Workshop Report

Conservation and Development of Ancestral/Indigenous Plant Genetic Resources: Challenges, Tools and Perspectives
Sharing the Canadian, Mexican and American Experiences

May 10–11, 2016
Room VND-1853, Pavillon Ferdinand-Vandry, 1050 de la Médecine Ave.
Laval University, Quebec City, Canada
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Organizers

- PROCINORTE/NORGEN Taskforce on Genetic Resources (Axel Diederichsen, Peter Bretting, José Fernando De La Torre, Audia Barnett)
- Legal Research Chair in Food Diversity and Security, Laval University (Geneviève Parent, Marie-Eve Buist)
- Agriculture and Agri-Food Canada – AAFC (Stéphane Gariépy, Thomas Burelli)

Background

In February 2015, the NORGEN Taskforce on Genetic Resources decided to make Indigenous people and agriculture a topic for a NORGEN WebEx meeting entitled “First Nations and Agrobiodiversity” that was held in November 2015. AAFC Quebec colleagues leading the “Three Sisters Project,” which started earlier that year, also participated in the meeting. The PROCINORTE Secretary contacted the Legal Research Chair in Food Diversity and Security of Laval University, which resulted in a plan to organize a joint workshop since all three groups have an interest in the matter and come from different perspectives: genetic resources, food security, and agricultural economic and legal aspects. A special effort was also made to have representation from Indigenous people at the workshop, because they are the ones who historically developed, and in many cases also preserved, the genetic resources and associated knowledge for the benefit of future generations.
Objectives

OVERALL OBJECTIVE

The overall objective was to bring together key stakeholders from the United States, Mexico and Canada, including Indigenous people, involved in conservation and the utilization of diversity in crop plants, with a particular emphasis on crops relevant to Indigenous agriculture. The participants included individuals from government and non-governmental organizations, universities and seed savers. They were invited to share information and to develop the complementarity of each other’s activities to improve food security, the economy and ecological resilience.

KEY OBJECTIVES

To increase understanding of the status and of the importance of Indigenous plant genetic resources for food security:

- Elaborate the important role of the diversity of cultivated plants for food security and the central role local communities play in their conservation and utilization;
- Consider the resilience of local communities by understanding the roles of seed keepers and Indigenous food product projects;
- Look at local communities, their know-how and technical expertise;
- Recognize the access and benefit-sharing aspects when it comes to plant genetic resources and the rights of local communities.

To present the Canadian Three Sisters project and share Canadian, Mexican and American experiences in conservation and utilization of plant genetic resources:

- Understand the context and the objectives of the Three Sisters project;
- Share insights among those attending the workshop, and share knowledge about other projects throughout Canada, the United States and Mexico;
- Explore strategies to enhance synergies for conservation and utilization of plant genetic resources;
- Identify possible obstacles that affect such projects;
- Discuss access and benefit sharing aspects affecting such projects.

To develop suggested next steps:

- Identify possible projects on Indigenous plant genetic resource conservation and utilization in Canada, the United States and Mexico.

To reflect on information and communication strategies to maintain interactions within and among Canada, Mexico and the United States on the subject of conservation and utilization of plant genetic resources involving Indigenous communities.
List of Participants

Moderator

• Linda Collette, Former Secretary of the FAO Commission on Genetic Resources for Food and Agriculture

Speakers

• Flavio Aragón Cuevas, Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), Mexico.
• José Fernando De La Torre Sánchez, INIFAP, Mexico.
• Carlos Hugo Avendaño Arrazate, INIFAP, Mexico.
• Audia Barnett, Secretariat of PROCINORTE and Inter-American Institute for Co-operation on Agriculture.
• Terrylynn Brant, Seed keeper, Six Nations of the Grand River, Canada.
• Peter Bretting, United States Department of Agriculture, Agricultural Research Service, Office of National Programs, National Germplasm Resources Laboratory, USA.
• Thomas Burelli, Doctoral Student, University of Ottawa, Canada.
• Marie-Thérèse Charles, AAFC, Quebec.
• Axel Diederichsen, Agriculture and Agri-Food Canada, Plant Gene Resources of Canada, and PROCINORTE-NORGEN Taskforce on Genetic Resources.
• Brad Fraleigh, Director, Multilateral Science and Technology Relations, Agriculture and Agri-Food Canada (AAFC), Ottawa, Canada.
• Stéphane Gariépy, Knowledge and Technology Transfer Manager, Science and Technology Branch, AAFC, Quebec.
• Nathalie Garon, Development Officer, Indigenous and Northern Affairs Canada, Quebec City, Canada.
• Michel Gros-Louis, AAFC, Quebec.
• Charly Jacob, Corn producer, Kanahwake, Canada.
• Vincent Levesque, Owner, Les produits autochtones Terre de l’Aigle (Earth Eagle), Wendake, Canada.
• Martin Mondor, AAFC, Quebec.
• Geneviève Parent, Full Professor, Head of the Legal Research Chair in Food Diversity and Security, Laval University, Quebec, Canada.
• Michael A. Rice, Teacher, Sir Wilfrid Laurier School Board, Rosemère, Quebec, Canada.
• Jean Sioui, Family Chief, Responsible for cultural development, the national archives and museum activities, Huron-Wendat Nation of Wendake, Canada.
• Marjolaine Sioui, Executive Director, First Nations of Quebec and Labrador Health and Social Services Commission, Wendake, Canada.
• Sébastien Villeneuve, AAFC, Quebec.
Attendees

- Solène D’Arexi, Student, Faculty of Law.
- Marie-Ève Buist, Coordinator, Legal Research Chair in Food Diversity and Security, Laval University, Quebec, Canada.
- Carolina Caceres, Environment Canada.
- Marie-Claude Desjardins, University of Sherbrooke.
- François Carl Duguay, Quebec Reference Center for Agriculture and Agri-food (CRAAQ).
- Élise Garnier, Student, Laval University.
- Anne-Marie Granger Godbout, Conseil des appellations réservées et des termes valorisants (CARTV).
- Tom Ignacchiti, Student, Faculty of Law.
- Joanne Lagacé, Quebec Reference Center for Agriculture and Agri-food (CRAAQ).
- Seth Lafort.
- Julie Landry, Agricultural Society for Indigenous Food Products (ASIFP).
- Adrianne Lickers, Student.
- Steve McComber, Seed keeper.
- Emily Missyabit McAuley, Agriculture and Agri-Food Canada.
- Geneviève Motard, Faculty of Law, Laval University
- Jamie Monastyrski, Assembly of Chiefs of Ontario.
- Jean-Louis Rastoin, Montpellier SupAgro.
Executive summary

The opening session

After a short introduction by Linda Collette, former Secretary of the Food and Agriculture Organization of the United Nations (FAO) Commission on Genetic Resources, Michel Gros-Louis of AAFC and member of the Huron-Wendat Nation of Wendake opened the session with traditional rituals. Representatives of each of the three host institutions (Laval University, Agriculture and Agri-Food Canada and PROCINORTE/IICA) provided opening comments, setting the context, objectives and expectations for the meeting. Taking place on the heels of the news that the Government of Canada will remove its permanent objector status to the United Nations Declaration on the Rights of Indigenous Peoples, the meeting was very timely.

Linda Collette was the moderator for the entire workshop and remarked that the three PROCINORTE countries—the United States, Canada and Mexico—share common crops and a long history of agriculture prior to European immigration but currently have different levels of commitment to the international agreements regulating access and benefit-sharing regimes regarding genetic resources. This set the stage for some interesting discussions. The program included the following sub-topics:

- AAFC Three Sisters’ Project: “Three Sisters value chain: characterization of attributes and functionalities of Aboriginal corn, squash and bean varieties, preservation of genetic material and prefeasibility of new culture models”;
- Status, access and study of plant genetic resources and associated knowledge belonging to Indigenous people – legal and technical aspects for respecting their rights – Indigenous Food Products projects;
- Conservation and utilization strategies within the community (in situ / on farm);
- Conservation and utilization strategies at national gene banks (ex situ);
- Strategies for conservation and utilization of plant genetic resources by Indigenous people in an economic context.

The meeting concluded with a round table discussion on success factors for the conservation and development of ancestral/Indigenous crop plant diversity.

Summary of presentations and discussions

Objective 1: To increase understanding of the status and of the importance of Indigenous plant genetic resources for food security

Using the UN Food and Agriculture Organization’s definition of food security, information was shared on the loss of agricultural biodiversity globally and on the implications for food security. The importance of maintaining and conserving Indigenous genetic resources at the community level for the benefit of food diversity and security was acknowledged by the Legal Research Chair in Food Diversity and Security at Laval University, who also spoke about the various international legal instruments relating to agrobiodiversity. It is important to note that the FAO Treaty on Plant Genetic Resources for Food and Agriculture, the Convention on Biological Diversity and the Nagoya Protocol are the relevant treaties that consider fair access and equitable benefit sharing when it comes to plant genetic resources and associated knowledge.
Representatives of Indigenous groups in Quebec and scientists from Canada, Mexico and the United States shared practices and perspectives regarding the sustainable management and use of their respective plant genetic resources. Speakers presented both *in situ* and *ex situ* conservation practices, highlighting the rich diversity of traditional crops that exist in the Americas.

At the national level, Plant Gene Resources of Canada, the US National Plant Germplasm System and the National Genetic Resources Centre of Mexico collect, preserve and make plant germplasm available for research, breeding and educational purposes.

While practices within Indigenous groups differ from country to country, the value of their plant genetic resources is acknowledged in the three countries. Trust and respect were also common themes; they characterized interactions and collaborations at the community level and should be the model for further interactions. An important aspect of the workshop was the personal interactions. A seed keeper from the Six Nations of the Grand River in Canada brought a range of seeds as well as a slide show illustrating her operation as well as the larger cultural and spiritual background for such seed keeping work. Presentations on practices in Mexico showcased their *in situ* conservation strategies, including participatory plant breeding. The role of community seed banks in the conservation and exchange of germplasm in Mexico and Ecuador were of particular interest to Canadian participants.

Recognizing the value of Indigenous genetic resources as a source of food and medicine, participants also discussed utilization approaches. For example, the increasing level of obesity and non-communicable diseases among Indigenous communities motivated organizations such as the First Nations of Quebec and Labrador Heath and Social Services Commission to propose strategies for addressing this trend in parts of the population, including children. Initiatives to encourage healthier eating habits include promoting the use of traditional food in meal preparation, community gardens and nutrition programs in schools. Rediscovery of Indigenous crops such as Jerusalem artichoke may help to overcome such problems. Commercial activities in value-added preparations such as hominy corn and medicinal extracts demonstrated more entrepreneurial activities based on Indigenous plant materials. The workshop deliberations were complemented by a visit to the Wendake Museum, where the socio-cultural history reflects the importance and use of plant genetic resources in the Huron-Wendat tradition.

