

Climate-Smart Agriculture in Uruguay

Supplementary Material

This publication is the product of a collaborative effort between the International Center for Tropical Agriculture (CIAT) - lead Center of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) - and the World Bank, to identify country-specific baselines on CSA in Africa (Kenya and Rwanda), Asia (Sri Lanka), and Latin America and the Caribbean (Nicaragua and Uruguay). This document was prepared under the co-leadership of Andrew Jarvis, Andreea Nowak, and Caitlin Corner-Dolloff (CIAT); Alicia Martins Rodríguez, Mario Mondelli, Walter Oyhantcabal (MGAP Uruguay); and Holger Kray and Carlos Arce (The World Bank). The main author of this profile is Michael Carroll, and the team was comprised of Andreea Nowak (CIAT), Caitlin Corner-Dolloff (CIAT), Miguel Lizarazo (CCAFS), and Elizabeth Minchew.

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ANNEX I: Acronyms (Spanish)

ACA	Asociación de Cultivadores de Arroz
ANII	Agencia Nacional de Innovación e Investigación
ANPL	Asociación Nacional de Productores de Leche
AP	Alianza de Pastizal
ARU	Asociación Rural de Uruguay
AUGAP	Asociación Uruguaya de Ganaderos de Pastizal [Uruguayan Grassland Cattle Ranchers Association]
AUSID	Asociación Uruguaya de Siembra Directa [Uruguayan Association of No-till Farmers]
BID	Banco Interamericano de Desarrollo [IDB, Inter-American Development Bank]
BSE	Banco de Seguros de Estado
BM	Banco Mundial [The World Bank]
CAF	Cooperativas Agrarias Federadas
CAS	Consejo Agropecuario de Sur [Agricultural and Livestock Council of the South]
CEUTA	Centro Uruguayo de Tecnologías Apropriadas
CIEDUR	Centro Interdisciplinario de Estudios sobre el Desarrollo
CNFR	Comisión Nacional de Fomento Rural
CONEAT	Comisión Nacional de Estudio Agro-Económico de la Tierra
CSA	Agricultura Climáticamente Inteligente [Climate-Smart Practice]
DACC	Proyecto Desarrollo y Adaptación al Cambio Climático
DF	Dirección Forestal, MGAP
DGDR	Dirección General de Desarrollo Rural,
DGSA	Dirección General de Servicios Agrícolas [General Directorate for Agricultural Services]
DIEA	Dirección de Investigación y Estadísticas Agropecuarias,
DIGEGRA	Dirección General de la Granja
DINAGUA	Dirección Nacional de Agua
DINAMA	Dirección Nacional de Medio Ambiente [National Directorate for the Environment]
DINARA	Dirección Nacional de Recursos Acuáticos
DINOT	Dirección Nacional de Ordenamiento Territorial
FA	Fondo de Adaptación (Protocolo de Kyoto) [Adaptation Fund]
FAE	Fondo de Atención a Emergencias [Agricultural and Livestock Emergency Fund]
FAGRO	Facultad de Agronomía, Universidad de la República
FAO	Organización de las Naciones Unidas para la Alimentación y la Agricultura [Food and Agriculture Organization of the United Nations]
FFG	Fondo de Fomento de la Granja [Farm Promotion Fund]
FIECN	Facultad de Ciencias
FMAM	Fondo del Medio Ambiente Mundial [GEF, Global Environmental Facility]
FRU	Federación Rural de Uruguay
FUCREA	Federación Uruguaya Consorcios Regionales de Experimentación Agropecuaria [Uruguayan Federation of Regional Consortia for Agriculture and Livestock Experimentation]
GDR	Grupo de Desarrollo de Riego
GEI	Gases de Efecto Invernadero
GFCC	Proyecto Ganaderos Familiares y Cambio Climático [Project Family Ranchers and Climate Change]
GPS	Sistema global de posicionamiento [Global Positioning System]
GRAS	Unidad Agro Clima y Sistemas de Información [Agro-climate and Information Systems]
INALE	Instituto Nacional de la Leche [The National Milk Institute]
INASE	Instituto Nacional de Semillas

