



Food and Agriculture
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Climate change and food security and nutrition Latin America and the Caribbean

(policy guidelines)



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Food and Agriculture Organization of the United Nations

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FOREWORD



Together with the eradication of hunger and the elimination of poverty, the Food and Agriculture Organization of the United Nations (FAO) has defined - early in the 21st Century - its third global goal as “the sustainable use and management of natural resources”, in a clear understanding that the effects of climate change, their prevention and mitigation, constitute a core element in the development strategy: **resilience of livelihoods is as crucial for families as food production and the guarantee of regular and safe access to everything.**

The three goals are interdependent and reciprocal.

This is how the Sustainable Development Goals (SDG), in more than half of which FAO participates both in the design as well as the monitoring, present challenges with cross-sectoralism and mainstreaming as their most noted features.

The 17 goals, 169 targets and 230 indicators agreed - undoubtedly the most ambitious agenda approved by the United Nations member states - approach complex social, production, sanitation and environmental issues, that require coordinated and integral responses, furthermore considering that the effects of initiatives focused on certain areas shall have to have repercussions on others as well.

This way, the analysis of certain issues that are relevant for development, increasingly requires extensive views, both regarding technical matters as well as the actors involved, whether as beneficiaries or affected parties.

In this sense, although FAO is already assisting countries in the implementation of several SDGs, this document begins the analysis of an issue as relevant as the fight against rural poverty - approached in SDG 1 - and the eradication of hunger - SDG 2 -, in a context in which climate change - SDG 13 - **is no longer a presumption**, but a concrete reality that implies a series of conditions for development.

At the time these lines were being drafted, the announcement was made that, on November 4, 2016, the Paris Agreement on Climate would come into force, as 72 countries, responsible for 56.7% of greenhouse gas emissions, have ratified it in their corresponding national parliaments. This establishes a new threshold of global agreements towards sustainability.

Latin America and the Caribbean have shown significant progress in matters of food security and nutrition, which led them to meet the goal undertaken in the Millennium Development Goals (MDG). Well, these progresses are threatened, among other factors, by climate change and the effects it can have over areas as diverse as food production, income generation, the availability of natural resources or the domestic food supply.

The work herein presented by the FAO Regional Office for Latin America and the Caribbean shows how climate change **affects** each of the four dimensions of Food Security and Nutrition: the **availability, access, utilization** and **stability** of food.

This publication is the first in a series that will approach these matters, in order to produce information to further develop synergies among different policy areas relevant to our region.

At the same time, it is an additional element in the cooperation FAO has been carrying out to sustain and support the implementation of Food Security and Nutrition strategies, within the context of climate change, as a key background to consolidate sustainable development in the region.

Raúl Benítez
Assistant Director General
FAO Regional Representative for Latin America and the Caribbean

1. Climate Change, Agriculture and Food Security and Nutrition

1.1. Climate Change and Agriculture

Climate change shows in different transformations of climate variables that are causing significant economic, social and environmental effects. The Intergovernmental Panel on Climate Change (IPCC), in 2002, has defined climate change as *“any change in climate over time, whether due to natural variability or as a result of human activity”*. Likewise, the Framework Agreement of the United Nations on Climate Change defines it as: *“a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”*. Both definitions coincide in the fact that climate conditions are changing, and thus the world, globally, is witnessing changes. IPCC itself has indicated, in repeated reports, that the increase in average air and ocean temperatures, ice melt increase, sea level increase, modifications in precipitation patterns (spatial and temporal heterogeneity) and extreme climate events (droughts, floods, heat/cold waves) are direct consequences of climate change (IPCC, 2007). This new scenario constitutes one of the greatest challenges for humankind in this 21st Century, as it constitutes the environmental framework within which all human activities are developed, including agriculture¹.

The performance of the agricultural activity, in general terms, depends on three main factors: (i) the genetic

¹ The term “agriculture” in this document is understood in its broad conception, and includes horticulture, pomology, field crop farming, livestock, aquaculture, fisheries and forestry activities.

origin of the species used in production, which will determine the maximum potential in regard to production quality and quantity, and its vulnerability (or resilience) to external factors, such as pests, diseases, water stress, among others; (ii) the management by farmers of agro-productive systems, seeking to improve surrounding conditions that are controllable to obtain the expected yields, such as irrigation, pest and disease management, weed control, crop rotation, soil nutrition, etc.; and (iii) the weather conditions, understood as such non-controllable environmental variables, as precipitation level, temperature pattern and incidence of extreme weather events.

It should be noted that, even when technological progress has allowed generating solutions that are applicable to agriculture, in order for it to develop managing temperature and humidity variables (greenhouses and mechanized irrigation, for instance), its capacity is limited to a certain threshold point. That is, technological progress, although a useful tool to reduce vulnerability of agriculture to climate change, cannot totally isolate its impacts. Likewise, the implementation of technology in agriculture is limited by its high costs, so generally it is rather linked to medium- and big-scale production systems, than to small family farming. In the latter case, the intrasite management is more related to traditional techniques, such as crop rotation, which allows maintaining the nutritional contribution of the soil, the biological control of pests and diseases, manual management of weeds, and the diversification of crops, among other practices.

Undoubtedly, the three factors mentioned above are closely interrelated. For instance, the genetic quality of crops today is determined by centuries and centuries of cultural management that involves the selection of the best specimens, according to certain criteria, in order to use their genetic material as base to establish the next seeding or plantation. This way, the new cultivated generation will have a phenotypic profile that is closer to the desired

one. With this, the best genotype has been selected, generation after generation, thus determining the characteristics of each crop, according to the climate and management conditions in which it is developed².

Another example that reflects the interaction among these three factors are the consequences resulting from greenhouse gas emissions from agricultural activities. In medium and big scale agro-productive systems, the implementation of technology high in carbon emissions is frequent in the tasks required to develop a productive cycle: land preparation, seeding or plantation, fertilization, technical irrigation, disease, pest and weed control, and harvest, among others. Although agriculture is not the main economic activity responsible for emissions, it represents 12% of the total carbon equivalent emissions at a global level (ECLAC, 2015a). Therefore, as a consequence of the intensive management, high in carbon emissions, of a sector of agricultural activity, the increase in the concentration of greenhouse gases has been aided, with the resulting consequences on the discussed climate variables.

Agriculture is an activity highly vulnerable to climate change, as it depends directly on environmental conditions, many of which are not controllable, which greatly define the productive levels and the quality of agro-productive systems.

This way, with the climate change seen in the change of precipitation and temperature patterns, variations in the distribution and intensity of the incidence of pests and diseases, for instance, is projected. Therefore, a pest or disease that shows up in crops with a marginal effect on yields, could increase its damage on them

² This example is also valid in livestock production systems, in which the best specimens have been gradually selected for reproduction.

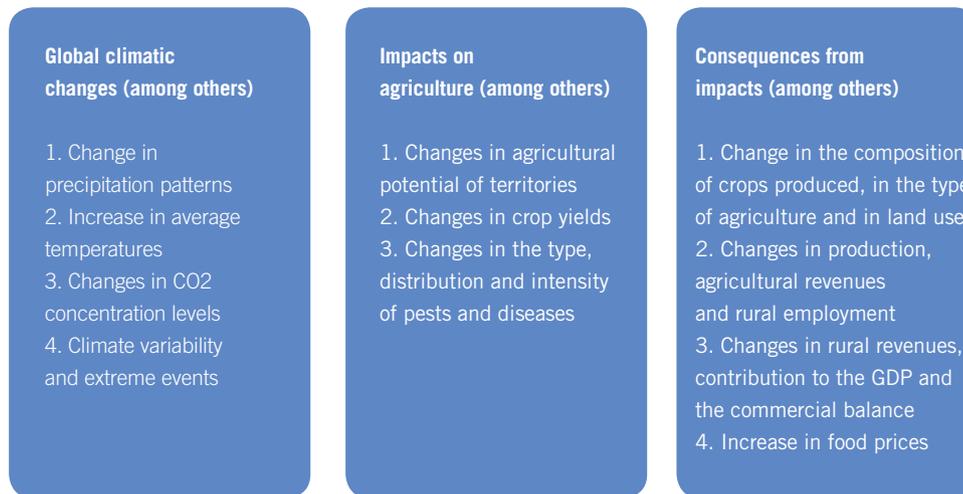
importantly if changes in climate variables determine a considerable increase in its population. It is also possible for them to develop in territories where they did not originally prosper, as they did not have the minimum climate conditions to reproduce, but, due to the new conditions, they now manage to establish themselves in new areas.

