Climate-Smart Agriculture in Grenada

Supplementary material

This publication is a product of the collaborative effort between the International Center for Tropical Agriculture (CIAT), the lead Center of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS); the Tropical Agricultural Research and Higher Education Center (CATIE); and the World Bank to identify country-specific baselines on CSA in seven countries in Latin America: Argentina, Colombia, Costa Rica, El Salvador, Grenada, Mexico, and Peru. The document was prepared under the co-leadership of Andy Jarvis and Caitlin Corner-Dolloff (CIAT), Claudia Bouroncle (CATIE), and Svetlana Edmeades and Ana Bucher (World Bank). The main author of this profile is Andrew Halliday (CATIE), and the team was comprised of Andreea Nowak (CIAT), Miguel Lizarazo (CIAT), Pablo Imbach (CATIE), Beatriz Zavariz-Romero (CIAT), Rauf Prasodjo (CIAT), María Baca (CIAT), Claudia Medellín (CATIE), Karolina Argote (CIAT), Chelsea Cervantes De Blois (CIAT), Juan Carlos Zamora (CATIE), and Bastiaan Louman (CATIE).

The supplementary material should be cited as:

World Bank; CIAT; CATIE. 2014. Supplemental material to Climate-Smart Agriculture in El Salvador. CSA Country Profiles for Latin America Series. Washington D.C.: The World Bank Group.

Special thanks to the institutions that provided information for this study: MAG, MARN, CASSA, CSC, CRS, PRISMA, PROLECHE and ASILECHE.

This profile has benefited from comments received from World Bank colleagues: Willem Janssen, Marc Sadler, and Eija Pehu, as well as from Natalia Gómez and Luz Díaz.

Contents

This Supplementary Material is in support of the Climate-Smart Agriculture in Grenada 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

ACP	African Caribbean and Pacific Group of States
ASAP	Adaptation for Smallholder Agriculture Program
CAMI	Caribbean Agrometeorological Initiative
CARDI	Caribbean Agricultural Research and Development Institute
CARICOM	Caribbean Community
CATIE	Tropical Agricultural Research and Higher Education Center
CCCCC	Caribbean Community Climate Change Centre
CCDP	CARICOM Capacity Development Programme
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CDB	Caribbean Development Bank
CIAT	International Center for Tropical Agriculture
CIMH	Caribbean Institute for Meteorology and Hydrology
CMO	Caribbean Meteorological Organisation
CPF	FAO Country Program Framework
CSA	Climate-smart agriculture
ECLAC	UN's Economic Commission for Latin America and the Caribbean
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GAB	Grenada Association of Beekeepers
GAFY	Grenada Agricultural Forum for Youth
GCA	Cocoa Growers Association
GCCA	Global Climate Change Alliance
GCDA	Grenada Community Development Agency
GCIC	Grenada Chamber of Industry and Commerce
GCNA	Grenada Co-operative Nutmeg Association
GDP	Gross Domestic Product
GEF-5	Global Environment Facility, 5th period
GFDRR	UNFCCC's Global Facility for Disaster Reduction and Recovery
GHG	Greenhouse gas
GIS	Geographic information system
GIZ	German Agency for International Cooperation
GNSDS	Grenada Nutmeg Sector Development Strategy
GOAM	Grenada Organic Agriculture Movement
GRENROP	Grenada Network of Rural Women Producers
ICCAS	Integrated Climate Change Adaptation Strategies
IDB	Inter-American Development Bank
IFAD	International Fund for Agricultural Development
IICA	Inter-American Institute for Cooperation on Agriculture

IKI	International Climate Initiative of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety of Germany
LAC	Latin America and the Caribbean
MAG	Ministry of Agriculture, Lands, Forestry, Fisheries & Environment of Grenada
MAREP	Market Access and Rural Enterprise Development Program
MNIB	Marketing and National importing Board
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
OECS	Organization for the Eastern Caribbean States
PPCR	Pilot Program for Climate Resilience
RCC	UNFCCC Caribbean Regional Climate Centre
RCP	Representative Concentration Pathway
SIDS	small island developing state
SPCR	Grenada Strategic Program for Climate Resilience
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

Annex II: Agriculture and foreign trade in Grenada

According to the statistics provided by the International Trade Centre (ITC), exports of agricultural products (raw goods, including cocoa beans and derived products) contributed to 42% of the total value of national exports in 2013. In the last five years, the most important agricultural products exported by value were nutmeg and cocoa beans. Wheat and meslin flour, with an average participation of 20%, is derived from imported grains (the raw material is not produced in the country). The main importers of Grenada's nutmeg are Germany (48%) and the Netherlands (32%), while France is the largest importer of cocoa and cocoa preparations (54%).