**Objective 2: To present the Canadian Three Sisters project and share Canadian, Mexican and American experiences in conservation and utilization of plant genetic resources**

The Three Sisters Project in Canada epitomizes co-operation and collaboration. With the participation of the First Nations community, Agriculture and Agri-Food Canada and academia, participants spoke of their various roles and activities in an environment of transparency, trust and mutual respect. Where seeds used in research came from communities, for example, shared decision-making took place at every stage of the project, and agreements were established to ensure that Indigenous rights were protected and the data gathered on ancestral lineage were shared.

Studies being conducted by AAFC on the Three Sisters (maize, squash and beans) seek to enhance agri-food production, so seed preservation and adapted growing methods to suit the food use are among the areas being explored. Research being conducted at the AAFC Research & Development Centres involved field work as well as characterization of functionality of the Three Sisters, providing information on the varieties with the most attractive properties—e.g. high antioxidant levels were identified for continued study. Such properties are key issues in preparing value-added products.
In Mexico, the centre of origin for maize and many other crops, cultivation practices by Indigenous groups are similar. Workshop participants were informed of the wide diversity of native material in Oaxaca, a region that also hosts both wild and cultivated species of beans and pumpkins. *In situ* conservation of Three Sisters crop diversity (maize, garden bean, pumpkin) over the years has benefited from community seed banks, native seed fairs, and the training of custodians and farmers. In addition, participatory improvement programs are undertaken with the active involvement of Indigenous groups who exchange germplasm.

**Objective 3: To develop suggestions for next steps**

Speakers and participants who represented the three countries of North America concurred that the workshop addressed issues pertinent to the conservation and sustainable use of Indigenous genetic resources and that it was a first and important step. A better understanding was gained of the various perspectives and interest was stimulated in practices that are transferable between Indigenous groups in the Americas.

A round table discussion provided a forum for representatives of the three countries and First Nations groups in Canada to air their views on the conditions deemed necessary for the successful conservation and development of ancestral/Indigenous crop diversity. The following recommendations were proposed to guiding future action:

- The message that the law and legal agreements are not there to block activities, but rather to provide a tool for making relations transparent and reliable, needs to be strengthened, while making efforts to acknowledge and collaborate with Aboriginal cultural and legal systems.
- The existence of great mistrust was noted and the need to build trust among all concerned was expressed clearly.
- The strength of *in situ* / on farm conservation by Indigenous people was recognized, and the complementarity of *ex situ* conservation in national gene banks for the conservation and use of plant genetic resources was acknowledged. It will be important to build on synergies from this complementarity for the future.
- Research and Development activities should be continued in collaboration with the government bodies, with transparency and mutual respect.
- Future meetings should include representation of First Nations / Aboriginal people from the United States and Mexico.
- Efforts should be made to investigate the ancestry and/or “relatedness” of selected plant genetic resources in Canada and Mexico.
- The value of Indigenous foods should continue to increase through food processing and medicinal extracts.
- The possibility of a joint public awareness program regarding the importance of ancestral genetic resources should be explored.
- Government-funded capacity-building projects in access and benefit sharing for Native groups across Canada should be explored.
- An effort should be made to find ways for continued and improved interaction and communications among all stakeholders at the national and international levels regarding plant genetic resource projects and initiatives relevant to Indigenous people.
- The relevance of opening perspectives for the next generation of Indigenous people was emphasized and sharing should be one of the guiding principles.
Preamble

On Tuesday and Wednesday, May 10 and 11, 2016, a workshop related to the “Three Sisters” project being led by Agriculture and Agri-Food Canada, PROCINORTE and the Legal Research Chair in Food Diversity and Security was held at Laval University. The main purpose of the workshop was to address the conservation and development of Indigenous genetic resources with respect to Canadian, Mexican and American experiences. The event brought together a number of players: experts from the research community, government players and Indigenous community representatives.

Introduction

Linda Colette

Linda Colette, former Secretary of the Commission on Genetic Resources for Food and Agriculture (CGRFA) was the workshop moderator. She worked for the United Nations Food and Agriculture Organization (FAO) on sustainable development issues at different levels for over 20 years.

Ms. Colette introduced the work presented throughout the day, drawing participants’ attention to the fundamental importance of biodiversity for food security, just as genetic diversity is a pillar for producers, particularly given the climate change that our societies are dealing with. The CGRFA was created in 1983 to address issues related to phytogenetic resources. In 1995, the FAO Conference broadened the Commission’s mandate to include all aspects of biological diversity related to agriculture and agri-food (FAO, 2016).

This genetic diversity is essential at a number of levels and particularly at the local level for Indigenous communities. In 2015, the CGRFA underscored the crucial role played by farmers with respect to genetic diversity through seed conservation. This was also highlighted in the Sustainable Development agenda.¹

Ms. Colette emphasized that the meeting was meant to be a friendly gathering, and that the workshop was an opportunity for the participants from different backgrounds to discuss and share their ideas as openly as possible.

¹ http://www.un.org/sustainabledevelopment/biodiversity/
Opening

Geneviève Parent

Geneviève Parent is a full professor in the Faculty of Law at Laval University and head of the Legal Research Chair in Food Diversity and Security².

Ms. Parent began by pointing out that the day before, the Canadian government had announced that it had decided to fully support the Declaration on the Rights of Indigenous Peoples.³ This was an important step that would certainly lead to progress in the years to come.

Ms. Parent thanked everyone in attendance as well as the workshop organizers.

Brad Fraleigh

Mr. Fraleigh is Director of Multilateral Science and Technology Relations at Agriculture and Agri-Food Canada. He stated that the relationship between Indigenous people and Canada should be based on respect, recognition, co-operation and partnership.

Mr. Fraleigh also briefly presented the “Three Sisters” project. The project is being led by Sébastien Villeneuve and Stéphane Gariépy. It began in 2015 with the goal of studying and showcasing the different ancestral varieties of the Three Sisters (corn, beans and squash) in co-operation with Indigenous partners.

In addition, Mr. Fraleigh commented that the three countries represented at the workshop (Mexico, Canada and the United States) were part of an agriculture research network, PROCINORTE,⁴ and the NORGEN Task Force.⁵

He then reviewed the background of the workshop, introduced the speakers and reminded the participants that the purpose of the event was to increase knowledge of the genetic diversity of resources with a view to improving food security.

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²  https://chaire-diversite-alimentaire.ulaval.ca

³ “Today’s announcement that Canada is now a full supporter of the Declaration, without qualification, is an important step in the vital work of reconciliation. Adopting and implementing the Declaration means that we will be breathing life into Section 35 of Canada’s Constitution, which provides a full box of rights for Indigenous peoples.” (The Honourable Carolyn Bennett, M.D., P.C., M.P. – Minister of Indigenous and Northern Affairs). Online: http://news.gc.ca/web/article-en.do?mthd=tp&crtr.page=1&nid=1063339&crtr.tp1D=1&_ga=1.96096796.1473861182.1449173448

⁴ PROCINORTE is the Co-operative Program in Agricultural Research and Technology, a regional mechanism that facilitates co-operative research activities of trilateral interest to Canada, Mexico and the United States. http://www.procinorte.net/Pages/Default.aspx

⁵ The Task Force on Genetic Resources for Food and Agriculture (NORGEN) was initiated in 1999 to develop a focal point for agricultural genetic resource programs and to facilitate the exchange of information under the umbrella of PROCINORTE. http://www.agr.gc.ca/eng/science-and-innovation/international-engagement/scientific-cooperation-with-international-organizations/?id=1180131840314#j
Audia Barnett

Audia Barnett is the Secretary of PROCINORTE and the Inter-American Institute for Co-operation on Agriculture (IICA). The Institute represents 34 countries in the Americas and also has an office in Spain. The IICA promotes more sustainable agriculture. Ms. Barnett also insisted that the purpose of the workshop was to link the knowledge of the three countries represented and highlight the many points in common with respect to ancestral agricultural practices.

Marjolaine Sioui

Ms. Sioui is Executive Director of the First Nations of Quebec and Labrador Health and Social Services Commission. She presented the Commission’s role.

She first explained the different Indigenous Nations living in Quebec. There are 11 Nations that can be distinguished by ethnicity, language, culture and history: 10 First Nations and the Inuit Nation.

The mission of the First Nations of Quebec and Labrador Health and Social Services Commission is to promote the physical, mental, emotional and spiritual well-being of the Indigenous people in its territory.

The health of Indigenous people is a source of concern. Ms. Sioui presented some statistics showing that 53.4% of children have a diet that can be considered harmful to health (such as eating fast food several times a week) and can lead to overweight and obesity issues. These problems are also seen in adults.

There are also problems with diabetes, as one out of three adults aged 55 to 64 have the condition.

Eating locally sourced traditional food is increasingly rare and this seems to be having negative repercussions on the health of Indigenous people.

The Three Sisters Project

The Three Sisters Project: Context, Objectives and State of Progress

Michel Gros-Louis and Stéphane Gariépy

The floor was given to Stéphane Gariépy and Michel Gros-Louis of Agriculture and Agri-Food Canada (AAFC). They provided a detailed introduction to the Three Sisters project, which is a multidisciplinary initiative that brings together participants from different backgrounds, including scientists and Indigenous people.

The “Three Sisters” is an agricultural system in which corn, squash and beans are grown together, which leads to better disease resistance, productivity gains and less reliance on fertilizers. This type of agricultural system is very old and is still used in some communities and in family gardens today. Some ancestral varieties are even available commercially.
A number of Agriculture and Agri-Food Canada scientists are working to improve agri-food production resulting from the Three Sisters system.

AAFC decided to develop this project with the goal of gathering knowledge about this method, preserving the seeds, improving cultivation methods and using them post-harvest. The Department has been working with Indigenous communities and the scientific community since 2015. Mr. Gariépy also explained that the main purpose of the project was to study the characteristics of varieties of corn, squash and beans and the products derived from them in order to develop their value-added for Indigenous stakeholders while studying the health benefits of these foods.
The detailed objectives of the project are to improve production methods, increase awareness of the importance of preserving ancestral values, develop new products from these crops and support the people interested in reviving them.

There were many questions at the start of the project, which began to take concrete shape in summer 2015 with the planting of ancestral varieties of beans, corn and squash that were purchased from artisanal seed growers in cultivated parcels.

