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**MAIZE AND THE GREEN REVOLUTION:
GUATEMALA IN THE GLOBAL CONTEXT OF AGRICULTURAL
RESEARCH, 1954-1964**

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**EL MAÍZ Y LA REVOLUCIÓN VERDE:
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Abstract:

This article presents the results of an investigation whose objective was to establish the international links that Guatemala formed with diverse latitudes of the globe, for the purpose of applied scientific research into maize from 1954 to 1964, a period marked by the advancement of the green revolution in Central America. From a global history perspective, the study of the green revolution will be addressed as a process which involved the articulation of networks conformed through the circulation of specialists, civil servants and students, as well as the exchange of knowledge and agricultural materials. The sources used include a specialized bibliography and archive documents.

Keywords: Green Revolution, maize, Guatemala, agriculture, global history.

Resumen:

El artículo expone los resultados de una investigación cuyo objetivo fue establecer los vínculos globales que Guatemala trabó con diversas latitudes del orbe a propósito de la investigación científica aplicada al maíz entre 1954 y 1964, período marcado por el avance de la revolución verde en Centroamérica. Desde la historia global, se propone el estudio de la revolución verde como un proceso articulador de redes configuradas mediante la movilidad de especialistas, funcionarios y estudiantes, así como por el intercambio de conocimientos y materiales agrícolas. Las fuentes a las que remite el texto incluyen bibliografía especializada y documentos de archivo.

Palabras clave: Revolución verde, maíz, Guatemala, agricultura, historia global.

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Introduction

Central America is a region of contrasts, not only in terms of its geography, but also in its cultures and agriculture. A glimpse at the history of maize crops on the isthmus presents proof of this diversity. While in Guatemala this crop is key to the diet and the wisdom of the *men of maize*¹, in Costa Rica its use as fodder is associated with the meat industry. At the same time, preferences in terms of food preparation divide the crop into white and yellow varieties, which, depending on their preparation, are valued for their mildness, taste and price. Thus, it is important to consider the guidelines that have influenced the applied research of maize in Central America, which have aimed to increase production and diversify its uses.

In this sense, this article presents the results of an investigation which, through the consideration of the case of Guatemala, shows the Central American interconnection with global networks in agricultural investigation via the *Programa Cooperativo Centroamericano para el Mejoramiento del Maíz* (Central American Cooperative Program for the Improvement of Maize, hereafter PCCMM, its Spanish acronym)². This was an initiative born of the collaboration between Costa Rica, Guatemala, Honduras, El Salvador, Nicaragua, Panama and the Rockefeller Foundation (RF) which, from 1954 to 1964, had as its main goal the development of new commercial varieties of maize³, which made it a pioneer project for the introduction of the Green Revolution on the isthmus⁴. This article shows the ways in which Guatemala contributed to the structuring of the Green Revolution's global circulation and exchange routes; specifically, by means of the renovation of the guidelines for agricultural research and education.

In accordance with these ideas and using the framework of global history⁵, it is suggested that the Green Revolution was a process of the articulation of networks, through which the generation and sharing of knowledge was enabled, facilitated by the international circulation of scientists, students and agricultural professionals⁶. By the term Green

¹ I use this expression from the novel *Men of Maize* by the Guatemalan writer Miguel Ángel Asturias, who with it refers to the traditional customs of the indigenous peoples in Guatemala. Miguel Ángel Asturias, *Los hombres del maíz* (Paris: ALLCA xx, 1996).

² A first version of the arguments developed here can be found in my Master's thesis. Diana Alejandra Méndez Rojas, "El Programa Cooperativo Centroamericano para el Mejoramiento del Maíz: Una historia transnacional de la revolución verde desde Costa Rica y Guatemala, 1954-1963", (Master's Thesis in Modern and Contemporary History in Instituto de Investigaciones Dr. José María Luis Mora, July 2018).

³ Breeding Superior Strains of Corn for the Lowlands of Central America, Rockefeller Archive Center (RAC), Collection R. F., Record Group 6.13, Series 1.1 E, Box 13, Folder 150.

⁴ The PCCMM was founded in 1954 and had a work plan until 1963, when it became the Central American Program for the Improvement of Food Crops. One of the main changes reflected in the change of name was that, as well as considering crops other than maize, it marked the end of the collaboration with the RF and the transfer of the administration of the program to the Organization of American States. It currently maintains its activities under the name of the Central American Cooperative Program for the Improvement of Crops and Animals, representing a total of 65 years of continuous activity. As is to be expected, its guidelines have changed over the years, but it is still firmly committed to regional collaboration.

⁵ I return to the guidelines of the global history discussed by Sebastian Conrad, *Historia Global. Una nueva visión para el mundo actual* (Barcelona: Crítica, 2017): 124.

⁶ This proposal was constructed in relation to the ideas of Gabriela Soto Laveaga who argues for the compression of "how local people understood the arrival of new agricultural ideas and, more important, which locals received the knowledge", Prakash Kumar *et. al.*, "Roundtable: New Narratives of the Green Revolution", *Agricultural History* 91, n. ° 3 (Summer 2017): 410.

Revolution, an integration process of global agroalimentary systems is suggested, which began in the United States at the end of the 19th Century⁷. Its geographical expansion in Latin America, Asia and Africa throughout the 20th and 21st Centuries⁸ has depended on the continued renovation of a model for agricultural modernization based on the inclusion of biological-mechanical input (such as experimental seeds) and the modification of guidelines for the research and teaching of agriculture. This was with a view to modifying agricultural practice, that is to say, the relation that societies have with food production⁹.

The exchange networks of the Green Revolution have operated on different scales internationally, as a result of the differing capacities for action of individuals who have promoted their connections, the most important ones being philanthropic, scientific, commercial and geopolitical. Despite this, a sustained global interaction has been articulated which has enabled the Green Revolution to become the dominant paradigm in global agricultural production; that which, since 1980, has enabled the greatest volume of production to be destined for the meat industry, and not for direct human consumption¹⁰ and, more recently, for the production of biofuels, for example, the fuelling of motors¹¹.

Amongst the philanthropic agencies, the RF stands out as one of the main promoters, and with it the Ford Foundation, whose concept of philanthropy proposed to resolve the greater ills (such as food scarcity), dealing with its causes via the generation of new knowledge, through economic investment in long-term projects that could be applied on a large scale¹², for example, in genetics. In relation to the commercial agents, it is necessary to point out that the Green Revolution promoted the agrarian complementarity between the United States and other regions across the creation of homogenous biotypes designed to function as part of a technological package¹³, which was offered by US companies dedicated

⁷ On this topic consult Tore Olsson, *Agrarian Crossings. Reformers and the Remaking of the US and Mexican Countryside* (United States: Princeton University Press, 2017).

⁸ The most successful experiences (by their statistical records in production) have been those in areas with conditions that are particularly favourable given their genetic diversity, access to irrigation works, an auspicious political context and trained staff who can carry out research work as well as maintain links with peasant farmers. Examples of these are the experiences of Mexico, India, Pakistan and the Philippines. A detailed analysis of these cases can be found in Nick Cullather, *The Hungry World. America's Cold War Battle Against Poverty in Asia* (United States: Harvard University Press, 2010).

⁹ I have constructed this definition in reference to different authors and as a result of my own research on the topic. The most important: Harry M. Cleaver Jr., "Contradicciones de la revolución verde", in *Contradicciones del capitalismo* (Buenos Aires: Ediciones Periferia, 1973), 63-109; Cullather, *The Hungry World...*; Cynthia Hewitt de Alcántara, *La modernización de la agricultura mexicana: 1940-1970* (México: Siglo Veintiuno Editores, 1982); Wilson Picado Umaña, "Conexiones de la revolución verde. Estado y cambio tecnológico en la agricultura de Costa Rica durante el período 1940-1980" (Doctoral Thesis in History, Universidad de Santiago de Compostela, 2012).

¹⁰ David Barkin, Rosemary L. Batt and Billie R. DeWalt, *Alimentos versus forrajes. La sustitución entre granos a escala mundial* (México: Siglo Veintiuno Editores- UAM-Xochimilco, 1991).

¹¹ José Alfredo Pureco Ornelas, "El maíz de México para el mundo. Alimento, patrimonio y ese oscuro objeto del deseo", in *El pasado del futuro alimentario: los alimentos ancestrales americanos*, coord. by Enriqueta Quiroz & Helena Pradilla Rueda (México: Instituto Mora, 2019), 22.