Table 1 Major export products of the agricultural sector (2009 – 2013)

Agricultural products	Thousands of US $					Var % 2012 - 2013	Average participation % (2009 – 2013)
	2009	2010	2011	2012	2013		
Nutmeg, mace and cardamoms	3,017	5,161	9,956	11,062	14,298	29	59
Wheat and meslin flour	4,291	3,508	3,969	2,447	674	-72	20
Cocoa and cocoa preparations	827	1,185	1,873	6,989	2,264	-68	18
Fruits (various, fresh)	82	89	144	141	279	98	1
Fruits (frozen) and nuts	38	83	145	219	182	-17	1
Others (< 1 % of participation)	213	139	238	151	213	41	1
TOTAL	8,468	10,165	16,325	21,009	17,849	-15	100

Source: Trade Map (Trade statistics for International Business Development), ITC

According to the same source, imports of agricultural products constituted 6% of the total value of national imports in 2013. In the last five years, the most important agricultural products imported by value were wheat and meslin, maize, rice, vegetables and soybeans. Cereal imports are sourced mainly from the USA (85%), while edible vegetables are imported mainly from the Netherlands (49%).

Table 2 Major import products of the agricultural sector (2009 – 2013)

Agricultural products	Millions of US $					Var % 2012 - 2013	Average participation % (2009 – 2013)
	2009	2010	2011	2012	2013		
Wheat and meslin	4,551	4,788	8,632	6,240	6,241		45
Maize	781	1,825	3,415	2,463	926		14
Rice	1,578	1,201	1,117	1,683	1,114		10
Edible vegetables (various, fresh and frozen)	1,400	1,799	1,072	792	981		10
Soybeans	0	1,415	2,420	1,156	0		7
Malt	378	365	338	330	271		2
Others (< 2 % of participation)	1,425	1,153	897	1,169	1,049		12
TOTAL	10,607	13,131	18,596	14,557	10,649		100

Source: Trade Map (Trade statistics for International Business Development), ITC

Annex III: Land-use in Grenada

Forty-one percent of Grenada was classified as agricultural land in 1995, the year of the last available agricultural census, down from 72% in 1961[1]. Over this period the area dedicated to temporary crops was dramatically reduced; permanent crops also suffered a decline but continued to represent the main agricultural land use [1, 2]. These changes reflect both the diversification of the economy into other sectors (manufacturing and tourism) and the migration of the population from rural areas to urban centers. The establishment of monocultures over large areas has also influenced the pattern of land use in Grenada [1].