During the winter of 2015, analysis protocols were developed, fresh products were characterized and the production of ingredients was analyzed. At the same time as these analyses were being performed, Michel Gros-Louis began meeting with seed keepers in the following communities: Akwesasne, Kahnawake, Tyendinaga and Six Nations.

Mr. Gros-Louis spoke after Mr. Gariépy. He began by presenting the Saint-Hyacinthe Research and Development Centre. The Research Centre supports Canada’s agri-food industry and makes it more competitive. He also talked about some products that could be produced from pumpkin seeds (pumpkins are squashes, so they are part of the Three Sisters), such as powder, vinegar and oil.

Michel Gros-Louis pointed out that there are practically no Indigenous farms today. For example, in Kanahwake, while there were over a thousand or so in 1920, they can be counted on one hand today.8

Michel Gros-Louis then presented the Indigenous people of Quebec and Ontario as well as a series of photographs taken during his trip to the First Nations of Quebec and Ontario. Through his photos, he showed that there were seed keepers in various communities, including the Six Nations, who were carefully conserving seeds.

Access and Study of Seeds and Knowledge Belonging to Communities

The Importance of Genetic Resources and Knowledge Preserved by Indigenous People and Communities for Food Security

Geneviève Parent

Professor Geneviève Parent’s presentation focused on the importance of conserving genetic resources and the associated traditional knowledge in order to ensure food diversity and security.

During her presentation, Ms. Parent reminded the audience of the definition of food security and what it means:

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

FAO World Food Summit Plan of Action 19969

Protecting biological diversity is essential in the current context of globalization. And yet, agriculture is facing a loss of diversity, in both the varieties cultivated and the growing methods and practices used.

The recognition of the resources and knowledge held by Indigenous people in international law.

Ms. Parent reviewed various international texts that deal with the issue of protecting Indigenous knowledge and resources. To begin, there is the International Treaty on Plant Genetic Resources for Food and Agriculture,\(^\text{10}\) as well as the Global Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture,\(^\text{11}\) which are major texts in this field.

There is also the Convention on Biological Diversity,\(^\text{12}\) an international treaty adopted in 1992 aimed at encouraging national strategies to promote

- The conservation of biodiversity
- The sustainable use of its components
- The fair and equitable sharing of the benefits derived from the use of genetic resources

Article 29 of the United Nations Declaration on the Rights of Indigenous Peoples,\(^\text{13}\) adopted in 2007, recognizes that

*Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall establish and implement assistance programmes for indigenous peoples for such conservation and protection, without discrimination.*

Even more specifically, Article 31 of the Declaration states

*Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.*

There are therefore institutions and texts that recognize and protect Indigenous people and their cultural heritage at the international level. However, there is sometimes a difference between the texts and their implementation, an aspect highlighted by Professor Parent in her lecture.

According to the United Nations Special Rapporteur, food systems need to be rethought. There are new ways to look at agriculture as well as alternatives to industrial production models. The concept of Territorialized Food Systems (TFS)\(^\text{14}\) was also presented, as defined by Jean-Louis Rastoin, Professor Emeritus at Montpellier SupAgro in France. The objectives of TFS are to develop locally produced


\(^\text{12}\) Convention on Biological Diversity, June 5, 1992, 1760 UNTS.


products, to favour family agriculture, networks of small and medium-sized enterprises (SMEs) and micro-enterprises in agri-food as well as alternative distribution channels. This allows for better sharing of the value created, the invention of new production models that are consumer health friendly while incorporating good natural resource management practices and limiting the environmental impact as well as losses and waste throughout the food chain. The ways Indigenous people protect and develop their seeds and other genetic resources should be taken into account in that concept.

For more information about the work of the Chair in Food Diversity and Security, go to www.chaire-diversite-alimentaire.ulaval.ca, or write to cddsa@fd.ulaval.ca

Contributions of Researchers and Communities to a Research Framework Involving Indigenous People and Presentation of Practical Tools

Thomas Burelli

In his presentation, Thomas Burelli focused on experiences and contributions which are, in his opinion, underestimated. Dealing with the regulation of the circulation of traditional knowledge, people tend to focus on international law and national legislation.

Very few people focus on the contributions of researchers and Aboriginal people. It is an awkward situation, as researchers and Aboriginal people are among the most concerned actors in this field.

Aboriginal people as key informants for scientists

Aboriginal people have developed traditional knowledge in various fields, such as the environment and agriculture. In these areas, researchers talk about traditional ecological knowledge. In this category, a distinction can be made between knowledge about ecosystems and botanical knowledge. Because of these types of knowledge, Aboriginal people have always been key informants for explorers and scientists. Botanical knowledge can help to identify resources (new crops for instance), potential new uses or genes with attractive properties. Knowledge about ecosystems is used in Canada, for example for species conservation purposes through co-management mechanisms.

Since the first contacts with Aboriginal people, explorers and scientists have tried to gain access to traditional knowledge. However, over the years, the relationships between Aboriginal people and researchers have often been dominated by violence, a lack of benefit sharing, and a lack of information and transparency. You can see on screen one example of the relationships which were established with Aboriginal people.

More recently, some researchers have argued that all the existing traditional knowledge has been published and that it would not be necessary to study and to rely on traditional knowledge to find new

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resources and uses. However, numerous research projects are focusing on traditional knowledge which is developed to identify resources and uses. The Three Sisters project is only one example.

What all these projects show is that the integration or use of traditional knowledge is significantly increasing the chances of finding promising resources and uses. That is not surprising at all considering the years of experience of Aboriginal people (while it seems still surprising for some researchers).

**The protection of genetic resources and traditional knowledge in international law**

The issue of access to genetic resources and associated traditional knowledge has been addressed in international law. Several treaties, conventions and declarations have been adopted to regulate this field and to recognize the rights of Aboriginal people. The issue has been addressed in many international forums (related to the environment, culture, Aboriginal rights, intellectual property) and the rights of Aboriginal people concerning their resources and knowledge are widely accepted among the international community (especially prior informed consent for access and use of resources and knowledge and the right to fair and equitable benefit sharing).

Article 31 of the United Nations Declaration on the Rights of Aboriginal Peoples summarizes the rights recognized in international law: “Indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts.”

However, most of the international texts require implementation measures and in this context, countries are often seen as the competent authorities to implement such measures, for instance through the adoption of a national legislation.

**The lack of national legislation in most cases**

In fact, very few countries have managed to implement the principles of international law, especially in the fields of Aboriginal rights and traditional knowledge protection. This is the case of Canada, where no specific legislation on access and benefit sharing has been adopted since 1993. It should be stressed that countries are not obliged to adopt any legislation. Each party to the convention is responsible for determining whether any action is required and then choosing the appropriate measures. It should also be noted that in the absence of specific ABS legislation, other legal frameworks can regulate the access and use of genetic resources (at least some types of genetic resources) and traditional knowledge. These frameworks include property law, contract law and wildlife protection legislation.

Despite the lack of specific legislation on ABS in Canada, several workshops have been organized to discuss ABS implementation in Canada and the needs of local actors. Several discussion papers and implementation strategies have been developed and shared. Very interesting orientations can be found in these texts.

So, in a context characterized by the existence of many international principles and norms and no specific national legislation in Canada, what is the reaction of researchers and Aboriginal people?

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20. See the presentation given by Stéphane Gariépy and Michel Gros-Louis, page 14.
Did researchers stop working on traditional knowledge? Did Aboriginal people decide to stop working with researchers? In some cases yes, but it is also possible to identify many research projects which have been conducted since the 1990s. If the relationships have not stopped, did they evolve towards more respect for and protection of Aboriginal rights? In other words, have researchers and Aboriginal people tried to transform their relationship?

In Canada, there has been a vast diversity of contributions. This is not the case in every country.  

**General frameworks and contracts adopted by researchers and Indigenous people**

Two types of contributions for the regulation of relationships between researchers and Aboriginal people can be observed in Canada: general frameworks and contractual practices.

So far, Thomas Burelli has identified around 60 general frameworks developed by Aboriginal people and their institutions (mainly) and by universities, some 50 contractual practices, models and effective contracts. These are only some of the instruments developed. Some are still hidden and unknown for various reasons.

These instruments are providing information about the expectations of researchers and Aboriginal people with regard to their relationships. They are very instructive about the types of relationships they wish to develop, and the types of relationships they have established since 1992.

This does not mean that these contributions should not be criticized or that they are allowing for balanced and fair relationships. But they should be studied more carefully.

Canada recently stressed the importance of raising awareness about these contributions in the context of access to genetic resources on Aboriginal land and to traditional knowledge associated with genetic resources.

**Who are the contributors?**

Who has contributed to the regulation of the relationships between researchers and Aboriginal people? The general frameworks have been developed by several Aboriginal institutions: representative political organizations (such as the Assembly of First Nations, the Council of Yukon First Nations, Femmes autochtones du Québec), representative sectoral organizations (such as the First Nations Centre, Yukon First Nations Heritage Group), tribal councils and First Nations bands.

It shows the importance of the issue at every level of Aboriginal governance in Canada. Some of these instruments are guidelines and standards which are shared to inspire or to serve as models in any Aboriginal context. Other are very specific frameworks applying to specific communities.

Instruments have also been developed by academia. Since 1998, Canada’s three research councils, which are among the largest funding agencies, have developed ethical frameworks. Specific measures for Aboriginal people have been gradually defined in these frameworks. It was only in 2010 that a specific chapter on projects involving Aboriginal people was included in the federal ethical framework.

Some universities have also adopted their own ethical frameworks. But most of the universities and colleges in Canada rely on the tri-council policy.

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21. For instance, very few initiatives and instruments can be observed in France.
In terms of contractual practices, Thomas Burelli has identified consent forms which are exchanged between researchers and participants in a research project, models of contracts (developed in particular by Aboriginal people and their institutions), and general research agreements applying to a specific research project.

The main principles and mechanisms recognized in the instruments

Regarding the first phase of research projects and prior informed consent, most of the instruments describe the information to be provided to Aboriginal people in order for their consent to be respected. It usually includes the following elements: a description of the goals, methods, funding agencies, expected outcomes, benefits and risks for the communities.

Consent is defined as an ongoing process during the whole research project. According to some instruments, it has to be confirmed during the project. In most cases, a right to withdraw consent is included in the instruments. It means that participants can decide to leave the project at any time. Should this happen, it is recognized that the data collected should be returned or destroyed.

Regarding the use of resources and traditional knowledge, full transparency about the uses is usually required. Secondary uses (meaning uses other than the one initially accepted) are not authorized without the consent of the communities and their members.

Access to resources and knowledge collected by third parties: some instruments are dealing with this issue and usually forbid such transfers.