Likewise, global changes affect the precipitation pattern in regard to temporal and spatial heterogeneity. Forecasts indicate that, by the end of the 21st Century, a variation in the precipitation level ranging between 22% and 7% is expected for the case of Central America. In South America, heterogeneous changes are also expected in precipitation levels, as in the north east region of Brazil there would be a 22% reduction, while in the south west zone of South America, a 25% increase is expected (ECLAC, 2015a; CEPAL, 2015b). The expected effect of this situation, in those zones where there would be a fall in precipitation levels, is less availability of irrigation water for agriculture, because snow storage at mountain tops is reduced, river flows fall, and water accumulation in watersheds decreases. With that, farmers inhabiting such zones will have smaller flows to irrigate their fields, reducing productivity.

Additionally, the region will be affected by more intense and frequent climate events, such as the El Niño-Southern Oscillation phenomenon, oscillations in the Atlantic Ocean and tropical cyclones, among others (IPCC, 2013b). El Niño, in the future, will continue to be the most important cause of the inter-annual variability in the tropical Pacific and, due to the increase in atmospheric humidity, climate variability is likely to intensify (IPC, 2013a). This means that a greater frequency is expected in the incidence of precipitation-related extreme phenomena (for instance), such as droughts and floods, that affect directly the performance of agro-productive systems.

On the other hand, in general, increases are expected in average temperatures throughout all months of the year, as well as in daily temperature ranges. Forecasts for the end of the 21st Century indicate possible temperature increases by more than 2° in Latin America and the Caribbean (ECLAC, 2015a). This brings as consequence a change in the duration of the physiological stages of crops, which are based on the accumulation of chilling hours and degree days for their development, as well as in greater water requirements to meet the demand due to evapotranspiration as a result of higher temperatures. This implies that, for some species, climate conditions become more disadvantageous for development, while, for others, they represent an opportunity. Likewise, an increase is expected in the “zero-degree isotherm”, the altitude above which precipitation falls as snow and allows its accumulation on mountains. This will result in more runoff. Figure 1 summarizes the mentioned impacts on agriculture that have been previously discussed.

Figure 1. Consequences of climate impact on agriculture



Source: Own preparation, based on Parry et al. 1998.

This way, we have a scenario of land use reassignment in the mid-term, in order to establish those that have better expectations regarding performance and resilience upon the new climate scenarios. This, because species could get established in territories where they could not develop before, which could represent an opportunity. However, in other territories, the expected impacts of climate change could imply a great threat to sustainability in agriculture, particularly in arid and semiarid territories, where already now water availability is little, and where future scenarios of further water restriction are predicted (IFPRI, 2009).

Anyhow, and as previously indicated, climate change has as consequence a greater variability in climate behaviour. This means that the difficulty increases in predicting the future climate conditions in the territories that allow concluding, with certainty, that new crops will have a good yield. That is, climate change is strongly linked to uncertainty for decision-making, whether for farmers or for public policy makers, because, even though conditions might improve for the development of new crops, the risk of bad results, given climate variability is greater.

In addition to directly affecting agricultural and livestock activity, climate change will directly affect the availability and quality of the natural resources that are important for the development of different human activities. For instance, water resources, biodiversity and forests are particularly sensitive (Magrin and Marengo, 2014). During the 20th Century, Andean glaciers have been considerably reduced, and a volume reduction ranging between 78% and 97% in tropical glaciers is expected for year 2100, with low or intermediate emissions. Likewise, a nearly total melting of these glaciers is projected for high emission scenarios. For austral Andean glaciers, reductions ranging between 22% and 74% are expected by 2100, depending on the emission scenario (World Bank, 2014). The above is due to the increase in average temperatures at altitudes that lead to faster snow melting and an increase of the so-called “*zero-degree isotherm*”.

Likewise, biodiversity can be affected negatively by climate change. Reductions are expected in the geographic distribution of some species, even to the point of extinction. The above would be a result of changes in temperature and precipitation patterns that change the natural environment where species develop. Even

though it is hard to model³, there is a clear trend for the projected temperature increase to negatively affect a greater number of species, instead of benefiting them. Endemic and highly specialized species are most vulnerable, because they have evolved to meet a specific ecologic function so, if climate changes affect environmental conditions, their ecologic niche could be reduced and their population could be endangered (World Bank, 2014).

The Amazon rainforest is an ecosystem of the utmost relevance at a global level, which is being significantly affected. The greater frequency of years with droughts and higher environmental temperature, together with anthropic factors such as the impact of forest fires, land use change and deforestation, threaten the sustainability of the ecosystem and its ecosystemic functions and services (World Bank, 2014). As a consequence, a replacement of Amazon rainforest for semi-arid and savanna vegetation has been observed, due to the drier and warmer environment, thus affecting the hydrology cycle and biodiversity (ACTO, 2014).

Another important example of the effects of climate change is observed in the Central American Dry Corridor. It is a group of ecosystems combined in the ecoregion of the dry tropical forest of Central America, that begins in Chiapas - Mexico, and continues on the Pacific line of great part of the central pre-mountain region of Guatemala, El Salvador, Honduras, Nicaragua, and part of Costa Rica (to Guanacaste). In Honduras, it also includes fragments that reach towards the Caribbean coast. In this region, it has been possible to note that the variability in the precipitation pattern has increased, with extreme events taking place more frequently:

3 To analyze the impact of climate change on biodiversity, mathematical models of species distribution, dynamic models of global vegetation, among other methods, are applied.

extended droughts during the “El Niño” periods, which translate into the reduction of water available to meet the needs of human population or agriculture, and intense rains due to the influence of hurricanes, tropical depressions and storms during the “La Niña” periods, which lead to landslides, collapses and damages in public and private infrastructure. Natural habitats are very fragmented in the territory and the effects of climate change affect all population in the eco-region, which outnumbers one million people, that has subsistence agriculture as the driver of its economic activity, with high poverty and malnutrition indexes that mainly affect rural population and indigenous communities (FAO, 2012).

1.2. Climate Change, Right to Food and Food Security and Nutrition

Considering the expected impacts of climate change on agriculture, it is possible to forecast that climate change will also have significant effects on the Right to Food and on food security and nutrition in the region, if the current greenhouse gas emission trends remain stable.

In 1948, the Right to Adequate Food was established in the Universal Declaration of Human Rights, which stated in its Article 25 that “Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food” (UN, 1948). Later, in 1999, General Comment N° 12 of the Committee on Economic, Social and Cultural Rights, in addition to establishing that the State is obliged to respect, protect and assist the right to food, it indicates that the Right to Food happens when food is sufficient, adequate, sustainable, safe, respecting the cultures, available and accessible both economically and physically (UN, 1999). Furthermore, the “Voluntary Guidelines to Support the Progressive Realization of the Right to

Adequate Food in the Context of National Food Security” (FAO, 2004), establish a set of specific measures in both areas.