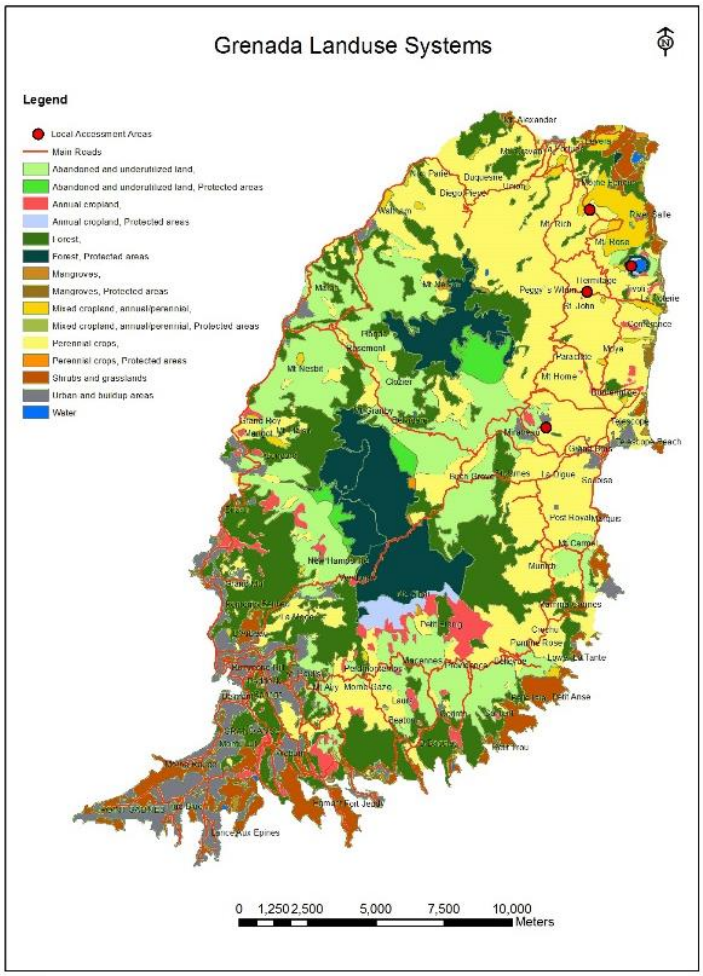


Figure1 Grenada land-use map (2009), courtesy of Land Use Division of the Ministry of Agriculture

Currently, perennial and mixed cultures (mainly nutmeg, cocoa, and spices) are concentrated in the northern part of the island of Grenada. In the South, annual crops (vegetables, fruits, and tubers), pastures, wooded areas, and major urban areas predominate. Western Grenada encompasses large areas of abandoned land (mostly large plantations). On the islands of Carriacou and Petit Martinique there are small areas of temporary crops and pastures[3]. Abandoned farmland and pastures close to the coast have been the site of the expansion of tourism infrastructure and the commercial and residential sectors [2].

[1] William AN. 2003. Country experience in land use issues: Grenada. St. Georges: Ministry of Agriculture.
[2] Government of Grenada. 2000. Biodiversity Strategy & Action Plan.
[3] Ministry of Agriculture. 2011. Annual Agricultural Review 2009, Grenada W.I. St. Georges: Ministry of Agriculture.

Annex IV: Nutmeg and cocoa production in Grenada

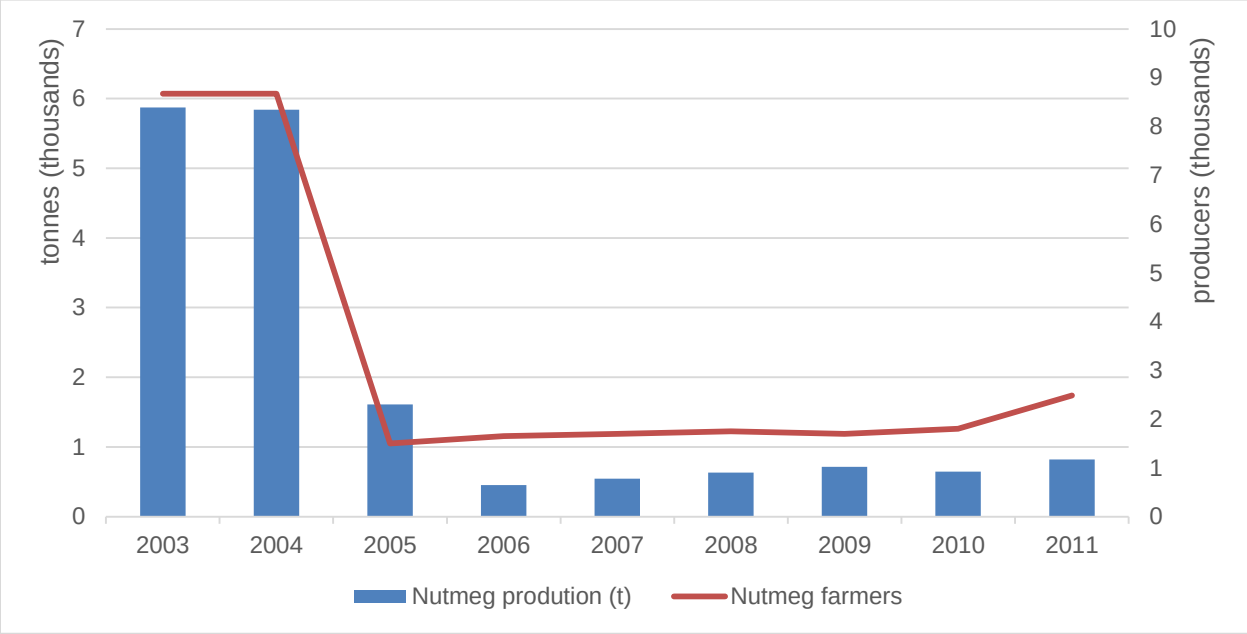


Figure 2 Nutmeg and cocoa production in Granada.
Source: Ministry of Agriculture (Ministry of Agriculture. (2013). Annual Agricultural Review 2010–2011 Grenada W.I. Saint Georges: Ministry of Agriculture.

