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CLIMATE CHANGE AND ITS IMPACT IN AGRICULTURAL, FORESTRY AND FISHERIES PRODUCTION IN LATIN AMERICA AND THE CARIBBEAN

1. The Food and Agriculture Organization of the United Nations (FAO) is a leader in international efforts to eradicate hunger and malnutrition. Its principal mandate is to improve levels of nutrition, to foster agricultural productivity and to contribute to improving standards of living among rural populations. FAO construes agriculture to include the forestry sector, as well as fisheries, aquaculture and livestock raising.

2. Under its mandate, FAO provides technical assistance to member countries in the region, and particularly to the most vulnerable ones, to enhance their capacity to mitigate the negative effects of climate change and climate variability on agriculture and food security, while maintaining sustainable management of natural resources – this in a context of increasing population and rising demand for food and other agricultural products. FAO uses its multi-disciplinary experience in agriculture, forestry, fisheries, aquaculture and livestock raising to foster an integral approach to climate change adaptation and mitigation.

CLIMATE CHANGE AND FOOD SECURITY

3. Over the last 50 years, the world population, which now numbers 6.5 billion, has increased more rapidly than ever before. In 2050, agricultural capacity will be called on to meet the food demands of some 9.2 billion people, while ensuring income, jobs and essential ecosystem services and, at the same time, responding to the challenges of climate change at the global and regional levels.

4. Agriculture is both a victim of climate change and a contributor to it. Agriculture, forestry and other types of land use generate significant greenhouse gas emissions.

5. Some studies emphasize the importance of the institutional context as a factor mitigating or aggravating the effects of climate change (see figure 1). In developing countries, according to research conducted from this perspective, the socioeconomic conditions under which climate change must be dealt with – along with dependence on imported food – figure more prominently in food security than do the biophysical changes themselves. Thus, the most important public policy issue will be that of addressing poverty (ECLAC, 2009).

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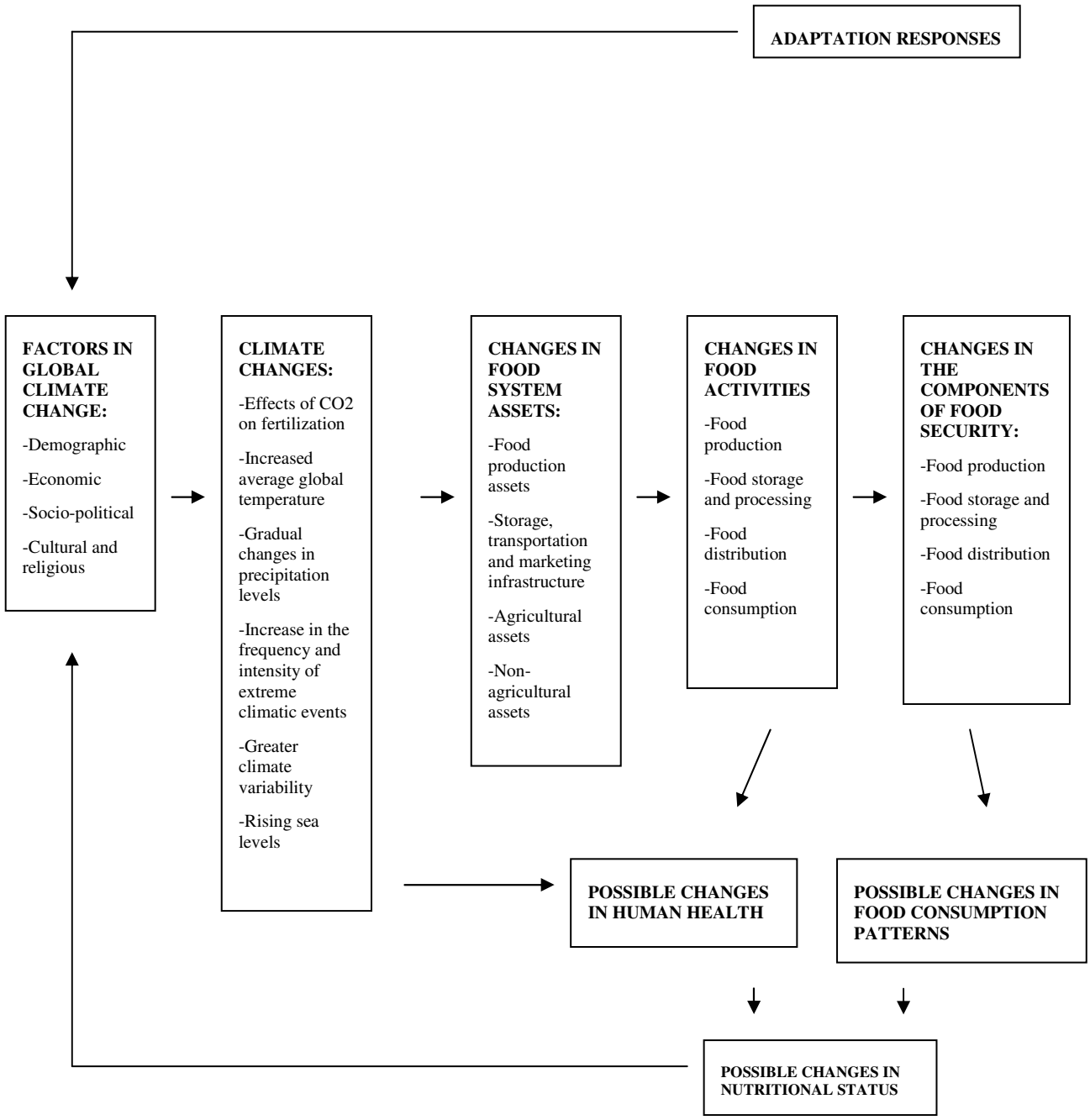
FIGURE 1. CLIMATE CHANGE AND FOOD SECURITY