¹² Thomas David & Ludovic Tournès, "Les Philanthropies: Un Objet d'histoire transnationale", *Monde(s)*, n. ° 6 (2014) : 8.

¹³ For the case of Mexico see: Netzahualcóyotl Gutiérrez, "Cambio agrario y revolución verde. Dilemas científicos, políticos y agrarios en la agricultura mexicana del maíz, 1920-1970" (Doctoral Thesis in History, El Colegio de Mexico, 2017).

to the production of chemical fertilizers, machinery, certified seeds and other products¹⁴. With regards to the geopolitical aspect, it is necessary to stress that the Green Revolution was supported by a vision of US foreign policy that considered that hunger and poverty in Latin America and Asia were not a universal condition of humanity, but rather a threat to global peace¹⁵ given that communist revolutions could advance as a response to scarcity¹⁶. In this way, the Green Revolution became the scientific solution to the fight against hunger, and in its positioning¹⁷ the US government was supported by philanthropic foundations and companies, as well as in specific programs such as Point IV of Harry Truman's manifesto¹⁸ and the Alliance for Progress during the presidency of John F. Kennedy¹⁹.

In the case of Guatemala, these tendencies could be more evidently noted in the renovation of the guidelines for the research and teaching of agriculture which, through the Universidad de San Carlos, the *Instituto Agropecuario Nacional* (National Agriculture and Livestock Institute, IAN) and the RF's fellowship program, connected Guatemala with countries that took part in the globally applied agricultural research into maize, amongst them Ghana, Nigeria, Ethiopia, Kenya, Uganda, Rhodesia (now the Republic of Zimbabwe), South Africa, Angola, Mozambique, China and Cambodia. Naturally these contacts were preceded by those established between Guatemala and the rest of the American continent, mainly with United States, Mexico, Colombia, Brazil and Cuba. In relation to the links between Guatemala and the countries here mentioned, it is relevant to highlight that not all of these links had the mediation of the RF, and for this reason the text explores the nature of south-south exchanges within the global context of the Green Revolution.

This article values the role of the RF in the promotion of the Green Revolution, nevertheless it considers that the history of the PCCMM goes beyond this narrative. That is

¹⁴ Adolfo Olea Franco, "La introducción del maíz híbrido en la agricultura mexicana: Una historia de equívocos científicos, intereses comerciales y conflictos sociales", in *Ciencia en los márgenes. Ensayos de historia de las ciencias en México*, ed. by Mechthild Rutsch and Carlos Serrano Sánchez (México: Universidad Nacional Autónoma de México, Instituto de Investigaciones Antropológicas, 1997).

¹⁵ This perspective began to be institutionalized in the United States in the 1910s, during the administration of Woodrow Wilson, and extended until the government of Dwight Eisenhower in the 1950s. Cullather, *The Hungry...*, 8.

¹⁶ Cullather, *The Hungry...*, 8.

¹⁷ The first public mention of the Green Revolution was expressed in 1968 by William S. Gaud (administrator for the United States Agency for International Development) in a document which underline the achievements of genetically "improved" seeds in the fight against world hunger. He highlighted the experiences in Pakistan, India, Turkey and the Philippines. From that moment the green tone was confronted with the red communist revolutions and the White Revolution in Iran. William S. Gaud, "The Green Revolution: accomplishments and apprehensions", March 8, 1968, accessed September 20, 2017, <http://www.agbioworld.org>. For a semantic discussion of the term Green Revolution see: Wilson Picado Umaña, "Breve historia semántica de la Revolución Verde", in *Agriculturas e innovación tecnológica en la Península Ibérica (1946–1975)*, coord. by Daniel Lanero & Dulce Freire (Madrid: Gobierno de España, Ministerio de Medio Ambiente y el Medio Rural y Marino, 2011).

¹⁸ Point IV stipulates that US assistance would be granted through science and technology, and therefore the agricultural programs were articulated mainly via the United States Department of Agriculture. The most common mechanism was the sending and sale of foodstuffs, amongst which the greatest volume of exportations was concentrated in wheat, followed by maize, rice and sorghum. Arturo Warman, *La historia de un bastardo: Maíz y capitalismo* (Mexico: Fondo de Cultura Económica, 1988), 223-224.

¹⁹ The Alliance for Progress was a foreign policy program promoted by the President of the United States, John F. Kennedy in 1961. The basic idea of the program was to promote development in Latin America with US support, at the same time as removing the material conditions for the spread of communism. Nevertheless, the results achieved were limited.

to say that the Green Revolution was one chapter, amongst others, in the agrarian history of Central America, and consequently the beginning of the collaboration with the RF did not launch the experiments with seeds in the region, nor did it stimulate the concerns which motivated Guatemalans to become an associate of the program. Previous work in the area of agriculture generated diverse experiences, amongst them some with a clear international bias. A clear example was the introduction of the soviet line of cereal production, proposed by the controversial scientist Trofim Lysenko, which was implemented in Guatemala at the hands of exiled Spanish republicans²⁰.

To analyse the issues which have been referred to until now, this article is divided into two sections. The first, outlines the guidelines for the creation and running of the PCCMM, with the aim of placing the Guatemalan experience within the regional context of the time. The objective here is to show that a consideration of regional dynamics was added to the global guidelines, that is, the tension between the agrarian history of Central American and global agriculture. The second section focuses on the specific study of the Guatemalan experience. In this sense, the parameters for the renovation of agricultural research and teaching at an institutional level will be considered, as well as the way in which the international travel of Guatemalan experts contributed to the development of the crop. The documental sources come from the Rockefeller Archive Center (Sleepy Hollow, New York) and the *Centro de Investigaciones Regionales de Centroamérica* (Central America Regional Research Center, Antigua, Guatemala), especially the reports, letters and press notes contained within.

The Central American Cooperative Project for the Improvement of Maize (PCCMM its Spanish Acronym)

On a regional level, the PCCMM was carried out during a period that was characterized by the increased economic growth²¹ and the modernization that occurred in Central America from 1945 to 1979²². During this period, agriculture was the main base for the economy

²⁰ Arturo Taracena Arriola, *Guatemala, la República Española y el Gobierno Vasco en el exilio (1944-1954)* (Mexico: Universidad Nacional Autónoma de México, El Colegio de Michoacán, A. C., 2017), 405. One of the paths which best exemplifies this point is that of the biologist Rafael De Buen Lozano, who sought refuge in Guatemala under the government of Juan José Arévalo, who, in 1945, named him Director of Chemical-Biological Research in the Universidad de San Carlos. In this position, the biologist wrote several works, one of them titled *Historia del maíz (History of maize)*. In 1948, he was transferred to the newly created Institute for the Consolidation of Production (*Instituto de Fomento de la Producción*), of which he would later become its director. After the military coup in 1954, De Buen Lozano fled in exile to Mexico, while in Guatemala, on the 12th February 1955, "sovietizing literature" was burned in front of the National Palace (to mark the visit of the vice-president Richard Nixon), amongst which there were materials written by the Spanish republican and from his own collection. Arturo Taracena Arriola, "Rafael de Buen Lozano: El periplo americano de un republicano español", *Cuadernos Intercambio sobre Centroamérica y el Caribe* 12, n. ° 2 (July-December, 2015): 109-115.

²¹ Sofía Méndez states that from 1950 to 1970, the Central American countries showed growth of "on average a rate of 5% annually, and between 1970 and 1978 this was at 5.4%. Over the last three decades, the role of primary activities within the total product decreased, from 38 to 27%, and proportion of industrial activities increased, from less than 14% to 21%". Sofía Méndez, "Economía centroamericana", *Nexos*, (1 July, 1982), <https://nexus.com.mx/?p=4081>.

²² According to Héctor Pérez Brignoli, Central America from 1945 to 1979 experienced a phase characterized by reconstruction following one of the periods of civil war in the region, which led to a new period of crisis or failed reconstruction, despite the hopes invested in different projects aimed at economic development, social reform and, in some cases, the advancement of democracy. The end-date of this period is 1979, which was the year in which the Somoza dictatorship was overturned in Nicaragua. Héctor Pérez Brignoli, ed., *De la posguerra*

(despite low levels of production)²³, due to the exportation of products that were able to raise prices in the international market, such as coffee, bananas and sugar. As a result, there was a growing interest in projects to modernize the production of export crops, and to diversify them, as well as in the case of some products whose local consumption it was hoped would increase, such as meat.

