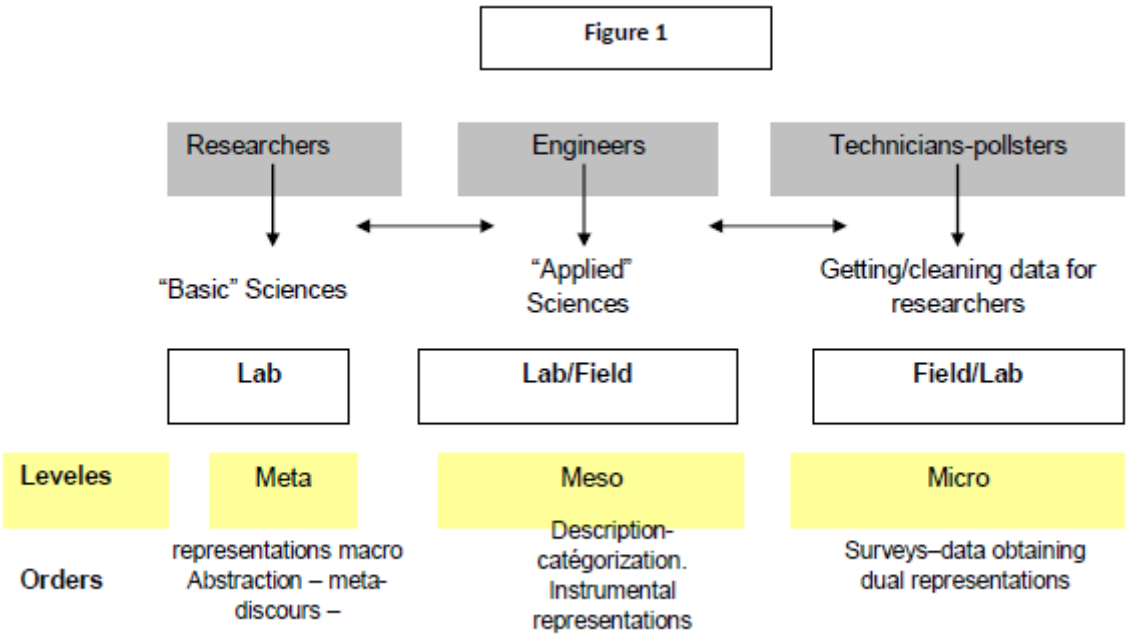
« … Lo que pasa es que primero procesamos primero 16,000 encuestas y luego nos dieron un bonche como de otras 10000, ya no me acuerdo, la segunda parte, si, es que como no lo pudimos procesar todo, no tuvimos el acceso a la información completo, así de corrido, tuvimos que irlo haciendo en partes. Ahí fue una cuestión de manejo de confidencialidad de la información, ellos se quedaron con la información. Nosotros nada más entramos a la parte de análisis y le regresamos todo » (statistics technician, data analysis group, IIMAS, March 5, 2013).

The interviews carried out for this survey[24] suggest that a division of labour based on status was added to the segmentation of the phases of the project and its operations, and that this in turn left its mark on the mode of production of information on maize in the PGM.

II – The PGM and knowledge of maize: a product of the science system?

[24] Partial (as mentioned above), as the operation was carried out only in the State of Mexico; some interlocutors, such as members of CONABIO, could not be reached.

As we have seen, operations of four types were undertaken in the PGM. They are linked to three states (or stages) of science: revision of the literature on maize; collection of data on the terrain; characterisation of species collected with a view to conserving and digitising the information; and analysis, morphogenetic on the one hand and socio-economic on the other. Collection of data is proper to all research and is carried out by technicians and investigators on the terrain. The second type of operation belongs to applied research and is carried out by technicians and researchers, combining field- and laboratory-work. The third type is "fundamental" research, undertaken by research workers in laboratories. The structuring of the PGM operations can be represented as follows.



The four types of operation and scientific activity correspond to three "levels" of knowledge: a "micro"-level (in particular investigation on the terrain), a "meso"-level (exploitation of investigation results with a view to applying the results of research), and a level that can be termed "meta": the production of knowledge embracing knowledge of a lower order (e.g. the state of the art established after bibliographical research) and of analyses that have already been carried out.

These three levels were clearly distinguished in the PGM, but the different operations were not always properly articulated. Engineers and agronomist researchers in charge of re-collection operations and characterisation of the species collected were indeed put in touch with investigators on the terrain, but this was not always the case with work on the socio-economic section. The researchers in charge of analysis had access to data provided by CONABIO only after investigators had collected it. Whereas engineers and agronomists worked together, the project had not linked the socio-economists we interviewed with the

corresponding agronomists and biologists. In the design of the project, a division in status thus clearly marked the functioning and operation of the PGM.

To these three levels of function and status were superimposed three "orders" of the knowledge generated. These orders were distinguished by their relation, direct or indirect, (1) to the collection of data and to the context of this collection (at the level of what we can call - for the time being – concrete "nature"), and (2) (at the other end of the scale of abstraction), to knowledge drawn from the analysis of data, using various registers of knowledge to interpret and valorise all possible meanings. Political and philosophical approaches (to nature, to science, and even more to abstraction), characterise this knowledge and its "meta" mode of production. We will have more to say about these different levels when we examine the issue of the relations between scientific knowledge and its "traditional" counterpart, and the way in which the latter is represented. For the time being we note this division here only insofar as it points to the juxtaposition, but without combination, of different registers of data and of knowledge; and also insofar as it reflects the segmentation and compartmentalisation of the overall Project and its division into sub-projects, on a disciplinary and/or operational basis.

The PGM did not actually construct this partition for its own purposes. The partition stemmed initially from the Mexican organisation of science, from which, in a way, the organisation of the PGM resulted. This organisational system provides for marked partitions within itself, dividing not only status groups from one another, but also researchers from one another, and researchers from engineers. A meritocratic system — the *Sistema nacional de los investigadores* (SNI ; Foro Consultivo Cientifico y Tecnologico, 2005) — serves to distinguish research workers from one another according to their scientific production and responsibilities, and also in terms of their training in human resources, experience in administration, involvement in the development of national and international networking, and leadership shown (Didou et Gérard, 2010, Gérard, 2013, *op. cit.*)[25]. The system is based on the canons of international research (and in particular scientific articles published in "indexed" journals), and sets up a marked division between researchers (only some 10% of all teacher-researchers, irrespectively of status, are members of this group), just as it does between different types of science and scientific production.

The principles of structuring that we have just described were reproduced in the divisions and partitions established by the *Proyecto Global de los Maíces nativos,* which partitions both personnel and the types of knowledge produced. Without more exhaustive investigation we cannot assert that all the researchers working on the project (we have already pointed out the "meta" level of the research in question and of the resultant knowledge) were members of SNI, or that all engineers were not members. The researchers responsible for the analysis of results, however — e.g. H. Perales Rivera for *Modelos de distribución para las razas de maíz en México y propuesta de centros de diversidad*, J. D. J. Sánchez González for *Diversidad del Maíz y teocintle*, R. O. Paczka for *Consultoria para Conabio sobre algunos aspectos de la diversidad nativa de maíz en México*, and lastly E. Lazos Chavero and M. Chauvet Sánchez, for *Análisis del*

[25] These parameters constitute criteria for evaluating scientific careers and promotions.

contexto social y biocultural de las colectas de maíces nativos en México — were all members of SNI (table1)[26].

This fact prompts us to characterise members of the project according to three parameters: *position in the organisation* of science, *position in the field* of knowledge, and *position in the project*. These three variables reveal to some extent the structure of the project and the preferential mode of production of knowledge. Another parameter should be added to these three: the academic discipline in which the person concerned works. This last criterion makes it possible to position systems of representation and authors' discourse by linking them to the author's position in the organisation and in his field of expertise. We will come back to this later. Before this, however, we must ask how the three positions are connected.

In the national organisation (or "system") of researchers, SNI, there is a strong connection between the first two positions. Researchers who are members of the SNI meritocracy satisfy in principle the minimal requirements that we have pointed out. Conversely, researchers recognised as legitimate authorities in their field are very often members of SNI. This articulation, however, is neither automatic nor systematic. Just as certain members of SIN owe their positions, according to some authors, to a hidden play of cooptation within the organisation rather then to their legitimate scientific merits (Vega y Léon, 2012), so too, many researchers who are recognised in their field are not members of SIN, either because they have not applied to be admitted to it or, because once in it, they have not done what is needed to remain there[27], or because their mode of production of knowledge does not conform to the pattern preferred by the organisation. Researchers working in applied rather than in fundamental science (i.e. validated by indexed journals) provide an example.

There are three degrees of articulation - strong, weak and null – between position in the organisation of science and position in the field of knowledge. This is reflected in the structure of the PGM. Researchers who are members of SNI and whose scientific production, distinctions received, and responsibilities in research and in training give them strong legitimacy in their field provide examples of strong articulation. Researchers who are recognised in their field, e.g. many agronomists, but who are not members of SNI, provide an example of weak articulation between the two positions. "Producers of data", e.g. investigators and technicians, are outside SNI and their position in the field of knowledge is weak.

Available data on participants in the PGM[28] have not enabled us to establish the position of all participants in the "system" of science. It would take a more exhaustive inquiry to establish every participant's position in his or her field of expertise. On the other hand, as we have already explained, our inquiries have enabled us to distinguish three degrees of articulation between position in the system and position in the field of knowledge. In the absence of exhaustive data on the first two positions, what correspondences can we find, at least

[26] In our survey in the Federal District the same rule applied to researchers and engineers and the same division between majority and minority membership of SNI was recorded.

[27] Researchers of the levels "candidate", SNI1 and SNI2 are evaluated every 3 years and SNI3 researchers every 5. Failure to live up to standards can lead to demotion or even dismissal from the System.

[28] Available data concern only the coposition of project groups, classified by researchers' names and institutions. For an example, see appendix: research group on analysis of socio-economic data.

hypothetically, between positions in the system of science and in the field of knowledge, and the structuring of the PGM?

To go by the personal profiles (concerning all types of status and function in the project) we have examined, the positions of leaders (or managers) of projects in the system and in the field of knowledge are either strongly or weakly articulated. Persons in charge of the project on the state of the art in scientific knowledge on maize, and the project analysing socio-economic data fit into the first category: strong articulation. Persons in charge of data collection or morphogenetic analysis of samples fit into the second category: weak articulation; though recognised in their respective fields, they are less likely to be members of SNI, either because they do not want to join it, or because their scientific production (e.g. determination of maize hybrids), is assimilated to applied research, and this does not qualify them to enter into, or to progress within the national research system. Similarly, persons identified as *colaboradores* are less likely to belong to SNI than leaders are.