Source: FAO 2007

6. Agriculture occupies a special place in most of the countries of Latin America and the Caribbean (LAC) because of its contribution to GDP, jobs, exports and overall economic strength. Furthermore, it continues to play an essential role in food production for domestic consumption and in food security, particularly in the lowest-income countries. For these reasons, and due to the fact that farming is dependent on climate, agriculture is one of the sectors most vulnerable to the effects of climate change.

7. Observations in LAC – a region of great agro-ecological diversity, and recognized as such in the fourth report of the Intergovernmental Panel on Climate Change (IPCC) – suggest that in temperate zones (southeastern South America, for example), yield will increase for certain crops, most notably soy and wheat, and to a lesser degree, maize. As a result of increased thermal stress and drier soils, productivity in tropical and subtropical regions, where temperatures are currently close to the maximum that crops can tolerate, is expected to drop to one third of present levels. It is also possible that in arid zones (central and northern Chile, the Peruvian coast, northeastern Brazil), the salinization and desertification of agricultural land will increase (see table 1). Thus, it is essential that proposals and strategies to adapt to climate change take account of the specifics of the highly diverse agroecosystems in the Latin American and Caribbean subregions.

TABLE 1: Some important effects of climate change on agriculture, forestry and ecosystems, according to their origin and probability of occurrence.

Climate changes	Probability	Effects
Hotter days, warmer nights, and more frequent hot days and nights in most terrestrial areas.	Nearly certain	Increased yield in colder environments, reduced yield in hotter climates, and increased problems with insect pests.
More frequent hot periods and heat waves in most terrestrial areas.	Very probable	Reduced yield in hotter regions as a result of thermal stress and a greater number of uncontrollable fires.
More frequent intense precipitation in most terrestrial areas.	Very probable	Damage to crops, soil erosion, and water-saturation of soils that makes cultivation impossible.
Increase in the number of areas affected by drought.	Probable	Land degradation, lower yields, crop damage, inability to grow certain crops, greater livestock mortality and risk of uncontrollable fire.
Increased intense tropical cyclone activity.	Probable	Crop damage, trees uprooted by the wind, damage to coral reefs.
Increased incidence of extremely high sea levels (apart from tsunamis).	Probable	Salinization of irrigation water, estuaries and freshwater systems.

Source: Adapted from Intergovernmental Panel on Climate Change (IPCC), 2007

Agriculture has the potential to take early action, which is crucial in attempting to mitigate the effects of climate change

8. Agriculture is a major source of greenhouse gas emissions and accounts for 14% of such emissions globally. Of this 14%, developing countries account for 74%. If changes in land use associated with agriculture, including deforestation (of which agriculture is a major cause), are added to the equation, this latter percentage rises considerably. Between 1990 and 2005, agricultural greenhouse gas emissions in developing countries increased by 32%, and they are expected to continue rising. Reducing and eliminating agricultural emissions, while ensuring food security and fostering economic growth, should be part of an urgent global attempt to meet the

last of the objectives (set forth in Article 2) of the United Nations Framework Convention on Climate Change (UNFCCC). There is a high potential for mitigation in the agricultural sector, and 74% of this potential lies in the developing countries. The IPCC and world financial indicators underscore that the magnitude of the challenge of stabilizing greenhouse gas concentrations will necessitate reducing emissions from agriculture, forestry and other land use (AFOLU) to whatever extent is sustainably possible, until new technologies become economically viable. Action is feasible; inaction is not an option.

Agriculture contributes to nationally appropriate mitigation action (NAMA) in developing countries.

9. Nationally appropriate mitigation action (NAMA) is an important starting point for developing countries to assist in mitigation efforts. In many developing countries, agriculture is highly climate-sensitive, as well as being the most important sector of the economy. Moreover, this sector has considerable technical and economic potential for mitigating emissions. In many cases, agricultural mitigation practices also benefit agricultural productivity and resistance, and thus contribute to food security, sustainable development and climate change adaptation. For these reasons, mitigation in the agricultural sector in developing countries is important in creating NAMA. Including agriculture in NAMA can also help to counterbalance the current exclusion of most forms of agricultural mitigation from the Kyoto Protocol's Clean Development Mechanism.