With regards to maize and produce that, generally speaking, was targeted at feeding the local population, the majority of production relied on small and medium-sized farms, whose incomes did not enable them to invest in significant improvements. This situation meant that modernization in this sector was mostly sponsored through projects funded by international cooperation. Two of the experiences prior to the creation of the PCCMM (and which contributed to its establishment and development) were the programs which emerged from the Inter-American Institute of Agricultural Sciences (IICA its Spanish acronym)²⁴, with headquarters in Costa Rica, and the Inter-American Technical Service for Agricultural Cooperation (STICA its Spanish acronym)²⁵ with a presence in all of the isthmus. These organizations formalized channels for international scientific exchange in the region, of which the PCCMM took advantage. The closest channels of exchange referred to projects to establish experimental stations for regional collaboration, which, at the same time, is evidence of one of the most permanent phenomena in Central American history: the search for economic integration, in the face of inequality in the global economy.

The PCCMM began in 1953 as a Maize Improvement Program, as a result of an informal agreement between the Agriculture and Industry Ministry in Costa Rica, the IICA and the RF. The aim was to develop “superior” varieties of maize which would be designed to be grown in the lowland areas of Central America²⁶. The Ministry had experience in this type of work, as since 1949 it had been working on the introduction and trial of open-pollinated and hybrid varieties, through the Maize Section of the Department of Agronomy²⁷. In this way, from the outset the main contribution of international aid agencies would be the development of new lines of seeds, as well as the articulation of points of international exchange. The PCCMM was emphatic in this, as it maintained that it was guided by the

a la crisis (1945-1979) (Spain: Sociedad Estatal Quinto Centenario, Facultad Latinoamericana de Ciencias Sociales, 1993), 9.

²³ Rodolfo Pastor, *Historia mínima de Centroamérica* (México: El Colegio de México, 2011), 14.

²⁴ Founded in 1942 in Turrialba, Costa Rica, the IICA was the result of an initiative of some Latin American governments later joined by the Organization of American States. The guiding principle of this new institution was to contribute to the reestablishment of the production of strategic crops, such as rubber, some fibres, rice, tropical oleaginous plants and plants that could be used in the production of insecticides. The volume of production of these crops had been affected by the Second World War, and in particular events in Asia.

²⁵ Founded in 1948 in Costa Rica, the STICA emerged from other agricultural programs that had been promoted by the Inter-American Affairs Office during the Second World War. Wilson Picado mentions that the objectives of this service were to provide technical support in the production and distribution of foodstuffs, as well as the development of a national system of agricultural extension, which would include the implementation of illustrative work, issues concerning nutrition, and domestic economics. Picado Umaña, “Conexiones de la revolución verde. Estado y cambio tecnológico en la agricultura de Costa Rica durante el período 1940-1980”, 190.

²⁶ Breeding Superior Strains of Corn for the Lowlands of Central America, RAC Collection R. F., Record Group 6.13, Series 1.1 E, Box 13, Folder 150.

²⁷ Directrices del plan nacional del PCCMM en Costa Rica, 1954, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 66.

principle of promoting the philosophy of cooperation and scientific exchange of ideas relating to the improvement of maize²⁸.

In line with these guiding principles, it was decided that the focus of the work should be the development of hybrid seeds, as it was considered to be the most appropriate technique to increase agricultural output. This experimental focus had proved successful in the United States, where the hybridization of maize for commercial purposes had begun in the 1930s. In this way, the Corn Belt in the United States' mid-West was one of the first places that, in a few decades, had replaced traditional varieties with hybrids²⁹, supported by the international exchange market. Central American scientists were aware of their contributions in this endeavour. William C. Paddock, for example, indicated that the hybrid varieties could not easily be moved from one place to another, much less in Guatemala where the diversity of maize was greater than that in the United States³⁰; this meant that the Central American country had much more to contribute in terms of genetic diversity than that which it could gain by obtaining North American or European varieties, which performed less well in Guatemala³¹. As a consequence, the main aims of the PCCMM were:

1. To obtain (through cultivation, selection and maintenance) strands of maize that were superior in terms of their agricultural performance and their resistance to disease, and that were well adapted to the Central American lowlands.
2. To develop material for basic studies in the cultivation and genetics of maize.
3. To offer opportunities for postgraduate studies in the cultivation and genetics of maize³².

The work in Costa Rica advanced, and, towards the end of 1953, the RF began to make moves to establish a program that would involve all of Central America, in response to requests from the governments of El Salvador, Honduras, Nicaragua and Panama. To launch the activities, the RF designated Edwin J. Wellhausen (then director of the *Programa Agrícola Mexicano*, Mexican Agricultural Program, a predecessor project to the PCCMM) who proposed a model for collaboration that combined one plan at regional level and another at national level for each one of the member countries. This decision was justified given the differing capacity for agricultural investigation in Central America³³. It was in this context that the name Central American Cooperative Program for the Improvement of Maize

²⁸ Proyecto Cooperativo Centroamericano para el Mejoramiento del Maíz, Tercera Reunión Centroamericana, Antigua Guatemala, December 9-15, 1956, RAC Library Collection.

²⁹ "In 1941, hybrid seeds were used on 40% of land on which maize was grown, but in Iowa the percentage was greater than 90%. During the 1950s, the use of hybrid seeds for maize was universalized, the first crop with which this occurred," Warman, *La Historia...*, 202.

³⁰ In one of his reports, William Paddock quotes the US historical geographer Carlo O. Sauer, who, in his work "Agricultural Origins and Dispersals", claims that "just in one town in Mexico or Guatemala there are more varieties of maize than in all of the *Corn Belt*". William Paddock, "Iowa State College- Guatemala Tropical Research Center", RAC Collection R. F., Record Group 6.13, Series 1.1, Box 24, Folder 267.

³¹ William C. Paddock, "Guatemala's Agriculture", September 1954, Antigua Guatemala, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 24, Folder 267.

³² Centro Latinoamericano de Demografía (CELADE), *La población del Istmo centroamericano en el umbral del siglo XXI: Dimensiones, desafíos y potencialidades*, (Santiago, 1991), 4.

³³ For example, in the case of Honduras the coordination of the PCCMM regional plan had to propose the operative guidelines to the national coordination, under the charge of Eugenio Molina and Juan F. Rothe, "given the total absence of information, previous work and experienced personnel who would be in a good position to be able to do this." Monthly report of activities, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 6, Folder 74.

emerged³⁴. In this way, a structure was established that would coordinate the group, and the institutional representation of each country was incorporated within this structure. In terms of administration, the PCCMM had a Central Advisory (Management) Office under a member of the RF team (established in Mexico), and a Central American coordinator. The head office of the coordination was established in Costa Rica, as it had IICA staff members, as well as meeting the following criteria:

1. Political stability.
2. Land on both coasts [Pacific and Caribbean] to facilitate the program.
3. An agricultural school, or college of a level that was adequate to guarantee a sufficient number of technical assistants for the program.
4. Good lines of communication to facilitate the work in cultivation, in the event that more than one cultivation and testing station would be needed³⁵.

The PCCMM began its work in January 1954. In that same year, the first official meeting of the project was held, from the 24th to the 30th of October in the IICA, Turrialba, Costa Rica. The objective of this meeting was to evaluate the work that had been carried out during the first months and draw up the agenda for the second year. It is worth mentioning that over the duration of the project the annual meetings were held each year without fail, which can be seen as evidence not only of continuity, but also as an expression of an ongoing interest in the promotion of the initiative³⁶, as well as in the construction and maintenance of a space dedicated to scientific debate.

In the PCCMM's regional plan, the dividing of tasks by country obliged all partners to integrate an experimental station in their list of activities, as well as carrying out others according to their national plans, this with the aim of exposing materials to different climatic conditions. In the same way, each national plan should support seed multiplication, considering the varieties best adapted to their country. Furthermore, it was compulsory that at some point during the project's duration, at least one PCCMM annual meeting be held. Each partner also committed to employing personnel exclusively dedicated to work in the improvement of maize. These personnel had to attend the annual meetings and present the advances in their research. To be able to carry out these tasks, the universities and research centers were active participants, the most important of these being:

³⁴ Letter from Donald L. Smith to Alfredo Carballo Quirós, May 2, 1955, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 67.