The structure of the projected analysis of the results of the PGM according to function and status in SNI of participants, illustrates this hierarchy.

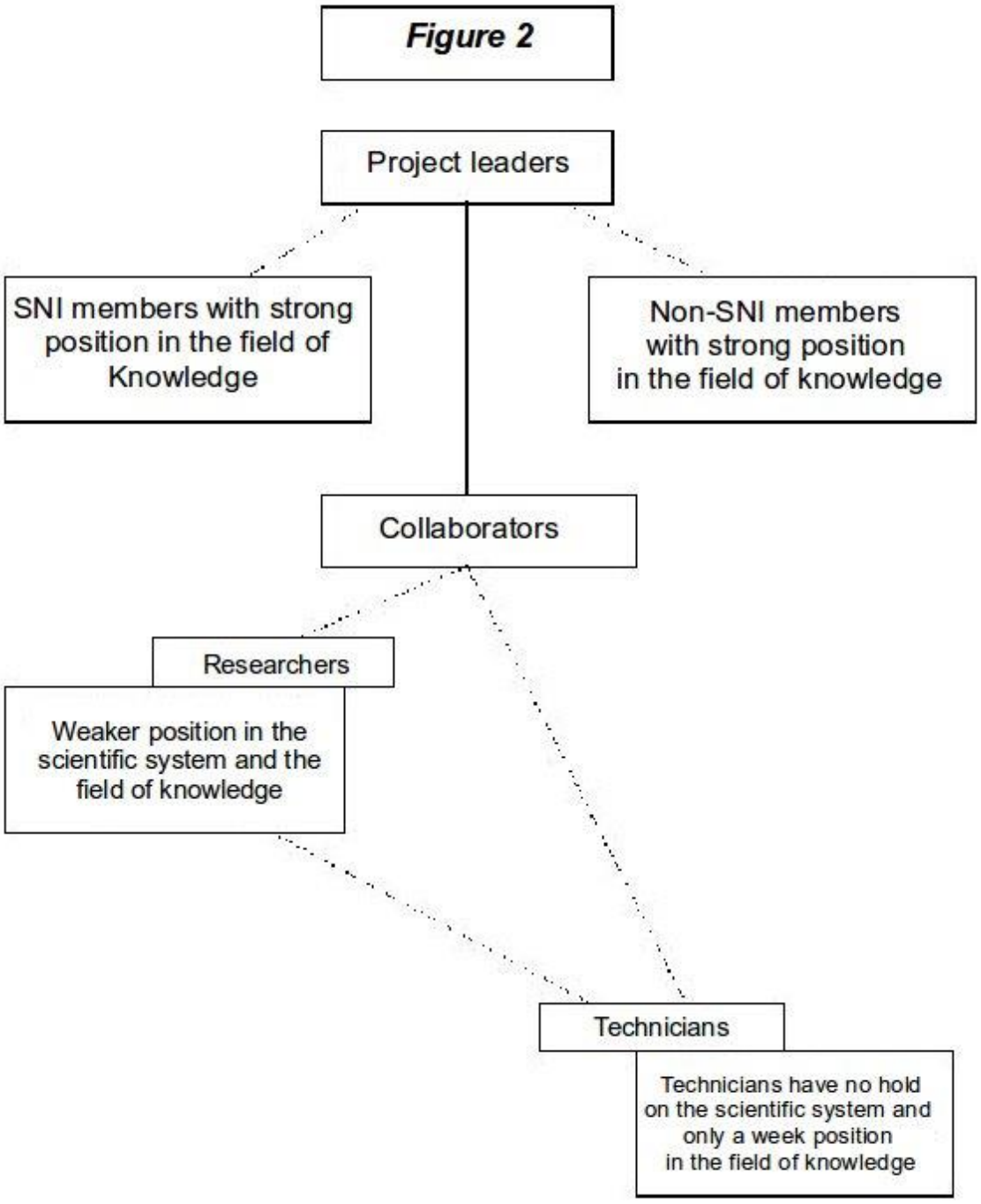
Table 1

Distribution of participants in “Projected analyses of results”, according to status in SNI and function in the PGM

	Function	SNI
Distribution models for the landraces of corn in Mexico and proposal of diversity hotspots	Leader	SNI1*
	Collaborator	Not applicable (foreigner)
Diversity of maize and teosinte	Leader	SNI2*
Consulting role for CONABIO on dimensions of the native diversity of corn in Mexico	Leader	SNI1*
Consulting role for CONABIO on dimensions of the native diversity of corn in Mexico	Leader	SNI2*
	Leader	SNI2*
	Collaborator	No
	Collaborator	No
	Collaborator	No

* According to the curriculum base of the SNI, 2009.

The structure of the PGM can thus be illustrated by the following outline.



This system of correspondences enables us to develop the first figure, which attempts to represent the links between two levels: that of the position of different types of personnel involved (researchers, engineers, technicians, investigators) in the hierarchy of functions in the PGM, and that of the different levels of knowledge produced ("méta", "meso", "micro").

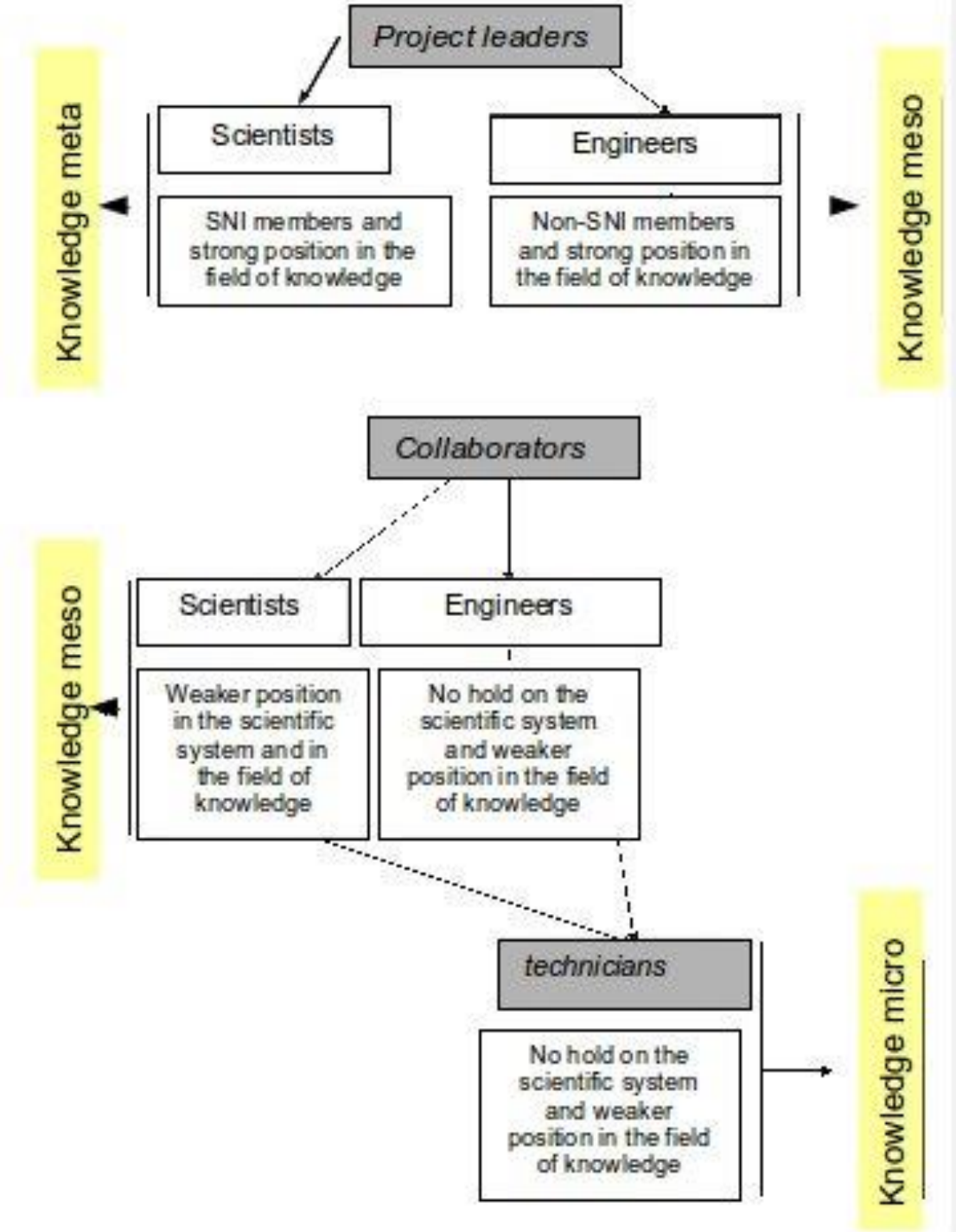
According to our survey, the leaders of the projects aimed at producing "knowledge of the knowledge" of maize, on the one hand, and on the other hand the analysis of data derived from the PGM, produced knowledge of the "meta" order. The researchers involved were all members of SNI and were well known for competence in their discipline and their knowledge of natural resources and the environment. They had been awarded distinctions to indicate this, and it was corroborated by the responsible positions they held in their respective institutions. Their position as leaders in the PGM thus goes together with a strong linkage between position in the system and position in the academic field. To these three positions corresponds a production of discourse and knowledge of the "meta" order.

Some leaders of the projects aimed at collecting and carrying out morphogenetic analysis of maize samples have a profiles similar to that described above, even though they perform work only of the "meso" order of knowledge. Other leaders of these projects, however, are less well placed in the science "system". Though their position in the field is strong, thanks to recognition of their work by their peers, they are not members of SNI. At the same time, their research comes closer to applied science, and the knowledge they produce is of the "meso" order.

Lastly, the technicians and terrain investigators we interviewed were classified as "collaborators", and had been called into the PGM by other collaborators (researchers or engineers) to work on the terrain submitting the questionnaire to farmers, to take part in the collection of maize samples or, because of their technical competencies as statisticians of the IMMAS, to map maize species. Working at the very bottom of the hierarchy of functions in the PGM, these operatives were not members of SNI, and their position in the field of knowledge (measured by the institutional standards of SNI) was weak. The knowledge stemming from their field of activity falls into the "meso" category.