10. At the same time, the context in which NAMA occurs offers opportunities to explore innovative funding mechanisms based on more flexible approaches, multiple funding flows and projects that provide innovative payments/incentives to rural producers, including small landowners. Some forms of agricultural mitigation that involve high up-front investments, transaction costs or risks may not appear financially attractive to international carbon compliance markets, but public financing could be justified on the grounds that such activities significantly increase production, while reducing vulnerability to climate change.

11. In addition, the variations in countries' capacities and circumstances suggest that it could be necessary to adopt staged approaches, in order to ease the transition to a type of sustainable development that includes low emissions. An initial phase could focus on building confidence, capacities and national strategies, with public funding for technical assistance and capacity-building – possibly in the form of a trust composed of multiple donors, using profits from payments generated through auctions. Over time, the reductions in emissions generated by pilot projects could be purchased. These reductions, rather than being used to meet the requirements, would instead be used to gain experience and demonstrate to farmers that environmental services can be economically offset. An intermediate phase could involve implementing strategies, expanding projects and, when appropriate for the country, using sectoral mitigation approaches based on public funding and simple methodologies. Countries that either possess or develop the necessary capacities and knowledge could transition to accelerated reductions in emissions through the use of market incentives and monitoring methodologies, while developing stronger reporting and verification capacities and establishing mechanisms to ensure social and environmental integrity. This, in turn, could pave the way for using the carbon purchasing mechanism in the NAMA framework to reduce/eliminate emissions, taking full advantage of private-sector investment and innovation capacity, while fostering the development of future schemes for maximizing carbon-fixing, and at the same time opening up opportunities for the developing countries to trade national emissions rights, in ways suitable to the particular country involved.

Adjusting to national circumstances and capacities

12. For the agricultural sector, NAMA will vary from country to country, and must be compatible with national circumstances and capacities. For example, mitigation measures with high concomitant benefits for food security, poverty reduction and strengthening of agricultural production systems will be important in areas where agricultural productivity has stagnated, particularly in cases where a large proportion of the population or of the economy depends on

agriculture. Agriculture is under pressure to raise production levels in order to satisfy the increasing food demand associated with a growing population. This creates pressure to convert land to agricultural uses, and leads to land degradation, resulting in higher emissions. Such consequences could be avoided by adopting sustainable agricultural and land use practices that reduce or eliminate emissions. However, in order for farmers to make the transition, there needs to be substantial public investment in capacities, institutional development, agricultural extension services and financing.

13. Appropriate action in the agricultural sector could also play an important role in reducing agricultural emissions and environmental pollution in the more advanced production systems through intensive use of capital, while facilitating adaptation to climate change. In many cases, agricultural and environmental policy instruments to promote more sustainable production and mitigation are already in place. However, technology and monitoring systems, reporting and verification processes, and institutional capacity to manage multiple objectives and complex programmes are often lacking.

14. Policies for mitigation in industrialized agricultural production could contribute to producing a more consistent and global system of greenhouse gas emissions accounting, while at the same time enhancing horizontal enforcement of environmental policy.

Requirements for monitoring, reporting and verification (MRV) – an element of the staged approach

15. Efforts to develop monitoring, reporting and verification (MRV) for the agricultural sector must take account of objective, cost and specific country capacities. As mentioned above, countries will require different transition periods to adopt accurate MRV systems for monitoring emissions reductions/elimination. Financial assistance, capacity-building and technology transfer are necessary if the developing countries are to institute MRV systems for mitigation in the agricultural sector. The goal is to gain greater precision and achieve mitigation targets through market-based approaches. The low level of adoption, and the relatively disappointing experiences with accounting methodologies in the area of land use, land-use change and forestry (LULUCF), underscore the fact that a staged approach with agreed increases in accuracy thresholds could be the most appropriate way to facilitate learning through experience and to encourage the early mitigation actions that are so urgently needed.

Synergies between adaptation, official development assistance (ODA) and mitigation funding

16. Most of the countries will have to face the challenges of mitigation and adaptation. It is important to place high priority on mitigation measures that also have strong benefits for adaptation – for example, most mitigation actions associated with agricultural land. Lower priority should be given to adaptation activities that do not have benefits in terms of mitigation, or that actually increase emissions. Funding preferences should favour beneficial types of activities, though a supplement based on the value of the "adaptation good" could be taken into consideration. Monitoring, reporting and verification systems to quantify the value of the "adaptation good", using mutually agreed accounting units, would have to be developed. Ideally, mitigation and adaptation activities, in combination, will substantially reduce transaction costs.

ADAPTING TO CLIMATE CHANGE

17. Adapting to climate change means managing risk by monitoring the quality of information and how it is used, providing guarantees against the risks of climate change, adopting proven best practices to strengthen vulnerable systems of livelihood, and designing new technological and institutional solutions.