³⁵ Considerations for the Establishment of a Corn Program to Serve Central America, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 6, Folder 74.

³⁶ The meetings were held as follows: 1) Turrialba, Costa Rica, October 24-30, 1954, 2) Turrialba, Costa Rica, October 11-15, 1955, 3) Antigua, Guatemala, December 3-15, 1956, 4) San Andrés, El Salvador, February 16-20, 1958, 5) Panama, Panama, March 9-12, 1959, 6) Managua, Nicaragua, February 15-18, 1960, 7) Tegucigalpa, Honduras, February 20-23, 1961, 8) San José, Costa Rica, March 12-16, 1962, and 9) San Salvador, El Salvador, March 12-15, 1963. The only year in which no annual meeting was held was in 1957, due to the fact that the Agriculture Ministry of El Salvador (host of the fourth meeting) had already finalized its 1957 budget at the time of acquiring this new commitment. For this reason, the meeting was postponed until 1958, when it took place in San Andrés. Information from *The Rockefeller Annual Report*, years 1954-1963.

Table 1. Collaborating institutions of the PCCMM

Guatemala	<ul style="list-style-type: none"> • <i>Instituto Agropecuario Nacional</i> (National Agriculture and Livestock Institute, IAN). • Universidad de San Carlos • <i>Escuela Nacional de Agricultura</i> (National School of Agriculture) • <i>Instituto de Nutrición de Centro América y Panamá</i> (the Central America and Panama Institute for Nutrition, INCAP) • <i>Servicio Técnico Interamericano de Cooperación Agrícola</i> (Inter-American Technical Service for Agricultural Cooperation, STICA)
Costa Rica	<ul style="list-style-type: none"> • Ministry of Agriculture and Industry • Universidad de Costa Rica • <i>Instituto Interamericano de Ciencias Agrícolas</i> (Inter-American Institute of Agricultural Sciences, IICA) • STICA
Honduras	<ul style="list-style-type: none"> • Ministry of Agriculture • <i>Escuela Agrícola Panamericana</i> (Panamerican Agricultural School, EAP) • STICA.
El Salvador	<ul style="list-style-type: none"> • Ministry of Agriculture and Industry
Nicaragua	<ul style="list-style-type: none"> • Ministry of Agriculture and Livestock • <i>Servicio Técnico Agrícola de Nicaragua</i> (Nicaraguan Technical Agricultural Service, STAN).
Panamá	<ul style="list-style-type: none"> • <i>Escuela Nacional de Agricultura</i> (National School of Agriculture) • <i>Instituto Nacional de Agricultura</i> (National Agriculture Institute).

It is also important to indicate that, from the first tasks, the PCCMM concentrated their experimental activity on doing tests of uniform production; that is an affordable study based on statistical analysis. This put to one side the evaluation of other aspects such as morphology or texture, and, of course, the cultural value of the crop. As well as the trials carried out in Central American countries, a series of PCCMM seed exchanges began. These seeds were sent to different countries upon request (to be tried out and included in their experimental series), accompanied by publications and correspondence regarding the guidelines for their growth. In general, mailings for experimental purposes were not charged (other than when postage costs were very high): there were no property rights concerning the varieties, and within the agricultural sciences exchange with the global community was seen in a positive light, to enable the comparison of results regarding the adaptability of maize to different climate zones. However, this situation does not eliminate the fact that there was also commercial exchange: among the list of buyers Mexico, Colombia, Brazil, Bolivia, Venezuela, British Guyana, Cuba, the Dominican Republic, Belize, the United States, Ghana, Kenya, Nigeria, Mozambique, Rhodesia, China, Taiwan and Cambodia stand out. As can be observed, this mechanism was one of the main contributions for the connecting of the region with agricultural research at an international level.

Some of the requests for seeds were motivated by the arrival to different latitudes of personnel that maintained a relationship with one of the RF's programs in Latin America. One example is that of Samuel C. Litzenberger who participated in the national program of

the PCCMM in Nicaragua and was then transferred to Cambodia as the Agricultural Advisor for the United States Operations Mission to Cambodia in Phnom Penh, through whom a request was made for seeds in order to develop synthetics³⁷. Ángel Salazar Blancud (then coordinator of the PCCMM) sent 24 samples: *Francisco Flint* grown in Cuba, *Dorado de Tiquisate* from Guatemala and *Amarillo Salvadoreño* from El Salvador³⁸. In the same way, there were mailings to Asia; for example, in 1962 to Taiwan by means of the Corn Research Center in the district of Tainan³⁹. Seeds were also sent to some countries in Africa; in 1960 samples of *Comiteco-Guat. 418* and *Salvadoreño Compuesto* were sent to the Department of Agriculture of Kitale, Kenya⁴⁰.

It is worth highlighting that the reports of the annual meetings generated considerable interest amongst countries that were also in the process of developing hybrid seeds. The routes for exchange were also broad in this sense; for example, we could mention that from 1956 the first PCCMM report was incorporated in *Bragantia*, a journal published by the Agricultural Institute of the State of Sao Paulo, Campinas Brazil⁴¹. Another case, much further from Central America, was the request made by Manuel Dias da Silva (an associate of the *Junta de Exportação dos Cereais de los Servicios Técnicos* in Mozambique and the *Ministério de Ultramar* in the Vila of Joao Belo) in which he expressed his interest in receiving the following editions of the PCCMM's annual report⁴². Also, from Brazil, the study *Razas de maíz en la América Central*⁴³, (Breeds of maize in Central America) was requested by José Verissimo Oliveira, who was responsible for the improvement of maize in the Veranopolis Experimental Station in the state of Rio Grande do Sul⁴⁴. In the same way, the study was sent in 1959 to the Research Center of the *Institut National Pour l'Etude Agronomique* in Belgian Congo⁴⁵ (at the present, Democratic Republic of Congo) and to H. H. Storey from the East African Agriculture and Forestry Research Organization in Kituyu, Kenya⁴⁶.

³⁷ Letter from Samuel C. Litzenberger to Ángel Salazar, November 15, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 65.

³⁸ Letter from Ángel Salazar to Samuel C. Litzenberger, December 8, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 65.

³⁹ Letter from Edwin J. Wellhausen to Ming-Hsien Sun, October 16, 1962, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 8, Folder 101.

⁴⁰ Letter from Edwin J. Wellhausen to M. N. Harrison, March 7, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 1, Folder 3.

⁴¹ Letter from Jose Elias de Paiva Netto to Donald L. Smith, December 22, 1956, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 54.

⁴² Letter from Manuel Dias da Silva to Donald L. Smith, July 18, 1957, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 54.

⁴³ This publication is part of a series of studies which investigate the origin, diversity and use of maize on the American continent, supported by the Committee for the Preservation of Indigenous Strains of Maize and the RF. Personnel from the PCCMM participated in its production, and it represents one of the first registers in which it was concluded that the greatest diversity of maize in Central America was in the Guatemalan highlands. E. J. Wellhausen, Alejandro Fuentes O. and Antonio Hernández Corso, *Razas de maíz en la América Central* (Mexico: Secretaría de Agricultura y Fomento, 1959), s. p.

⁴⁴ Letter from José Verissimo Oliveira to Edwin J. Wellhausen, March 20, 1959, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 54.

⁴⁵ Letter from Louis C. Williams to R. Gallien, December 2, 1959, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 1, Folder 3.

⁴⁶ Letter from Claud L. Horn to H. H. Storey, March 9, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 1, Folder 3.

In some cases, the reciprocal interest in collaboration stemmed from the possibility of adding new test sites for the PCCMM⁴⁷. This was the case in the request for Central American seeds by the geneticist Ernesto Paterniani from the *Escola Superior de Agricultura "Luiz de Queiroz"* in Piracicaba, Brazil⁴⁸. The collaboration was very fruitful, so much so that the work carried out in Piracicaba was added to the PCCMM's regular harvest tests in 1958⁴⁹. A similar case is that of the Agricultural Department of British Honduras (now Belize), that participated in the PCCMM associated tests in 1957, and expressed its disposition to maintain the collaboration over the following year; nevertheless, this aspiration was not fulfilled⁵⁰.