Four distinct orders are thus articulated in the PGM: that of positions in the "system" of science; that of positions in the field of knowledge; that of functions in the PGM; and that of the level of knowledge produced. On the basis of our survey, strong articulation can be hypothesised as characterising the PGM as a whole, so that each level of knowledge is the product at one and the same time of the respective positions of the PGM personnel and of their positions in the order of functions and the order of status, and all of this both in the SNI and in their field of expert knowledge. Schematically — and pending, once again, further information on the positions of all personnel involved in the PGM in the science "system" and in the field of knowledge — figure 1 can be completed as follows.

[Figure 3]



These admittedly incomplete data suffice nonetheless to illustrate broadly the view that the mode of organisation and implementations of the PGM has prolonged and reproduced to a

large extent the hierarchy of researchers and other members of the personnel involved in the research. Conversely, knowledge produced of maize can be seen as a product of these divisions and hierarchies.

It would seem that these divisions between researchers apparently do not stem from science alone. Other interests concerning maize in Mexico also marked the orientation of work on the PGM. There seems to be a marked division between ethno-botanists, sociologists and agronomists (to take merely one example). Ethno-botanists and sociologists tend to pay more attention to societal aspects of the uses to which plants are put, whereas agronomists are more interested in the processes of conservation, production, varietal improvement, etc. that are affected by scientific developments that political and other stakeholders (agencies, firms) seize upon in order to promote certain species (e.g. transgenic maize). This does not necessarily mean, however, that agronomists and geneticists press for an orientation towards commercial exploitation of scientific progress; but the arena in which they figure, whether knowingly or not, as actors and producers of knowledge is basically distinct from that in which another type of competition is taking place: that in which actors of another sort pursue the objective of producing "fundamental" (or "pure") science that is linked to social issues.

Are the disciplines involved foreign to one another?

Under the project, the segmented allocation of work to different work groups was thus not only structural, but also hierarchical, based on differences of status. Yet another division, however, cut across this, dividing it not only by discipline but also according to the different methods employed. The orientations of the project were to a large extent defined by agronomists and biologists, as the member of CONABIO cited above recalled. Two thrusts and operations characterised this orientation: sampling on the one hand, and on the other the development of the main investigative tool: the questionnaire. The first level of sampling was by regions and, within the regions, by municipal territories. However, as a sociologist involved in the collection operations pointed out, two dimensions could not be accommodated within this territorial division into administrative regions. The purpose of this division was to apprehend the presence of different types of maize. However, species and varieties are obviously sown in natural spaces that ignore regional and municipal frontiers. And then too, many species and varieties can exist in the regions where samples were collected, but outside the municipal areas explored. Thus:

« *no se podía dar una división o una segmentación del estado, bueno de la república, porque no podía haberlo, porque era tan mega diverso que no se podía hacer esa división que ellos [CONABIO] querían pretender hacerlo ¿no?* »

(sociologist, collaborator, UAM-A, March 18, 2013).

Besides this, collection was oriented in a particular, individualised manner by the leaders of the sub-projects. Analysis of the data had also to take into account the conditions under which the collection had taken place. But the researchers dealing with this analysis had not planned this beforehand, and it had taken place without their know either the conditions or the

collection tools (at least in the case of socio-economic data[29]). We propose to dwell for a moment on these collection operations and on the methods applied.

The gathering operations did not follow a general protocol that held for all groups; the initiative was left to the different leaders who, coming from different disciplines (e.g. agronomy, ethno-botany), each used his or her customary method. Agronomists often simply used past gathering operations as a basis.

« Como cada región agroecológica le da ciertas características también a la cultura de la gente, entonces también teníamos que estar considerando todo eso; tipos de vegetación. Entonces primero establecimos ese protocolo de... para la colecta, después rutas de colecta. Ese protocolo lo establecimos de acuerdo a experiencias que ya existían por el maestro Hernández Xolocotzi[30], que él fue aquí en México un explorador que diseñó muchas, muchas cosas… Entonces nosotros revisamos eso, y establecimos, si esta zona es semi, o subtropical dentro del Estado de México, entonces, nosotros esperamos encontrar tal y tal raza y de acuerdo a los estratos altitudinales, nosotros, en ésta parte vamos a encontrar este tipo de raza y en la parte más alta, aunque está dentro del subtrópico, vamos a encontrar ésta otra y va a interactuar también ésta otra que ya es de las partes intermedias, y así lo fuimos llevando hasta las partes altas. Entonces nosotros estuvimos visualizando eso, bajo estas herramientas, y con los, la información que ya tenemos del comportamiento y distribución del, del maíz de acuerdo a sus grupos raciales en los que se caracteriza y fue así como lo establecimos »

(agronomist, engineer, INIFAP, Chapingo, March 14, 2013).

In other places, such as the Sierra Sur of Oaxaca, where no collection operation had ever taken place, collection took on a more exploratory form, based on geographical data concerning in particular the size of municipal territories, while following the same mode of introduction to the terrain and of making contact with the farmers. Operations would commence with researchers and investigators contacting the municipal authorities, asking them to facilitate communication with the local farmers. One of the investigators, a biologist who had been invited in by the leader of one of the sub-groups, an ethno-botanist, recalls:

« Lo que nosotros hacíamos era literalmente llegar al municipio. Siempre nos dirigimos a las autoridades, en este caso al cabildo, le llaman en Oaxaca, para pedir la autorización y bueno lo que hacíamos era… llegar, pedir autorización, platicarles un poco del proyecto de lo que se iba a tratar, en este caso colecta de maíz, necesitábamos mazorcas del maíz… (…) en un principio habíamos propuesto que eran… eran diez mazorcas para que quedara abarcada la diversidad de maíz. Pero resultó que era muchísimo material ¿no?, entonces lo reducimos a cinco siempre y cuando nosotros lo que íbamos, es que, hacíamos, era llamar a la gente por megáfono,

[29] In actual fact, sequencing of operation (from design of collection tools to collection and then analysis) seems to have been less important in the agronomic section of the Project. Some researchers working on morphogenetic analysis took part themselves in collection operations, whereas the sociologists did not; the ethno-botanists who collected data by questionnaire were not called on to analyse them. Similarly, whereas the INIFAP research team was "integrated" – apparently with regular communication between members – the subdivisions dealing with treatment and exploitation of socio-economic data were drawn from different institutions and had no connection before joining the Project.

[30] Hernandez Xolocotzi [1913-1991] est considéré comme l'un des pionniers, au Mexique, dans les travaux sur le maïs. Il a notamment participé aux premières collectes avec la Fondation Rockfeller, et travaillé avec les principales institutions qui se dédient aux recherches sur le maïs (Colegio de Posgraduados, INIFAP, etc.).

invitarlos a quien quisiera participar, la gente que iba hacíamos entrevistas. (…)Entonces ya les platicamos que solamente era un proyecto de investigación con una Universidad autónoma, independiente del gobierno y bueno, la gente que se interesaba, que quería seguir, bueno a ninguno se le obligó, quien quisiera participar, y bueno, pues les platicamos que lo que queríamos era hacer un listado de los maíces que había en esta región. Entonces la gente que se quedaba le aplicábamos la encuesta emm… en un principio fue sólo aplicar encuestas y los invitábamos o bueno, les pedíamos que nos llevaran a colectar directamente el maíz a su milpa. En ese caso, bueno, había milpas que nos tocaba caminar hasta cinco horas para colectar sólo cinco mazorcas. (…)En las entrevistas les preguntábamos lo usos que se le daba el maíz, el ciclo en que duraba el maíz… emm... ¿Qué otra cosa? Cosas como el almacenamiento, este, de dónde lo habían obtenido, la procedencia y el origen de la semilla. Este… bueno yo ahí distingo la procedencia es, digamos, si viene dentro o fuera de la comunidad ¿no?, y digamos el origen si es del ciclo anterior so lo compró, si lo intercambió, si fue un regalo ¿no?, básicamente… »

(biologist, technician, participating in the project, UAM-I, México, March 7, 2013).

Here the sampling criterion was the size of the municipal areas ("more than 300 people"), selected by a system of geographical information and by socio-demographic criteria (age and gender of inhabitants). However:

« no hubo un criterio bien definido para la hora de aplicar las encuestas, por sí íbamos con esa idea, pero ya estando en el campo uno se da cuenta que a veces esos criterios pues no funcionan tan bien porque la gente a veces, digamos, en este caso está un poco esta complicación del dialecto, bueno del idioma ¿no?, que hablamos en diferentes idiomas entonces la gente grande, en general, a veces hay comunidades en donde ya no hablan… no hablan el castellano, hablan sólo el zapoteco en este caso » (*ibid*.).

From a methodological point of view, four points should be made here. Firstly, no common protocol of investigation was set, each sub-group being left free to collect and administer the questionnaire as it thought fit. Secondly, the protocols applied followed the disciplinary orientations of the leaders of the operations, based in some cases on "maize routes" that had been identified by agronomists, and in other cases on more generic geographical data. Thirdly, gathering operations were sometimes carried out on the basis of agronomic information or previous experience of collection, but sometimes without any knowledge of this sort, so that different operations — collection, identification and characterisation — were carried out either by unqualified teams, or in an even more segmented fashion, with the teams subsequently bringing in specialists from other institutions. Lastly, over and above the collection of cobs, grain and seed, investigation of farming practices was subject to the unsystematic contexts in which the questionnaire was administered (one of these contexts being the local language), and also to competence (or lack of competence) of the investigators in the techniques of field investigation, leaving in totality or in part to the arbitrary judgement of the individual investigator the conception and respect of the sampling criteria being applied to the population, and also the administration of the questionnaire itself. In charge of analysing the data, E. Lazos and M. Chauvet point out that:

« En cuanto a la parte socioeconómica y cultural de la base de datos, no todos los equipos tuvieron la sensibilidad o el tiempo suficiente para recabar la información, que desde nuestro punto de vista, es fundamental para entender el contexto social, cultural y político de los maíces nativos. Miles de registros tuvieron que ser anulados ya que la poca información que brindaban en este sentido perturbaba fuertemente la validez estadística del estudio. La base de datos para el análisis socioeconómico y cultural se restringió a 7950 registros, con colectas entre 2006 y 2010. Existen cédulas con mayor información en ciertos rubros y sin información en otros. Una constante de olvido fue la superficie cultivada y los rendimientos. Al carecer de estadísticas nacionales sobre la superficie de maíz nativo cultivado, hubiera sido muy importante tener las superficies registradas y los rendimientos para lograr marcar tendencias regionales en este aspecto.

