Climate-Smart Agriculture in Mexico
Supplementary material

Contents

This Supplementary Material is in support of the Climate-Smart Agriculture in Mexico profile within the Country Profiles for Latin America Series. The annexes below are references where relevant in the text. The Supplementary Material cannot and should not be read in isolation. It can only be read in association with the chapter.

Annex I: Acronyms

CCMSS	El Consejo Civil Mexicano para la Silvicultura Sostenible, A. C.
CIAT	International Center for Tropical Agriculture
CICC	Comisión Intersecretarial de Cambio Climático
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
COFUPRO	Coordinadora Nacional de las Fundaciones Produce, A. C.
Colpos	Colegio de Postgraduados en Ciencias Agrícolas
CONABIO	Comisión Nacional para la Biodiversidad
CONADESUCA	Comité Nacional para el Desarrollo Sustentable de la Caña y Azúcar
CONAGUA	Comisión Nacional del Agua
CONANP	Comisión Nacional de Áreas Naturales Protegidas
CONAZA	Comisión Nacional de las Zonas Aridas
ECLAC	Economic Commission of Latin America
EN-REDD+	Estrategia Nacional – Reducing Emissions from Deforestation and Forest Degradation
FAO	Food and Agriculture Organization of the United Nations
FIP	Forest Investment Program
FIRA	Fideicomisos Instituidos en Relación con la Agricultura
FIRCO	Fideicomiso de Riesgo Compartido
GCCA	Global Climate Change Alliance
GEF	Global Environment Facility
GIZ	German Society for International Cooperation
IADB	Inter-American Development Bank
IFC	International Finance Corporation
INECC	Instituto Nacional de Ecología y Cambio Climático
INIFAP	Instituto Nacional de Investigaciones Forestales Agricolas y Pecuarias
ITESM	Instituto Tecnológico y de Estudios Superiores de Monterrey
JICA	Japan International Cooperation Agency
KfW	German Development Bank
MasAgro	Modernización Sustentable de la Agricultura Tradicional
OINFA	Organismo Integrador Nacional de Fondos de Aseguramiento
SAGARPA	Secretaria de Agricultura Ganadería, Desarrollo Rural Pesca y Alimentación
SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales
SMN	Servicio Meteorológico Nacional
TNC	The Nature Conservancy
UACh	Universidad Nacional Autonoma Chapingo
UN	United Nations
UNAM	Universidad Nacional Autónoma de México
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WB	World Bank

Annex II: Production systems selection

Production system selections were made according to the product's contribution to economic development, harvested area and food security. Environmental impact and interviewees' comments were also taken into account. The methodology consisted of 3 main steps: 1) Identifying agricultural products that contributed the most to daily kilocalorie consumption per capita; 2) Identifying agricultural products that occupied the largest harvested area in the country; 3) Identifying agricultural products with the highest production value. A ranking score from 5 to 1 was given to the top products on each list. Then the rankings were averaged to compute an average top 5 ranking. Products that contribute to kilocalorie consumption but very little harvested area (e.g. soybean) were eliminated from the list. Similarly, products with high harvested area and value of production but not directly intended for human consumption (e.g. sorghum) were eliminated from the list. Milk and cattle meat, as animal products, were added to the list due to three considerations: 1) They complement the top list of crop products with animal production systems; 2) Milk contributes significantly to average daily/kcal consumption per capita; and 3) Livestock GHG emissions from pasture, land use change, and enteric fermentation contribute to more than half agriculture GHG emissions in Mexico.

In the case of Sinaloa, livestock was originally considered as a top product. However, interviewees did not mention significant practices for these products. Instead, cucumber was suggested to be included in the list due to its high production value.