Requests for teocintle (a type of grain similar to maize) were also made, as although this was not one of the foci of the PCCMM's work, there were nonetheless various samples. In 1962, for example, Friedrich G. Brieger (who promoted the creation of the Committee for the Preservation of Indigenous Strains of Maize) requested samples of *Teocintle Gro.* and *Teocintle Guatemala* for the purposes of experimentation; the Guatemalan sample was highly valued as it was considered to be purer, that is to say, less contaminated with maize⁵¹. Another request for teozintle came from James Gordon from the Agricultural School in Kumasi, Ghana; he received five different types of Guatemalan teozintle⁵².

It is important to emphasize that in many cases the exchange was reciprocal; in this way the PCCMM was able to invite other countries to try the seeds from its programs. This was the case with the request made by Alfredo Carballo (PCCMM coordinator) in 1954 to Pedro Obregón for the varieties *Venezuela-1*, yellow maize of Cuban origin, and *Venezuela-3*⁵³, white maize which was the result of experimentation with the first variety⁵⁴. This shipping was accompanied by memos from the Venezuelan Agriculture and Livestock Ministry, in which the origin of the varieties and the conditions of their creation were registered.

Another example of the exchange of seeds is that which was established by the PCCMM with some seed companies, the most important of these being: Pioneer HiBred Corn Co., with headquarters in Iowa, United States⁵⁵, Semillas Cornelli from Cuba and Semillas

⁴⁷ In addition to integrating new sites for experimentation, some exchanges became sustained programs of work with central american maize varieties; it was the case of India, Australia and Indonesia, where the new seeds allowed to increase the yields. Fuentes O. Resumen de seis años de cooperación técnica entre la Fundación Rockefeller y la Sección de Maíz del IAN, 7 de marzo de 1960, RAC, Collection R. F., Record Group 1.2, Series 300, Box 5, Folder 36.

⁴⁸ Letter from Ernesto Paterniani to Robert D. Osler, August 28, 1958, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 54.

⁴⁹ Letter from Alfredo Carballo Quirós to Ernesto Paterniani, October 18, 1958, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 54.

⁵⁰ Letter from D. H. Romney to Robert D. Osler, May 31, 1958, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 61.

⁵¹ Letter from María Luisa Martínez to Friedrich G. Brieger, September 26, 1962, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 57.

⁵² Letter from María Luisa Martínez to James Gordon, March 9, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 1, Folder 3.

⁵³ Letter from Pedro Obregón to Alfredo Carballo Quirós, June 29, 1954, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 66.

⁵⁴ Langham & Gorbea, "Maíz blanco Venezuela- 3 Una selección de alto rendimiento", Circular n° 5, Ministerio de Agricultura y Cría de Estados Unidos de Venezuela, February 1944, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 66.

⁵⁵ Letter from Edwin J. Wellhausen to William L. Brown, March 14, 1959, *Ibíd.*

Poey S. A., with offices in Havana, Cuba⁵⁶. At the same time, the RF indicated that the regional plan should try not to establish ties with companies, and therefore it recommended that these links be run by each individual country⁵⁷. Finally, amongst the main university programs that were associated was the Atkins Garden and Research Laboratory of Harvard University, located in Cienfuegos, Cuba⁵⁸.

Maize and the Green Revolution in Guatemala

In January 1955, Guatemala joined the PCCMM through the National Agriculture and Livestock Institute (IAN, its Spanish acronym)⁵⁹. Its incorporation was formalized during the second meeting of the project, which was held for the second consecutive time in Costa Rica, during the month of December of that same year. It is worth pointing out that Guatemala had participated in the experimental tests from the first year of the activities, as the directors of the IAN were very interested in taking part in the work; for this reason, Guatemalan delegates attended the first annual meeting as observers. Other observers were Cuba, the United States and Venezuela⁶⁰. The informal integration of Guatemala was largely down to the efforts of the Agriculture Minister, Lázaro Chacón Pazos, son of the then deceased former president of Guatemala, Lázaro Chacón González.

The work to be carried out within the Guatemalan national plan was based on the guidelines already described in the regional plan. With regards to the specific issues of the lowlands, it is necessary to point out that, in the case of Guatemala, displacement to coastal areas was the solution to enable to the extension of cultivable land under the new agricultural systems. The challenge was significant: although natural conditions for the cultivation of maize existed, the growing of this grain in the highlands was associated with knowledge systems and cultural practices that the (mostly indigenous) peasant farmers did not want to modify, nor move to the lowlands⁶¹. At the same time, the biological conditions on the coast presented multiple challenges. To give one example, we could consider the characteristics of the soil; despite the fact that the flat terrain was appropriate for the introduction of mechanization, the high temperatures and depth of the substratum made it prone to the growth of pasture which would prevent the appropriate growth of the maize cobs, and furthermore the low levels of nitrate in the tropical soil made it necessary to use chemicals, which raised production costs while not guaranteeing plentiful harvests⁶². These types of problems show the duality of the scientific and technical management of the Green Revolution. However, it

⁵⁶ Letter from Ángel Salazar to Samuel C. Litzenberger, December 8, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 5, Folder 65.

⁵⁷ Letter from J. George Harrar to Donald L. Smith, January 10, 1955, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 7, Folder 86.

⁵⁸ Letter from J. George Harrar to Donald L. Smith, January 10, 1955, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 7, Folder 86.

⁵⁹ This institution received a formal invitation to join the PCCMM at the start of 1954, through the visit of Sterling Wortman and Alfredo Carballo Quirós. *Varietades mejoradas e híbridos del Programa Cooperativo C. A. y su zonificación ecológica en Guatemala*. RAC Collection R. F., Record Group 6.13, Series 1.1, Box 6, Folder 72.

⁶⁰ The Rockefeller Foundation, *Annual Report, 1954...*, 183.

⁶¹ On the other hand, indigenous people from Sololá and other highlands of Guatemala migrated stationary to work in coffee plantations in the lowlands, so they consumed corn from the coastal areas and contributed to the grain trade. W. H. Hatheway, *Journal of Trip to Guatemala to E. Wellhausen*, from January 17-31, 1962, RAC Collection R. F., Record Group 1.2, Series 300, Box 5, Folder 37.

⁶² William C. Paddock, "Guatemala's Agriculture", September 1954, Antigua Guatemala, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 24, Folder 267.

should be noted that this type of difficulty was not exclusive to the PCCMM, but rather they were a permanent feature of Guatemalan agrarian history; for example, the plans for Agrarian Reform which were promoted during the government of Jacobo Arbenz did not achieve success in promoting the population of the coastal areas for agricultural purposes⁶³.

Nevertheless, the Guatemalan experience differs from its Central American counterparts as it made important modifications in the areas of agricultural research and teaching, same case of Costa Rica. This was a result of the general plan of the PCCMM which, through the RF, extended an institutional incentives plan and a fellowship program to the region. These stipends were directed to projects that in the long term would result in agronomic professionalization in different areas of the agricultural sciences, for example, in animal science, biometry, plant science, soil science, biochemistry and even library science with emphasis on agriculture. We will now consider these two inter-related aspects, the donations and the fellowship program, highlighting the international exchanges of the IAN and the Universidad de San Carlos⁶⁴.

In order to contextualize the impact of these transformations, it is relevant to underline that the number of Latin Americans with advanced qualifications in agricultural science was severely limited. In 1965, the Organization of American States in collaboration with the IICA published a directory of Latin Americans with post-graduate studies in agriculture in which it could be seen there was a total of 497 professionals in all areas. Mexico and Brazil were top of the list with 69 and 74 graduates respectively⁶⁵. In Central America the sum total was 66 people divided as follows: in Costa Rica there were 24 MSc and 15 PhD; in Guatemala 4 MSc and 3 PhD; in Panama 13 MSc and 3 PhD; in Honduras 2 MSc; in Nicaragua 1 MSc and in El Salvador 1 MSc⁶⁶.

The low number of professionals in Guatemala facilitates understanding of the number of fellowships granted in the PCCMM framework, even more so given that a good number of students obtained their qualifications. The RF fellowship program aimed at PCCMM included three kinds of support, these were: 1) Fellowships, aimed at highly specialized research and directly related to one of the operational programs of the RF, 2) Scholarships, intended for to undergraduate or postgraduate studies, designed to strengthen the institutional structure of recipient countries and 3) Training awards, granted to outstanding students or officials for short stays. Likewise, travel supports were included to attend conferences or courses. The RF provided amounts to 81 fellowships, divided as follows⁶⁷:

⁶³ Paddock, "Guatemala's Agriculture".