18. Many small-scale farmers in the tropics produce on marginal land, which is more vulnerable to effects of climate change such as more frequent and intense droughts. These farmers

cannot withstand a reduction of income from their modest farms, and are poorly equipped to adapt to changing conditions. Climate change will affect the land's capacity to grow different crops and to support livestock, fish and pasture. It will also impact the health and productivity of forests, the incidence of pests and disease, and will affect biodiversity and ecosystems. Some farms will be ruined by increased aridity, depletion of ground water, salinization and rising sea levels.

19. Historically, farmers, livestock raisers, forest inhabitants and fish farmers have learned to deal with variations of climate, often adapting their crops and practices to meet new conditions. However, the gravity and pace of climate change today present new challenges. Changes of temperature and precipitation, as well as more frequent extreme weather conditions, are expected to reduce agricultural production and lead to the loss of other goods, jeopardizing not only food production but also access to food resources as well as their stability and use. In some areas, the changes may exceed the population's ability to adapt.

20. Many adaptation efforts will be based on strengthening current measures – for example, ecological and sustainable agricultural practices, early warning systems, systems to identify critical climate change situations and disaster risk management. Others will focus on rural investment to reduce the long-term effects of short-term variations in climate, through agricultural insurance and incentives for farmers to adopt better practices and make better use of agricultural land.

21. Agriculture is not only a victim of climate change, but is also a source of greenhouse gases. The production of crops and livestock releases greenhouse gases into the atmosphere, and this is a major contributor to methane gas emissions (from livestock and wetlands, particularly rice fields) and to nitrous oxide emissions (from fertilizers). Changes in land use, including such phenomena as deforestation and soil degradation – two devastating effects of unsustainable agricultural practices – cause the release of vast quantities of carbon into the atmosphere, contributing to global warming.

22. The use of biofuels as a means of decreasing carbon emissions and reducing dependence on fossil fuels has decisive consequences for food security, as well as for current and future land use.

Land and land tenure

23. Climate change threatens to destroy many rural communities. For example, rising sea levels could force many communities in low coastal and delta areas to move to higher terrain. Moreover, droughts brought on by climate change could, with increasing frequency, cause farmers and herders, dependent on rain to grow crops or feed livestock, into conflicts over land and water.

24. The displacement of populations will probably lead to competition over land access between migrating and existing communities. Efforts to reconcile different land use needs pose an enormous challenge for government at all levels. In cases where land rights are not formalized, and different traditional systems of landholding exist side by side, governments must work closely with local communities to establish fair and equitable land tenure systems, and to develop effective conflict resolution mechanisms. Many displaced communities may find themselves unable to sustain their traditional agricultural or pastoral livelihoods. Land-tenure policies to facilitate resettlement must incorporate a broader programme that offers opportunities for displaced persons to make a living outside of the agricultural sector.

Water resources

25. As a result of climate change, farmers will face increasingly unpredictable conditions and more variable water supplies, with more frequent droughts and floods. However, these effects will vary dramatically from one place to another. Scientists predict that an increase of 1 to 3 degrees Celsius will benefit agriculture in northern latitudes, while most of the countries subject to food insecurity throughout much of the arid and semi-arid tropics will face diminishing precipitation and run-off.

Land use management and natural resource planning in watersheds to mitigate the effects of climate change

The watershed is the logical basis for natural resource planning and management, which must seek to make productive systems sustainable and thus contribute to food and nutritional security. It is in this area that the use and management of natural resources (human activity) interacts most strongly with the ways in which these resources themselves respond (environmental reactions).

Using the watershed as the basis for planning, in order to introduce changes in production systems – with a corresponding effort to reconcile and integrate production with the protection of natural resources – is a technical and strategic option dictated by the nature of the interaction between these elements.

Any significant action regarding land use and land management within a watershed will generally have measurable effects in the short or medium term, whether positive or negative, with regard to soil recovery/deterioration, biomass balance and plant cover, water quantity and quality, fauna and other variables that are important for the sustainability of productive systems.

Source: FAO, 2002.

26. The sector most affected will be rainfed agriculture, which constitutes 96% of all cultivated land, and 87% of such land in South America. In marginal semi-arid zones with long dry seasons, there will be an increased risk of losing crops. Where stable production cannot be ensured, populations will be forced to migrate.

27. However, irrigated operations in the large river basins and deltas are also exposed to risks from a combination of factors: reduced run-off, salinization, increased flooding, rising sea levels and urban and industrial pollution. In some major productive agricultural areas, these stresses will cause a reduction in production, biodiversity and the natural capacity of ecosystems to recover. As the food supply is progressively limited, there may be detrimental effects on millions of farmers and consumers throughout the world.

28. In areas where reduced precipitation is expected, water storage, management and productivity will need to be improved. Large irrigation systems will have to adapt to changes in water supply systems, and there will have to be increased support for measures to control water use in small-scale local operations.