Annex III: Agro-ecosystems

This study bases its analysis on eco-agricultural regions defined in "Farming systems and poverty: Improving farmers livelihoods in a changing world" By Dixon, J. A., Gibbon, D. P., & Gulliver, A. (2001). These regions share similar resource bases, enterprise patterns, household livelihoods, and constraints. Therefore, for each ecoregion similar development strategies and CSA approaches would be appropriate. According to Dixon, et al. (2001) Mexico encompasses 4 different agro-ecoregions: irrigated, maize-bean, dryland-mixed, and coastal plantations. A description of these systems is below:

Irrigated

This farming system encompasses enormous areas of arid lands across northern and central Mexico. Almost all the land in this system is irrigated. The presence of irrigation infrastructure allows for a relatively high degree of intensification of production, mostly for cash crops. Key products within this system include maize, wheat, cotton, horticulture, and vines. Poverty is low to moderate (Dixon, Gibbon, & Gulliver, 2001).

Maize-Bean

Stretching from central Mexico to the Panama Canal, this system is historically and culturally based upon the production of maize and beans for subsistence. The system includes a substantial indigenous population. The historical loss of the highly productive valley bottom lands to non-indigenous settlers and commercial operations has led to extensive poverty and severe land degradation in many areas (Dixon, Gibbon, & Gulliver, 2001).

Dryland mixed

This system has a well-established economic and productive structure. The system faces moisture and soil quality constraints. It is a system with considerable poverty among small-scale producers, who exist alongside large-scale extensive ranches and often depend on seasonal migration and wage labor for survival. Land degradation is a serious problem (Dixon, et. al. 2001).

Coastal Plantation and Mixed

The system occupies some of the richest agricultural lands, but also includes mangrove swamps and isolated areas of tropical forest. There are two major sub-systems: 1) small-scale family farms with mixed agriculture, in-shore fishing and frequent off-farm employment (e.g. tourism); and 2) large-scale plantations with intensive production and significant poverty among laborers, although poverty is not otherwise prevalent (Dixon, Gibbon, & Gulliver, 2001).

Annex IV: Climate change predictions (CIAT analysis)

CIAT extracted annual rainfall and mean annual temperature data for Mexico for 2030 from 19 global climate models (GCMs) forced with IPCC RCP5. The "Representative Concentration Pathways (RCP)" database aims to document the emissions, concentrations, and land-cover change projections of the RCPs. The data provided for the RCPs is extensive and has undergone several procedures to assure quality and consistency, to harmonize regional base year emissions to recent inventories, and to downscale the projections to 0.5 x 0.5 degrees.[1]

The following projections are derived from the GCMs. Precipitation in Mexico will likely decrease in most of the country's territory by 2030. In general, precipitation could decrease the most (up to -114 mm/year) in the central and coastal states of Mexico (Veracruz, Tabasco, Sinaloa, Jalisco, Michoacán, and Guerrero). The slightest precipitation decreases (increments of no more than -33 mm) could happen in the North and Northwest. States included in these regions are Baja California, Baja California Sur, Sonora, and parts of Chihuahua, Durango, and Zacatecas.

Overall, mean annual temperatures are predicted to increase by 1–2°C by 2030. Although mean annual temperatures will probably increase in all departments, the increase is likely to be greatest in the states of Sonora, Chihuahua, Coahuila, Nuevo León, Tamaulipas, and Sinaloa.

265mm

-144mm

Projections based on RCP 4.5 emissions scenario and downscaled using the Delta Method.
MEX: Max = 33, Min= -114

2°C

0°C

Projections based on RCP 4.5 emissions scenario and downscaled using the Delta Method.
MEX: Max = 2, Min= 1