Por otro lado, desde nuestra óptica, faltaron precisiones en la captura de datos. La antigüedad de la raza cultivada en manos de los productores es una variable que debe ser mejor entendida. Por ejemplo, si un productor dice que esa raza lleva 5 años cultivándola, no sabemos si en verdad, apenas hace 5 años adquirió la semilla por primera vez o si en alguna ocasión perdió la semilla y luego hace apenas 5 años la pudo recuperar. Esta consideración que pareciera una nimiedad, podría ilustrarnos la dinámica de adquisición y pérdida de los cultivos »

(Lazos and Chauvet, *op. cit*., p. 487).

In actual fact, the priority given to the agronomical view of the situation can also be discerned elsewhere: not only in the way in which investigations were made (had the investigators been informed of the usual protocols?), but also in the lack of preparedness of many investigators, who were sometimes unfamiliar with this type of field-work (a detail mentioned by a member of the CONABIO personnel, a project manager), and yet again in the segmenting of different research groups and the absence of horizontality and transversal relations between groups from different disciplines. Division of knowledge of maize can thus be seen not only in the structuring of the project, but also in the way in which it was implemented, and in the exploitation of the data it produced. One of the principal agronomists suggests this in the following terms:

« lo que pasa es que… yo creo, bueno según mi impresión, como que los sociólogos y los socioeconomistas son una raza aparte ¿verdad? (risas) su mundo es otro… Su mundo es otra cosa, a lo mejor para nosotros los de conservación, los de mejoramiento, nuestra visión es mucho más cercana a la planta, al, al trabajo relacionado con la planta en sí. Todo ese tipo de cosas ¿no?, la selección que hace el hombre, por qué lo hace, y el socioeconomista es, es como un mundo aparte ¿no? es ver al hombre en el contexto de la comunidad, en el contexto de los mercados, de las influencias de otro tipo… y eso cuando les digo que su mundo aparte no considero que sean malos ¿no?, sino que son áreas que a veces a uno le cuesta trabajo entender, como a ellos les cuesta trabajo entender lo nuestro, lo que nosotros hacemos (…) »

(Agronomist, project leader, INIFAP, March 19, 2013).

Conversely and by implication, the sociologists cited above, who were in charge of analysis of the socio-economic data, point to the separation of disciplines into distinct domains, a separation that they find erroneous, contrary to the very principle of conservation and reproduction of the agricultural heritage:

« La conservación de los maíces nativos es un problema complejo y como tal, debiera de ser abordado desde una perspectiva transdisciplinaria. No se trata de conservar las diversas razas de maíces en bancos de germoplasma, por el contrario, su existencia está imbricada en un complejo entramado socio-bio-cultural que ha permitido su subsistencia por milenios y se debieran de diseñar políticas y programas integrales para su conservación que apunten a una reproducción sustentable de dichas razas y que brinden el bienestar para las sociedades campesinas e indígenas de nuestro país. En este sentido, agrónomos, fitomejoradores, ecólogos, biólogos junto con antropólogos, economistas, sociólogos, politólogos, entre otros, en comunicación con las comunidades y organizaciones campesinas e indígenas y las asociaciones civiles involucradas podrían contribuir para lograr conservar, reproducir, adaptar, manejar una de las mayores riquezas de nuestro patrimonio: el germoplasma agrícola »

(Lazos and Chauvet, *op. cit.*, p. 486).

On the contrary, the PGM maintained a differentiation between disciplines and a hierarchy between the different specificities (geographical, agronomical, socio-cultural) of the production of maize.

The political urgency of collecting the various data, agronomical and socio-cultural, the division of operations b**y** discipline, and the pyramidal mode of structuring the project, missing to a large extent the horizontal dimension of exchanges between sub-groups and between operations of differing natures, gave rise to numerous uncertainties in the data collected, in particular in the socio-economic area. A large number of questionnaires were not completed; lack of precision in the data collected (cf. note 16) led the authors cited above to point out the impossibility of reaching valid conclusions as to the true importance of maize in the sovereignty of Mexico as regards its food-supply. For conclusions to be reliable, they would in the first place have had to be based on knowledge of the proportion of production that is destined to be consumed by the producer or to be commercialized.

« Varias investigaciones han levantado varias preguntas en torno a este tema: ¿el cultivo del maíz es una estrategia de sobrevivencia real?, ¿la persistencia del autoconsumo es una manera de conservar los maíces?, ¿la demanda comercial de maíces es una manera de que se conserven? En otras palabras, los cuestionarios incluían la consulta sobre el destino de la producción, pero al ser una pregunta suelta y sin el complemento de otras, la información nos impide llegar a conclusiones en este tema. Inclusive, en Michoacán donde existen 22 razas, el maíz nativo ha dejado de ser el abasto para la demanda de tortillas en las propias comunidades, una parte creciente ahora se trae de Sinaloa

(Orozco et al., 2010) » (Lazo et Chauvet, *op. cit*., p. 487).

Finally, though in the framework of the PGM questions were put to farmers, this orientation stemmed more from concern for the conservation of local and national species of maize than from a political will to improve knowledge, let alone to improve “indigenous” techniques of conservation.

This structuring of the project, with sub-projects compartmentalised and segmented according to the academic disciplines involved, thus comes on top of a sharp division of

information on maize, with agronomical knowledge being kept to one side, and socio-economic knowledge to the other. This division by academic discipline into two ensembles of questions corresponds to two major orientations that are kept apart. On the one hand, there is conservation (as heritage) together with improvement of the species. On the other hand, a perspective that is more political seeks in the socio-economic contexts of maize production the data indispensible for reproduction and, beyond that, survival of the Mexican food-supply. As we have seen, it is the former aspect that has been given priority, not only in the orientations and design of the project, but also in its structuring and modes of implementation.

Another remark should be added here. In Mexico, maize is not thought of as a single entity. The varieties cultivated are many and various, and besides that there are profound differences between North and South in the systems of production. To put this simply: on the one hand there are large surfaces being cultivated with advanced technologies, and on the other hand small surfaces and rather more monoculture. The populations are also different: in the South (e.g. Chiapas, Oaxaca) there are more "natives" than in the North (e.g. Sinaloa). The researchers whom we interviewed hinted at two lacunae. One of these was the fact that socio-economic and cultural data on the production and usage of maize have not been adequately accounted for; we discussed this with our interviewees. The other lacuna was the scant attention paid to the sheer diversity of the country and to the regional specificities of primitive species of maize. Overall policy, failing to differentiate between Northern and Southern particularities, was unable to come up with a proper assessment of the stakes inherent in a resource of national importance. In brief, a project such as the PGM would seem to have masked both the *regional* resources, together with the conditions under which they can be preserved and safeguarded, and the *national* need to apply to all regions the same treatment (we recall here the inequalities in subsidies pointed out at the outset of this report) in view of this preservation.

The global project on primitive varieties of maize was not the only one to have been implemented in the course of the past decade. But it was one that received considerable support and mobilised an important community of researchers. To go by many of the latter, the results are particularly appreciable as far as the varieties of maize discovered in Mexico are concerned, but are far less satisfactory when it comes to the conditions of production and reproduction, of losses, and of the emergence of new species.

The political agenda, as we have pointed out, weighed heavily on the orientations of the project. Besides this, the orientations and implementation of the project show a ranking of "objects" regarding maize that is subservient to the Mexican "system" of science in its structuring principles, and to an "order of knowledge" that gives priority to the "exact" (or "natural") sciences, so that the methods and knowledge of agronomists are given more weight than those of sociologists and ethnologists[31]. This a priori division between different academic

[31]Some of the personnel involved in the Project were highly critical of it, in particular as regards the data collected; impugning its methodological orientation, incompleteness, and lack of exactitude (*cf.* Lazos and Chauvet, *op. cit*.). This criticism alone points to the failings in the orientations of the Project, showing that certain researchers called on to work (in particular at the "meta-" level of bibliographical appraisal) were constrained to such an extent by the framing and methods selected by the chief contractor that they had difficulty in applying the proper methodology.

fields is by no means neutral in its effects and in the knowledge yielded: a "genetic" bias, so to speak, affects not only the conditions under which samples are collected, but also the socio-economic conditions under which maize is produced, together with their transmission and the related modes of production. These elements are treated as secondary: a part of the natural resource that has become invisible. This in turn reveals both the political orientation of the principle of conservation and the characteristics of the science "system" mobilised. Would it have been mobilised another way if the political orientations had been different?

Some examples of the representation of farmers' knowledge will enable us to analyse in greater detail these orientations and the interpretative grids used in the PGM. We base also this on interviews of people involved in the project.

III — Scientific and "traditional" knowledge: never to meet?

The agronomist R. O. Pacska, who was involved in the project, writes in his report that:

"Primitive populations of maize en Mexico are being lost, mainly because of massive imports of subsidised, inexpensive seeds, and also because there is pressure to replace traditional *nixtamalizado* maize with industrial meal; the reasons for this are support for improved maize of all sorts; rural migration and the erosion of the rural population, and in particular the indigenous population. A sombre prospect. Faced with it, we observe in various population groups an increasing interest (not always quite convincing) in primitive maize farmed or conserved in banks of genetic material. Numerous projects have thus come into being to conserve *in situ* and to improve through participation plants cultivated in maize fields; these are now beginning to be documented and reported in various publications" (Paczka, *op. cit.*, p. 152).

Another agronomist, also involved in the project, told us that:

« Ahí a veces el, el concepto de mejoramiento participativo, a veces es medio confuso ¿no? es como, es cuando, el concepto en sí dice: que el campesino participe en el mejoramiento, pero no necesariamente participe haciendo los cruzamientos y todo eso, no, no, no, sino que él decida qué características quiere, qué características no le está gustando de su material y eliminarlas y también que participe, que le muestres una variación de diferentes materiales y él diga: este, este, este o este me gusta; y ya le preguntas, por qué: por lo alto, por lo bajo, por lo bonito, por lo productivo, por lo sano, eso ya… »

(agronomist, project leader, INIFAP, March 19, 2013).