Water is the key

It will be essential to intensify agricultural production by improving water management, in order to ensure the world food supply and achieve food security. Increased water shortages and more intense precipitation as a result of climate change will be common features of changes in the overall model of water availability. These shifts will pose a grave threat to stable agricultural production, especially in areas that are continually irrigated. A secondary threat is the loss of productive land due to the dryness of the soil (and the associated salinity), depletion of ground water and rising sea levels.

Projections for 2030 indicate that irrigated areas will be increasingly pressed to raise their productivity per unit of water, both to soften the impact on production in the more volatile rainfed areas and to respond to the declining availability of water. Managing this risk to production from increasing aridity and greater variations in precipitation will require irrigation and rainfed systems that are more receptive and flexible in their approach. In the short term, the gradual adjustment of large-scale operations and drainage systems will be essential to ensure more intense cultivation and to close the gaps between actual and potential yields. The key adjustments for maintaining cultivated areas under irrigation include:

- Optimizing the storage and distribution of water by developing on-demand water supply systems
- Protecting irrigated areas from the damage produced by floods, and maintaining drainage systems
- Introducing more water-efficient growing practices
- Adjusting institutional capacities to ensure that existing plans function properly (water governance)

Negotiating water allocations and inflows for agriculture throughout river basins, in a way that balances the competing interests of different sectors, will be a fundamental prerequisite to improving operations and increasing productivity.

Well targeted investment in small-scale water control services, and improvements in large-scale services and the associated institutional reforms, will be profitable in the medium term.

In the long term, for areas affected by water shortages where commercial agriculture is possible and profitable, it will be necessary to transition to a more precise system of irrigation agriculture.

Source: Climate change and food security: a framework document, FAO, 2007

Forestry

29. Tropical forests account for approximately 40% of the world's forest cover, and contain roughly 60% of the world's forest biomass. Latin America's tropical forests, which provide around 22% of the world's forest coverage, strongly influence the local and regional climate, and play an important role in the world's carbon balance. They also contain a large proportion of all of the world's plant and animal species. The forests of tropical and subtropical Latin America are of great economic importance, supplying commercial products for domestic and international markets. A large number of people depend on jobs in these areas; many others – indigenous groups, in particular – subsist principally on non-wood forest products. The temperate forests of South America are important, though to a much smaller extent, for Chile's export economy, and to an even lesser degree for Argentina's.

30. Latin America's forest cover declined from 992 million hectares to 918 million hectares between 1980 and 1990, representing an annual deforestation rate of 0.8%. Deforestation between 1970 and 1990 rose from around 5.4 million hectares per year to approximately 7.4 million hectares per year (FAO, 1993). Between 1980 and 1990, deforestation reduced the tropical forest cover from 826 million hectares to 753 million hectares, representing a reduction of 0.9% (United Nations Environment Programme, UNEP, 1992). The tropical forests of the Pacific coast of Central America once covered 55 million hectares. Less than 2% of this forest still exists,

although countries such as Costa Rica have conserved and protected some of their forests in national parks or forest reserves. Similarly, only 4% of the original 100 million hectares of Brazil's Atlantic forest (which also extends, to a small extent, into Paraguay and northeastern Argentina) remains relatively untouched. In Argentina, of the 106 million hectares of forest that existed in 1914, less than a third remained by the 1980s. High rates of deforestation have also been seen in the Paraná section of Brazil, in the country's subtropical forests and in the Gran Chaco area, as well as in the southern forests of the Patagonian Andes.

31. Latin America's forests face an additional threat from climate change, as indicated in the vulnerability studies conducted by the Catholic University of São Paulo (UCSP) and in projects carried out by the Global Environment Facility (GEF). Unless adequate measures are taken, poor management of these ecosystems will generate increasingly serious climate change effects. Logging is on the rise, especially in the tropical and subtropical countries, and local communities will face serious shortages of forest products for subsistence and traditional commerce. The clearing of forests is also expected to increase in response to the growing demand for agricultural land.

32. The large-scale conversion of tropical forests into grassland is likely to produce changes in local surface climates, higher soil temperatures, fluctuations in daytime temperatures and less evapotranspiration. A considerable proportion of the precipitation in the Amazon River Basin comes from evapotranspiration, which could decline as a result of ongoing large-scale deforestation. The scale of forest clearing could increase run-off from the enormous Amazon River system, while at the same time having undesirable effects beyond the areas being cleared. According to projections, the tropical forests will be replaced by degraded grasslands, with no significant rise in surface temperatures, while evapotranspiration and precipitation will decline in the Amazon River Basin. In addition, the lengthening of the dry season will make it difficult for the forest to re-establish itself.

33. The global carbon cycle could also change. The potential of Latin America's tropical forests to act as carbon sinks has been considered at high risk, but the effect of climate change on carbon sequestration in tropical soils can be highly complex, since it depends on air temperature, CO2 concentrations, distribution of seasonal precipitation, nitrogen fixing and fires. In the Amazon, the conversion of forest to grassland over a period of 35 years has created a net source of methane and a net CO2 sink.