⁶⁴ A more detailed approach to the important role of Rockefeller fellows in the development of the PCCMM can be found in my master's thesis: Méndez, "El Programa Cooperativo Centroamericano para el Mejoramiento del Maíz".

⁶⁵ Organization of American States, Inter-American Institute of Agricultural Sciences, *Latinoamericanos poseedores de Grados Avanzados en Ciencias Agrícolas* (San José: OEA, IICA, 1965), 70.

⁶⁶ Organization of American States, Inter-American Institute of Agricultural Sciences, *Latinoamericanos...*, 70.

⁶⁷ The table was created using data drawn from different documents of the RF collection held in the RAC, in particular those belonging to the Record Group 10.2, such as Recorder Cards, Fellowships on Agricultural Sciences, RAC, (Collection R. F., Record Group 10.1, Subserie 2, Box 1).

Table 2. Fellowships awarded within the PCCMM framework, 1953-1969

Country	Fellowships	Scholarships	Training awards	Total
Costa Rica	5	22	0	27
Guatemala	4	17	0	21
Honduras	1	11	1	13
Nicaragua	2	14	0	16
Panamá	0	4	0	4

The beneficiaries with a fellowship from Guatemala were: Marco Aurelio Flores, Ricardo Bressani, Miguel Ángel Guzmán Foresti y Eugenio Schieber. The beneficiaries with a scholarship from Guatemala were: Waldemar García, Adolfo Fuentes Castañón, Óscar Nery Sosa Sandoval, Jorge Luis Juárez Pérez, Antonio Aníbal Sandoval Sagastume, Astolfo Fumagalli Culebro, Iván Raúl Balconi, José de Jesús Castro Umana, Gonzalo Armando Fletes García, Juan de Dios Calle, Eduardo Rodolfo Guillén Paíz, Mario Roberto Vela Díaz, Luis Felipe Rosales, Norberto Matzer Ovalle, Federico Adolfo Richter Martínez, José Rodolfo Algara Guerra y Carlos Eugenio Del Águila Bernasconi⁶⁸. In the following pages some of these professionals will be referred directly.

National Agriculture and Livestock Institute (IAN)

The IAN, founded in 1944, was created by growers of Cinchona and the United States Department of Agriculture (USDA) to promote work with maize, beans, rice, wheat, coffee and rubber, through their areas of research and agricultural extension. Given the advance of their work on maize, the Institute was incorporated into the network of collaborators of the PCCMM, and, as such, an important number of their staff was involved in experimentation work. In 1965, the IAN was completely administered by the Agriculture Ministry in Guatemala and its area of research was reconfigured in the General Research Authority. The change was conclusive, as from that point the funding from the USDA ended and it fell under the maintenance and supervision of the Guatemalan government.

During the 1950s, the IAN was an articulatory body for a considerable amount of agricultural work, and for this reason it shared premises with the National Agricultural School –founded in 1921– in the “La Aurora” complex, Alameda, Chimaltenango, and the coffee plantation Bárcena, where coordinated seed testing projects with students and professors of the PCCMM were carried out. It is worth mentioning that this school collaborated with the United Fruit Company (UFCO), as it had received donations for improvements and, furthermore, the company employed graduates in its plantations as agronomy technicians. This situation changed when the company decided to found the

⁶⁸ Most of these fellows were of Guatemalan nationality, however, it is necessary to indicate that there was not always a correspondence between the nationality of the fellows and the country through which they obtained the stipend.

Panamerican Agricultural School (EAP) in Zamorano, Honduras during 1942⁶⁹. Other experimental stations that were used by the IAN were located in Cuyuta, Antigua, Quetzaltenango and Ovalle.

Between 1954 and 1963 the RF had granted the IAN a total of 73,780 dollars, designated for the purchase of lands to extend the experimental stations, the acquisition of laboratory equipment, the strengthening of work to extend agriculture⁷⁰, and the maintenance of a library⁷¹. Furthermore, funds were granted so that the institute's staff could carry out research trips (this budget area was the most important in terms of the internationalization of the PCCMM's activities)⁷².

One of the cases which best illustrates this aspect is that of Eugenio Schieber⁷³, in charge of the Department of Plant Pathology of the IAN, who received funding in 1964 to carry out a research trip to Africa. The objective of his trip was to evaluate the occurrence of plagues and illnesses that affected maize, as well as observing the adaptation of varieties developed in Mexico, Colombia and Central America⁷⁴. Schieber was a specialist in the study of plagues (fungi) that attacked maize crops, in particular the variety *P. zeae* (Guatemalan plague), *P. sorghi* and *P. polysora*, which were the most commonly found in Central America⁷⁵. In the case of Africa, the most common variety was the *P. polysora*, which was considered a plague native to the American continent and had arrived in Africa in 1949, devastating vast crops in Ghana and Nigeria. The issue was of considerable impact, if we take into account that in those years South Africa was the third biggest exporter of maize worldwide, and thus sought to avoid epidemics. Furthermore, in many African countries the cultivation of maize was an important part of human alimentation, while in others it was the

⁶⁹ Miguel Ramiro Castillo Montejo, "La enseñanza agrícola en Guatemala" (Master's Thesis in University Teaching, Universidad de San Carlos, Guatemala, 2007), 51-55.

⁷⁰ The Rockefeller Foundation, *Annual Report*, years 1954-1963, spending annex.

⁷¹ For this purpose, the RF designated 2,500 dollars, which were invested over two years in subscriptions to specialized journals and in the purchase of some books. It is worth highlighting that this was thanks to the request of former fellowship recipients of the RF, who worked in the Institute and appealed to the Foundation for the maintenance of the conditions necessary to carry out their research. Amongst them were: Eugenio Schieber, Oscar Nery Sosa, Alejandro Fuentes, Astolfo Fumagalli, Marcial Barrios, Adolfo Fuentes, Marco Dimas Mendoza, Vaclav Masek and Antonio Sandoval. To show some examples of the literary connections in agricultural research, the following subscriptions could be mentioned: *Indian Journal of Agricultural Science*, *Malayan Agricultural Journal*, *Missouri Farmer*, *Netherlands Journal of Agricultural Science* and *Philippine Journal of Agriculture*. Grant in Aid to the Instituto Agropecuario Nacional, RAC, Collection R. F., Record Group 1.2, Series 319, Box 1, Folder 10. Letter from technicians (former Rockefeller Foundation fellowship recipients) to Boris Arévalo, January 30, 1960, RAC, Collection R. F., Record Group 1.2, Series 319, Box 1, Folder 10.

⁷² The IAN had received financial support from the United States since its foundation, however from 1959 onwards the Administration of International Cooperation reduced its support, transferring complete responsibility for the maintenance of the Institute to the Ministry of Agriculture in Guatemala. It was during this transition period that the RF designated the greatest amount of funding to support the IAN. Grant in Aid to the Instituto Agropecuario Nacional, RAC, Collection R. F., Record Group 1.2, Series 319, Box 1, Folder 10.

⁷³ Despite the fact that Schieber's parents were of German origin, Schieber had lived in Guatemala since childhood, and had therefore completed his studies there, obtaining the title of *Perito Agrónomo* (Agronomy Specialist) in 1949 in the National School of Agriculture. Years later, in 1957, he received a fellowship from the RF to carry out his MS studies in the University of Wisconsin within the framework of the PCCMM's activities. In this way, Schieber maintained contact with members of the RF's Agricultural Sciences Program, a situation which favored him in the granting of the means to carry out his research in Africa.

⁷⁴ The Rockefeller Foundation, Personal History Record and Application for Travel Grant, Eugenio Schieber Herbstreuter, RAC, Collection R. F., Record Group 1.2, Series 319 E, Box 2, Folder 11.

⁷⁵ Corn Stunt Disease in Guatemala, Eugenio Schieber and Manlio Castillo, RAC, Collection R. F., Record Group 1.2, Series 319 E, Box 2, Folder 11.

main livestock fodder⁷⁶. As an additional fact, Rhodesia (now the Republic of Zimbabwe) was the second country, after the United States, to grow hybrid maize commercially⁷⁷.

In the design of his tour, Schieber received suggestions from different researchers from the RF who had experience in Africa, amongst them Edwin J. Wellhausen, Ralph Richardson and John McKelvey. Schieber also was advised by Robert C. Moncur and Francis J. LeBeau from the USDA, who helped him to establish contacts prior to his visit to Africa⁷⁸. During his trip, the Guatemalan visited Ghana, Nigeria, Ethiopia, Kenya, Uganda, Rhodesia, South Africa, Angola and Portugal, from where he then flew to New York to interview members of the RF prior to his return to Guatemala.