In 1996, countries gathered at the World Food Summit⁴ defined Food Security as the state in which *“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”*. This definition acknowledges four dimensions of Food Security and Nutrition: (i) Food availability, understood as the existence of sufficient quantities of food of appropriate quality, supplied through domestic production or imports; (ii) Food access, which makes reference to the capacity of individuals to economically and physically access appropriate foods for a nutritious diet; (iii) Utilization, a concept that makes reference to the quality of food and how this affects the state of nutritional well-being and health of the population; and finally, (iv) Stability, which refers to the consolidation and sustainability through time of all dimensions of food security and nutrition (FAO, online)⁵.

Climate change has direct effects on food security and nutrition, because it has an impact on its four dimensions. Given the multidimensional character of food security and nutrition, and the existing relations among the variables that influence it, there is a series of complexities when it comes to analyzing its impact; however, in general terms, it is possible to identify the most important ones.

Traditionally, the effects of climate change tend to be linked to the **stability** dimension, given that it makes reference to the sustainability through time of the other

4 <ftp://ftp.fao.org/docrep/fao/Meeting/018/k6050s.pdf>

5 [Food Security and Nutrition Program.](#)

dimensions, and is expressed by the introduction of greater uncertainty regarding the productive performance of agricultural activities, of the income of households and of prices. Latin America and the Caribbean have reduced the proportion of population in state of under-nutrition, going from 14.7% in 1990-1992, to 5.5% in the current three-years period⁶ (FAO, FIDA and PMA, 2015). However, progresses of the last 25 years can be compromised if, as a result of the frequency and intensity of climate events, the stability of food supply is affected in the medium and long term. This could happen if the physical availability of food is affected, in case crop harvests decrease. In this scenario, the physical and economic access of families to food would be reduced, due to the reduction in the amount available and the price increase. With this, there might be changes in food patterns towards a non-nutritious and less healthy diet, causing nutritional issues in families.

In the case of **availability**, as previously indicated, climate change curtails, among other aspects, the production levels in local and national areas, access to water resources, the import capacity of the country, and the existing food stocks, being able to importantly alter the performance of productive systems, either directly, through changes in precipitation and temperature patterns, among others, or indirectly, through the increase in frequency of pests and diseases. This situation can cause alterations to the different stages of the productive cycle; it can affect production conditions before the seeding of the crop (nutritional and humidity conditions of soil, for instance), as well as it can alter the agro-productive system once it has been set (for instance, the incidence of floods or droughts affecting the availability of nutrients, the physical quality of the soil, etc.). This way, climate change can affect directly the production

with the potential reduction of the physical amount and variety of food available. In the post-production stage, climate change can affect the environmental conditions for storage of the harvest (for instance, due to higher temperature and humidity), subject to cause losses. Climate impacts on big producer zones could have several effects on commerce, by reducing the international offer of foods.

Likewise, climate change can affect the **access** dimension of food security and nutrition, because family revenues can vary, after the alterations that might be experienced by the livelihoods in households where revenues, in whole or in part, depend on the agricultural sector. These revenues can be affected by the smaller production, or by a fall in the demand for employed labour in agricultural tasks, affecting the food purchase power. Likewise, the purchase capacity of families can be reduced by an increase in food prices, which could not be afforded by most rural households in state of vulnerability. Therefore, climate change can impact access to food, particularly among those most vulnerable who dedicate a greater portion of their revenues to purchase it, affecting the amount, diversity and quality of the diet and, therefore, health. Another more indirect consequence could be, for instance, the increase in the cost of public programs for school meals, with possible coverage reductions. Likewise, internal trade conditions can be affected, if post-harvest production chains, transportation infrastructure and trade networks are altered, which would prevent the normal food supply to the territories, thus affecting physical access to it.

All these conditions can determine a reduction in the physical and economic access to food.

Along this, it is necessary to note that prices are usually more volatile than income, so sudden increases can curtail the population's capacity to acquire adequate food.

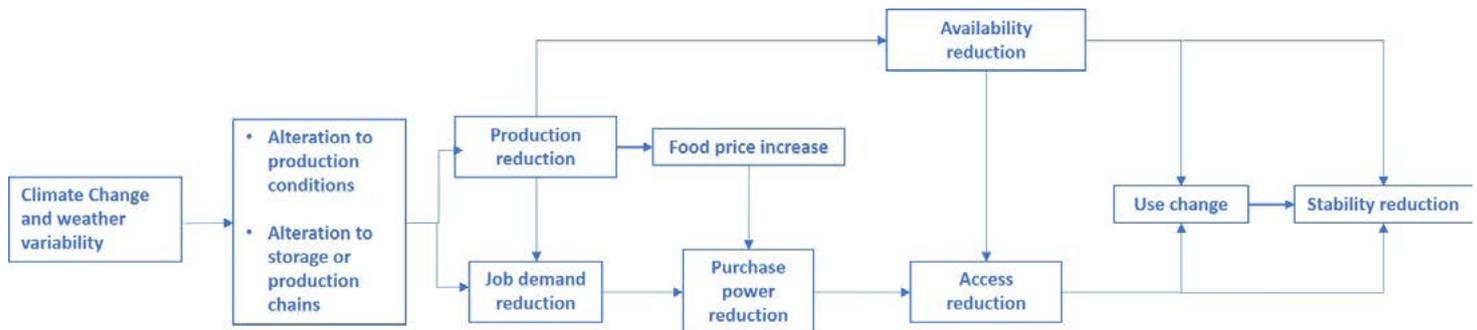
⁶ With that, goal 1C of the Millennium Development Goals for the region was met.

On the other hand, international markets transmit the effects of climate change to other places and economies, affecting internal prices. This effect will depend on the degree of national dependence on international food markets.

Climate change can also affect the **utilization** dimension. On the one side, the change in food availability and the potential reduction in household income, already mentioned, can generate important changes in

the diets of the population, due to a scarcely varied food intake, far from healthy eating habits, that would have negative consequences on nutrition. Likewise, as sanitation conditions can be altered as a result, for instance, of the lack of water available, it could compromise food safety. That would increase the risk of catching diseases and would reduce the quality of food, in general. Figure 2 presents a summary of what has been mentioned in previous paragraphs.

Figure 2. Impacts and consequences of climate impact on food security and nutrition.



Source: Own preparation, 2016.

The adverse effects of climate change and the incidence of extreme climate events alter food systems as a whole, reduce productivity of the agricultural sector and directly affect the livelihoods of the population living in rural zones and, indirectly, of urban population as well. It is necessary to keep in mind that the effects of climate change are not distributed equally and it is likely that greater impacts will take place in populations that are already in a situation of vulnerability. The pre-existing conditions of poverty make this group of the population more exposed to having its social, economic and environmental conditions worsened due to the effects of climate change (FAO, 2012). This way, the likelihood of an increase in climate variability and extreme climate phenomena, leads to risk management to guarantee food security and nutrition as well as sustainable agriculture, becoming more relevant in the public agenda.

Adaptation of food systems requires considering all variables in the different stages of the food chain, and needs more efficient production and distribution forms, with less environmental externalities, that is, it requires the mitigation process, at the same time.

2. Policies on Climate Change in Latin America and the Caribbean

2.1. International Agreements

The United Nations Organization (UN) was the first institution to promote consolidating a great international agreement geared towards the conservation of the environment. In June 1972, it held the United Nations Conference on the Human Environment in the city of Stockholm, also known as the Stockholm Conference. One hundred thirteen countries participated in this meeting and, as a result, a declaration was issued containing 26 principles and an action plan with recommendations for the countries regarding the protection of the environment. Principle 1 of the Stockholm Conference states that *“Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations...”* (ONU, 1972). This principle sets the bases for what, later, in 1988, would be defined as a Human Right in the Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights, known as the Protocol of San Salvador. Its article 11 establishes: *“T”Everyone shall have the right to live in a healthy environment and to have access to basic public services The States Parties shall promote the protection, preservation, and improvement of the environment”*. This is how many States contain explicit articles in their constitutions regarding the right of people to a healthy environment.