Conservation of resources and traditional knowledge: The question here is, where should the collected resources and knowledge be gathered during and after the projects? In some instruments, it should be kept locally; in other cases, it is kept by universities, while Aboriginal people retain access rights.

One of the most interesting and innovative topics which can be found in the instruments is the participants’ rights to the data collected. In some instruments, a right to participate in the analysis and interpretation of the data is recognized. This can help to avoid misinterpretations and deformations of traditional knowledge, for instance. In most of the instruments, participants have a right to review the data, to comment on them and to ask for some elements to be excluded from publication. That is a way to avoid confidential and sacred elements from being disseminated.

Some instruments go even further: all the articles and documents from a research project can be reviewed, amended if needed and approved by the participants.

Regarding the last phase of research projects, it is recognized in most of the instruments that the data and results should be shared with the participants and their community, if possible in their own language and in plain language.

The participants’ contributions should also be recognized in the publications (with their consent and with due respect for confidentiality requirements).

Finally, the issue of intellectual rights developed with the project results was addressed. What we can find in these instruments is that every party to the agreement should consent to the development of innovations and that the intellectual property rights should be negotiated and shared with the communities and their members.

We can also find in these instruments some elements regarding respect for Aboriginal languages and their norms and protocols.
The development of a framework for the Three Sisters project

In the context of the Three Sisters project, the existing instruments identified in Canada have been used in order to select good practices. To define good practices, Thomas Burelli looked for principles, rules and mechanisms that enable Aboriginal people to control the circulation of their resources and knowledge. Such elements can be identified at each step of the research project (the access phase, the utilization phase and the valorization phase).

A consent form has been developed. This form is only a proposal which can be amended based on comments from local players. The consent form will be signed by all the participants in the research project to be sure that they are informed about the project goals and their rights.

In its current state, the consent form provides information about the Three Sisters project (the project team, methods, goals, benefits and potential risks, etc.). The consent form also specifies participants' rights. For example, they have a right to withdraw from the research project at any time and without any consequences if they are not comfortable with the goals of the research or any other aspect of the research. Their anonymity will be protected if they request it. It is also stated in the consent form that no intellectual property application will be considered or filled in without the participants' prior informed consent. The seeds shared by the participants are entrusted to Agriculture and Agri-Food Canada for the purpose of the Three Sisters project. Participants retain ownership over the seeds. As a result, the seeds cannot be shared with any third party without the prior informed consent of the participants.

Conclusion

In his presentation, Thomas Burelli described contributions which are usually underestimated. Canada is a very rich case study to observe such contributions. New Zealand, Australia and the US are countries where similar experiences can also be identified.

In some countries, very little has been done. For instance, in France, only very few examples of contributions from researchers and none from Aboriginal communities can be observed. In many cases, French researchers have not taken into account how principles have evolved and led their research projects with no regard for Aboriginal rights. According to Thomas Burelli, this is a very risky strategy. For instance, a French research institute was recently accused of biopiracy in French Guyana for using traditional knowledge and genetic resources without consent and without sharing the benefits.23 Such accusations are disastrous for the reputation of researchers and their institutions, but also for the trust between researchers and Indigenous people.

By studying local contributions, Thomas Burelli wants to demonstrate and to stress the capacity of researchers and Aboriginal people to regulate their relationships. It is a technical area, but no more complicated than any other. Many examples of ethical frameworks and contractual practices are already available and could inspire people.

Finally, according to what can be seen in the emerging instruments in Canada, what seems really important for successful and respectful projects is transparency (especially about project objectives, methods and outcomes), the participation of every partner in project development and management, and shared decision-making mechanisms (at every step of a project).

The Role of Native Indigenous Communities of Mexico in the Access of Genetic Resources and the Fair and Equitable Benefit Sharing

José Fernando de La Torre

José Fernando de La Torre’s presentation was on the role of Mexico’s native Indigenous communities in the access to genetic resources and fair and equitable benefit sharing.

Convention on Biological Diversity

Mr. De la Torre began by citing the three objectives\(^\text{24}\) of the Convention on Biological Diversity (CBD):

- To preserve biological diversity
- To promote the sustainable use of its components
- To assure the fair and equitable sharing of the benefits derived from their utilization

The CBD describes the role of Indigenous communities and their ties to biodiversity. In particular, it recognizes the “close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources, and the desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices relevant to the conservation of biological diversity and the sustainable use of its components.”\(^\text{25}\) The CBD thus recognizes traditional knowledge as an essential element in the conservation of biodiversity and its sustainable use.

Adoption of the Nagoya Protocol

At the 4th Conference of the Parties\(^\text{26}\) (COP) of the CBD in 1998, a decision was taken to establish a panel of experts to clarify principles and concepts related to Access and Benefit Sharing (ABS). In 1999, an ad hoc open-ended working group\(^\text{27}\) on ABS was created. The group met 11 times from 2005 to 2010. In 2002, the Group developed the Bonn Guidelines\(^\text{28}\) on ABS as a first instrument to guide the parties for the implementation of ABS mechanisms.

At the 10th COP in Nagoya, Japan, the parties to the CBD adopted the Nagoya Protocol, which came into force in October 2014. The aim of the Protocol is to implement the third objective of the CBD: the fair and equitable sharing of benefits arising out of the utilization of genetic resources and the associated traditional knowledge. It is a constraining instrument. However, the Nagoya Protocol still has many grey zones. Mr. De la Torre stated that for many observers, the Protocol is a masterpiece of ambiguities. This has resulted in major problems with implementing it for States.

In Mexico, the National Focal Point,\(^\text{29}\) which is the environment ministry, gathered an intergovernmental group to develop an ABS framework. An instrument is currently being reviewed by the many authorities involved in its development.

\(^{24}\) Article 1, Convention on Biological Diversity, 1992.
\(^{26}\) All the decisions of the 4th COP are available online: https://www.cbd.int/decisions/cop/?m=cop-04
\(^{27}\) https://www.cbd.int/abs/wgabs/
\(^{29}\) Country profile on the CBD website: https://www.cbd.int/countries/default.shtml?country=mx
The Indigenous people of Mexico

According to the Commission for the Development of Indigenous Peoples, 10.45% of the Mexican population is Indigenous and 6.6% still speak a pre-Hispanic language. Indigenous people are distributed throughout the country, but the highest concentrations can be found in southwestern Mexico, which is the tropical part of the country. (Figure 1)

The communities are located in poorly developed mountainous regions and have a well-defined culture and identity that is closely related to the environment.

There is a very rich tradition of in situ conservation as well as extensive use of genetic resources and the associated traditional knowledge.

Figure 1. Distribution of Indigenous People in Mexico

Genetic resources in Mexico

Over 1,200 species of plants are used for food consumption in Mexico; they come from either agriculture or wild harvests. Many of these species are limited to local use, but are still promising because of their resilience, and thus their potential for adaptation to climate change.

Our appreciation of genetic resources relies to a great extent on the traditional knowledge of local and Indigenous communities passed on from generation to generation. The importance of this knowledge has to be properly understood and valued by users. Hence, the rights of Indigenous communities have to be taken into account when negotiating access to genetic resources and traditional knowledge and benefit sharing.

30. There are 11 language families, 68 languages and 364 dialects.
ABS and traditional knowledge

The basic mechanisms for ensuring fair and equitable ABS are the PIC and the MAC.

PIC stands for “Previously Informed Consent.” It refers to the permission given by a competent authority of a country that, according to the institutional and legal framework in force, authorizes access to a genetic resource. The consent has to be acquired before access to the genetic resources is granted.

MAC stands for “Mutually Agreed Conditions.” It refers to an agreement between the users and the providers of a genetic resource (seeds, seedlings, etc.) that sets out the conditions of access and use, but also the way in which benefits arising from the use of this resource will be shared among the parties.

Who are the providers and users of genetic resources?

The providers of genetic resources may be states, which have sovereignty over the natural resources present in their territories, but they can also be individuals and Indigenous communities.

Users are highly varied and include botanical gardens, research institutes and even private companies.

Consultation of the Indigenous communities

The Indigenous communities have to be considered during the process of developing an ABS framework because the Mexican constitution recognizes the Indigenous communities’ rights to genetic resources. A consultation process has to be initiated when the rights and subsistence of Indigenous communities are affected.

They must be consulted according to the traditional uses and procedures of each community. And this is done under the supervision of Mexico’s federal government.
Two levels of access in the Mexican ABS framework

All access to genetic resources does not require the same level of scrutiny (for instance, genetic resources which are commonly used, genetic resources which are already accessible in gene banks, etc.). That is the reason why Mexico has developed a two-level access system, one of the levels being a procedure of “facilitated access.”

Facilitated access applies to non-profit research projects, taxonomy, collection, pre-breeding purposes and research projects. In these cases, consultation will be very quick and will be achieved through the CDI (Commission for the Development of Indigenous People in Mexico31), which is a civil organization representing Indigenous communities.

Complete access procedures have to be followed when commercial uses and profits are envisioned (as the first or second intention). In these cases, a consultation with the Indigenous community has to be organized and mutually agreed conditions have to be negotiated.

The consultation of Indigenous communities involves four phases: 1- preliminary agreements, 2- Informative phase, 3- Deliberative phase, 4- Meeting of final agreement (PIC signature). The consultation process can take up to six months according to Mr. De la Torre.

Mr. De la Torre noted that biodiversity study and utilization projects do carry some risks for users, and the possibility of turning a profit is uncertain for many of them. That is why a double procedure was developed in Mexico so as not to discourage users’ initiatives and, if applicable, to provide for consultation and benefit sharing if the results are expected to be good.

**Indigenous and Northern Affairs Canada Development Programs**

Nathalie Garon

Nathalie Garon is an economic development adviser for Indigenous and Northern Affairs Canada. She presented the existing economic development support opportunities for Indigenous start-ups and expanding companies. Her presentation focused on one program in particular, the Community Opportunity Readiness Program (CORP).

CORP is a Government of Canada program that covers the majority of activities, supporting companies that are in development or at the start-up stage. The financial support generally granted covers between 30% and 40% of the total cost.

Information about the program are available at this web address: [www.aadnc-aandc.gc.ca/eng/1100100033414/1100100033415](http://www.aadnc-aandc.gc.ca/eng/1100100033414/1100100033415)

**Examples of Indigenous Food Products Projects**

**Value Creation from Non-Timber Forest Products. The Example of Labrador Tea Extract Production**

Vincent Levesque

Vincent Levesque’s presentation covered these Indigenous products developed by Earth Eagle (Terre d’Aigle) that are produced in Wendake.