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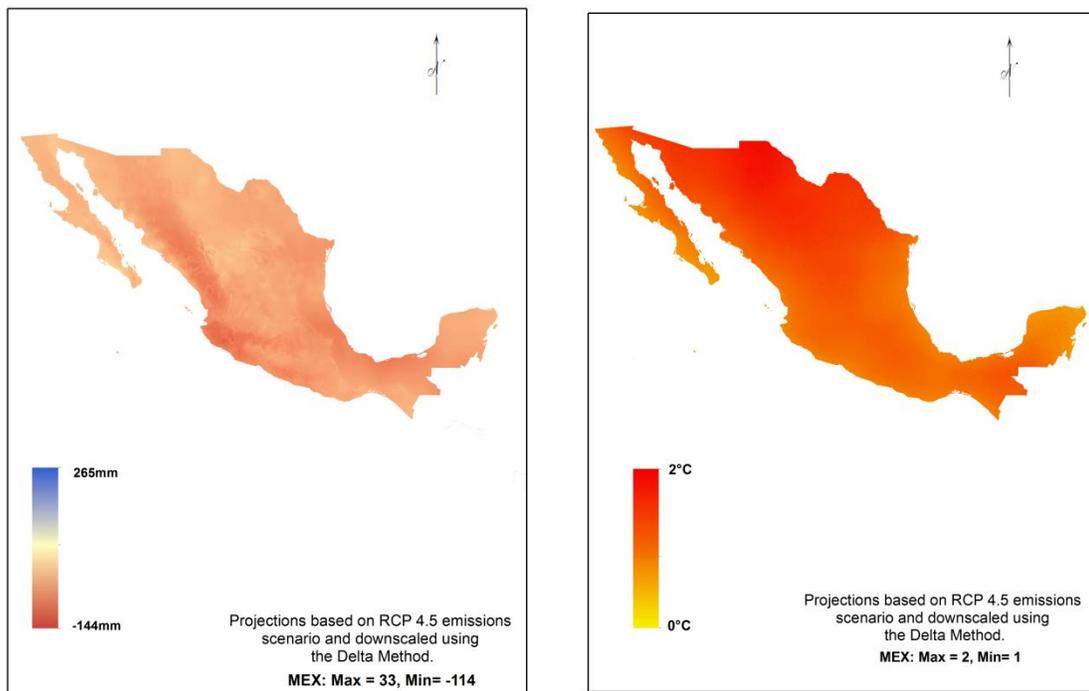
[1] More information about the statistical downscaled delta method dataset used by CIAT in Ramirez & Jarvis (2008) .

Annex V: Ongoing CSA practices

As shown in Figure 4 below, some agricultural practices implemented in Mexico have a high climate smartness rating but low adoption rates. Silvopastoralism, biodigestors, drip irrigation, Conservation Agriculture, and cover crops are examples of such practices that have high potential for future impact. In addition to on farm practices, institutional and programmatic support is needed to scale up CSA. Meteorological early warning systems, farmer networks, strengthened agricultural extension, index-based insurance schemes, financial incentives, property rights, and payment for ecosystem services are some possibilities
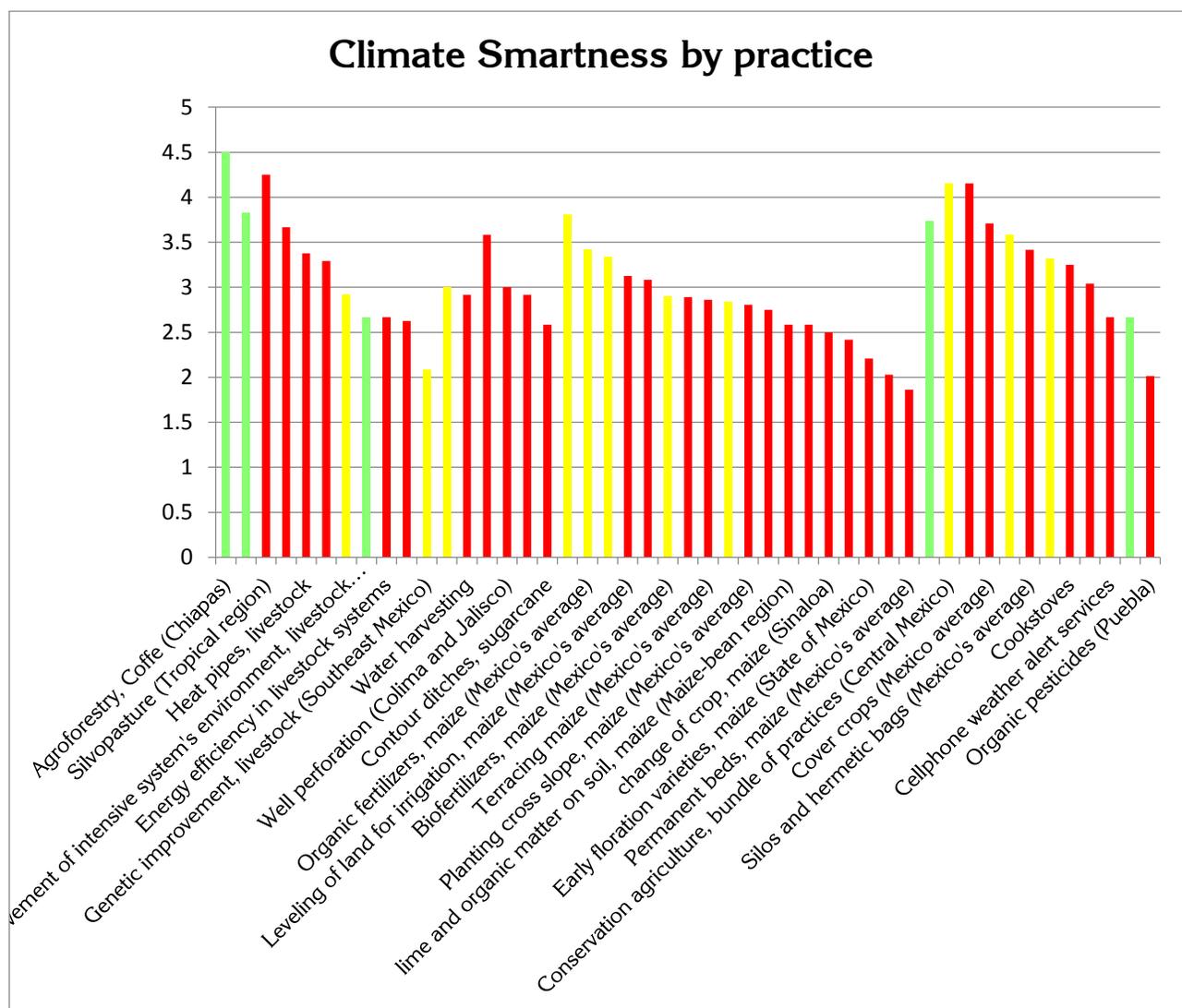