Likewise, Principle 1 of the Stockholm Conference sets the bases for what is now called “Sustainable Development”, by establishing inter-generational equity in access to natural resources, that is, the responsibility of

present generations in using the environment seeking to maintain its availability and quality for future generations to be able to enjoy it as well⁷. It also acknowledges that natural resources can be used for people to improve their well-being condition, by being a source of valuable goods or services for the communities (food, water, air, heating, etc.).

Twenty years later, in 1992, the United Nations Conference on Environment and Development was held in Rio de Janeiro, with the participation of 178 countries. It acknowledged, in 27 universal principles, the link of the environment and social and economic development as a primordial factor for the well-being of communities. Its article 3 defined the concept of sustainable development, establishing that *“The right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations.”* This definition was based on what had been stated by the United Nations World Commission on Environment and Development, in 1987, which involves three dimensions in the development model of societies: environment, social and economic.

The Convention on Biological Diversity was also signed during the Conference, acknowledging the importance of biological diversity conservation and the fair use of the genetic heritage, while at the same time the Statement of Principles for the Sustainable Management of Forests was issued.

The Rio Conference (1992) was the first international meeting to discuss matters related to climate change and greenhouse gas emissions. As a result, 154 governments signed the United Nations Framework Convention on Climate Change (binding agreement), which came

⁷ This principle would then made formal in 1992.

into force in 1994 and looked for *“the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner”*.

The Kyoto Protocol of 1997 was created to apply what was defined in the United Nations Framework Convention on Climate Change of 1992. It included binding goals for 37 industrialized countries under the principle of common but differential responsibilities, acknowledging that they are the main responsible parties for the high levels of greenhouse gases currently in the atmosphere, and that these are the result of the burning of fuels for over 150 years. Not all industrialized countries joined the Kyoto Protocol. The U.S.A., responsible for approximately 18% of greenhouse gas emissions, did not ratify it.

Later, a series of international meetings and conferences were held, in which care for the environment and the concern for climate change were the core discussion. Among others were the World Summit on Sustainable Development of 2002, better known as the Johannesburg Summit, the declaration of which acknowledged the global environmental issue, but weakly concluded ratifying the existing efforts and approaches, which proved to be insufficient to drive progress in the implementation of global agreements (La Vina et al, 2002).

In 2009, the XVI Regional Conference of the United Nations Framework Convention on Climate Change was held in Copenhagen. The goal of this summit was to achieve a legally binding agreement on climate that could be applied starting from year 2012, at the end of

the validity of the Kyoto Protocol⁸. The goal intended, which was not achieved due to lack of agreement, was the global reduction of greenhouse gas emissions by at least 50% by year 2050, regarding base year 1990. At the last minute, a non-binding agreement was signed among the United States, India, Brazil and South Africa, which contained commitments to add transparency to the level of greenhouse gas emissions of signatory countries, and included the proposed emission reductions only as a reference. This agreement was rejected by several developing countries that deemed it insufficient, and the plenary session of the Conference limited itself to just acknowledge the document.

Six years later, the XXI International Conference on Climate Change (better known as COP21) was held in Paris, with the purpose of limiting the increase in global average temperature to less than 2°C by year 2100, through establishing voluntary emission reduction goals. The Paris Agreement was signed by 195 parties (States or regional economic integration organizations members of the United Nations Framework Convention on Climate Change) and would come into force if at least 55 members representing at least 55% of the total global greenhouse gas emissions ratified it. On October 5, 2016, the Paris Agreement met this requirement, so it will come into force starting November 4, 2016⁹.

⁸ It should be noted that a second period of validity for the Kyoto Protocol, until December 31, 2020, was ratified in the XVIII United Nations Conference on Climate Change, held in Doha in 2012 (Doha Climate Conference), continuing the work of the previous Durban Conference (COP17) held in 2011.

⁹ More information in http://unfccc.int/paris_agreement/items/9444.php

The Paris Agreement. (2015) and the Kyoto Protocol (1997) are the most important environmental commitments signed by the countries to reduce emissions and begin a transition process towards a low-carbon economy.

Acknowledging the impacts of climate change on social and natural systems, other more specific and limited meetings have been held. An example of this is the Third United Nations World Conference on Disaster Risk Reduction held in Sendai, in 2015. The Sendai Framework was approved in this meeting (187 countries signing), calling countries to adopt specific measures or risk reduction in all sectors, whether at local, national, regional and global levels, considering four priority areas: (i) understanding disaster risk; (ii) strengthening disaster risk governance to manage disaster risk; (iii) investing in disaster risk reduction for resilience; and (iv) enhancing disaster preparedness for effective response and to “Build Back Better”.

2.2. Regional Commitments regarding Climate Change

Over the last few years, important progresses have been observed in the climate commitment of countries in Latin America and the Caribbean. At international level, countries in the region have ratified the main multilateral agreements to reduce greenhouse gas emissions. Table 1 presents the signature and ratification status of the Kyoto Protocol and the Paris Agreement among countries in Latin America and the Caribbean. It shows that all countries analyzed have ratified the Kyoto Protocol and that, except for Nicaragua, all countries have signed the Paris Agreement. These results show the regional commitment to reduce climate change impacts at a global, regional, national and local level.

Table 1. Ratification status of the Kyoto Protocol and the Paris Agreement in Latin America and the Caribbean (day/month/year).

Country	1997 Kyoto Protocol ¹⁰			2015 Paris Agreement ¹¹		
	Protocol Signature	Ratification	Effective date	Agreement Signature	Ratification	Effective date
Antigua y Barbuda	16/03/1998	03/11/1998	16/02/2005	22/04/2016	21/09/2016	04/11/2016
Argentina	16/03/1998	28/09/2001	16/02/2005	22/04/2016	21/09/2016	04/11/2016
Bahamas	*	09/04/1999	16/02/2005	22/04/2016	22/08/2016	04/11/2016
Barbados	*	07/08/2000	16/02/2005	22/04/2016	22/04/2016	04/11/2016
Belize	*	26/09/2003	16/02/2005	22/04/2016	22/04/2016	04/11/2016
Bolivia	09/07/1998	30/11/1999	16/02/2005	22/04/2016	05/10/2016	04/11/2016
Brazil	29/04/1998	23/08/2002	16/02/2005	22/04/2016	21/09/2016	04/11/2016
Chile	17/06/1998	26/08/2002	16/02/2005	20/09/2016		***
Colombia	*	30/11/2001	16/02/2005	22/04/2016		***
Costa Rica	27/04/1998	09/08/2002	16/02/2005	22/04/2016		***
Cuba	15/03/1999	30/04/2002	16/02/2005	22/04/2016		***
Dominica	*	25/01/2005	25/04/2005	22/04/2016	21/09/2016	04/11/2016
Ecuador	15/01/1999	13/06/2000	16/02/2005	22/06/2016		***
El Salvador	08/06/1998	30/11/1998	16/02/2005	22/04/2016		***
Granada		06/08/2002	16/02/2005	22/04/2016	22/04/2016	04/11/2016
Guatemala	10/07/1998	05/10/1999	16/02/2005	22/04/2016		***
Guyana	*	05/08/2003	16/02/2005	22/04/2016	20/05/2016	04/11/2016
Haiti	*	06/07/2005	04/10/2005	22/04/2016		***
Honduras	25/02/1999	19/07/2000	16/02/2005	22/04/2016	21/09/2016	04/11/2016
Jamaica	*	28/06/1999	16/02/2005	22/04/2016		***