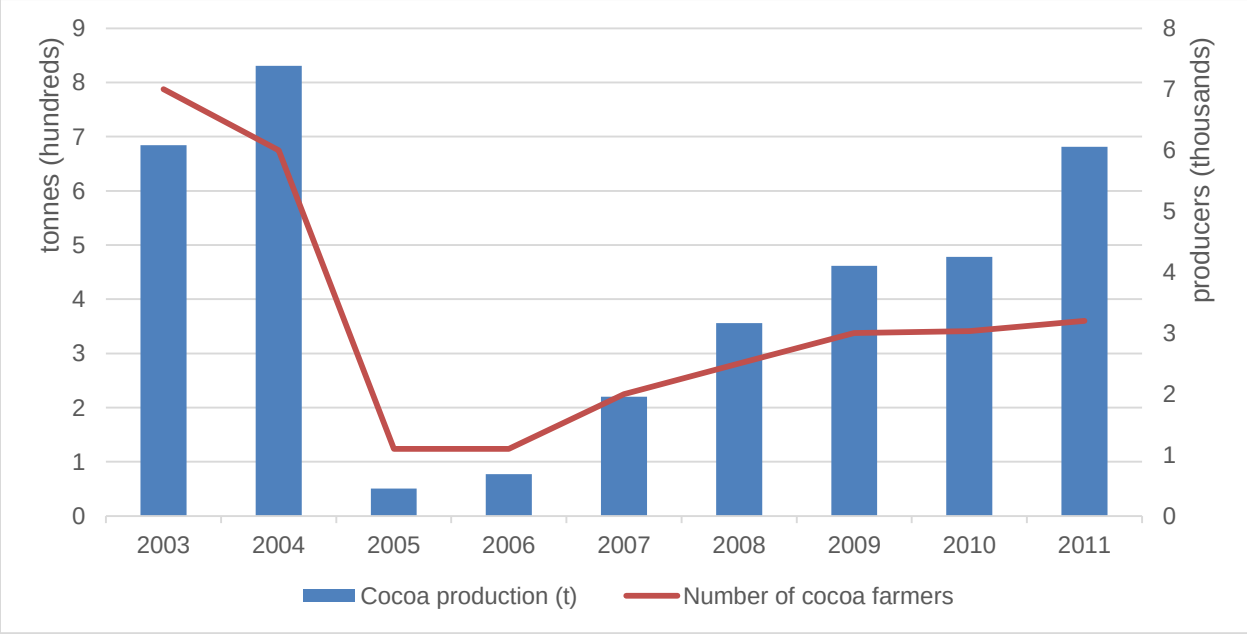
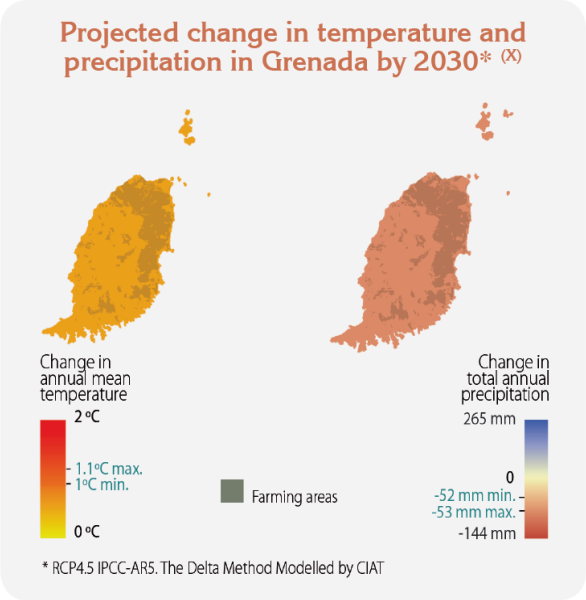


Figure 3 Cocoa production and farmers in Granada.
Source: Ministry of Agriculture (Ministry of Agriculture. (2013). Annual Agricultural Review 2010–2011 Grenada W.I. Saint Georges: Ministry of Agriculture.