An ethno-botanist in charge of one of the sub-projects expressed her interest in having taken part in the project:

« En términos de conocimiento del maíz definitivamente si me aumentó mi conocimiento sobre la diversidad de maíz, me ayudó a entender más, sobre precisamente el papel del manejo de las comunidades indígenas y campesinas. El papel del manejo en la diversificación del maíz ¿no?, en entender que la dinámica del maíz es muy compleja, que es una especie muy compleja y que precisamente las comunidades que interactúan con el maíz tienen una serie de estrategias muy finas para conservar el maíz, para diversificar el maíz, en una escala espacial

y temporal. Que la dinámica del maíz actualmente, o sea, un poco…este…contradiciendo a lo que mucha gente dice que el maíz en México ya no sirve, que ya son variedades que ya no sirven, que son variedades obsoletas, que casi, casi son para museo, son como piezas de museo, entonces hay que meter variedades mejoradas y demás. Yo lo que veo es que la dinámica del maíz es muy compleja, y que las estrategias de los campesinos de manejar el maíz no se está dando así como con los ojos cerrados, sino que verdaderamente hay toda una lógica de por medio para decidir en qué momento, qué variedad, cómo, en dónde sembrarla…y que no podemos decir que ya conocemos todo el maíz, definitivamente no, y que el maíz sigue evolucionando; es una especie que sigue evolucionando y que precisamente, hay todo este manejo, dentro de cada variedad, los cruces entre variedades, la selección, todo este tipo de cosas son precisamente estrategias que van moldeando la evolución del maíz, y que precisamente esto no acaba y que en este sentido tenemos que entender más esa dinámica y respetar más a los cultivos del maíz, ¿no? »

(ethno-botanist, project leader, UAM-I, México, March 7, 2013).

Participative improvement, agricultural practices and social practices linked to maize: what place was given to consideration of farmers' knowledge of the subject? Very little, directly: this was not the object of the PGM, which was intended rather to show the wealth of the country's botanical heritage, in order to counter the entry of transgenic maize. Some researchers, however, echoed this concern, whence the interest in looking at this aspect of the project, or at least at the harm resulting from the fact that it was not given adequate treatment. According e.g. to the agronomist Rafael Ortega Paszka, the study of maize responded to three concerns: firstly, "to understand and protect the links between man and maize in the context of the traditional rural communities of the country that form the major part of the population, and to support their development and that of our country; secondly, to contribute to scientific knowledge of maize, a paradigmatic plant in the world and above all in Mexico, and whose rank in many chapters of various sciences is of particular importance; and thirdly, to safeguard the genetic resources and the knowledge linked to them, seeing that maize is fundamental tor the independence of the food supply in Mexico and other countries" (Paczka, *op. cit.*, p. 125).

Now, during the Programme no ethnographic study expanded knowledge of the usages of maize, of the practices of cultivators, or of the conditions of capitalisation and circulation of seed[32]. Furthermore, as we have already pointed out, the socio-economic data gathered were only partial, and suffered from a lack of application of the scientific protocols that normally go with surveys of this sort; this particular dimension of rural communities' knowledge was to a large extent left in the background. Above all, however, a fictitious perspective was maintained, assuming that species and varieties of maize existed so to speak in their own right, as though plants were independent of the populations who cultivate them, hybridise them to produce new varieties, exchange or abandon them, and so forth.

[32] Pazcka, in his report (cit. supra) devotes only four pages to the "causes of the enormous diversity of maize in Mexico" (*causas de la enorme diversidad de maíz en México*). Among these "causes" he suggests the origins and usages, the diversity of natural environments, of agricultural systems, and of cultures (Paczka, *op. cit.*, pp. 127-131). Marginal to the Project, other work was devoted to the mobility and the permanence of certain varieties, and to the way in which they are linked to primitive traditional groups. See in particular the work of Hugo Perales *et al.* (2011), of the Colegio de la Frontera Sur.

The questionnaire submitted to farmers unwittingly tells us a lot about this. The rare questions asked about conditions of production concerned the varieties produced (in all morphological configurations) and the places they came from, the size of parcels of land planted, and the qualitative assessment by the farmer of the variety concerned[33]. The replies as such can give only a static reply to the questions asked about the production of maize and about its varieties. But when we questioned them, the agronomists themselves pointed out the movement of maize and the "routes" it followed, from Sinaloa to Oaxaca, for example. To sum up, in maps of the distribution of maize throughout the country, apart from the "routes" indicated by the places where such and such a variety of maize existed and was produced, what is lacking is the circuits through which grain and seeds moved and were exchanged. Though data on conservation were collected, they refer in the main only to existing situations and to the geo-morphological conditions of the permanence of species, but not to the socio-economic conditions governing this conservation, and even less to the conditions that lead to the disappearance of certain species or the appropriation and production of new species, e.g. hybrids[34].

We have noted the ways in which the structuring and functioning of the project served this objective, relegating to the background socio-economic data on the contexts in which the samples of maize had been collected. The people interviewed spoke a lot about this whenever we showed interest in it.

Telling us about the importance of familiarity with the socio-economic contexts in ensuring the conservation of species and varieties of maize, one of the principal agronomists involved in the project said, for example:

« Hay germoplasma que se está moviendo dentro de las comunidades, que de un año a otro se pueden perder y si no tenemos información socioeconómica y cultural, no vamos a saber, en cambio, si pudiéramos decir, por decir hay áreas, y sucedió, en un año que colectamos en, en Chihuahua, hay una raza muy, muy escasa de muestras, el palomero toluqueño, palomero tipo chihuahua, al siguiente año que quisieron ir a colectar ya no tenían y no lo tenían porque el señor que lo mantenía su principal trabajo era, usar el maíz para alimentar ganado, consiguió un maíz que a él le pareció más productivo, lo sustituyó y no se preocupó de guardar semilla o no del otro y ya no tenían »

(agronomist, project leader, INIFAP, March 19, 2013).

[33] In their report on the socio-economic and cultural conditions linked to maize, E. Lazos and M. Chauvet deal, insofar as the data collected allow them, with the following points concerning cultivation practices: monoculture / multi-culture; sowing of one or more varieties of maize by the farmer; presence or absence of associated cultures; density of cultures; type of culture (irrigated / non-irrigated); cycle of production and duration; dates of sowing and harvesting; methods of sowing (manual/ mechanical/ animal); use of fertiliser/manure. As to socio-cultural factors, three types of data were selected: producer's age, linked to duration of the cultivation of each type of maize; producer's ethnic group, common names (Lazo et Chauvet, *op. cit.*, p. 527).

[34] Paczka notes that between 1940 and 1996, 168 improved varieties (*mejorados*) of maize were created, half of them being hybrids, 34% varieties, and 15% synthetic varieties. (Paczka, *op. cit.*, p. 154).

In their report on "the social and bio-cultural context of the collection of primitive maize in Mexico", E. Lazos and M. Chauvet introduce the methodological note in the report with the following words:

« El cultivo de maíz nativo en este trabajo se concibe como un proceso socio-bio-cultural y por tanto la estructura social tiene un soporte para la conservación de las distintas razas de maíz »

(Lazos and Chauvet, *op. cit*., p. 525).

In a lot of discourse, and even in some reports, one finds awareness of the conditions of production of maize, of cultivators' practices and of the social usages of maize. It is by no means easy to grasp and analyse the way in which this kind of knowledge is represented in the minds of those in whom one can discern it. Though at present it seems obvious to many agronomists that, if we are to avoid jeopardising the processes of conservation and improvement of the species, more attention should be paid to these practices and to the socio-economic and cultural conditions of production. Yet it is hardly possible, on the basis of the current survey, to categorise these representations according to criteria such as the academic discipline of the author dealing with them, or his or her status and function in the project. This is understandable: these representations are can hardly be constructed when their object itself – farmers' knowledge – is still in such a diffuse state, impossible to apprehend without the tools forged for this specific purpose by an intellectual discipline[35]. An approach of this sort to the knowledge and practices of rural communities is by no means common, and it is rarely used as a primary interpretative grid for understanding the process of conservation of natural resources. Not being able to categorise the representations contained in the discourses recorded — this would have required investigation of a highly particular, and indeed unique order — we will attempt here merely to point out the most salient features of the representations contained in the replies recorded to questions concerning the aspects of "traditional" or "indigenous" farmers' knowledge that specifically interested the researchers involved in the PGM. What, in this knowledge, added to their own scientific knowledge? And what did they learn from the population's reactions to their scientific discourse and to their scientific knowledge of maize?

How do the scientists involved in the project represent the knowledge of farmers and their agricultural practices these conditions in their own minds? And do their representations evince an approach that is different from the dominant one in the project, which aims simply at the conservation and improvement of varieties of maize? To what extent, if any, has serious consideration of so-called "traditional" knowledge been "built in" to the questionnaire submitted to the farmers and to the collection of samples?

[35] Sign of a considerable distance, a sociological and institutional construct linked to this category of knowledge. The question of scientific studies' taking into account farmers' "know-how" seemed so strange to several of our interlocutors that I had to reformulate it in order even to be able to record their representations on this subject.

Traditional versus scientific knowledge: dichotomy and division

To interpreters of farmers' knowledge and practices, transgenic maize "comes as a bonus". Transgenic maize as an issue "condenses" and encapsulates a number of social changes linked to the cultivation of maize: changes in the nature of the product, in the rules of production, distribution and commercialisation, and changes in agricultural practice.

These new varieties are not yet widely known, and are still treated summarily (in a "commonsensical" fashion) without exact knowledge of what they are. To go by some researchers who took part in the gathering operations, these varieties are greeted with suspicion and even fear:

« Ya nos dieron las semillas, las trajimos y salieron unas contaminadas nuevamente, fuimos con ellos…este…la gente se angustió mucho; estaban muy preocupados los campesinos, estaban muy preocupados…este…hablamos con ellos, porque sí, incluso, luego, luego se ven las reacciones dentro de las comunidades; la gente que se siente como el culpable y los demás así como hay es que tú nos trajiste casi, casi veneno ¿no?, entonces sí fuimos muy cuidadosos en trabajar esa parte para que no hubiera conflictos, les explicamos que pues no tenían la culpa, porque ellos ni siquiera sabían »

(ethno-botanist, researcher, UAM-I, March 5, 2013).