Mexico	09/06/1998	07/09/2000	16/02/2005	22/04/2016	21/09/2016	04/11/2016
Nicaragua	07/07/1998	18/11/1999	16/02/2005	**		
Panama	08/06/1998	05/03/1999	16/02/2005	22/04/2016	21/09/2016	04/11/2016
Paraguay	25/08/1998	27/08/1999	16/02/2005	22/04/2016		***
Peru	13/11/1998	12/09/2002	16/02/2005	22/04/2016	25/07/2016	04/11/2016
Dominican Republic	*	12/02/2002	16/02/2005	22/04/2016		***
Saint Kitts and Nevis	*	08/04/2008	07/07/2008	22/04/2016	22/04/2016	04/11/2016
St. Vincent and the Grenadines	19/03/1998	31/12/2004	31/03/2005	22/04/2016	29/06/2016	04/11/2016
St. Lucia	16/03/1998	20/08/2003	16/02/2005	22/04/2016	22/04/2016	04/11/2016
Surinam	*	25/09/2006	24/21/2006	22/04/2016		***
Trinidad and Tobago	07/01/1999	28/01/1999	16/02/2005	22/04/2016		***
Uruguay	29/07/1998	05/02/2001	16/02/2005	22/04/2016		***
Venezuela	*	18/02/2005	19/05/2005	22/04/2016		***

*These countries made their environmental commitments by «Joining» the agreement, as they signed it when the Protocol had been negotiated. It has the same legal effect as the «Ratification».

**Nicaragua did not sign the Paris Agreement because it deems it insufficient to combat the effects of climate change on vulnerable countries.

***For every country ratifying the Paris Agreement once the conditions for its coming into force have been met, it will begin its validity on the thirtieth day starting from the date on which the country presents its ratification.

Source: Compiled by author, 2016, based on United Nations Framework Convention on Climate Change (as consulted on October 07, 2016).^{10 11}

10 http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

11 https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en

Additionally, the other countries in the region are continuously working on agreements to face climate change. Some examples of political dialogue are the Action Plan of the Community of Latin American and Caribbean States (CELAC) 2016, CELAC's Plan for Food Security, Nutrition and Hunger Eradication, Samoa Pathway, Regional Strategy of Climate Change of the Central American Integration System (SICA), and the Constitutive Treaty of the Union of South American Nations (UNASUR), among others. In addition to the progresses made on the subject by the Latin American Parliament (PARLATINO) and the Central American Parliament (PARLACEN).

In regard to climate change, CELAC held the II Meeting of Ministers of the Environment and Top Level National High Authorities related to Climate Change, based on the commitments made in COP21, to agree upon and present the road map of countries in the region and thus achieve the Sustainable Development Goals (SDGs). Likewise, CELAC countries commission the Environment Work Group to consider the possibility of elaborating a multi-dimensional strategy to facilitate sustainable management and approach the challenges of countries upon climate change, the conservation of the environment and the loss of biodiversity, particularly that of those most vulnerable countries in the region.

On the other hand, the CELAC 2025 Plan for Food Security, Nutrition and Eradication of Hunger (CELAC, 2015) results from the political will of 33 countries in the region to eradicate hunger and poverty by year 2025, gathering the main successful policies and initiatives developed by the countries in the region in regard to food security and nutrition, and has been established as the main road map towards “zero hunger” by year 2025. Its pillars comprise: (i) coordinated food security strategies through the framing and direction of national and regional public policies to face the challenges of food security

(availability, access, utilization and stability), focused on gender and incorporating the human rights perspective, particularly the human right to food; (ii) timely and sustainable access to safe, adequate, sufficient, nutritious and culturally relevant food for all people, especially the most vulnerable, in order to develop and fully maintain their physical and mental faculties; (iii) nutritional well-being and assurance of nutrients, respecting the diversity of food customs, for all groups in vulnerable situation; and (iv) stable production and timely attention to socio-natural disasters that might affect food availability.

Meanwhile, the Small Island Developing States, among which are the Bahamas, Barbados, Jamaica and Trinidad and Tobago, in the third International Conference on Small Island Developing States, approved, at the highest possible level, the Resolution “Accelerated Modalities of Action for Small Island Developing States”, also known as the Samoa Pathway (SIDS, 2014). Such resolution has an item on climate change, among others, in which the State reaffirm the risk and threat that climate change poses for them, it being one of the greatest challenges they must face. Likewise, they note the relevance of having multi-sectoral and integrated efforts, with funding to face climate change. Additionally, they request support to increase their resilience, improve the surveillance systems, increase awareness and knowledge of the risks of climate change, and repair persistent deficiencies in the capacity to access and manage climate funds.

Within the area of the Central American Integration System (SICA), two are the main instruments that show the political will of the region regarding the challenge posed by climate change. On the one hand, there is the Regional Strategy on Climate Change (CCAD-SICA, 2010) that presents both the threats and effects of climate change in Central America, due to its geographical location and social and economic situation, as well as a framework of action and response upon such climate

change. The strategy has the purpose to “contribute to preventing and reducing the negative impacts of climate change by increasing resilience and the capacity for adaptation in order to reduce human, social, ecological and economic vulnerabilities, build capacity to influence and reduce climatic threats and voluntarily contribute to reducing GHG emissions, as permitted by national circumstances”¹²

On the other hand, the 2015 2020 Framework Regional Environmental Strategy (CCAD, 2014) seeks to “promote the environmental integration of the region for the social and economic development of the peoples, articulating efforts and enhancing the available resources”, and has among its strategic lines one of climate change and risk management for the mainstreaming of the approach for mitigation and adaptation to climate change and the integral risk management in all national policies and plans, in order to guarantee the protection of the lives of the population in the region as well as of private and public assets.

At the same time, the Constitutive Treaty of the Union of South American Nations (UNASUR, 2008) states that the Union of South American Nations is a space of sub regional integration and union, that seeks social-economic equality, social inclusion and citizen participation, in addition to strengthening democracy and reducing asymmetries within the strengthening of the sovereignty and independence of the States. One of its specific goals is cooperation in catastrophe prevention and the struggle against the causes and effects of climate change.

Meanwhile, there have been important progresses made in the parliamentary world, placing climate change and food security and nutrition as an emerging priority in parliaments throughout the region. Highlights of such achievements during 2016, are the commitment by the PARLATINO Commission of Agriculture, Fisheries and Livestock, for the drafting of the Model Law on Climate Change and Food Security and Nutrition, as well as the PARLACEN commitment to support the creation of a Framework Law to provide guidelines for sectoral legislation in the Central American region¹³.

2.3. National Efforts regarding Climate Change in the Region

The set of strategies for the adaptation and mitigation of climate change effects include different sectoral areas, which depend on a series of factors, such as the geographical, climate and social-economic characteristics of each country. On the other hand, ECLAC (2015a) analyzes the sectoral emphasis of adaptation strategies in Latin American countries, and concludes that these focus on the water, infrastructure, human settlements, agriculture, biodiversity, health and energy sectors. It also points out that there are gaps regarding the design and implementation of adaptation measures, allowing a state of greater vulnerability (Table 2).

12 <http://www.sica.int/busqueda/secciones.aspx?IdItem=55544&IdCat=48&IdEnt=879>

13 <http://www.parlacen.int/Portals/0/ForoRegional/DECLARACION-Foro-MEDIO-AMBIENTE.pdf>

Table 2. Summary of priority sectors per country in Latin America and the Caribbean

Country/ Sector	Energy	Agriculture & Livestock	Land use change	Biodiversity	Forestry	Industry	Water	Coastal Zones	Health	Tourism	Transportation	Residues	Miscellaneous ¹⁴
Argentina	X	X		X			X		X	X	X		
Bolivia													X
Brazil													X
Chile	X	X		X	X		X		x	x			x
Colombia													X
CARICOM ¹⁵							X	X	X	X			
Costa Rica	X		X	X		X	X					X	
Ecuador		X		X			X						X
El Salvador		X		X	X								X
Guatemala		X		X	X		X		X				X
Honduras	X	X	X	X	X		X						X
Mexico													X
Nicaragua	X				X		X						X
Panama	X	X		X			X			X			
Paraguay	X	X			X		X		X				
Peru													X
Dominican Republic				X			X		X	X			
Uruguay	X	X		X			X		X				X
Venezuela		X					X						

Source: ECLAC, 2015a.