34. Tropical forests are probably affected more by changes in the availability of water in the soil (due to seasonal drought, soil erosion or leaching of nutrients as a result of heavy rains, etc.) – and conceivably as a result of CO2 fertilization – than by temperature changes. The leaching of nutrients, erosion and logging can also result in a reduction of biomass and biodiversity.

Messages of the Collaborative Partnership on Forests: forests and climate change

1. Sustainable forest management will provide an effective framework for mitigating the effects of climate change and adapting to it.

2. Mitigation measures should be carried out in tandem with measures to adapt to climate change, using efficient forest management for this purpose.

3. Establishing intersectoral collaboration, economic incentives and opportunities for alternative livelihoods are essential in reducing deforestation and forest degradation.

4. It is urgent and essential to strengthen capacities and implement governance reforms.

5. Forest monitoring and evaluation help decision-makers, but greater coordination at all levels is needed.

6. The members of the Collaborative Partnership on Forests are committed to implementing a mutual collaboration approach to climate change mitigation and adaptation based on integrated forest management.

Source: Collaborative Partnership on Forests, Strategic Framework for Forests and Climate Change, 2008.

Fishing and aquaculture

35. The fisheries sector provides jobs for over 200 million people worldwide, with 98% of these living in the developing countries. Fishing is the principle source of protein for many poor populations and, for more than 2.8 billion people, provides approximately 20% of animal protein. Climate change jeopardizes this important source of income and nutrition for the poor.

36. Climate change will cause rises in water temperatures and sea levels, melting of glaciers, changes in the salinity and acidity of the oceans, cyclones in some areas, less rain in others, and changes in the patterns and abundance of fish populations. However, while climate change jeopardizes the sustainability and productivity of a fundamental economic and environmental resource, it also offers opportunities, particularly in the area of aquaculture.

37. Climate change will affect populations that depend on fishing and aquaculture by increasing the costs of production and marketing, reducing purchasing power and exports, and increasing dangers from more disadvantageous atmospheric conditions. Small fishing communities in some areas will face situations of greater uncertainty due to reduced food availability, access, stability and use, lower supply of food of aquatic origin, and fewer work opportunities.

38. Aquaculture production, which currently provides 45% of marine foods consumed worldwide, will continue to increase to meet future demand. For aquaculture, climate change will offer new opportunities. Production will probably increase in the more temperate regions, as rates of growth improve, the growing season becomes longer, and new areas where the climate was previously too cold become suitable for fish farming. Thus, there will be increased opportunities for aquaculture, especially in tropical and subtropical areas.

Transboundary pests and diseases

39. Pests and diseases have historically affected food production, whether directly, through losses of food crops and animal production, or indirectly, in the form of reduced profits due to insufficient yield from commercial crops. Not surprisingly, small-scale farmers have the most to lose in this regard. These losses are now being aggravated by climate change and increased climate volatility, and are threatening food security and rural livelihoods worldwide.

40. Although there is clear evidence that climate change is altering the distribution of animal and plant pests and diseases, it is difficult to predict all of the associated effects. Changes in temperature, humidity and atmospheric gases can accelerate plant, fungal and insect growth rates and generation, changing the interactions between pests, their natural enemies and their hosts. Changes in land cover, such as deforestation and desertification, can leave remaining flora and fauna increasingly vulnerable to pests and disease. New agricultural practices must be developed, along with different crop varieties and animal breeds. New integrated management principles must be developed to deal with pests, as well. The countries should examine the desirability of introducing biological control agents or new pest- and disease-resistant crops and breeds. Governments should also place maximum priority on strengthening national animal and plant health services.

RISK MANAGEMENT

41. For thousands of years, human populations have faced disasters. Experiences must be compiled**,** analysed and systematized to enhance planning and improve local programmes to respond to disaster situations. New solutions will also be required. The usefulness of previous experience must be assessed in the context of the unprecedented and extremely rapid changes that are likely to occur as a result of climate change.

42. The population can be trained at the community level to improve prevention efforts and be better prepared to deal with risks. To this end, rural organizations will need to be strengthened such as farmer field schools. Technologies and systems must be created to monitor local

conditions and to help farmers and local authorities understand in greater detail how climate change will affect their areas. To minimize the effects of climate change on hunger, a multi-pronged approach at the national, regional and international levels will be required.

43. Closer collaboration is needed between scientists specializing in climate change, who develop projections for the future, and groups working on disaster management and food security, who focus on the present.

44. New forms of funding must be explored to address the risks of climate change and ensure food security. This includes establishing microfinancing instruments for communities and households, broadening the function of the private sector, increasing the role of foundations, and giving the rural population access to the carbon trading markets.

LINKING AGRICULTURE TO A CLIMATE CHANGE REGIME: THREE PROPOSALS

45. Following are three proposals for associating agriculture with a future regime to address climate change. The principal goal is to make use of the sector's unique potential for synergy between food security, sustainable agricultural development and adaptation to climate change, while at the same time contributing to the mitigation efforts of the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD).