Because it is new and has not been properly mastered, and because its origins are misunderstood or disputed, transgenic maize also "condenses" a whole range of oppositions that represent the farmer's world. This world is seen as aligned with tradition, in opposition to a world in which technology is the dominant paradigm. "Native" or "Creole" maize is seen as traditional; the older generation is familiar with it; it is associated with long spans of time, with permanence, with community and generosity, with reproduction and autonomy, with nature, experience and oral culture, with authenticity, peasantry and rural autochthony. Transgenic maize, on the other hand, is associated with modernity, with the younger generation, with movement, short spans of time, individualism and dependency, with the money that replaces land as the main form of capital, and with science as the main form of knowledge, with written culture, and with an outside world that seems urban and foreign.

This structuring of representations as opposites shows that the object represented has been misunderstood, and also just how difficult it is to get beyond initial perceptions in thinking out particularities that do not really lend themselves to binary categorisation (e.g. elderly / youthful; tradition / modernity; community / individualism, etc.). Without proper knowledge of the peasantry and of farming milieus, and without adequate tools to analyse the social realities of the latter, these categories are often generalised, with their elements reduced to the lowest common denominator: "older folk are attached to their maize" / "young people migrate and abandon farming"; "old people want to protect their maize at all costs" / " young people are ready to adapt to new species of maize because they realise that traditional crops are not profitable", and so forth.

The categories mobilised to represent a world that is difficult to decode for people who have not lived and worked in it (many investigators had never encountered it before) were drawn from a common register that is proper to urban milieus — the milieus from which the

investigators came; rural realities were assimilated to these. The investigators thus sorted individuals out into categories that are either equivalent to those of urban milieus, or on the contrary completely foreign to them. Thus "old folk" are put with tradition (i.e. the rural world), and "youth" with modernity (i.e. the urban world); for the old, the main resource is land and, for the young, the market, commerce, and so forth.

This is how the world of farming came to be understood in terms of a "tradition" that is presumed still to be alive (though admittedly only in far-off, ever-remoter places), or else in terms of an evolution that undervalues authenticity. A form of idealisation of the past often envelops the rural, peasant world, travestied by the myth of origins, and embodying dichotomised representations:

« la gente del campo es más humilde, es más humana que la gente de las ciudades ¿no? Porque a mí me ha tocado que ha… he llegado a lugares que la gente no tiene más que un plato de frijoles y te lo da, aunque ella se quede sin comer, te lo da, y te lo da de corazón, y te lo da bien y no te pide nada a cambio, incluso de ofenden si tú les dices te pago (…) te decía "te la regalo, es lo que a mí, así lo decían, es lo que la madre tierra me da, yo te lo regalo, yo sé que no vas a hacer mal llévatelo" »

(biologist, investigator, UAM-I, March 5, 2013)

« En el caso de la agricultura, pues yo creo que en el caso de las plantas es lo mismo, o sea México era un país productivo, México era un país donde la gente… el consumo de vegetales era muy elevado, y ahorita ya no, ya prácticamente con la tecnificación del campo pues se perdió todo ese concepto de milpa, se perdió todo este uso de plantas asociadas al maíz, e incluso la gente culturalmente también cambió ¿no? , porque muchas veces la gente dice: "es que si yo como quelites es como si yo fuera ignorante o retrasado o salvaje" ¿no?, y nosotros decimos, la verdad es que decimos, es que no es cierto los quelites son ricos en proteínas, en minerales, etcétera, y nosotros al revés les decimos, "no es cierto; no al contrario mejor sigan comiendo los quelites, más bien acá estamos mal, pero sí lo ve uno en el campo" ¿no?, uno llega al campo y quiere comer algo: tacos, tortas, y los quelites ya no existen porque a la gente le da pena o ya no hay porque la gente usa herbicidas en sus terrenos. Entonces hubo muchas implicaciones derivadas de esto ».

(ethno-botanist, researcher, UAM-I, March 5, 2013).

Though this binary framing of representations has admittedly not yet become general, it has already been schematised and admits of many nuances. When deconstructed, it provides an interpretative grid that does help to understand representations of farmers' knowledge. Identified as "traditional" by application of these binary categories, farmers' "know-how" constitutes a type of knowledge - empirical, rather than scientific - that corresponds to a "state of nature" characterised by permanence and conservation that survive despite the onward march of progress. Knowledge of this type embodies representations that provided many PGM operators with a justification for their activity. This "traditional" knowledge is "costumed" in a form of ignorance and subsequently naturalised:

« las plantas se domesticaron por gente que no sabía ni siquiera escribir, ni leer, ni nada, (…) »

(ethno-botanist, researcher, UAM-I, March 5, 2013)

In the eyes of our interviewees, farmers' knowledge should not so much be thought of as ignorance, as simply knowledge belonging to a register other than that of science — science that nonetheless has drawn from this knowledge:

« (…) se domestican las plantas y actualmente toda la investigación molecular y demás que se está haciendo, pues simplemente está corroborando lo que ya se sabía desde hace mucho tiempo ¿no?, todo eso fue derivado del conocimiento tradicional »

(*ibid*.).

Farmers "know their maize", of course; but this knowledge is merely intuitive; their practices stem from experience, and are not based on proof; they do not give rise to cumulative progress, which only science can make possible:

« son indígenas gente que muchos no van a la escuela o no nunca han ido a la escuela o son jóvenes que dejaron la escuela, no sé en la primaria[36], siempre había preguntas, al menos alguien preguntaba… Obviamente es un poco difícil para ellos entender que es un transgénico y demás, pero a pesar de eso tratamos de explicarles cómo era el maíz transgénico, y pues sí, tratar de darles valor a su maíz, ¿no? »

(*ibid*.)

This intuitive knowledge is experimental, but it is by no means an obstacle to science; on the contrary, it calls for improvement, demanding to be raised to a scientific level:

« yo pienso que si a la gente se le explica, o sea si a la gente realmente se le explica se les dice, miren, pasa esto, de la ciencia nosotros hemos encontrado ciertas cosas, hemos encontrado estos beneficios, estas problemáticas y ayudarlos a decidir pues que sí, digamos, ellos yo estoy segura que si lo pueden tomar en consideración el conocimiento, si lo pueden tomar en cuenta. Y lo van a incorporar en la medida que a ellos les beneficie y que ellos vean que es prudente, porque, digamos, el caso de las variables de los híbridos, pues, pasó eso ¿no? »

(*ibid*.).

This practical knowledge merits our attention as, despite its non- (or pre-) scientific nature, it can contribute to researchers' knowledge:

« Para nosotros toda está parte del manejo, de dónde viene la semilla, cómo la compran todo eso, nos ayuda un poco a entender qué tanta diversidad genética puede haber en las milpas, qué tanta erosión genética puede haber también ¿no?, si la gente siembra sólo una variedad

[36] E. Lazo et M. Chauvet remind in their report on « social and biocultural context of sampling of primitive varieties of corn in Mexico », how the rural population have had fewer years of formal schooling (72,7 % have been to school but only 15 % remain in secondary school and only 4% reach higher education). This population is also largely in a condition of « marginality, poverty, and social rejection ». In 2008, according to INEGI, 48% of Mexican population was in a state of poverty (Lazos & Chauvet, *op. cit.*, p. 24). The authors of this report highlight the inequalities in the distribution of public resources directed to the agricultural sector. Most poor producers are completely excluded from special public programs. « In short, those with most resources are also the beneficiaries of gouvernmental support » (*ibid.*).

todo el tiempo, todo el tiempo, puede ser que… de hecho la gente lo dice : se cansa. La misma gente lo dice, o sea, no habla de erosión genética, pero si dicen es que el maíz se cansó ya, entonces cuando se cansa cambiamos de variedad, entonces ya hay una, está como el concepto a nivel genético lo tienen muy claro ellos, aunque no hablan de genética, pero es muy claro lo que está pasando »

(*ibid*.).

In sum, though farmers know without actually realising that they know, so to speak, their knowledge is the fruit of time-honoured ancestral experimentation, and science should not simply reject it. On the contrary, science should protect it, safeguard it, and develop it. "[We should] explain to them what transgenic maize actually is, what it implies (…), and try more or less the inform them, to raise their awareness" (ibid.) Thus for many researchers innovation should not be merely abstract; one should build on a foundation that is already there, to preserve and sometimes accomplish its promise, eradicating obstacles to its improvement at the same time as saving what is worth saving.

An agronomist involved in the *Proyecto de los maices nativos* explained that, given farmers' imperfect knowledge and their predominant concern for the preservation of the agricultural heritage and its improvement, scientists' intervention was in fact timely, despite its often paternalistic nature:

« (…) la generalidad es de que ellos tienen inquietudes sobre otro tipo de maíz; ellos quieren algo diferente, ellos quieren saber si hay otro maíz mejor que el que tienen ahí, pero, la segunda, es, los usos, qué usos le puedo dar, éste no me lo compran, nada más tengo que comérmelo, y nada más, bueno pues existen desde cuestiones ornamentales, desde uso para hoja, el uso para el pozole, las harinas, el pinole y entonces empezamos a platicar y son cosas que ellos no las desconocen, pero sí tienen esa inquietud sobre qué uso le pueden dar, y... y el tercero, si es la conservación, pero ese, ese es, son así contadas las personas que dicen: "cómo le puedo hacer para yo conservar mi maíz, que no se me contamine, que no se me pierda", es ahí donde nosotros les podemos platicar sobre algunas técnicas para que ellos puedan conservar sus maíces y al mismo tiempo irlas mejorando, sin perder sus características »

(agronomist, collaborator, INIFAP, March 14, 2013).

« Ellos no están muy conscientes sobre la importancia de conservarlo. Ellos están conscientes de su abuelo, su papá lo venían haciendo, y ellos sienten como una obligación mora a seguirlo haciendo. (…) enseñarles a conservar, concientizarlos sobre eso porque aunque la gente es grande, muchas cosas ya hay que contaminan esa ideología y simplemente, el saber que la agricultura o el cultivo del maíz no es redituable aquí en México, eso hace que la gente vaya cambiando de patrón, de hasta de cultura, no solamente de, de cultivos, cambia cultura, cambia hábitos y por lo tanto el maíz se va relegando. Entonces una labor importante es la concientización sobre la conservación »

(ibid.)

Farmers were generally appreciated as preservers: "*ellos están abiertos a probar, pero si no les funciona definitivamente no adoptan esa tecnología*[37]*".* In actual fact, the paradox contained in these assertions is only apparent, expressing one of the representations we have mentioned: if farmers preserve their species, it is not only because of "tradition", but also for fear of losing heir capital. Conservation corresponds to respect for inherited teachings, i.e. to application of the principles of repetition and reproduction. This tradition thus presumably lacks knowledge of *proper* conservation. What scientists have to do is therefore to educate the people whose activity is part of the traditional order.