As well as examining the maize crops in the different countries and carrying out a series of interviews with African civil servants and scientists, Schieber gave several conferences about the types of plagues known in America. For this, he used color projections that showed the effects of the fungi on the crops. At the same time, Schieder registered that amongst the main Latin American varieties that were then being cultivated in Africa, the most predominant (but with a high level of susceptibility to plagues) was the *Cuzco*, originally from Peru⁷⁹. In the same way, he confirmed some of the prior observations of African scientists regarding the fact that Colombian varieties of maize were more appropriate, given their adaptability to the African climate, than their Mexican counterparts⁸⁰.

Amongst the more noteworthy results and proposals from Schieber's final report we can find the following: 1) The maize crops from the western region of Africa were the most affected by the *P. polysora* plague, 2) The initial RF program in Nigeria enabled neighboring countries to be helped to confront plant plagues, 3) Ethiopia was the least advanced country in terms of research on the cultivation of maize, and therefore varieties developed in Latin America would be very useful for the first harvests, 4) The experimental stations in Kenya were the most ideal to begin the selection of maize varieties with greatest resistance to the *P. sorghi* plague, 5) In South Africa the main plague was the rust variety *Helminthosporium turcicum*, a problem that it had in common with Mexico, and therefore it was felt that coordinated work with the Mexican Agricultural Program would be highly beneficial, 6) In his opinion, the station in New Lisbon in Angola was in good condition to advance with new experimentation techniques that would stimulate an African *Corn Belt*, and 7) He proposed that the young African growers and plant pathologists carry out study stays in the *Centro Internacional de Mejoramiento de Maíz y Trigo* (International Center for the Improvement of Maize and Wheat, CIMMYT) in Mexico⁸¹. These recommendations were gradually incorporated.

Schieber's trip met with wider goals within the RF in the American continent, and especially in the division dedicated to maize (at that time under the responsibility of

⁷⁶ Letter from Robert C. Moncure to Francis J. LeBeau, April 14, 1962, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 11.

⁷⁷ Letter from M. N. Harrison to Eugenio Schieber, April 29, 1960, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 11.

⁷⁸ Report of Observations and Study of Maize Diseases in Africa, Eugenio Schieber, 1964, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 12.

⁷⁹ Letter from Eugenio Schieber to Ralph W. Richardson, June 17, 1965, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 12.

⁸⁰ Letter from Edwin J. Wellhausen to M. N. Harrison, May 18, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 1, Folder 3.

⁸¹ Letter from Edwin J. Wellhausen to M. N. Harrison, May 18, 1960, RAC, Collection R. F., Record Group 6.13, Series 1.1, Box 1, Folder 3.

Wellhausen) as it allowed for the evaluation of the relevance of new generations of seeds for Africa. Furthermore, Schieber's research, at that time the only of its type, was not only highly appreciated by the RF but it also generated interest amongst seed companies. One example of this is the request from the Asgrow Seed Company to obtain a copy of Schieber's report, which, they indicated, would be of great use for the commercial expansion that the company planned to begin in Africa with the sale of hybrid maize seeds⁸². Unfortunately, the response that was sent to the company is unknown, but nonetheless this is indicative of the value placed on this kind of research by the private sector, as well as within the PCCMM at an international level. What was registered was the sending of copies of the field report to the parties that had hosted the plant pathologist.

The San Carlos University

The Universidad de San Carlos⁸³ began its collaboration with the PCCMM within the framework of the renovation plans for the Faculty of Agronomy, established in 1950 and moved the main university campus in 1954⁸⁴. The initiative for the creation of the Faculty came from a core group of professors who were concerned that the university should promote the professionalization of agronomic teaching in the country, as, in the same way other Central American countries (apart from Costa Rica), the highest academic grade which the Guatemalan education system granted (via the National School of Agriculture) was of *Perito Agrícola* (Agricultural Specialist), whose knowledge was purely technical⁸⁵. To gain the funding necessary to construct an independent building, the purchase of laboratory equipment, the compiling of a specialized library and the renovation of study plans, this group of professors sought external support. Amongst the professors in this core group there were some scientists associated with the activities of the PCCMM, such as the Agronomist Engineer Armando Fletes (later an RF fellowship recipient) and the Chemical Engineer Mario Brauner.

⁸² Letter from Asgrow Seed Company to The Rockefeller Foundation, March 3, 1965, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 12.

⁸³ Founded in 1676, during the colonial period, it is one of the oldest educational institutions on the American continent. The same as the majority of universities from that period, its background is associated with religious congregations, in this case with the archbishop of Milan, San Carlos de Borromeo who promoted its development and in whose honor the university is named. Its first buildings were in Antigua, Guatemala, however after the earthquake of 1773 it was moved to Guatemala's capital city.

⁸⁴ The Faculty of Agronomy was the first to open from March 1 within the university campus, and was inaugurated with celebrations over three days on March 19, 20 and 21, 1954. In that initial period the Rector of the university, Miguel Ángel Asturias Quiñones, served as director, but shortly after the direction was taken on by the engineer Alfredo Obiols. "Edificio para la Facultad de Agronomía. Obra vial, campos deportivos y hermosas calzadas van a estrenarse", *El Imparcial*, February 8, 1954, Archivo Histórico, Publicación Diario El Imparcial, CIRMA. "Desde el primero de marzo funcionará en su nuevo edificio la Facultad de Agronomía. Programa Cultural y Deportivo se apresta, tres días de fiesta para inaugurar las obras terminadas", *El Imparcial*, February 9, 1954, Archivo Histórico, Publicación Diario El Imparcial, CIRMA.

⁸⁵ William Paddock -appointed to the IAN- noted that the School of Agriculture, despite serving a useful purpose, could not be considered as anything more than preparatory school. He added that the level of the institution could not increase unless staff with more advanced studies joined, and would train the students in a different way. The IAN had been interested in contributing in this way, however the statutes of the Institute conceived it as a research center, which prevented it from becoming too involved. William C. Paddock, "Guatemala's Agriculture", September, 1954, Antigua Guatemala, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 24, Folder 267.

Between 1954 and 1957, the RF granted the sum of 20,000 dollars for the purchase of laboratory material, supplements and books. Although this was a considerable amount, it was not until the year 1957 that the Faculty of Agronomy began to receive a constant flow of donations through the initiative “Program for Agricultural Education”, which was established via the United States Agency for International Development (USAID). It later joined the activities of the Alliance for Progress and extended its objective to support the professionalization of the teaching of agricultural engineering in Guatemala. Other collaborators were Kentucky University and, to a lesser extent, the RF.

The program’s priority was the reform of the study plan, under the guidance of professors from Kentucky University⁸⁶. For this purpose, one of the first tasks of this team was the evaluation of the curriculum and the review of the teaching conditions for the drawing up of a proposal. The observation that the existing system promoted a practical focus on agriculture rather than one directed towards specialization is worth noting; in the words of the report’s writers:

The prevalent educational philosophy in Guatemala, especially in reference to agriculture, is that a man should know about everything: the antithesis of specialization. This is the main reason why the study plan is constituted in its present form. In other words, rather than needing to call five or six men to resolve a problem it is hoped that just one man will be able to solve it. As a consequence, his education should prepare him to assume this responsibility⁸⁷.

In this way the curriculum was reorganized to integrate in greater depth subjects relating to plant genetics, especially that relating to Mendelian experiments which, it is indicated, should be applied to maize⁸⁸. Another area of great interest was that of entomology, in this case the suggestions came from Dr. Juan G. Rodríguez from Kentucky University, who had experience in the experimental work of the Mexican Agricultural Program and in the PCCMM⁸⁹. At the same time, the importance of including specialized subjects in biometry and advanced statistics was insisted upon, as well as the provision of courses in animal science, especially related to nutrition and fodder. Although the laboratory specialization for the handling of seeds through the changing of classification and storage criteria was incentivized, it was indicated that this was work that would be greatly benefitted

⁸⁶ In 1954, William Paddock proposed a plan for the reform of the research area of the Agronomic Engineering course in the Universidad de San Carlos, according to which the Faculty should be supported by the IAN and adopt a joint work plan, with the aim of training agronomists in research and agriculture. For this purpose, a US educational entity should also support the initiative, and for him the most logical choice was the Iowa State College which had years of experience in Guatemala through its experimental center in the city of Antigua, established in 1946. Despite the fact that the changes that occurred in the Faculty of Agronomy followed a different path, it is interesting to recover Paddock’s proposal because it shows the connections that existed between Guatemala and the United States concerning agriculture. William C. Paddock, “Guatemala’s Agriculture”, September, 1954, Antigua Guatemala, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 24, Folder 267. William Paddock, “Iowa State College- Guatemala Tropical Research Center”, Report for January 1º, 1953-July 1º, 1954, RAC Collection R. F., Record Group 6.13, Series 1.1, Box 24, Folder 267.