Include agriculture in the national appropriate mitigation actions (NAMA) of developing countries

46. Many agricultural practices and some uses of agricultural land may be priority candidates for inclusion in NAMA, given the multiple benefits that they provide for mitigation, sustainable development, environmental services and synergies for adaptation.

47. For the benefits to be realized, farmers must adopt such practices and land uses. This requires the development of capacities, as well as financial and technology transfers, designed to address the particular characteristics of agriculture (which shares some similarities with REDD).

48. Paragraph 73(d) of the negotiating text of the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA) (FCCC/AWGLCA/2009/8) states that NAMA may include "REDD-plus activities and other mitigation actions implemented in different areas and sectors, including agriculture". While national circumstances will determine the shape of NAMA, the importance of agriculture in the economies of many developing countries – specifically the least developed countries – and in the livelihoods of 70% of the region's poor makes it a key element, in much of the developing world, in successfully addressing climate change within a context of sustainable development.

Ensure funding for mitigation and adaptation measures in agriculture

49. Two main steps are necessary in this respect:

(i) **Increase the scope of the clean development mechanism (CDM)** in such a way that the potential capture of carbon in and above the soil through agriculture (a process that represents 89% of agriculture's technical mitigation potential) can be used to full advantage. Agriculture, forestry and other land use (AFOLU) activities could include reducing emissions from deforestation and forest degradation (REDD), sustainable forest management, restoration of wetlands, sustainable development of agricultural land and grasslands, and other sustainable uses of land. For a variety of reasons, the use of temporary and long-term certified emissions reduction units (ICER and tCER) to obtain credits for land use (forestation/reforestation) has not gained market

acceptance. A totally financed unit could be created by adopting a "buffer" approach to ensure ongoing viability. The implications of different types of ceilings and incentives for the unit-based reduction of product emissions highlight the need to investigate different uses of land and areas. FAO has already begun such work in the region's livestock-raising sector.

(ii) **Establish new funding mechanisms with broader and more flexible approaches** that integrate different funding sources and projects to provide innovative payments/incentives capable of reaching producers, including small landowners. Promising possibilities in this respect include: a staged approach that uses progressive modalities to achieve greater profitability; initial payments guaranteed by insurance bonds or performance guarantees; simplified rules; and recognition of formal and traditional communal/individual property rights.

Move towards a comprehensive view of land use. Managing synergies.

50. The transition to a comprehensive approach that addresses all types of land use could facilitate better management of synergies, and of the carbon exchanges and carbon losses that come from mitigating greenhouse gas effects.

51. Under this approach, points of reference for examining soil-based carbon could include: (i) all types of carbon in the soil (soil and biomass, above and below ground) as they relate to greenhouse gases; or (ii) all types of carbon in the soil, but, insofar as possible, with separate accounting for different land use systems – in other words, for those that can be regulated under a national REDD benchmark. This should be based on the nature of the ecosystems and should include the adoption of sustainable measures to adapt to climate change, with special reference to the region's fragile ecosystems.

52. Other important issues involve the need for eventually instituting a rigorous accounting system for greenhouse gases as they relate to land use. Such a system would be needed to register losses resulting from mitigation activities associated with land use, bioenergy and trade, and to guarantee effective horizontal implementation of agricultural and environmental policy. It will also be important to define a transition period for each country, in order to provide a planning horizon, so that national agencies can build capacities and establish management systems. Research to address gaps in knowledge will also be important. Based on national circumstances, there also needs to be technology transfer and financial assistance. Incentives could be provided for those who are first to adopt these measures.

THE FAO FRAMEWORK FOR ACTION

53. With the number of hungry people in the world exceeding 1.02 billion, 70% of whom live in rural areas where the primary source of income is agriculture, forestry and fishing, FAO is attempting, in climate change discussions and activities, to address concerns related to food security.

54. FAO's mandate to "raise levels of nutrition, improve agricultural productivity, better the lives of rural populations and contribute to the growth of the world economy" guides its work on climate change. Based on its multi-disciplinary activities in agriculture, forestry, fishing, aquaculture, livestock raising, rural development economics and food security, FAO takes an integrated approach to climate change adaptation and mitigation. This includes identifying current and future challenges, and providing assistance to members, especially those that are most vulnerable, in order to improve their capacity to deal with the negative effects of climate change (and associated climate variability), and to help identify ways to maximize new opportunities. FAO places special importance on identifying opportunities and practices that have the potential to promote synergies between the objectives of adaptation and mitigation, while simultaneously advancing development objectives.

55. The work of FAO covers a wide spectrum of activities, ranging from the local to the global level, and from immediate action to long-term strategies for addressing climate change. FAO is committed to approaching ecosystems in a way that takes account of agriculture, forestry and fishing.