14. The Miscellaneous sector includes infrastructure and human settlements, mainly.

15. The Caribbean Community (CARICOM), includes as member states Antigua & Barbuda, Bahamas, Barbados, Belize, Dominica, Granada, Guyana, Haiti, Jamaica, Montserrat, St. Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, Surinam and Trinidad and Tobago. It also includes Anguilla, Bermuda, the British Virgin Islands, the Cayman Islands, and the Turks and Caicos Islands, as associate members.

At a national level, several countries already have climate change laws or are in full legislative process for their enactment, while others have chosen to develop sectoral legal bodies in such regard. Anyhow, the degree of progress regarding laws is even among countries. It is convenient to mention also that progresses on climate legislation matters have been driven by international agreements, for the implementation, at a national level, of the agreements made.

However, developing countries, including Latin America and Caribbean countries, have not considered that having formal climate change laws before the international meetings and conferences that seek reaching agreements to reduce emissions, for instance, would have allowed for more and better negotiation tools for legally binding agreements. In other words, countries that have a national climate change law are in better position for the international negotiation of agreements on this matter (UNEP, 2015). Table 3 presents, as a summary, the progresses on climate laws and public policies on climate change of the 33 countries in the region by 2015. It shows that most analyzed countries have a political/strategic or legal framework regarding climate change. Likewise, the effort made by some countries to have a specific law on climate change is noted.

Table 3. Climate and political public laws in countries of Latin America and the Caribbean

Country	Specific law on Climate Change	Specific draft law on Climate Change	Policy, strategy or plan specific to Climate Change
Antigua & Barbuda			
Argentina			X
Bahamas			X
Barbados			X
Belize			
Bolivia			X
Brazil	X		X
Chile			X
Colombia		X	X
Costa Rica		X	X

Cuba		X	X
Dominica			
Ecuador		X	X
El Salvador		X	X
Granada			
Guatemala	X		X
Guyana			X
Haiti			
Honduras	X		X
Jamaica			X
Mexico	X		X
Nicaragua		X	X
Panama			X
Paraguay		X	X
Perú		X	X
Dominican Republic			X
Saint Kitts & Nevis			
St. Vincent and the Grenadines			
St. Lucia			X
Surinam			X
Trinidad and Tobago			X
Uruguay			X
Venezuela		X	

Source: PNUMA, 2015 and FAO, online.

Strategies for adaptation and mitigation to climate change in the agriculture sector have a series of specific objectives, among which, the following can be mentioned: (i) to improve efficiency in the use of resources in agro-productive systems, through reducing the use of water, energy and agrochemicals, which implies reducing the carbon footprint in the sector; (ii) to have more diverse systems, that use local supplies and consider natural strategies for the management of disease and pest control; (iii) to make a sustainable use of the land resource, to prevent exceeding its productive potential and thus avoid desertification or erosion processes; (iv) to have crops that can tolerate extreme climate conditions, which means having biological resources that are able to continue being productive under conditions of water or thermal stress; (v) to strengthen the capacity of family farmers, who are those with a higher degree of vulnerability as they do not have resources to implement adaptation or mitigation measures; (vi) to promote the change of technology and productive techniques towards those with lower emissions; (vii) to promote productivity, so as to involve lower emission levels per product unit; (viii) to include risk management tools, such as agricultural insurance; and (ix) to promote the implementation of environmental services payment for the conservation of ecosystems.

In general terms, Governments have expressed their concern for climate change, among others, due to how it affects the poorest and most vulnerable, which results in an increase in their food and nutrition insecurity, and the impact on their livelihoods. As such, they promote approaching climate change focused on the reduction of poverty, the increase of food security and nutrition, disaster risk management and the sustainable use of natural resources. This way, countries are making progress towards the development of public policies, strategies and actions plans that: (i) strengthen actions of equitable and inclusive social-economic development,

focused on reducing poverty (the most efficient in adaptation to climate change and building resilience); (ii) on the transit of traditional agriculture towards a sustainable agriculture in response to the Climate Agreement, but also the Sustainable Development Goals; (iii) on the relief of the burden imposed by the effects of climate change on the poorest and smallest farmers, through, for instance, the promotion of focused investments, of social protection programs and specialized agricultural insurance; and (iv) on the allocation of more investment resources and in a more balanced way, for adaptation actions (by the smaller) and mitigation actions (by the bigger) in regard to climate change.

Some initiatives that have been developed by the countries and that have effects on climate change adaptation and mitigation, are presented hereunder as an example.

Environmental Services Payment System (Costa Rica)

A highlighted initiative is the Environmental Services Payment Program implemented by Costa Rica. This initiative seeks to reduce greenhouse gas emissions from deforestation and increase carbon sinks, while improving the income of rural population. The program consists on the distribution of an economic incentive to owners of forests and plantations for the ecosystemic services they provide to society and which have direct incidence on the protection and improvement of the environment.

The Program has legal support, as Forestry Law N° 7575, of 1996, acknowledges the importance of the environmental services that forests provide, as a good/service with value. The legally acknowledged environ-

16. <http://www.fonafifo.go.cr/psa/>

mental services are: (i) mitigation of greenhouse gas emissions (setting, reduction, sequestration, storage and absorption); (ii) protection of water for urban, rural or hydroelectric use; (iii) protection of biodiversity for its conservation and sustainable, scientific and pharmaceutical, research and genetic improvement use, as well as for the protection of ecosystems and life forms; and (iv) natural landscape beauty for scientific and tourism purposes.

The Program funding, at the beginning, came from a tax on fuels, one third of which was dedicated for payment purposes. Later, in a tax reform, the sole tax on fuels was created, 3.5% of which is destined to fund this Program, so as to guarantee its economic sustainability. Likewise, the Forestry Law allows other complementary funding sources, such as contributions from the State budget, donations or loans from national or international institutions, contributions from the World Bank, the Global Environmental Facility and from developed countries, such as KfW from Germany, among others.

The Program has allowed achieving positive impacts on the reduction of deforestation rates, recovering forest cover and degraded lands, reducing illegal logging, promoting non-traditional exports, contributing to rural development, reducing poverty and contributing to the global environmental goals. According to the Annual Management Report of 2014 of the National Forest Financing Fund, during that year, approximately 276,814 hectares were subject to the Program, which implied a budget execution of approximately US\$ 22 million. However, available resources have not been enough to meet the demand, so efforts have doubled to get more funding with private companies.

The Program, as an instrument to improve the life quality of forest owners, has been a tool to contribute to the well-being of families, because it generates additional

incomes they did not receive before and because the environmental services resulting from the conservation of forests benefit not just the communities, but the land owners as well (Ortiz, 2004). In a poll carried out on 100 beneficiaries of the Program, 81% of them said their life quality improved, and 79% of them would renew the agreement with the Program at the end of its validity. Respondents said, regarding the payment, that the better life quality is not due exclusively to the economic revenues they receive from the Program, but to the emotional satisfaction of preserving the forests.