Annex V: Climate change projections for Grenada

Future expected climate in the Caribbean shows a consistent drying trend across models and global warming scenarios[4] in agreement with historical observed trends of increased temperatures[5]. Drier conditions will be the result of an increase in mean annual temperature – particularly over land areas – combined with reduced precipitation[6]. Future precipitation reduction is expected throughout the year over northeastern South America (including the region covering Grenada) with good agreement across climate models, except between March and May when models differ on the direction of the anomalies[6]. Larger precipitation reductions are expected between June and August[6]. Although evidence on the anthropogenic influence on historical trends of cyclone activity is inconclusive, future scenarios at the global scale agree on an increase of intensity (by 2-11%) and a reduction in frequency (by 6-34%), with large discrepancies between regional projections[6].



CIAT extracted annual rainfall and mean annual temperature data for Grenada for 2030 from 19 global climate models (GCMs) forced with IPCC RCP 4.5. The RCP database aims to document the emissions, concentrations, and land-cover change projections of the Representative Concentration Pathways (RCPs). The data provided for the RCPs are extensive and have undergone several procedures to assure quality and consistency, synchronize regional base year emissions with recent inventories, and downscale the projections to 0.083 x 0.083 degrees (approximately 1 km^2). Predictions are derived from the GCMs and compared to a baseline period from 1960 to 2000.

Precipitations in Grenada will likely decrease for 2030 by 53 mm and mean annual temperatures are predicted to increase by 1.0–1.1°C by 2030. These trends are consistent with previously modeled projections for the country[7], which also indicate that the North Atlantic hurricanes and tropical storms could continue to increase in intensity.

[4] Neelin JD, Münnich M, Su H, Meyerson JE, Holloway CE. 2006. Tropical drying trends in global warming models and observations. Proceedings of the National Academy of Sciences, 103(16), 6110–5.
[5] Aguilar E, Peterson T, Ramírez Obando P, et al. 2005. Changes in precipitation and temperature extremes in Central America and northern South America, 1961–2003. Journal of Geophysical Research, 110(D23107).
[6] Biasutti M, Sobel AH, Camargo SJ, Creyts TT. 2012. Projected changes in the physical climate of the Gulf Coast and Caribbean. Climatic Change, 112(3-4), 819–845.
[7] CARIBSAVE. 2012. The CARIBSAVE Climate Change Risk Atlas (CCCRA): Climate Change Risk Profile for Grenada.

Annex VI: CSA practices in Grenada: a detailed list

Table 3 CSA Practices in Grenada

System	Practice	Degree of adoption
Nutmeg	Restoration of hurricane damaged plantations	3
Cocoa	Organic cocoa in mixed, multilayer plantations	3
Fruit, Veg, Root crops	Drip feed irrigation	3
	Solar powered irrigation systems	2
	Contour ploughing	2
	Intercropping	3
	No-burn agriculture, with shredding, composting, mulching	3
	Increased cultivation of tubers (hurricane resistant)	3
Livestock	Stabled dairy goats with cut-and-carry fodder production	2
	Beekeeping	3
All agriculture	Controlled use of agrochemicals	2
	Organic agriculture	2
	Water capture and protection of water sources	3
	Terracing	1
	Composting organic waste	2
	Biodigesters	2
	Drought resistant crops/varieties	2
	Risk mapping	1
	Micro-level weather insurance [8]	1
Sector-wide	Develop food-processing capacity [9]	4
	Developing sustainable land management capacity	2
	Integrated watershed management [10]	1
	Developing management and decision making capacity	2

Source: Based on information from expert informants and additional sources shown in footnotes

Table 4 Criteria for degree of adoption scores

[8] Government of Grenada. 2010. Grenada Nutmeg Sector 2010-2015 Development Strategy. St. Georges: Ministry of Agriculture.
[9] Ibid
[10] Ministry of Agriculture policy objective

Score	Criteria for practices
0	Suggested by interviewee as a good idea
1	Research and development / policy commitment
2	Validation in field trials / small project / new measures being adopted by one or a few companies / new ideas being promoted by agencies
3	Scattered adoption across the sector(s)/ large project / not known - default score
4	Widespread adoption
5	80 to 100% adoption