Thus a marked division between farmers' and scientists' knowledge persists: *« hay una frontera entre ellos y nosotros ; por muchas razones no lo sienten muy accesible el contacto con los científicos, y pues más bien siguen ellos resolviendo sus problemas »*(*ibid*.). Can this division be overcome? To go by some researchers, it has been so completely naturalised that it has come to seem "normal". Can science absorb and integrate this traditional knowledge, developing it for the benefit of the farmers? This question may seem strange; its corollary — i.e. the fact that farmers adopt scientific knowledge more or less as they think fit (and not necessarily as scientists intend them to do) can also legitimately be asked. The former of these questions is raised in these terms by most researchers; it expresses the dichotomy that we have pointed out, and includes an entire hierarchy in the system of oppositions we have noted. By implication, it is therefore up to the farmers to adapt to science, and not the other way round; scientific knowledge is better fitted than its "traditional" counterpart to preserve species and improve them.

« hay toda una serie de apoyos científicos, digamos como a cuestiones novedosas; como un enfoque muy tecnológico, aparentemente para incrementar, no sé, los rendimientos; aparentemente mejorar la economía de los campesinos y de los indígenas. Sin embargo, este, como que no se, realmente no se incorpora la misma filosofía de esas personas ¿no?, de los indígenas y los campesinos, no se ha entendido, cuál es la esencia de por qué la gente decide sembrar ciertas variedades o no (…)por qué no se implementan programas regionales basados en las condiciones ambientales, topográficas, climáticas, edáficas incluso, de vegetación locales y en ese contexto pues que la gente misma sea la que genere sus propios híbridos, o sea que usen sus propias variedades para ellos incrementar sus propios rendimientos ¿no?, y más bien, es apoyarlos en ese sentido, o sea, sin ser paternalistas, sin ser el clásico, te doy dos pesos para ver en qué te los gastas, no. Es realmente implementar programas que sean así…este…que haya seguimiento incluso ¿no?, que haya premios y demás, pero que realmente la gente pueda aprovechar esos recursos que tiene en su ambiente y no estar incorporando cosas que pues quién sabe si vayan a funcionar bien o no

(ethno-botanist, *loc. cit*.).

It would seem to be urgent to take traditional knowledge into account. To go by the agronomist researchers interviewed, the survival of plant species depends on it:

[37] He also underscores, as do others, that numerous farmers have been led to experiment without having been warned of possible consequences, and that as a result there is a lot of reticence, similar to the rejection encountered on many occasions by investigators during the collection of samples for the PGM.

[37] For a comprehensive list of participants, see the *Informe de gestión* of the PGM, on the CONABIO Internet page: http://www.biodiversidad.gob.mx

« después de haber hecho esa colecta, casi podemos asegurar que todos, todas las razas que existían en los 40's o 50's están presentes todavía ahorita, ahora, por cuánto tiempo, quién sabe, la industria y la globalización son fuertes, que pudiéramos decir que, qué tanto pudieran influir en la, la erosión de esta diversidad, y yo creo que una erosión cultural conlleva también a una erosión en germoplasma, si cambiamos la cultura de los pueblos como lo estamos haciendo, este, eso conlleva también a un deterioro de, cambio de costumbres, cambios de formas de vivir, cambios de siembra, cambio de cultivos… »

(agronomist, project leader, INIFAP, March 19, 2013).

Is the issue therefore one of paying attention to farmers' knowledge in order to protect the genotype heritage more effectively? This posture, though not shared by all researchers involved in the project, reveals nonetheless the hierarchical system of representation to which the so-called "traditional" knowledge is subjected: it is perceived first and foremost as a function of the preservation of species, and not as something that could produce new knowledge of species as yet unknown, or of species that could possibly be created. The first issue raised is not that of the cultural identity, socially differentiated, of farmers' knowledge (assembled under the banner of the adjective "indigenous"), but that of its possible function in the process of conservation of vegetal species. This utilitarian function hides all other functions, reducing the knowledge in question to its possible importance in the application of overall policies aimed at increasing agricultural yields. As we have shown, this function is also framed politically and institutionally as part of a production of knowledge contaminated by the principles of hierarchy and partition not only of the object to be known but also of the community of researchers whose vocation it is to develop knowledge.

Before concluding, and with a view to linking these representations of knowledge to the data dealt with in the first part of this report, we must ask whether complementary elements can be added to the analytical grid that we have used to illustrate the functioning of the PGM? As we have pointed out, to categorise these representations is not an easy task: their object (knowledge) is diffuse, and the representations themselves often seem to be relatively unstructured. Moreover, categorising these representations according to status, function and academic discipline (i.e. as the researchers have been categorised), can, without adequate support, lead us to constitute categories that are arbitrary. Examples of this would be "agronomists' representations" or "sociologists' representations", as though these were homogeneous, shared by all members of the disciplinary community, and distinct from those of other groupings. Moreover, as we have already pointed out, the objective or function of the PGM was not to contribute to knowledge of "traditional" knowledge. Nonetheless – as we are unable to take any further this analysis of the representations of researchers on this subject – we nonetheless formulate some conclusions as to the conditions under which these representations have arisen.

In a project such as the PGM, scientists were not called upon to guarantee the preservation of the resource (by means of improved identification and inclusion of elements of the context of production, transmission, circulation, and so forth), but first and foremost to identify and characterise the agronomic properties of the heritage in question, and to assess its presence, diversity and distribution in Mexican territory. Of course, maize is being preserved in data banks where it is kept at a controlled temperature, but the conditions that led to its

emergence (in particular in terms of agricultural practices) have still not become a central concern.

The gap between scientific and "traditional" knowledge would seem finally, in a project of this sort, to be much the same as the gap between political (or economic) agents and scientists; the latter are not seen as anything but suppliers of primary knowledge; they are never asked to contribute their meta-knowledge of this knowledge. Similarly, traditional knowledge is not used by scientists (except perhaps by ethno-botanists and socio-economists, a minority in projects such as the PGM), except marginally and as part of a heritage, but not as a partner in a dialogue between different kinds of knowledge.

Conclusion

When all is said and done, a project like the *Proyecto global de los maices nativos* helps a lot to understand the place assigned to "traditional" or "indigenous" knowledge — and, conversely, to the place that is *not* assigned to it. The workings of the project, its orientations, both political and methodological, its pyramidal structure, segmented according to academic disciplinary boundaries, its hierarchy of priorities imposed on the different facets of a resource such as maize, all reveal the extent to which the system of apprehension and interpretation of the knowledge concerned has been *constructed* both politically and sociologically. It has been "framed" and "constrained" (in particular by political orientations) at the risk of relegating to the background qualitative approaches to the role of this knowledge in the genesis and evolution of the resource, maize, allowing genetics to become a predominant concern in the debate on the yield of this resource and of its preservation.

Our brief ethnography of the *Proyecto Global de los Maices nativos* has revealed two major determinants in the treatment of problems exemplified by the preservation and conservation of maize. On the one hand, there is the political construction put on the issue, and on the other hand the subjection of the "system" of science, in its organisation and hierarchies, to this political construction and its prescriptions. This subordination of the knowledge of maize entails a quadruple distortion and records it. Firstly, the production of knowledge is backed by the system formed by the positions of participants in the "science system" and in the field of cognition. Secondly, the hierarchy of knowledge conforms to a segmentation of the process of research, so that the resultant knowledge stems first and foremost from technical operations and treatment, with the socio-economic dimension of knowledge of maize, and a fortiori its important symbolic dimension, being treated as mere illustrations. Thirdly, this knowledge undergoes a hierarchical reorganisation, with agronomy being given pride of place in the corpus mobilised, while sociological, economic and anthropological knowledge is relegated to a secondary role. Lastly, the knowledge produced is subjected to a categorisation and a segmentation of political representations of maize; on the strength of this, research is assigned the relatively static functions of conservation, heritage and improvement, rather than the dynamic and forward-looking function of understanding the socio-economic conditions of production and improvement.

The *Proyecto Global de los Maíces nativos* was conceived and carried out in such a way that it finally sharpened a series of oppositions and contradictions proper to the understanding and

scientific treatment of the question of the conservation of maize. “Hard” science is opposed to social and human sciences; meta-discourse is opposed to the technical operations of data collection; “scientific” knowledge is opposed to “traditional” knowledge. The Project could have aimed at reducing these oppositions and achieving a synthesis that could enable “traditional” knowledge to contribute to a scientific treatment of resources. But this was not to be the case. On the contrary, the Project simply corroborates the very postures that prevent progress of this sort. It could have enabled researchers to move beyond the conventional interpretative grid according to which traditional knowledge belongs to the register of conservation of a supposedly timeless heritage; it could have enabled those researchers who were attempting different interpretations to elaborate them. Instead, it merely reasserts the well-worn political and systemic principles that underlie the divisions between the agents of cognition and between types of knowledge, and the absence of dialogue between different forms of knowledge: between researchers themselves, and between scientific research workers and maize farmers. Our ethnographic study of the *Proyecto global de los maíces nativos* shows that in the absence of dialogue, “traditional” and “scientific” knowledge of a resource such as maize are political and sociological constructs, and that this is why they cannot possibly meet.

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Annexes

Annexe 1 – Guide to qualitative conversations with researchers interviewed for the survey of the PGM

1) Professional trajectories of researchers, scientific and militant activities, fields of expertise

Interviewee's initial training, academic and professional path

Progress of his/her career: uniquely in an academic milieu, or comprising in addition activities of expertise, civil administration, or employment in civil society?

Interviewee's academic discipline? Membership of a scientific community?

His/her main research issues in the course of his/her career? What are they at present?

2) **Summary of career**: professional insertion and promotion

Exploration of the conditions under which insertion into the profession took place:

— When did it take place? How (circumstances, conditions of entry, contacts, networks, etc.)? Where was his/her first job?

— How was he/she recruited into a scientific institution for the first time? By whom?

Did this insertion correspond to his/her education? How did this lead him/her to the laboratory?

Stages in the trajectory: insertion into the laboratory (dates, position, status, functions in the institution, level of responsibility, etc.)