Figure 4 Ongoing CSA practices by production system

Annex VI: CSA Institutions

Institutions	Description	CSA activities promoted	Instruments used for promotion
Universidad Autónoma Chapingo, Colegio de Postgraduados, Universidad Autónoma Agraria Antonio Narro, Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), Universidad Nacional Autónoma de México (UNAM)	Private and public universities in Mexico focusing on business, agriculture, or research.	Knowledge Training Generation of information	Education, research, capacitation
Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP)	Public institute focusing on the development of scientific knowledge and forest and agriculture innovations	Value chain integration, sustainable management of forests, water, soil, meteorological knowledge	Research, information gathering, meteorological stations
Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT)	Agriculture research institute member of the CGIAR consortium specializing in wheat and maize improvement.	Seed storage, improved seeds, conservation agriculture practices, distribution of seed	research, promotion, technical assistance, management
Civil Society Organizations including: The Nature Conservancy, National Civil Council for Sustainable Silviculture (CCMSS), red MOCAF, CEDICAM, Reforestamos Mexico, etc.	Non-governmental organizations implementing sustainable projects related to forests, conservation, development, etc.	Payments for Ecosystem Services, REDD+, Silviculture, agroforestry, Local carbon markets, conservation agriculture, water management, improved seeds, soil improvement, etc.	advocacy, capacity development, technological assistance, lobbying, policy recommendations, evaluation of policy effectiveness, etc.
Coordinadora Nacional de las Fundaciones Produce (COFUPRO)	Civil Society Organization that represents producer's organizations before public and private entities and responds to producer's limitations and needs to provide	Weather information, technical assistance, cellphone climatic warnings, mechanization, protected agriculture, pilot local payment for ecosystem services market, carbon neutrality, biodigestors, biofertilizers, carbon capture, pressured irrigation, organic pesticides, conservation agriculture	Farmer representation, coordination, strategic planning, capacitation, studies and assessment, experience exchange