INDC	Contribución Prevista Nacionalmente Determinada
INFIA	Instituto de Mecánica de los Fluidos, Facultad de Ingeniería, UDELAR
INIA	Instituto Nacional de Investigación Agropecuaria [National Institute of Agricultural and Livestock Research]
INUMET	Instituto Uruguayo de Meteorología
IPA	Instituto Plan Agropecuario [Agricultural and Livestock Plan Institute]
IPL	Intergremial de Productores de Leche
IRI	Instituto Internacional de Investigación en Clima y Sociedad, Universidad de Columbia
ISAGRO	Información Satelital para el Agro [Agro Satellite Information]
MGAP	Ministerio de Ganadería, Agricultura y Pesca
MVOTMA	Ministerio de Vivienda, Ordenamiento Territorial y Medioambiente
NAP	Plan Nacional de Adaptación
OPYPA	Oficina de Programación y Política Agropecuaria, MGAP
PG	Proyecto Ganadero MGAP/BID
PIB	Producto Interno Bruto
PNUD	Programa de Naciones Unidas para el Desarrollo
PPR	Proyecto Producción Responsable, MGAP/BM
PREISPA	Programa Regional de Empleo de Información Satelital para la Productividad Agrícola
PRENADER	Programa de Manejo de Recursos Naturales y Desarrollo de Riego
PROCISUR	Programa Cooperativo para el Desarrollo de Tecnologías Agropecuarias en el Cono Sur [Cooperative Program for Development of Agricultural and Livestock Production Technology in the Southern Cone]
REDD	Reducción de Emisiones por Deforestación y Degradación de Bosques
RENARE	Dirección de Recursos Naturales Renovables, MGAP
SARAS	Instituto Sudamericano para Resiliencia y Sustentabilidad
SIG	Sistema de Información Geográfica, RENARE-MGAP
SINAE	Sistema Nacional de Emergencia [National Emergency System]
SISTD	Sistemas Modernos de Información y Soporte para la Toma de Decisiones [Modern Information and Decision-Making Support Systems]
SNIA	Sistema Nacional de Información Agropecuaria, MGAP
SNIG	Sistema Nacional de Información Ganadera
SNRCC	Sistema Nacional de Respuesta al Cambio Climático [National System of Response to Climate Change]
SUL	Secretariado Uruguayo de la Lana
UCC	Unidad de Cambio Climático [Climate Change Unit]
UDELAR	Universidad de la República Oriental del Uruguay
UNFCCC	Convención de las Naciones Unidas Sobre el Cambio Climático [United Nations Framework Convention on Climate Change]
UTCUTS	Uso de la tierra, cambio de uso de la tierra y silvicultura [Land Use, Land Use Change and Forestry]

Abberviations and Units

Ha	Hectares
Kg/ha	Kilograms per hectare
%	Percentage
CO ₂	Carbon dioxide
Ton	Ton
Mm	Milimeters
°C	Degrees Celsius
N	Nitrogen

ANNEX II: Methodology for the identification of major production systems

The identification of the main production systems took place in the context of an expert workshop which was convened for the analysis and characterization of the main climate-smart practices in Uruguay. This workshop was jointly organized by MGAP and CIAT, and was opened by the Minister of Livestock, Agriculture and Fisheries (MGAP) and the Minister of Housing, Spatial Planning and Environment (MVOTMA). The expert workshop took place on May 27, 2015 with the presence of more than 50 specialists from the public and private sectors related to agricultural public policy and/or environmental, agricultural research and production.

As part of this exercise, prior to the identification and analysis of CSA practices in Uruguay (described in Annex III), the following production systems were identified as most relevant:

- Meat production (Cattle)
- Milk Production (Cattle)
- Rainfed Agriculture (including soybean, corn, wheat and fodder farming)
- Rice
- Intensive crops

The criteria used for the selection of these production systems were: (i) the relative importance in terms of occupied area, (ii) the contribution of each system to the country's economy (GDP and exports), (iii) the amount of employment generated, (iv) the importance of the system for family production, and (v) the current and/or potential relation between each system and climate change-related variables (more specifically, the contribution to emissions or adaptation needs to reduce the vulnerability of the systems to climate variability).

Applying these criteria, the meat and milk production systems are on the top of the list, given that they meet the five criteria mentioned above. These systems are followed by intensive crops (meeting 4 criteria) and soy and rice (meeting 3 criteria).

As the infographics in this document illustrate, the sum of the hectares occupied by these five systems reaches more than 90% of the productive area of the country (led by beef cattle, which occupies over 11 million hectares). Also, the selected systems represent the main productive sectors of family farmers and ranchers, and account for the majority of agricultural exports.

The only areas with some economic and/or significant production in the country that were not selected are commercial forestry and sheep production.

ANNEX III: Calculations of climate intelligence of agricultural practices in Uruguay

Productive System	Practice	Level Of Adoption 1= 0-30% 2= 30-60% 3= 60-100% of total agricultural area	CLIMATIC INTELLIGENCE						
			Water	Climate	Knowledge	Carbon	Energy	Nitrogen	Climatic intelligence average
Beef cattle	Integrated grazing management of natural pastures	1	5	5	3	5	5	5	4.7
Beef cattle	Water management/supply for cattle	1	5	5	4	4	5	4	4.5
Dairy cattle	Feeding: use of animal feed and reserves	2-3	3	5	4	2	3	2	3.2
Dairy cattle	Associative strategies of scale (i.e. rebreeding fields, food fields)	1	4	5	4	0	0	0	2.2
Rain-fed agriculture (soybean, corn, and wheat)	No-till	3	4	3.5	5	3	3	2	3.4
	Crop rotation, soil use plans	3	0	3.5	5	4	4	4	3.4
Rice	Water management	2	4	4	3	4	4.5	4	3.9
Rice	Pasture rotation	2	4	3	4	4	3	4	3.7
Intensive	Irrigation	3	5	3	3	0	0	3	2.3

plant production (citrus, fruit growing, and horticulture)	Integrated production programs (standards, solarization, sex confusion, and rotations), decreased use of agrochemicals								
Intensive plant production (citrus, fruit growing, and horticulture)		3	0	3.5	4	0	4	3	2.4