Mr. Levesque created this company, whose aim is to sell products with beneficial health properties based on traditional ancestral recipes. Labrador tea is an example of a product with great potential that was developed. Vincent Levesque brought with him a small bottle of Labrador tea essential oil and a bottle of Labrador tea extract to show the different ways that this resource can be developed and the results. A very large amount of raw tea is required to produce a small bottle of essential oil.

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34. [http://www.terredelaigle.com/](http://www.terredelaigle.com/)
Mr. Levesque especially thanked Agriculture and Agri-Food Canada. In order for the product to be brought to market, research had to be conducted on Labrador tea in order to study the plant’s effectiveness and its benefits using scientific methods.

It is therefore thought that Labrador tea has anti-cancer properties and strengthens the immune system.35

Mr. Levesque’s long-term plan is to create a company that can develop products containing Labrador tea. Since the plant grows more in the North, different productions could be created in different Indigenous communities in order to develop a network and create jobs for members of these communities. This could also help to revitalize traditional harvest practices.

Mr. Levesque showed a number of photographs featuring the research that has been done with AAFC.

A number of tests were conducted after the products were harvested by the First Nations: powder, concentrate, purée.

Mr. Levesque ended his presentation by stating that while there are numerous ideas, these products were developed with personal funds. Unfortunately, financial support is lacking to transform these ideas into concrete projects.

Development of a Hominy Corn Production Process Based on Ancestral Methods

Charly Jacob

Charly Jacob came from Kanahwake to present a project for the production of Hominy, a Native American dish prepared from corn that undergoes a process called nixtamalization, which removes the hulls from the corn kernels to make them easier to digest.

Charly Jacob explained at the beginning of his presentation that his interest in foods prepared with corn comes from his father, who had passed on his knowledge to Mr. Jacob. This knowledge enabled him to launch this project.

Tests were performed to develop an effective production process. White Iroquois corn is used.

As for the future, Mr. Jacob's main goals are to:

- Preserve and protect the seeds
- Produce products using traditional methods combined with modern development technologies
- Work with the Agricultural Society for Indigenous Food Product Co-op (ASIFP)

38. http://asifp.ca/
The Three Sisters Project: Products’ Characteristics and Potentials

Martin Mondor, Marie-Thérèse Charles and Sébastien Villeneuve

Marie Thérèse Charles, Martin Mondor and Sébastien Villeneuve all work for AAFC. They presented the characteristics and potential of products arising from the Three Sisters project. They began with an in-depth description of the Sainte-Hyacinthe and Saint-Jean-Sur-Richelieu research and development centres.

The Saint-Hyacinthe Research and Development Centre was created in 1987 and today has 19 research teams working to develop knowledge and technologies in order to improve production systems and associated practices. Four areas have been developed to support industry: information, infrastructure, expertise and industrial incubators.

The Saint-Hyacinthe Centre has expertise in a number of areas: food engineering research, food for health research and food safety research.

The Saint-Jean-sur-Richelieu Centre was founded in 1912. Its researchers are working to generate new knowledge, foster innovation and increase the commercialization of agricultural products, especially in the field of horticulture. The Centre has two experimental farms, one in Acadie and the other in St-Clotilde.

A number of research fields have been developed over the years. It was at this centre that the analysis of the bioactive components of Three Sister products was conducted. For example, a number of varieties were tested to analyze the carotenoid and antioxidant content. Many varieties of pumpkins, beans and corn were tested.

Examples of Ancestral Varieties of Corn, Beans and Pumpkins Available on the Market
Left to right: Algonquin squash, beans, Algonquin White corn

Then, different ways of developing these products were imagined. For example, many types of bread were prepared from pumpkin, bean and corn flour. Depending on the results, the bread was judged good or less good, particularly in terms of its industrial potential.

Other ways of developing Three Sisters products were also envisaged, such as nixtamalization and bannock.
In addition, methods were studied to determine whether all the parts of a pumpkin can be used (skin, flesh and seeds as well as the leaves and stem). Each part has some promising properties. The juice extracted is rich in Vitamins A and C and antioxidants, while the skin is rich in pectin and carotenoids, and the pulp can be used as flour.

Products made from different parts of the pumpkin are already on the market. For example, you can find pumpkin oil, powder and seeds, which can be eaten, as well as masks and other beauty products.

Work in the future will involve assessing the processing of the attributes for marketing corn, beans and pumpkin through their potential for use in breadmaking. The characteristics of non-commercial ancestral lines should also be studied.

Finally, the antioxidant potential of ancestral lineages is promising. Varieties of Hopi Black and Early Mohawk beans and Crookneck pumpkins have proved rich in bioactive substances. Some commercial ancestral lineages of maize, beans and pumpkin have demonstrated potential to be processed into ingredients in certain recipes.
Conservation and Utilization Strategies Within the Community
(In Situ)

In Situ Conservation and Participatory Breeding of Cacao with Indigenous Communities of the Soconusco Region in Chiapas, Mexico

Carlos Hugo Avendaño Arrazate

The presentation given by Carlos Hugo Avendaño Arrazate had a whiff of chocolate about it! Participants got a chance to experience the exotic nature of Mexico firsthand as the speaker came with a few sweets to sample.

The speaker talked about a project involving the participatory breeding of cacao with Indigenous communities in the Soconusco region in the state of Chiapas. He presented a number of products that dazzled our taste buds, such as chocolate-covered coffee beans and handmade chocolate.

Mr. Arrazate began with a review of some of the historical aspects of cacao production. As a beverage, it had a very important meaning for some communities, representing the drink of the gods in Mayan and other Latin American and Central American cultures. There are references to the chocolate beverages on ceramics, in paintings and in writings.

According to Bartley, cacao was originally domesticated in Central America, but it is widespread as a wild tree in the forests of Amazonian South America. There are three main types of cultivated cacao: Criollo, Forastero and Trinitario; the latter is thought to be a hybrid of the first two. Throughout the world, it is the Criollo that is the most widespread in Mexico because of its high quality and flavor appreciated by the chocolate manufacturing industry.

While cacao’s geographic origins are in Latin America, the region accounts for only 4% of world cacao consumption. The highest consumption of cacao is in Europe, accounting for 44% of world consumption.

The State of Chiapas

Cacao and tobacco cultivation is extensive in Chiapas, despite the ravages of Moniliasis, a disease caused by a fungus that affects these crops.

The project presented by Carlos Arrazate was carried out in Chiapas. The Mam people\(^3\) are the most common Indigenous group in the region.

There are a number of problems specific to this region, such as the multitude of cacao varieties introduced, but also the age of the producers—more than 65% of the producers today are over 51.

**The project: Participatory cacao breeding**

The project presented by Carlos Arrazate involved the harvesting of Criollo cacao beans in different regions of Mexico.

"The colour of the beans is very important for the taste of the cacao."

Carlos Arrazate

After analyzing the characteristics of the different types of cacao collected, the project involved getting the Indigenous population involved in cacao breeding, as well as to reintroduce some genetic diversity in local growing systems that could benefit producers.

The purpose of this project was to get the public to participate in growing cacao (participatory cultivation/breeding), put them in contact with researchers and get them directly and actively involved in production. The project involved a number of different phases.

- Phase 1: present the project to local players and find out what motivates them
- Phase 2: identify the characteristics of the different varieties of cacao to be selected (resistance to Moniliasis, quality, flavour, etc.)
- Phase 3: go into the field to identify promising trees
- Phase 4: identify promising plots of land for growing

\(^3\) https://en.wikipedia.org/wiki/Mam_people
• Phase 5: test resistance to Moniliasis through artificial inoculation

• Phase 6: Identify varieties that will be planted in local producers’ systems and improve genetic diversity

• Phase 7: evaluate the different environments in the Soconusco region

The challenge of this project lies in generating public interest in conserving and using the diversity of varieties of Criollo Cacao as a profitable and sustainable activity that can improve their living conditions. In addition, greater genetic diversity will provide better resistance to current and emerging diseases affecting crops.

The creation of a regional and international network will improve the conservation of biodiversity and develop sustainable breeding systems that have economic benefits for the regional economy.

To conclude, Mr. Arrazate stated that, in his opinion,

“The best cacao fertilizer is the grower’s involvement.”
In Situ Conservation Strategies and Participatory Breeding of the Milpa in Oaxaca, Mexico

Flavio Aragón Cuevas

Mr. Cuevas’s presentation dealt with the conservation and participatory breeding of Milpa\textsuperscript{44} in Oaxaca, Mexico,\textsuperscript{45} a project carried out with the INIFP.

He began by presenting the problems affecting Oaxaca:

- Climate change and the lack of genetic resources;
- Poverty;
- Hunger;
- Demographic pressure;
- Youth migration;
- Threat of GMOs.

While Mexico is considered the centre of origin of many resources that today make up a large part of the world’s diet (corn, beans, sunflowers, chilies, etc.), only 15 species of plants and 8 animals provide 90% of the country’s food.

Mr. Cuevas presented the origins of corn (maize), a plant named Teosinte, and how it evolved to become the corn we know today.

According to a recent study, there are 55 different types of corn in Mexico.

\textbf{Milpa}

Producers are the main keepers of Milpa, which is the Spanish term to designate the Three Sisters crop-growing system. Producers play an essential role because they select the best seeds, conserve them in times of poor harvests, and try to preserve ancestral corn crops from GMO contamination.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{milpa_diagram}
\caption{Milpa crop-growing system diagram.}
\end{figure}

\textsuperscript{44} https://en.wikipedia.org/wiki/Milpa
\textsuperscript{45} https://en.wikipedia.org/wiki/Oaxaca
The community of Oaxaca has developed seed banks. There are 11 today, with seeds from 400 producers, representing some 8,000 kg of different varieties of corn.

![Different Varieties of Corn Preserved in Oaxaca's Community Seed Banks (CSBs)](image)

But there is a wide variety of beans that are grown and whose seeds are also preserved in the CSBs, as are those of squashes.

The “Quelite” plant was presented as a resource with edible foliage. This plant grows in the Milpa, is found almost everywhere in the area and can be eaten in different ways.

The government has introduced a program to save 11 varieties of corn which involves local producers. There are 58 producers who support the project and who each have to conserve 200 kg in plastic or metal silos provided by the government, for a total of 11,600 kg of seeds. This participatory production project has also been developed for squash.

A meeting was organized between the various producers in order to promote the importance of conservation, encourage knowledge sharing among producers and raise public awareness of the importance of biodiversity.

To preserve genetic resources, there is a conservation infrastructure present in the communities, as well as a national genetic resource centre. In Oaxaca, there are some 2,100 collections of corn, 800 collections of beans, 400 collections of squash and 300 collections of peppers.