	technical assistance		
Ministry of Agriculture, Livestock and Fisheries (SAGARPA)	Public institution leading the agriculture development agenda in Mexico	sugarcane green harvest, crop rotation, irrigation, protected agriculture, catastrophic insurance for states, vessels energy efficiency, livestock vulnerability information, efficient machinery, biofertilizers, fuel efficiency, small dams, water reservoirs, soil improvement, cogeneration of energy, biofuels, biodigestors, thermic solar systems, fotovoltaic systems, organic fertilizers, etc.	Policy development, implementation of policies, direct cash transfers, insurance, subsidies, generation of information
Trust Funds for Rural Development (FIRA, Rural financial Institution (Financiera Rural), AGROASEMEX	Financial public institutions serving as development banks and grant financial and technical services for the promotion of scale up of CSA activities	energy efficiency, water efficiency, prevention of deforestation and pollution, carbon market access, technical assistance, forest plantations, irrigation technology, bulk acquisition of fertilizers, horticulture, livestock management, crop rotation, no tillage agriculture, information, risk management, etc.	Loans, guarantees, Technical assistance, policy development and implementation, subsidies, capacity development, diffusion of information
Secretary of the Environment and Natural Resources (SEMARNAT, Spanish acronym), National Protected Areas Commission (CONANP, Spanish acronym), National Biodiversity Commission (CONABIO), National Institute of Ecology and Climate Change (INECC), National Forest Commission (CONAFOR)	Public institutions leading the environment agenda in Mexico	Environmental Management Units (UMA), recovery of degraded lands, management of species and resources, land management, conservation, agroforestry, biodiversity friendly production, silvopasture, silviculture, ecotourism, information on climate change, forest plantations, Payments for Ecosystem Services, REDD+, Sustainable Forestry Certification, sustainable production of timber and non- timber forest products, etc.	Trust fund for climate change, subsidies, development of policies, technical assistance, loans, capacity development, research, communication to UNFCCC, guarantees, etc.
National Meteorological Service (SMN), National Water Commission, Mexican Institute for the Technology of Water (IMTA)	Public institutions leading the water and weather agenda in Mexico	Weather information for agriculture, extreme events alerts, Climate Change scenarios, hydraulic infrastructure, irrigation infrastructure, rain-fed agriculture infrastructure, water information dissemination, studies	Information, weather alerts, bulletins, subsidies, direct public investment, research, studies, policy development and implementation

Annex VII: Selected International CSA Finance projects

Institution and Funds	Name of CSA project or goals
Clean Development Mechanism and the Verified Carbon Standard	Livestock GHG mitigation projects
Development Cooperation Instrument	Fair trade certification for honey and coffee
European Union to Mexico	Diversification of agroforestry systems as a tool for the conservation of biodiversity in Chiapas, Mexico.
FAO	Sustainable management of bycatch
Forest Carbon Facility (FCPF)	REDD+ readiness Progress
French Agency development	-Promotion of integrative management of landscapes -Support to the program against climate change in Mexico, -Program of technical cooperation in forestry
GIZ (germany)	-Conservation and Sustainable Use of Selva Maya (operated by The Nature Conservancy) -Protection and sustainable use of marine and coastal biodiversity in the Gulf of California
IFAD	Microbasin management
IFC	Funding to private businesses: Netafim, Aurasolar, Norson, Proteak
Inter-American Development Bank specific mechanisms	Green lines financing for FIRA
Japan International Cooperation Agency	Capacity strengthening in four forest communities in the Northern sierra in Oaxaca for the sustainable management of natural resources
Norway (Norwegian Agency for Development and Cooperation)	Reinforcing REDD+ readiness in Mexico and enabling South-South cooperation
Sustainable Agriculture Initiative Platform (Nestle, Unilever, Group Danone, McDonald's, Coca Cola, Kellogg's, General Mills, etc.)	Rainwater storage and optimization of fertilizers application in Mexico
GEF	Development of GHG Emission Coefficients from Live Systems in Central Mexico and Development of Related Information Management System Renewable Energy for Livestock (Rural Development Program)
United Kingdom International Climate Fund	Development of biofuels in arid zones
USAID Development Grants Program	Integrated landscape management for REDD+, Mexico sustainable landscapes
World Bank	coastal watersheds conservation in the context of climate change, adaptation to climate change in the water sector, social resilience to climate change, etc