56. All of FAO's technical units – including its Departments of Agriculture and Consumer Protection, Economic and Social Development, Fisheries and Aquaculture, Forestry, Natural Resources Management and Environment, and Technical Cooperation, as well as FAO's Legal and Ethics Office and its and regional, subregional and national offices – are working on climate change issues. The Climate, Energy and Tenure Division, which is within the Natural Resources Management and Environment Department, is in charge of overall coordination, and facilitates integrated and cross-sectoral activities.

Basic principles guiding work on climate change at FAO include:

- Incorporating climate concerns in food security planning and development through all sectors and at all spatial and temporal scales
- Seeking a systems approach that builds on synergies between mitigation, adaptation and sustainable food production
- Working, based on demand, in ways that are locally adapted and participatory, and that take account of gender-specific needs, as well as the priorities of indigenous peoples and other vulnerable communities
- Dealing with adaptation and mitigation as an ongoing process of social learning that incorporates local and scientific knowledge
- Promoting synergies between various international conventions and agreements on climate change, desertification, biodiversity and forestry

Source: Climate Change and Food Security: A Framework Document, FAO, 2008

57. More specifically, work at FAO regarding climate change issues includes the following elements:

- Incorporating food security and the effects of climate change in rural development planning
- Developing a multidisciplinary approach
- Designing and validating methodologies based on a systems approach, with synergies that include mitigation and adaptation activities in sustainable food production
- Ensuring the integrity of ecosystems and the sustainable management of natural resources as a basis for designing mitigation and adaptation measures
- Addressing mitigation and adaptation as ongoing processes of social learning
- Combining local knowledge and scientific research in a compatible manner
- Taking account of the gender-specific needs of indigenous communities
- Ensuring active exchange of knowledge and communication
- Promoting synergies between various international conventions on climate change, desertification and biodiversity.

TOWARDS THE FUTURE: PARTNERSHIPS FOR COOPERATION, AND REGIONAL AND INTERNATIONAL AGREEMENTS

58. Efforts to mitigate climate change, and to adapt to its effects as this becomes necessary, cannot be undertaken by the region's countries in isolation. Beyond national agendas, which are indispensable, it is essential that there be regional and subregional agreements. Taking an active role in the major existing and developing global initiatives is equally important. Such initiatives include:

- Latin American and Caribbean Initiative for Sustainable Development (ILAC)
- Andean Committee of Environmental Authorities (CAAAM)
- Andean Coordination of Climate Change Offices
- Regional Convention for the Management and Conservation of Natural Forest Ecosystems and the Development of Forest Plantations
- Coordination Centre for Natural Disaster Prevention in Central America (CEPEDRENAC)
- Caribbean Community Climate Change Centre (CCCCC)
- Latin American Carbon Programme (PLAC)
- The Ibero-American Network of Climate Change Offices (RIOCC)
- Prototype Carbon Fund (PCF-WB)

59. Latin America and the Caribbean, in a way perhaps unique on the planet, faces a remarkable convergence of threats, risks, challenges and opportunities with respect to climate change. Certain actions therefore merit attention in the context of national, subregional and regional policy-making. These include:

- Strengthening the region's institutions
- Establishing mechanisms specifically designed for institutional strengthening
- Exchanging national knowledge and experience regarding climate change mitigation and adaptation

UNITED NATIONS CLIMATE CHANGE CONFERENCE IN COPENHAGEN

The Copenhagen Summit on Climate Change, held in December 2009, ultimately achieved a consensus in which 29 countries (including the United States and China) recognized the following points:

- Two-degree decline in temperature: The objective of limiting global warming to 2 degrees Celsius is "recognized". According to the Intergovernmental Panel on Climate Change (IPCC), warming of more than 2 degrees would be catastrophic both to humans and to nature.
- Greenhouse gases: By 31 January 2010, the industrialized countries are to present national greenhouse gas reduction targets for 2020. The latest draft no longer proposes a common objective for the industrialized countries. The reduction targets for emerging countries will depend on the financial and technological assistance they receive from the industrialized countries.
- Funding: The industrialized countries will provide the developing countries with a total of US$ 30 billion (approximately 21 billion euros) between 2010 and 2012 to help them deal with the effects of climate change and to help them develop in ways that are non-polluting. The wealthy States propose to provide approximately US$ 100 billion to the poorest countries by 2020.

- Oversight: The emerging and developing countries are to permit "international consultation and analysis" for their environmental protection activities, while taking into account their national priorities. Through this provision, China ensured that international inspections would not take place in the country itself.

- Deforestation: The draft states that it is vital to protect forests and to provide funds for this purpose, though it does not elaborate on this point. The source of the funds to combat deforestation, for example, remains unclear.
- Review: The agreement will be reviewed in 2015 to examine the possibility of limiting warming to 1.5 degrees Celsius. This measure was promoted most strongly by island States, which are threatened by rising sea levels.
- Binding nature: Reference to a legally binding agreement was eliminated.

Source: Adapted from http://sefrugal.wordpress.com/2009/12/21/acuerdo-minimo-en-copenhague-2009/