This example shows that a well-designed public policy, where environmental, social and economic incentives are correctly placed, can generate a highly positive impact on family farmers, because it allows them to increase their income level and diversify their production (considering environmental services as commercial goods), reducing rural poverty. The program was supported at an early state on a new environmental concept, also linked to the areas of climate, and the food security and nutrition of the population. At the same time, the program has managed to promote environmental sustainability at a local and national level, and to contribute to the reduction of pressure for deforestation or change of land use of forests, improving the conservation of ecosystems and fomenting the achievement of environmental goods and services that benefit both local communities and society as a whole.

Socio Bosque Program (Ecuador)

The Ecuador Socio Bosque Program, created in 2008, seeks to preserve forests and paramos in the country, through granting economic incentives to indigenous communities and farmers that commit to the protection of native forests. As the Environmental Services Payment Program of Costa Rica, the Socio Bosque Program

promotes the reduction of greenhouse gas emissions and increases carbon sinks. In an improved version of this Program, the “Socio Bosque” National Program of Incentives to the Conservation and Sustainable Use of the Natural Heritage was established, with the main purpose of integrating the incentive initiatives into a single national program, seeking an integral intervention in the territory and promoting an improvement in the life conditions of inhabitants, through the incentive to forestation with native species in degraded ecosystems, the conservation of native ecosystems and the promotion of sustainable production and trade of non-wood forest products.

Since year 2008, the Program has established approximately 2,800 agreements for a 20-years’ term, with indigenous communities and farmers (as individuals or legal entities), with which 1.5 million hectares are preserved, benefiting 187,000 people.

According to the Financial Sustainability Strategy of the Socio Bosque Program of 2015, the necessary budget to maintain the areas that are currently registered in the Program amounts to US\$ 12.5 million, US\$ 10.6 million of which correspond directly to conservation incentives (85%). The funding source is mixed, as part comes from state contributions, close to 45%, while 55% comes from international cooperation (mainly KfW - German Development Bank, GIZ - German International Cooperation, International Conservation and the Inter-American Development Bank).

This way, the Program has shown to be successful in terms of the surface protected and the simplicity of applicability for the conservation of ecosystems, because it manages to combine effectively the social, environmental and economic incentives. As the Environmental Services Payment Program of Costa Rica, the Socio Bosque Program is a source of income for low resource farmers given the annual payments for the maintainan-

ce and conservation of forests, which allows diversifying and increasing the level of the family income. Additionally, it represents a mechanism to increase resilience among families that are members of the program and the community as a whole.

Subsidy Program for Rural Insurance Premium (Brazil)

A third example of public policy to note is the “Subsidy Program for Rural Insurance Premium (PSR)”, implemented since 2004 in Brazil. This Program has the purpose of providing support to rural producers wishing to protect their crops from climate risks, through an economic subsidy granted by the Federal Government to co-finance the payment of insurance premium for agricultural producers, and thus extend coverage of private insurance. This is a risk management and adaptation measure, seeking to reduce the vulnerability of agriculture, as it provides economic support to farmers in case of a climate event affecting crop yield. The percentage of the subsidy paid by the federal government ranges from 40% to 60%, according to the priorities of the agricultural policy established by the Ministry of Agriculture, Livestock and Supply (MAPA, for its acronym in Portuguese). Subsectors supported by this Program are agriculture, livestock, forestry and aquaculture.

A coverage assessment comparing years 2005 and 2010, shows an increase of the insured area from 68,148 to 4,787,641 hectares. In terms of producers served, the figure went from 849 to 38,211 (Medeiros, 2013).

These three examples of public policy show that, combining correctly social, environmental and economic incentives, efficient mechanisms can be developed for the implementation of climate change adaptation and mitigation measures in the agriculture sector. The above

becomes more relevant with the expected effects of climate change, which will set conditions of greater pressure on the sustainability of agro-productive systems and that, unless treated with adequate public policies, will affect the most vulnerable populations. Likewise, they contribute for agriculture to continue performing the main role in countries in the region, as driver of rural social-economic development, that allows reducing poverty and progressing towards achieving full food security and nutrition in the region.

3. Recommendations

Public policies on climate change consider two types of measures: adaptation and mitigation. Adaptation measures correspond to those that reduce the vulnerability of natural and anthropogenic systems upon the actual or expected effects of climate change. That is, adaptation approaches the impacts of climate change. Mitigation measures are those that allow limiting and reducing climate change itself, through the reduction of greenhouse gas emissions, and the improvement of sinks to increase the capacity for the absorption of such gases. That is, mitigation approaches the causes of climate change. Adaptation and mitigation measures are compiled in the Intended Nationally Determined Contributions (INDCs) presented at COP21 (2015), which contain the voluntary goals and commitments on climate action to be adopted starting from year 2020 by each country, once the Kyoto Protocol validity ends. They establish the ways and means that countries will use to face climate change effects, considering mitigation and adaptation measures, to achieve the emission reduction goals each country has. The Inter-American Institute for Cooperation on Agriculture (IICA, 2016) examines the way in which the agriculture and livestock sector was considered in INDCs of 17 Latin American countries, and concludes that all countries included mitigation goals directly or indirectly related to agriculture, and that

the measures approached in INDCs mainly focused on adaptation.

The Paris Agreement (2015) establishes the need for “enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal”. Within this framework, agriculture has been gaining a more relevant role in international climate negotiations, as it plays a role of utmost importance in rural development, employment generation, poverty reduction, environmental sustainability and food security of countries, particularly developing ones. However, agriculture is highly vulnerable to climate change effects, as it depends greatly on uncontrollable climate variables, as previously mentioned. Even so, it has potential to achieve the integration of adaptation measures to reduce climate risk, as well as mitigation measures, to allow reducing the greenhouse gas emission level (IICA, 2016), even becoming a carbon sink.

A series of recommendations are presented hereunder to face climate change, while at the same time preserving food security and nutrition:

- **Political commitment**

It is important to emphasize the need to move political commitment to face the challenges that climate change already poses to the development of countries. Without political commitment, it will be difficult, if not impossible, to develop the recommendations mentioned hereunder. It is necessary to define “adapting and fighting climate change” as a national priority. This commitment must go beyond declarations. In this sense, it is also necessary to continue working on the development of evidence, social awareness on the matter for the understanding

of its immediate and long-term consequences, and the organization of multi-sectoral discussion spaces, both at a technical and at a political level, among other actions.

- **Intersectoralism**

To achieve food security and nutrition and to face the impacts of climate change, a multi-sectoral approach is needed, comprising, in an integral manner, public sectors of health, agriculture, economy, environment, social development, industry, energy and finances, among others, as well as the private sectors, non-governmental organizations (NGOs), academia and civil society.

Additionally, it is important to adequately combine roles and competencies of the executive, legislative and judiciary powers of countries. Facing climate change is not an exclusive task of the Government at the Executive level, because the concurrent action will be required, for instance, at Legislative level, for the allocation of the necessary resources and the approval of foment laws for adaptation and mitigation or, if applicable, to promote adjustments in agro-productive activities that are highly emission-intensive or generate great environmental liabilities.

It is also necessary to consider that commitments countries make in an international context regarding climate, cannot be achieved without the implementation of specific programs at national level with local impact, for which the simultaneous action of the different decentralized government levels is also important.

- **Regulatory bodies**

Countries must make progress in the formalization of the pertinent environmental regulatory bodies, to have the necessary environmental jurisprudence to imple-

ment public policy measures for environmental care and climate change adaptation and mitigation. This will also allow having a greater negotiation capacity in international meetings seeking to reach binding agreements in this regard.

In that area, it is important to encourage specific laws on climate change to adequately consider aspects regarding food security and nutrition. As previously mentioned, climate change will impact directly the stability, availability, access and nutritional use of foods and, therefore, it must be a legislative matter.

Likewise, in the legislative area, it is important to consider that the promotion of sustainable agriculture is, at the same time, an action of adaptation and mitigation to climate change and, therefore, it is important to discuss it and deal with it.