⁸⁷ “Edificio para la Facultad de Agronomía. Obra vial, campos deportivos y hermosas calzadas van a estrenarse” ... s. p.

⁸⁸ Program of Agricultural Education in Guatemala, Alliance for Progress, 1963, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 13.

⁸⁹ Program of Agricultural Education in Guatemala, Alliance for Progress, 1963, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 13.

by the university's association with seed companies, and for this reason it was not granted a significant budget allocation.

Although it is true that valuable modifications were made, the San Carlos study plan was only partially changed, given that according to the university's directors and some professors, Guatemala should make a progressive transition towards specialization as the demands of the government and private initiatives demanded wide abilities (theoretical and practical) of the agronomy students⁹⁰. Nevertheless, the evaluation made by those who benefitted from the program was generally favorable, and as a gesture of gratitude the title of honorary professor was granted to Levi J. Horlacher⁹¹, who wrote the project's report and who was Program Director in Kentucky, who indicated that the modest size of the agricultural education program in San Carlos had enabled results that were more beneficial and lasting in comparison with more ambitious initiatives within the Alliance for Progress⁹².

The program in San Carlos also generated interest outside of Central America, as can be corroborated by the register of notable people associated with the area of agronomy who visited the university, amongst them: Dr. Philip Blackerby from the Kellogg Foundation, Dr. L. A. Laing from the University of London and UNESCO (United Nations Educational, Scientific and Cultural Organization), the engineer Leonel Robles G. from the School of Agriculture in Monterrey, Mexico, Mr. Philip Cochin from the UN Special Fund and Dr. C. H. Kuile also from the UN. Furthermore, there were frequent visits from RF staff associated with the Program in Agricultural Sciences; the trips of Dr. Lewis M. Roberts (director of the *Programa Agrícola Colombiano* (Colombian Agricultural Program) from 1954 to 1958, and Associate Director of the RF Agriculture Division since 1960 stand out for their frequency.

Despite the political changes in Guatemala which took place between the military coup against the government of Jacobo Arbenz and the overthrowing of the presidency of Miguel Ydigoras Fuentes in 1963, the Universidad de San Carlos managed to maintain its autonomy and some privileges. One of the most important was that of being an authority for the revalidation (for professional work in Guatemala) of studies carried out abroad, and another was the freedom to create student organizations. In this second aspect the Association of Students of Agronomy is of note, within which PCCMM collaborators were linked, under the motto: "For a Guatemala which is diverse in terms of agronomy, agriculture and livestock"⁹³.

At that time, the institution had consolidated its position as the main center of professional studies in agronomy, registering a growing number of matriculations that, by 1963, was 5,777 students in the Faculty of Agronomy in the Guatemalan university campus.⁹⁴ It could be claimed that this was the result of the changes to the study plan and was directed

⁹⁰ Program of Agricultural Education in Guatemala, Alliance for Progress, 1963, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 13.

⁹¹ Program of Agricultural Education in Guatemala, Alliance for Progress, 1963, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 13.

⁹² The program lasted seven years, starting in 1957 and ending in 1963, and the sum total of the project's cost was 236,835 dollars; part of the donations came from the RF. Program of Agricultural Education in Guatemala, Alliance for Progress, 1963, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 13.

⁹³ Amongst them Rockefeller fellows like Gonzalo Armando Fletes García, Antonio Aníbal Sandoval Sagastume and Óscar Nery Sosa. "Guatemaltecos", *El Imparcial*, June 14, 1967, Archivo Histórico, Publicación Diario El Imparcial, CIRMA.

⁹⁴ Program of Agricultural Education in Guatemala, Alliance for Progress, 1963, RAC, Collection R. F., Record Group 1.2, Series 319, Box 2, Folder 13.

towards specialization. However, one of the aspirations of the Guatemalans which was not achieved in that period was the creation of a division for post-graduate study.

Conclusions

As has been demonstrated, the PCCMM was part of a long process, the Green Revolution. At the same time, the Green Revolution was part of a context in Central America of agricultural modernization, more concerned with products for exportation than with grains for internal consumption, and therefore the cooperative project occupied a niche that was independent from other plans directed in this field. It is interesting to highlight that the relevance of the PCCMM in the region was not of an economic nature, that is to say that the maize project did not transform the productive structure in the way that later projects of the Green Revolution dedicated to beans and rice did. Therefore, the greatest importance of the PCCMM at regional level was in the creation of circuits for the circulation of practices, ideas, people and materials that promoted the Green Revolution.

In these pages, the way in which the support from the RF, aimed at incentivizing agricultural research and teaching, constituted one of the most important impacts in the internationalization of the PCCMM has been shown. The routes were extensive and, although they began between the United States and Central America, they soon extended to connect with other Latin American countries and, in exceptional cases, with places as far as Africa. In this sense, we can maintain that Guatemala was at the vanguard of global agricultural research and participated actively in the generation of knowledge of the cultivation of maize and the extension of the grain throughout the globe. Guatemala was favoured with its wide genetic heritage, a result of the propagation of maize from its Meso-American origins, and of equal importance was the conviction of the scientists who committed to advance an endeavour of this scale, in adverse institutional conditions and within a country biased towards agricultural exportation.

With reference to the work in the transformation of the teaching of agriculture in Guatemala, it is interesting to underline that this was carried out with a marked foreign participation, that included the RF, US universities and even a small fragment of the Alliance for Progress. The reform of the study plans and the establishment of spaces that were specialized in agricultural disciplines extended the presence of the United States in Central America, as education was considered an enlargement of the promise of “American” development. In relation to this aspect, it is necessary to mention that there was a debate between the usefulness of specialization for the resolution of the challenges in agronomy, and the continuation of a type of practical teaching which integrated knowledge of a more general nature. In this aspect, we can identify the tensions between the global tendencies (which favoured specialization and professionalization according to an agricultural model based on intensive production) and a Central American regional focus, which highlighted the need to train new generations of agronomists that were capable of translating the paradigm of the Green Revolution to the Guatemalan context.

To summarize, it is considered that agricultural research and education are a force for change in the agrarian context, whose long-term effects have contributed to sustaining the advancement of the Green Revolution. This aspect has been the result of the interaction and exchange between the global North and South, given that agrarian change has permeated both hemispheres. Seen in this way, the history of the Green Revolution is one of joint global

creation, and not of the transference of a US model throughout the globe.⁹⁵ Nevertheless, the tone of these contacts fell within a context of asymmetry, most importantly in the economic and political spheres, and therefore the Green Revolution is commonly associated with the geopolitical positioning of the United States during the Cold War, and especially its context of anti-communism. The Guatemalan case corroborates this, as it fits into the global tendency with a national period marked by a military coup (supported by the United States) against the democratic government of Jacobo Arbenz in 1954, which marked the beginning of a period of retraction of the plans for agrarian reform in favor of agricultural modernization projects that did not recognize the value of including the knowledge of subsistence farmers and indigenous peoples. In this way, the de facto president instated by the coup, Carlos Castillo Armas, did not only represent a change of direction in political terms, but also in agrarian ones, as his commercial association with maize cultivation motivated him to promote the shortage of the grain, with the aim of price speculation and requesting imports from Mexico and the United States⁹⁶.

⁹⁵ This argument is taken from the proposal of the historian Tore Olsson. Kumar, *et al.*, “Roundtable: New Narratives of the Green Revolution”, 403-404. Tore Olsson, *Agrarian Crossings...*

⁹⁶ Telegram from Guatemala City to Secretary of State, Department of State, December 17, 1954, CIRMA, Archivo Histórico, Collection of documents on national policy declassified by the US State Department.

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