![Ex Situ Conservation: Location and Seed Keepers](image)

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46. See José Fernando De La Torre Sánchez’s presentation in this report, page 53.
It is essential that producers share their knowledge and pass it on to future generations, which is why workshops are being organized on topics such as soil erosion, water conservation and fertilization methods.

As Mr. Cuevas pointed out, it is important that participants learn what they do not know and reinforce the knowledge they have already.

The Institute is also trying to develop different media to promote the use of ancestral varieties: videos, scientific papers, etc.

“Who are we preserving ancestral varieties of Milpa for?”

Flavio Aragón Cuevas
Complementary Conservation and Utilization of Traditional Crops in Ecuador

Karen Williams (presented by Peter Bretting)

Mr. Bretting’s presentation was very colourful! The project he talked about is located in Cotacachi, Ecuador, in traditional farming communities. He began by talking about the diverse number of farm products grown, including potatoes, corn and beans.

Project partners:

- UNORCAC\textsuperscript{47} (Unión de Organizaciones Campesinas Indígenas de Cotacachi)
- INIAP\textsuperscript{48} - DENAREF (Instituto Nacional Autónomo de Investigaciones Agropecuarias - Departamento Nacional de Recursos Fitogenéticos y Biotecnología)
- Bioversity International\textsuperscript{49}
- USDA-ARS\textsuperscript{50} (United States Department of Agriculture Agricultural Research Service)
- Runa Tupari Native Travel\textsuperscript{51}

\textsuperscript{47} http://unorcac.nativeweb.org/
\textsuperscript{48} http://www.iniap.gob.ec/
\textsuperscript{49} http://www.bioversityinternational.org/
\textsuperscript{50} https://www.ars.usda.gov/
\textsuperscript{51} http://www.runatupari.com/index.php/en/
The project’s objectives are, first, to develop a way to conserve seeds in situ (that is, on the farm), but also ex situ. Seed conservation could also be developed with the associated cultural traditions, practices and knowledge.

The resulting objectives would be 1) develop complementary activities that could come from the crops, such as tourism or micro-enterprises; 2) revitalize ethnic identity and knowledge; 3) improve food security; and 4) improve education in agrobiodiversity. The development of agritourism could also be considered.

At the same time, a pilot project to enhance the value of native crops through their integration in non-traditional products could be tested at UNORCAC (Unión de Organizaciones Campesinas Indígenas de Cotacachi\(^{52}\)), an Indigenous organization in Cotacachi.

Examples of such products include pepper sauce, roasted squash seeds and physalis (cape gooseberry) marmalade.

**Agritourism**

Agritourism can be defined as a way to travel to farming communities that promotes the conservation and use of agrobiodiversity. This form of tourism provides tangible benefits to local communities.

In the case of Ecuador, the development of agritourism encourages traditional farming practices, and educates tourists about the connection between biodiversity, traditional farmers and farming systems.

Mr. Bretting concluded by presenting the lasting impacts of these projects. They are fairly positive. UNORCAC has incorporated the promotion of native crops into its agricultural programs. Seed fairs occur regularly. New products have been developed, the most successful being dried cape gooseberries,\(^{53}\) dried chili peppers and blackberries. Agrobiodiversity modules have been used in some schools and agritourism provides income to local communities.

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Testimonies on the Conservation and Utilization within the Community (In Situ)

Terrylynn Brant

Terrylynn Brant comes from the Six Nations of the Grand River in Ontario. She brought with her different varieties of corn seeds and a colourful presentation. The photographs that appeared throughout her presentation demonstrated how important agriculture is for her. From her perspective, having a garden is taking care of what we eat and feeding those we love. So it was to share her daily life and show what her community looks like, and the importance of the ties between her children and her garden that she presented these photographs. She explained that “the relationship we have with a garden is like a secret.”

Terrylynn said that she has been a seed keeper since she was born, because her family had been seed keepers. Over the years, she has acquired a very rich experience in seeds and today, she would like the knowledge of seed keepers to be recognized. Even if Indigenous knowledge cannot be compared with laboratory research, she hopes that it will be recognized and incorporated into different projects that Indigenous people and governments are collaborating on.

“We grow to feed our family” she stated in order to emphasize the goal of agriculture in the First Nations. For her, productivity and economic benefits are not goals. Her main objective is to take care of her community. The agriculture that she practises is a way to share healthy foods.

In addition, her presentation provided an explanation of her viewpoint on the institutions that seem to be promoting the recognition of Indigenous knowledge and supporting Indigenous people.

Terrylynn Brant also described the difficulties that she had faced, such as the feeling that the rights of First Nations were not being respected and that they did not have the same rights as non-Indigenous people.

Lastly, Ms. Brant stated that she appreciated the Three Sisters project and all the efforts being made to carry it out. However, she pointed out that these three sisters were related to the presence of “sisters” other than squash, corn and beans. She mentioned the soil itself and the role of insects in order to convey the idea that agriculture was a host of elements that must be taken into consideration. She also said that other promising polyculture systems existed.

Finally, Terrylynn Brant drew attention to her relationship with “knowledge” and the importance of “traditional knowledge” for her and Indigenous communities:

“We believe in the knowledge that our ancestors have passed on to us just as much as you believe in the research in your laboratories.”
Michael Rice

A Short Testimony

Mr. Rice, a high school teacher, brought along a box of seeds for his presentation. He shared some anecdotes about them, some of them from interactions with other seed keepers. He recounted the story of a small packet of black bean seeds. They had been given to him by a friend from El Salvador. This friend had told him not to water the seeds. But Michael did water them, thinking that water was necessary for their growth. As a result, none of the seeds grew. His story illustrated the fact that transferring knowledge is important, and that it can be indispensable in agriculture, particularly to know how to develop seeds into mature plants.

Highlights of the First Day

Brad Fraleigh

Brad Fraleigh ended the day by highlighting the elements covered in the presentations:

• The importance of developing knowledge and understanding, particularly through interaction with others;
• The importance of genetic diversity and its impact on food;
• The findings shared by some of the participants regarding the erosion of biodiversity;
• The local, national and international legal contexts;
• The presentations from other countries, in particular the three from Mexico and one from Ecuador, which increased understanding of agriculture projects with Indigenous communities in other regions;
• The acquisition of knowledge about some crops, such as Labrador tea and Iroquois white corn;
• Finally, the essential presence of Indigenous people who agreed to share their knowledge, their vision and their relationship with agriculture.

Thus, we can say that the goal of presenting the Three Sisters project and sharing knowledge related to this project was achieved on this first day.
Conservation and Utilization Strategies (Ex Situ)

Following a summary of the first day, during this session, the three speakers gave presentations on three experiences with ex situ conservation of genetic resources in the United States, Canada, and Mexico. These presentations highlighted the missions of conservation institutions, their methods, the extent of their collections, original projects developed with Indigenous communities and the link between ex situ conservation and in situ conservation.

Summary of the First Day

Audia Barnett

The first day of the workshop was largely focused on the study of three countries: Mexico, the United States, and Canada. Initiatives in Ecuador were also looked at.

These case studies demonstrated the existence of different legal frameworks surrounding Indigenous people, genetic resources and the associated traditional knowledge.

The presentations were also an opportunity to draw attention to some of the synergies between the case studies. We saw that the Three Sisters (corn, squash and beans) are grown in Mexico, the United States, and Canada in Indigenous and local communities.

A few of the presentations also brought to light some disturbing trends with respect to the diets of children in Indigenous communities. A number of speakers nevertheless described initiatives that are helping to counter these trends, such as projects on Indigenous foods developed in schools.

Also addressed were the role of seed keepers and the challenges that they face. How can we make sure they pass on their knowledge and resources to the younger generations and sustain essential in situ conservation practices? How can we better recognize the role and contribution of these seed keepers?

Concrete examples of the successful development of Indigenous products were presented, such as Labrador tea and pumpkin seeds. The development potential for plant-based products appears very significant.

Agriculture and Agri-Food Canada representatives provided concrete examples of collaborative projects that can be carried out between researchers and Indigenous communities as well as the benefits of joint research.

The crucial importance of mutual respect between researchers and the communities came up a number of times in the presentations. In the words of Terrylynn, the seed keeper, “If you want me to come to the table, meet me as an equal partner.” The tools and processes used to build and maintain respectful relationships were also described, such as codes of ethics and contracts.
The USDA/ARS National Plant Germplasm System and US Native American Tribal Nations

Peter Bretting

In his presentation, Peter Bretting described the national plant and germplasm system in the United States.

The term germplasm can be defined as the reproductive material of plants. In other words, it is the living genetic resources that are maintained for the purpose of plant breeding, preservation and other research uses. It can be seeds, tubers or cuttings. There are two complementary ways to conserve germplasm: in its original habitat or in gene banks.

The US National Plant Germplasm System is one of the largest national gene banks in the world. More than 576,000 samples of more than 15,000 plants species are maintained in collections. The collections focus mainly on food security crops such as grains or oil seeds, which provide most of the calories for humankind. The collections are also composed of large holdings of crops without major collections at international agricultural research centres, such as cotton, soybean and various horticultural crops.

The USDA National Plant Germplasm System developed the Germplasm Resources Information Network (GRIN), which has become an international standard shared with other collections. For instance, the Canadian gene bank has been using GRIN since 1994–1995.

54. “The Germplasm Resources Information Network’s (GRIN) mission is to support four projects, the National Plant Germplasm System (NPGS), the National Animal Germplasm System (NAGP), the National Microbial Germplasm Program (NMGP), the National Invertebrate Germplasm Program (NIGRP). GRIN provides National Genetic Resources Program (NGRP) personnel and germplasm users continuous access to databases for the maintenance of passport, characterization, evaluation, inventory, and distribution data important for the effective management and utilization of national germplasm collections.”  http://www.ars-grin.gov/
The USDA National Plant Germplasm System has about 20 facilities in the United States. Most of these gene banks are partnerships between the federal government, state agriculture experimental stations and state universities (Colorado State University, Fort Collins, University of California, Davis, etc.).
Example of an NPGS gene bank: the US Potato Collection (Germplasm in the form of tubers and seeds, in Sturgeon Bay, Wisconsin)

How do gene banks conserve genetic resources?

Conservation is a multiphase, often multi-year, endeavour that involves some of the following activities:

- Acquisition: by exchange or collection;
- Maintenance: in cold storage or in living collections in the field;
- Regeneration, documentation and data management: seeds lose their viability or are so broadly used that new seeds are needed;
- Distribution: hundreds of thousands of samples are shared every year;
- Characterization: morphological and genetic traits are studied;
- Evaluation: study of useful traits;
- Enhancement;
- Research in support of the preceding priorities.