- **Members of Parliament**

Due to the above, as indicated and emphasized, it is fundamental to position parliament members as strategic partners to fight the causes and effects of climate change, because the legislative can make an important contribution in the adjustment of national regulations to the international standards on this matter, as well as in establishing institutional frameworks and national budgets for this purpose.

The role of parliament members will be that of promoting, socializing and enforcing laws, as well as generating a dialogue of policies regarding climate change and food security and nutrition, within the framework of our sustainable development goals.

It should be noted that, over the last few years, the Latin America and Caribbean Parliamentary Front Against Hunger (FPH) has become an important ally in the region to work on these topics, and currently it has been

consolidated as an extensive network of parliament members from different political parties and legislative commissions, constituted in each parliamentary space in a permanent manner and seeking to put the struggle against hunger and malnutrition at the top level of public agendas as a national and regional level. The following are among the priority subjects for the work of FPHs in the region, linked to climate change and food security and nutrition, validated by parliament members in different regional spaces: (i) Adaptation and mitigation of climate change; (ii) Governance for the sustainable use of natural resources; and (iii) Strengthening of the resilience of livelihoods.

- **Human and institutional capacities**

Some countries have decided to create a specific institution to deal with the change, independent or linked to existing organizations, for instance, of the responsibilities for the national environmental management. Although both adaptation and mitigation actions must be developed under the coordination of the existing instantiation in the different sectors, it is important to have a specific strengthened agency, at the highest possible level, to coordinate the setting of goals, consolidate action plans based on multi-sectoral management, drive the sufficient budgetary allocation, assess outcomes and goals achieved, and support the national administration of the matter and the positioning of the country in the international political dialogue. The consolidation of this instantiation with appropriate resources is one of the necessary expressions of political decision to move ahead in the development of actions to face climate change.

The above must go hand in hand with the facilitation of processes to generate human skills, both in the public and private sector. Additionally, the structure of formal

education should be reviewed, to include the subject of climate change and food security and nutrition in the curricula of school and higher education. This skill generation process should be also accompanied by a dissemination process of the matter, raising awareness in civil society in general, and particularly, regarding the actions that might be developed by the population within a national context, to promote the adaptation of livelihoods, and mitigation of climate change.

- **Adaptation and mitigation**

Adaptation measures shall be efficient regarding climate change as long as it does not reach drastic levels, which have been defined within a global context as no more than a 2°C increase in global average temperature. If the appropriate mitigation measures agreed have not been taken, starting from this level, the efficiency of adaptation measures will be drastically reduced, particularly upon a high and unpredictable climate variability. This way, adaptation and mitigation actions must be implemented simultaneously.

Therefore, it is necessary for public policies to approach both climate change adaptation and mitigation. It is about reducing vulnerability promoting sustainable development, as well as limiting and reducing greenhouse gas emissions and improving their sinks.

- **Cooperation among countries**

Although a successful policy in one country might not be successful in another one, horizontal cooperation has shown us that countries can benefit from the exchange of resources, technology and knowledge. This way, countries can take as reference some public policies, which have been implemented in the region, and

improve them if applicable, for their implementation in their own territories.

As previously mentioned, state programs such as the payment for environmental services implemented by Costa Rica and, later, by Ecuador, have achieved the protection of a significant surface of forests and their ecosystems, contributing to the mitigation of climate change, as well as implying an increase and diversification in the income of rural families, aiding their adaptation. Likewise, the Brazilian Subsidy Program for Rural Insurance Premium has allowed managing the risk faced by the sector due to extreme climate events. This type of initiatives is inspiring and their development in other countries can become object of horizontal cooperation.

- **Investments**

The information available indicates that the main sources of economic resources to face the challenges of climate change, are resources from the State itself, through the national budget for the implementation of development programs, the action of national development banks that manage public funds and the international financial cooperation, mainly the regional one, through loans that are finally established as national resources.

This investment of the State must be adequately planned and balanced among adaptation and mitigation actions. Although State investment on mitigation is important, in developing countries the preparation and execution of investment plans that seek the strengthening of the adaptation of agriculture to climate change become even more important, particularly among family farmers, who are the most vulnerable.

- **Agroclimate information**

Having more timely and accurate agroclimate information, allows being prepared to face possible risks or disturbances that climate change might cause. This will also allow making regular assessments of risks and vulnerabilities to be able to implement preventive approaches. Compiled information must be available to be used both by decision-makers, as for farmers that need to plan their production. In both cases, it is necessary to improve the capacities to make an effective use of information in the decision-making process.

The timely availability of this information is essential for the operation of early warning systems and for the management of climate risk reduction.

- **Production Diversification**

By diversifying production, the resilience of agricultural systems increases and the sustainability of the ecosystem improves. This production diversification and the increase in the resilience of livelihoods, are possible through the access of agricultural producers, and mostly family farmers, to economic, financial, natural, human, technological, and genetic resources, among others. This way, national strategies for adaptation and mitigation of climate change, to strengthen food security and nutrition, shall have to promote extensive access to the mentioned resources.

- **Land use planning**

Land use planning is a fundamental tool to promote the sustainable use of natural resources, in addition to reducing the risks linked to an inadequate decision regarding the selection of sites for the development of agro-productive activities, which are not compatible with the

local physical, chemical or environmental conditions. Within this context, agro-ecological zoning, for instance, in addition to allowing the better planning of agro-productive activities, can be the base for the development of foment programs or for “discouraging” certain non-compatible activities. This way, land use planning must be accompanied by programs and strategies to allow their effective implementation with the participation and agreement of agriculture and livestock producers. Such programs shall have to be developed within a context that allows or facilitates adaptation to climate change among farmers.

- **Emergency funds**

As a result of the constant threats and the instability posed by climate change to food security and nutrition, it is necessary for countries to have funds to face situations affecting the normal food supply, in situations of social-environmental disasters such as droughts, floods, pests and diseases, interruptions in the food supply, etc. These should be funds that allow guaranteeing stability for food access and availability to the general population, but with emphasis on the most vulnerable.

Likewise, a relevant action is the strengthening of the national programs of food strategic reserves and of national systems of food supply, to act also in cases of national disasters, and in coordination, in regional situations affecting other countries or several countries at the same time, promoting an international collaboration effort for humanitarian aid.

- **Differential public actions**

The design of public policies for productive foment, adaptation and mitigation of climate change, must ac-

knowledge the heterogeneity of the effects observed in the territories and the heterogeneity of actors. This means that a specific public policy could be adequate for a zone in the country, but not for another one, due to the different social-economic context of inhabitants, environment and climate differences, etc. Likewise, a public policy for big and medium-sized producers, might not be effective for small family farmers, due to the scale of production, the investment needs, and the knowledge and technological levels involved, among others. This way, it is necessary to consider that public policies, to face climate change, while promoting food security and nutrition and fomenting sustainable agriculture, require different approaches according to territories and actors.

Within this area, it is important to consider the existence of a lag in the adaptation of the family farming sector itself, which represents a very vulnerable segment and that, in most cases, does not have the financial or technical tools to internalize modifications in its productive systems to allow it to adapt at the speed required by climate change.

- **Food loss and waste**

Loss levels in food production and post-harvest and the waste levels in value chains and those related to the unsustainable consumption of them, are too high. It has been estimated that, with the volume of food lost and wasted, the whole population currently suffering hunger and undernutrition in the world could be fed.

In regard to climate change, it is necessary to consider that food loss and waste also constitute a waste of productive supplies and useless greenhouse gas emissions, which contribute to climate change.

This way, governments must promote responsible food production and consumption, which will contribute significantly to the food security and nutrition of the population, while cooperating with climate change mitigation at the same time.

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