Main factors that helped the interviewee in his/her insertion into the profession (membership of networks, study abroad, knowledge acquired, professional experience on returning to Mexico, expertise in foreign languages, etc.) Who were the "recruiting agents" interested in the specialisations acquired in Mexico or abroad; with whom did they collaborate outside Mexico? What networks did they belong to?

What impact can the knowledge that has been acquired in the course of research have on integration into peer-groups formed in the same place or on the same theme ?

What are the **main subjects** and **major themes** on which the researcher has worked? How did he/she come to work on them, and in what institutional framework? What were his/her personal contributions? Did he/she play a part in the emergence of new research subjects?

- In all of the above, what was the influence of his/her training, institutional context, former teachers and colleagues, and social environment?

- Did environmental issues and that of protecting and conserving natural resources have an impact on his/her work in research? If so, in what way?

- Why and how did he/she come to take an interest in maize?

How would he/she rate this interest (as great, moderate, slight? With or without stimulation? What type of interest?)

3) Participation in the Project, implementation, methodology

How did the interviewee come to know about the Global Project on indigenous maize?

How we he/she integrated into it? According to what criteria were projects selected? Who worked out these criteria and made the selection?

What interest (scientific or other) did he/she have in taking part in the project?

How did the project fit in with his/her personal work?

What did he/she contribute to the project? What role did he/she play in it? Did he/she take on responsibilities? What were they?

If the interviewee was a group leader: did he/she choose personally the members of the group? On what criteria?

How did he/she go about the work? Was he/she in contact with leaders of other groups? If so, with what in view?

What sort of knowledge was mobilised?

What is his/her opinion of the methodology of the project? Who thought it out? Did he/she take part in its design?

How were the maize varieties collected? What were the different sequences (collection, treatment of data, analysis, etc.)? What was done with the samples collected?

To what extent was his/her participation in the PGM of use to his/her personal work? Did he/she devise any projects directly subsequent to the PGM, and thanks to its results?

IV. Scientific results

Did the interviewee's team (if he/she was a coordinator) produce results deriving from work on the PGM that were useful to its own work? If so, what results?

Has he/she already published the result, or considering doing so?

In general does the PGM seem to him/her to be an important project? If so, why? What were the main lessons learned from it, and what did it contribute?

III. Political effects of the Project and the future of maize

From a political point of view, is the PGM an important part of overall conservation policy?

Is the interviewee aware of other political or scientific programmes linked to the issue of conserving maize (e.g. PROMAC - Programa de Maices Criollos- Conanp-Semarnat, or Mas agro – CIMMYT)? Has he/she taken part in any of them? Do they seem to him/her to have been important, and if so, why?

What is his/her opinion of the debate on transgenic maize in Mexico?

Is it in his/her opinion important to conserve "Creole" maize varieties *in situ*? How should this be done?

What is the future of maize in Mexico? Can food-supply sovereignty be achieved and put into practice?

IV. Traditional and scientific knowledge

To what extent was the issue of traditional knowledge taken into consideration (if at all) in the PGM?

Beyond the PGM, was this issue taken into account by the interviewee in the course of his/her work? How did he/she do this?

How would the interviewee define traditional knowledge? (One should try to find out whether the interviewer has in mind erudite or technical knowledge.)

Can the interviewee give examples of this type of knowledge? (If he/she is able to provide these, one should try to find out how he had acquired them and integrated them to his/her own work, and whether he/she had changed any objects of lines of thought, or the methodology of his/her research.)

To what extent do the interviewer and his colleagues try to take traditional knowledge into account?

In his/her opinion do farmers have specific knowledge or know-how that could prove useful to scientists?

Conversely, does the interviewee consider that his own scientific knowledge could prove useful to farmers? To what extent? Why?

Has scientific knowledge changed farmers' traditional knowledge? And does the reciprocal hold?

If so, can the interviewee give precise examples of this link-up (or mutual understanding) between the two types of knowledge?

In his/her opinion has the PGM promoted some form of contact or exchange between the two types of knowledge? If so, what contact, and how did it come about? What did it produce in the way of concrete results?

Annexe 2 - Institutions impliquées dans la recherche du PGM

1. Center for Conservation Ecology & Environmental Change, School of Conservation Sciences, Bournemouth University
2. Centro de Investigación Científica de Yucatán A. C. (CICY)
3. Centro de Investigación y Estudios Avanzados (CINVESTAV) del Instituto Politécnico Nacional (IPN), Unidad Mérida
4. Centro de Investigación y Estudios Avanzados (CINVESTAV) del Instituto Politécnico Nacional (IPN), Unidad Querétaro
5. Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Hidalgo (UAEH)
6. Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT)
7. Centro Regional Universitario Centro Occidente (CRUCO), Universidad Autónoma Chapingo (UACh)
8. Centro Regional Universitario Península de Yucatán (CRUPY), Universidad Autónoma Chapingo (UACh)
9. Centro Universitario de Ciencias Biológicas y Agropecuarias (CUCBA), Universidad de Guadalajara
10. Centro Universitario de la Costa Sur (CUCSUR), Universidad de Guadalajara
11. Comisión de Atención de Denuncias y Reclamos 04, Tamazunchale, San Luís Potosí (CADER)
12. Comisión de Atención de Denuncias y Reclamos 06, Tantoyuca, Veracruz (CADER)
13. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO)
14. Cooperadores locales en la región de la Huasteca
15. Cornell University
16. Departament of Biology, Texas Wesleyan University
17. Departamento de Fitomejoramiento, Universidad Autónoma Agraria "Antonio Narro" (UAAAN)
18. Departamento de Preparatoria Agrícola, Universidad Autónoma Chapingo (UACh)
19. Department of Crop Science, North Carolina State University
20. Dirección de Centros Regionales, Universidad Autónoma Chapingo (UACh)
21. El Colegio de la Frontera Sur (ECOSUR), Unidad San Cristóbal de las Casas
22. Facultad de Agronomía, Universidad Autónoma de Nuevo León (UANL)
23. Facultad de Ciencias Biológicas, Universidad Autónoma de Nuevo León (UANL)
24. Facultad de Ciencias Forestales, Universidad Autónoma de Nuevo León (UANL)
25. Facultad de Estudios Superiores Iztacala, UNAM
26. Instituto de Biología, UNAM
27. Instituto de Ecología Aplicada, Universidad Autónoma de Tamaulipas (UAT)

28 Instituto de Ecología, UNAM

29 Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas, UNAM

30 Instituto de Investigaciones Sociales, UNAM

31 Instituto de Recursos Genéticos y Productividad (IREGEP), Colegio de Postgraduados

32 Instituto Nacional de Ecología (INE)

33 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP)

34 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental General Terán

35 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Bajío

36 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Centro Altos de Jalisco

37 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Centro de Chiapas

38 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Chiapas

39 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Chiapas

40 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Cotaxtla

41 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Delicias

42 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Huimanguillo

43 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Iguala

44 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Las Huastecas

45 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Mocochá

46 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Norman E. Borlaug

47 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Pabellón de Arteaga

48 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental San Luís

49 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental San Martinito

50 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Santiago Ixcuintla

51 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Sierra de Chihuahua

52 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Tecoman

53 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Valle de Guadiana

54 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Valle de México

55 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Valles Centrales

56 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Zacatecas

57 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Campo experimental Zacatepec

58 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Sitio experimental Tlaxcala

59 Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP), Unión Agrícola Regional Centro

60 Instituto Tecnológico de Conkal (ITC)

61 Jardín Botánico, Instituto de Biología, UNAM

62 Probiodiversidad A.C.

63 Servicio Nacional de Inspección y Certificación de Semillas (SNICS), SAGARPA

64 Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria (SENASICA), SAGARPA

65 Subsecretaria de Fomento y Normatividad Ambiental, Secretaría de Medio Ambiente y Recursos Naturales

66 Unidad Académica de Agricultura, Universidad Autónoma de Nayarit (UAN)

67 Universidad Autónoma de la Ciudad de México (UACM)

68 Universidad Autónoma del Carmen (UNACAR)

69 Universidad Autónoma Metropolitana, Unidad Azcapotzalco (UAM-A)

70 Universidad Autónoma Metropolitana, Unidad Iztapalapa (UAM-I)

Annexe 3- Liste (anonyme) des interviewés, dates et lieux des interviews[38]

Date de l'entretien	Lieu de l'entretien	Sous-projet du PGM	Statut dans le projet	Discipline
4-mars-13	Instituto de Biología, Jardín Botánico, UNAM	bibliografía (FX004)	Responsable	Ethno-botaniste
5-mars-13	Laboratorio de Redes, Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas (IIMAS), UNAM	Análisis	Colaborador	Statisticien
		Análisis	Colaborador	Statisticien
7-mars-13	Departamento de Biología, UAM-Iztapalapa	FZ003	Responsable	Ethno-botaniste
7-mars-13	Departamento de Biología, UAM-Iztapalapa	FZ003	Colaborador	Biologiste
	Departamento de Biología, UAM-Iztapalapa	FZ003	Colaborador	Biologiste
11-mars-13	Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuarias (INIFAP)	FY001	Colaborador	Agronome généticien
13-mars-13	Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuarias (INIFAP)	FZ016	Colaborador	Agronome généticien
13-mars-13	Colegio de Posgraduados (COLPOS)	colectas de maíz	/	Agronome généticien
14-mars-13	Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuarias (INIFAP)	FZ016	Colaborador	Agronome généticien
14-mars-13	Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuarias (INIFAP)	FZ016	Colaborador	Socio-économiste

[38] Pour la liste exhaustive des participants au PGM, voir le *Informe de gestión* du PGM, sur page Internet de la CONABIO : http://www.biodiversidad.gob.mx

15-mars-13	Colegio de Posgraduados (COLPOS)	bibliografía (FX004)	Colaborador	Agronome-cytogénéticien
18-mars-13	Departamento de Sociología UAM-Azcapotzalco	/	/	Sociologue
19-mars-13	Instituto Nacional de Investigaciones Forestales, Agricolas y Pecuarias (INIFAP)	FY001 - FZ 016 - FZ002	Responsable - colaborador	Socio-économiste
20-mars-13	Universidad Autónoma de Chapingo	/	/	Agronome Ethno-botaniste
20-mars-13	Departamento de Sociología UAM-Azcapotzalco	Análisis	Responsable	Sociologue
21-mars-13	Comisión Nacional para usos y conocimiento de la Biodiversidad (CONABIO)	CONABIO	Personnel attaché au suivi du projet	