The collections are meant to keep the germplasm safe and to encourage their use. They are living collections and not museums.

Availability of the collections

The material is made available free of charge for educational, breeding, and research purposes. It can be ordered online at: http://www.ars-grin.gov/npgs/orders.html.

The material is distributed in the US and internationally. Depending on the year, about two thirds or three quarters of the distribution is sent within the US. The samples are shared with the public and the private sector. University researchers make up the largest group of users.
Native American traditional crops

As in Canada and Mexico, there is a huge variety of crops and “wild plants” which embody Native American cultures and knowledge systems. Native Americans in the US have cultivated a rich diversity of traditional crops within a similarly diverse set of agricultural systems.

The New World Indigenous crops which are cultivated in the US include beans (Phaseolus); pumpkins, squash and gourds (Cucurbita, Lagenaria); maize (Zea mays); chiles (Capsicum); cotton (Gossypium); tobacco (Nicotiana); sunflowers (Helianthus); Amaranthus; and Chenopodium.

Some Old World crop introductions are also kept in the collections: wheat (Triticum), barley (Hordeum), melon (Cucumis, Citrullus), cowpeas (Vigna), peaches and apricots (Prunus).

Recent USDA/NPGS collaborations with Native American Tribal Nations to conserve genetic resources

Several collaborations with Native American Tribal Nations have been developed. For example, the conservation and storage of ash tree seeds for:

- Bad River Band of Chippewa, WI;
- Stockbridge-Munsee Mohican Community, WI;
- Grand Portage and Fond du Lac Tribes, MN;
- Leech Lake band of Ojibway, MN.

The ash tree is an important cultural and material resource. It is used, for instance, to build objects such as baskets and canoe paddles.

In Colorado, the USDA National Plant Germplasm System is conserving collections made by the Tribal Nations. Some Tribal Nations have decided to maintain the seeds on their territory (for instance the St. Regis Mohawk Tribe in New York). In this case, training on ash tree seed collection and preservation was offered and provided.

Other projects have also been developed, such as

- A joint USDA/ARS potato research and genetic analysis project with the Makah, Yakama and Haida tribes of the Pacific Northwest; Zhang et al. 2010 Inferred origin of several Native American potatoes form the Pacific Northwest and Southeast Alaska using SSR markers. Euphytica 174: 15-29.
- A joint Crop Wild Relatives workshop with Keweenaw Bay Native American Community in Michigan) USDA/ARS, USDA/Forest Service, Chicago Botanical Garden;

Main points of the presentation

- The US collections are among the biggest in the world and play a key role in the conservation of genetic resources.
- The US is also promoting and supporting research on the resources by sharing them.
- The collections are not static.

Collaborations with Indigenous communities have been developed for ex situ and in situ conservation of some genetic resources.
Ex Situ Germplasm Conservation by Plant Gene Resources of Canada as a Complement to On-Farm Conservation in Indigenous Agriculture

Axel Diederichsen

In his presentation, Axel Diederichsen described the Canadian gene bank (PGRC – Plant Gene Resources of Canada). The Canadian gene bank was established by Agriculture and Agri-food Canada (AAFC) in Ottawa in 1970 and moved to Saskatoon in 1998.

The mandate and tasks of the Canadian gene bank

The mandate of Plant Gene Resources of Canada is to acquire, preserve and evaluate the genetic diversity of crops and their wild relatives. The collections focus on germplasms of economic importance or potential for Canada.

The main deliverables of the gene bank are:

- viable germplasm;
- relevant information about the germplasm;
- a contribution to the conservation of plant genetic diversity for food and agriculture.

The Canadian genebank collection belongs to the larger ones in the world. It is composed of about 110,000 accessions from 980 species. PGRC is responsible for the world base collections of Barley, Oat, Pennisetum millet, and oilseed and green manure Brassica.

The Canadian collections are also composed of other collections outside of Saskatoon, such as clonal fruit germplasms at AAFC Harrow in Ontario and potato germplasms at AAFC Fredericton in New Brunswick.

The tasks of the PGRC are diverse and encompass:

- Different types of germplasm storage:
  - Working collection: +4°C, 10–20% air humidity, in paper envelopes.
  - Security back-up samples (25% of collection) at Svalbard Global Seed Vault and at Fort Collins, USDA.

- Seed viability testing according to international standards: there are four germination cabinets and a seed testing laboratory at PGRC;

- Regeneration and characterization: there are approximately 3,000 accessions per year in the field and in greenhouses;

- Documentation and information: http://www.agr.gc.ca/pgrc-rpc;

- Research collaborations within AAFC.
Acquisition, regeneration and digitization

New samples are being acquired every year. Between 2004 and 2015, a total of 9,873 accessions (an average of 900 annually) were added to the collection with temporary status.

The dominant groups in the collections are wheat, grain legumes, horticultural species, barley and oats. The samples are mostly donations from public breeding programs and horticultural material from Seeds of Diversity Canada. In some cases, the material has also been collected in situ.

Approximately 3,000 accessions of crops and crop wild relatives are regenerated in the field and in greenhouses annually. Priority is given to major crops and their wild relatives: self-pollinating cereals (barley, wheat, oats), out-crossing species (crucifers, sunflowers), winter annual, biennial and perennial species (forages, horticultural crops) and vegetatively maintained material: Jerusalem artichoke.

The Passport data of all the accessions are digitized. Characterization and evaluation data are continuously added. There are interactions with the AAFC Vascular Plant Herbarium DAO.

Who are the PGRC’s clients?

Between 2002 and 2015, around 4,200 seed samples were shipped out annually. These samples were sent to a total of 62 countries, but 65% stayed within Canada while 12% went to the US. The gene bank’s clients are plant pathologists, plant breeders, genomics researchers and citizen scientists.

The samples are exchanged according to the Standard Transfer Agreement of the International Treaty on Plant Genetic Resources for Food and Agriculture. This legal framework has been used since July 2008.

Examples of recent contributions to research

Very diverse research projects have been developed on the collections, such as:

- A genome size study of 99 accessions from 26 species of genus Avena (wild oat) assessed by flow cytometry (Dr. N. Tinker, AAFC Ottawa).
- Molecular diversity assessments (Dr. Y.-B. Fu, AAFC, Saskatoon).
- Extensive disease resistance screening projects since 2013 (Dr. R. Kutcher, University of Saskatchewan): on wheat: 6,200 accessions (stem rust, leaf rust, leaf spot, fusarium head blight); on oats: 1,500 accessions (crown rust); and on flax: 4,000 accessions (pasmo).
- The Three Sisters Project (Dr. Villeneuve, AAFC, Saint-Hyacinthe; Dr. S. Gariépy, Quebec City): Properties of Indigenous landraces and new opportunities for Indigenous agriculture.
- Assessing flax types in archaeological seed findings through comparisons with recent gene bank material of wild and domesticated flax (Dr. S. Karg, Copenhagen).

61. See the presentation given by Martin Mondor, Marie-Thérèse Charles and Sébastien Villeneuve in this report, page 30.
Three pillars for conservation of seed germplasm diversity for food and agriculture

The conservation of crop germplasm diversity rests on three complementary pillars, each with specific characteristics. The first pillar is *in situ* / on farm conservation which can be described as dynamic with an emphasis on direct interactions between the producers and users (mainly farmers/consumers). The second pillar is *ex situ* conservation in traditional active gene banks. This system of seed conservation is more static and focuses mainly on conservation and assessment of the genetic resources. Its users are mainly breeders and researchers. Finally, the third pillar would be gene banks that store back-up samples of genebank accessions, such as the Svalbard Global Seed Vault62 located in Norway. Similar to the traditional gene banks, their conservation is static; however, their goal is to store genetic resources as a security back-up for gene banks and they do not do any regeneration, characterization or distribution of germplasm. The issue of the stability and sustainability of each the conversation system can be raised and complementarity among them exists.

Landrace material of the Three Sisters crops at PGRC

The PGRC is conserving genetic resources from the Three Sisters (maize, squash and beans). In fact, some accessions are landrace resources from Canada and the US. This is especially the case for maize. The conservation of these resources in Canadian collections could lead to new research projects in collaboration with Indigenous communities in Canada and the US.

### Landrace material of the Three Sisters’ Crops and Helianthus tuberosus (Jerusalem artichoke) at PGRC

<table>
<thead>
<tr>
<th>Crop</th>
<th>Total</th>
<th>Landraces</th>
<th>Landraces from Canada or US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1,249</td>
<td>120</td>
<td>116</td>
</tr>
<tr>
<td>Garden bean</td>
<td>468</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Cucurbita</td>
<td>25</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Sunflower</td>
<td>591</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Jerusalem artichoke</td>
<td>162</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

Relevance of gene banks for food security

Gene banks such as the PGRC are relevant for food security by contributing to the following goals:

- Adapting to climate change
- Finding disease resistance for crop improvement
- Finding new chemical properties in crops
- Introducing new uses for crops
- Introducing new crops to Canada
- Adapting to changing production technology
- Changing market demands
- Preserving cultural heritage

Main points of the presentation

- The PGRC is a tool for genetic resource conservation.
- It provides opportunities to develop research projects on genetic resources.
- It is a dynamic tool contributing to exchanges of genetic resources.
- More collaborations with Indigenous people could be developed to share genetic resources in both ways and to conserve them.
Conservation Ex Situ in Mexico

José Fernando De La Torre Sánchez

In his presentation, José Fernando De La Torre Sánchez talked about the National Genetic Resources Centre of Mexico (hereafter “the Centre”).

Origins of the Centre

The Centre was built between 2009 and 2012. It has been in operation since 2012. Before its creation, Mexico did not have any national repository for the long-term conservation of germplasm. The country had to rely on local and foreign banks.

The Centre’s creation is a Mexican federal government initiative and it is funded by that government. It is also a multi-institutional initiative. The Centre is a very large facility, but it has few collections so far.

Main features and goals of the CNRG

The Centre’s mission is to ensure the conservation of the genetic resources present in Mexico with economic, social and environmental value in order to contribute to their equitable and sustainable use for the benefit of present and future generations, supported by scientific knowledge and cutting-edge technologies.

The Centre is composed of five conservation/research areas: crops, forestry, animal, aquatic and microbial genetic resources. It focuses on long-term conservation, for either Mexican or exotic species in the public interest.

Building collaborative relationships

Connections and relationships with national and international germplasm banks are being developed. At this moment, it is receiving germplasm to build its collections, including about 8,000 germplasm accessions from the US.

The Centre is currently working on developing databases that are compatible worldwide, like GRIN in the US. It has also had access to training sessions from partners (by NORGEN for instance).

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63. www.inifap.gob.mx
64. http://www.ars-grin.gov/
Seed inventory

The collections are currently composed of 24,216 accessions, of which 23,400 are crops.

The collections are also composed of in vitro propagated plant tissues: 418 accessions accounting for more than 11,043 plants in test tubes.
In addition, the Centre conserves livestock germplasm (26,950 straws), aquatic germplasm (2,079 straws) and microbial genetic resources (1,800 strains) for agriculture and industrial uses. No pathogens are kept in the collections. The reference strains are fungi and bacteria for biological control, Lactobacillus used in the cheese industry, edible fungi and microalgae.

**Main points**

- The National Genetic Resources Centre of Mexico is a very recent facility.
- The collections are currently being formed. This is one of the main priorities of the Centre.
- In this endeavour, collaborations and exchanges with other gene banks are of the utmost importance.
- The Centre is a tool for conservation and research on genetic resources.
- The Centre could be a relevant partner for community gene banks (see Flavio Aragón Cuevas’ presentation).
Round Table Discussion: Conditions of Success for the Conservation and Development of Ancestral/Indigenous Crop Plant Diversity

Participants (alphabetical order): Peter Bretting, Thomas Burelli, José Fernando De La Torre Sánchez, Brad Fraleigh, Michel Gros-Louis and Charly Jacob.

Linda Collette:
Some of you have made presentations. Is there something you forgot to say? Is there something you want to add or to stress? Also, in your opinion, what would be the future steps that we should try to achieve?

Thomas Burelli:
I feel that lawyers are often perceived as people who are trying to limit or to block some potential projects or collaboration. What I would like to stress is that the law offers tools, frameworks to help make collaborations more respectful, to protect the rights of each party. The law can be used to improve the quality of relationships. The more trust is developed, the less the law is important. Sometimes when you start a new relationship, it is important to have the law because you had so much mistrust in the past that you need new rules, new norms and a new foundation on which to build a new relationship.

When we talk about nation-to-nation relationships, it is important to seriously consider Aboriginal legal cultures and Aboriginal legal systems. Usually we think it is too complicated, and in some cases people have even argued that Aboriginal people do not have legal cultures or legal systems. It is very important to recognize these legal systems and to take their respect as a starting point in research projects. It is not more complicated than any other field of law. What is needed is only that people take the time to become acquainted with these systems.

Michel Gros-Louis:
Researchers are seeking projects in collaboration with Indigenous communities. These projects and science more generally, can contribute to the communities’ development, but Michel pointed out and emphasized the fundamental importance of financial resources. There is a lot of poverty on the ground. In many cases, the land in the communities has been despoiled. Similarly, while communities sometimes would like to develop agriculture projects, they cannot. We want to develop our ways of doing things, but we cannot. We want to be able to live from the land.

Michel also pointed out that there has been a steep decline in the number of Indigenous farms. The reasons for this decrease are unclear. We need science; but also more than that.

A great deal of effort has been made, including a lot of research. Agri-food processing is very important and we have two nice projects—the Three Sisters and Charly’s project. These are great achievements, but it is still on the land that something is needed, especially in Quebec according to Michel.

Michel also pointed out that Indigenous people are not always consulted before projects are implemented, even though there are organizations representing Indigenous people that can be consulted. The programs should be developed jointly. Sometimes the programs are not adapted to the reality of people on the ground.
Charly Jacob:
Following on from what Michel said, Charly stated that he had travelled to different communities in Ontario and in Quebec. I believe that a lot of Native people have the opportunity to get into the food industry, the farming industry, but as Michel stressed, the funding, the resources are not there. Many products could be developed. To market them, you need connections, a network, and that is where the financing problem arises. Some people get discouraged when faced with the steps involved and the obstacles.

Charly also said that he had found the conference very informative.

The time has come for the Native people of America to be recognized in the food industry.

José Fernando De La Torre Sánchez:
It was great to have this workshop and to meet the representatives of the Indigenous communities of Canada. In the future, I would like to see representatives from the US and Mexico. It was not possible this time but maybe next time. If the exchanges were rich this time, they would be even richer with more representatives from Indigenous communities. I hope we can achieve that.

The challenge of germplasm exchanges between countries should disappear shortly. I mean, we have been talking about exchange of knowledge, capacity building, and we have been talking about exchanges of germplasm. However, so far, we have been unable to make this a reality. This is a great opportunity to start working on it. The question is, how can we do this while respecting the regulatory framework of each country?

Peter Bretting:
I was thinking about using technology, fostering communication and building bridges. Technology provides an opportunity for interaction, particularly remotely, but with interpersonal relationships you can have much richer discussions and develop stronger relationships and networks. That is why the tour of the Huron-Wendat Museum65 with all of the workshop participants was particularly rewarding. These interpersonal relationships are helping us to move forward.

Brad Fraleigh:
When I look at the question of native genetic resources, it appears to me that there is a lot of shared interest and a lot of common ground. I think that from a government point of view, we should really be guided by the desires of the Native people, in terms of any types of co-operation in the future. I drew inspiration from the project Peter Bretting described. It illustrated how the government was accompanying what the Native groups wanted to do.66 And finding the common goals between the Native groups and the government.

As a government official, I have to mention that the government is also constrained by resources. Research projects have to be proposed and defended to get funding. Lots of questions are asked. People have to fill in very long forms which can be very complicated. So we also need to be able to

66. See Peter Bretting’s presentation in this report, page 44.
formulate the goals and the expected results and to be able to defend that in front of the senior managers who take the decisions. The participation of Native groups is a positive point in these projects. It is the same with international activities.

The government is going to fund capacity-building ABS projects in favour of communities in Canada (in negotiation). It will constitute another source of government funding.

We have seen that perspectives on the development of agriculture products are very important. If we continue on the path that has been opened up, to take our guidance from the desires of the Indigenous communities, I think that we can work very well in the future.

**Linda Collette:**

It seems to me that the general public does not know about and is not necessarily aware of the importance of Indigenous plants and traditional knowledge. Is this something that should be brought to the public's attention? How can we explain this to the public?

**Peter Bretting:**

In research, there is an interest in heirloom foods. Some of the heirloom foods are from Euro-American traditions, some are from Native Americans and some are from recent immigrant populations. It is mainly driven by the market and by community interests.

His department is not involved in marketing, but other departments are interested.

**Michel Gros-Louis:**

For sure the market is there for Indigenous products. But between the market and what we have, there are many steps. Producers sometimes have difficulty reaching a market. Vincent Levesque gave us several examples.67

We have land, a lot of young people. A lot of people are working with First Nations to develop products.

**José Fernando De La Torre Sánchez:**

If you remember yesterday, Flavio said that there is a trend specific to gourmet restaurants where some foods are made with specific products from specific Indigenous communities. It helps to increase the value of the product.

The added value of a product is not only monetary but also cultural. A lot of people are unaware of the existence of the traditional knowledge associated with products. For example there are more than 300 ways to eat maize and there are very specific industrial processes which were developed before the contacts with the Spanish. That knowledge is there, but sometime it is not transferred to the market. It is important to transfer the genetic resources and the traditional knowledge.

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67. See Vincent Levesque’s presentation in this report, page 27.
Thomas Burelli:

These are not Canadian examples, but there are very concrete cases of local and Indigenous knowledge and know-how being developed in different regions of the world, particularly in French overseas territories.

Knowledge and know-how can be developed and protected through geographic indications. What is recognized is the product and how it is made. That is the case of Tahitian vanilla, which is protected by an appellation of origin like Monoi de Tahiti in French Polynesia.

Another example of the development of traditional knowledge is in New Caledonia. In the Loyalty Islands, there is a project to create an Indigenous health centre and a community garden that would familiarize the public with certain Aboriginal medicinal plants.

Another example in New Caledonia is the Kanak road built by the Agence de Développement de la Culture Kanak in order to initiate visitors to the symbolism of plants in Kanak society. It traces the history of the hero founder Téâ Kanaké through the language of plants by successively evoking the five stages in his life.

Joyce Diabo:

We knew that the three sisters are found in other places in the world.

I came here, I am listening, I am trusting, but there is always this little piece of doubt, because historically we have lost so much and as a result we have trust issues. Building trust requires a lot of effort.

We met with Charly in our garden. We used to collect plants and to share them with elders and other people in need. Now, in Kahnawake, there is no more garden.

It is important that knowledge continues to be passed on. Young people are not always familiar with the associated knowledge. So there are significant needs in terms of education.

The workshop was an opportunity to learn things, especially about the preservation of seeds in gene banks. The presentations gave us a better understanding of some of the dynamics. This is helping to gradually dispel the doubts I have. Intellectual property is an area that creates a lot of fear and that seems to be used as an instrument of spoilation: how the last pieces of our cultural value system are being used for profit. The projects that were presented, particularly the work being done by the Canadian government and the conservation initiatives in the gene banks seem to her to be actions that can help.

68. This exists in Quebec. It is the only province in Canada where it exists. Elsewhere in Canada, trademarks are used. Geneviève's comment: it is a very interesting tool for indigenous communities because it maintains common knowledge. Communal protection.
71. http://www.adck.nc/accueil
Closing Remarks

Axel Diederichsen

Axel Diederichsen said that one of the objectives of the workshop was to build and develop a relationship of trust between the various participants present. In his opinion, the discussions and the ideas raised show that the process is under way and that a seed has definitely been planted.

He was particularly struck by a comment made by Terrylynn Brant. He said that it is not the seeds that are important, but rather the relationship that people have with the seeds and living things. Axel Diederichsen subscribes to this vision and insists that it is not only the seeds as such but also the other aspects which are very important; there are many more aspects.

In his opinion, it is important to take into account different perspectives concerning seeds: historical, biological, legal, economic, spiritual, etc. That is very important in order to grasp all of the issues surrounding the seeds, their use and their conservation. For that, it is crucial to communicate and talk because no one can grasp everything. The workshop was an effort in this direction in that it brought together jurists, public policy experts, representatives of Indigenous communities, and experts in in situ and ex situ conservation.

But for Axel Diederichsen, that is only a start. It is possible to do more, such as by inviting the people in charge of community gene banks.

He also underscored the importance of gene banks that could help to identify Indigenous landraces in their collections.

Lastly, in relation to this possibility of identifying Indigenous landraces in their collections, Axel Diederichsen ended his remarks by asking how we can further activate the genes which are in the banks. How can they be used and developed? According to him, this shows the importance of continuing to think about how ex situ and in situ conservation fit together and about how to develop more synergies between them.

73. See Terrylynn Brant’s testimony in this report, page 41.