ANNEX IV: Institutions, Policies and Instruments for CSA in Uruguay

Uruguay maintains an active participation in the numerous regional and international forums related to environmental issues of global importance. In this context, Uruguay ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 (Law 16.517) and the Kyoto Protocol in 2000 (Law 17.279). In terms of formal communications to the Convention, Uruguay sent three National Communications (in 1997, 1998, and 2010), and it is now in the process of preparing its Fourth Communication. In the regional context, Uruguay is an active member of the “Consejo Agropecuario del Sur (CAS)” [Agricultural and Livestock Council of the South], an entity composed of the Ministries of Agriculture of Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay. As part of the CAS, it is a member of the Intergovernmental Working Group on Public Policies related to Climate Change and of the Cooperative Program for Development of Agricultural and Livestock Production Technology in the Southern Cone (PROCISUR, from its Spanish acronym). This group addresses aspects linked to mitigation and adaptation to climate change as priority items on the agenda for regional work.

At national level, there are several agencies with crosscutting mandates and with the dual function of (1) developing and implementing actions in response to climate change, and (2) co-coordinating actions taken by the sectoral institutions in the field of climate change. Among them, the “Sistema Nacional de Respuesta al Cambio Climático (SNRCC)” (National System of Response to Climate Change), currently running in the orbit of the “Dirección Nacional de Medio Ambiente (DINAMA)” (National Directorate for the Environment) under the Ministry of Housing, Territorial Zoning, and the Environment (MVOTMA, from its Spanish acronym), the “Sistema Nacional de Emergencias (SINAE)” (National Emergency System), and the Environmental Office. Assisted by the Climate Change Unit (UCC) of the DINAMA, the SNRCC proposes policies and actions at national level and sets the official country’s position on climate change-related matters in international forums. The UCC is also the focal point of Uruguay to the UNFCCC and the Kyoto Protocol and is responsible for coordinating the preparation of national communications to the UNFCCC. At sectoral level, all ministries have technical units or technical consultants specifically focused on climate change issues.

Climate change is a highly significant factor to the Uruguayan agricultural area. As such, the Ministry of Livestock, Agriculture and Fisheries (MGAP, from its Spanish acronym) has prioritized adaptation to climate change (emphasizing on climate variability) in its policies and actions, incorporating it as one of the fundamental pillars of the process of sustainable production intensification that it promotes. Institutionally, this priority has led to strengthening all agencies of the MGAP involved with the development of public policies and/or the use and handling of the various aspects that comprise the productive matrix for each subsector.

Uruguay has a long and proven track record as a leading country in the management and conservation of natural resources. In particular, Uruguay stands out for being the first

country in Latin America to develop a detailed map of soil suitability covering the total agricultural area of the country. This categorization continues to be effective and is widely used for research, inspection, and even for commercial transactions of purchase and sale of rural properties.

This approach to the conservation of natural resources, shared by government and producers, has acquired a new dimension in the last 10 years, as a result of the reduction of traditional and extensive farming mainly caused by the expansion of the area dedicated to agriculture and dairy production. This productive transformation (encouraged by the favorable conditions for commodities, technological advances, and a significant growth of foreign investment) led the authorities to develop a strategy known as “Agro Intelligent Uruguay” which, since 2010, has guided public policies for the agricultural sector based on five strategic pillars:

- Promotion of competitiveness
- Sustainable intensification
- Adaptation to climate change
- Rural development
- Institutional strengthening and articulation

The policies and instruments developed by the MGAP to implement these strategic pillars comprise, to a large extent, guidelines for promoting production systems that integrate the CSA objectives in the country. This vision also recognizes the social dimension of competitiveness, intensification, and productive adaptation by incorporating the particular needs of family producers into the strategy. In this respect, Uruguay not only exhibits a favorable outlook in terms of CSA practices adoption of CSA by producers, but also shows a unique pro-CSA synergy that combines the political vision, strategic guidelines, technology advancements, and public mechanisms and actions to support the sector.

The main actions of Uruguay, in general, and of the MGAP, in particular, in relation to climate change and agriculture include the following:

- The preparation of **land use and management plans** that promote crop rotation to minimize erosion and soil degradation. In 2014 in total 13,160 plans were prepared covering more than 1.5 million hectares. This year the MGAP launched a similar program through RENARE intended for dairy production facilities located in critical watersheds which, in addition to the planning for fodder crops, will include measures for the use of nitrogen- and phosphorous-containing fertilizers to reduce emissions.
- **Weather-insurance schemes:** Insurance systems have been designed for all areas of farming production including horticulture, fruit growing, poultry breeding, pig breeding, and beekeeping. There was a marked increase in the area with

insurance coverage of deciduous fruit trees from 20% in 2012 to 80% in 2014. Additionally, index-based insurance pilot plans are being developed for horticulture, dairy production, and livestock breeding with differentiated incentives depending on business size.

- **Agro-climate and Information Systems (GRAS):** GRAS is a program of the INIA that carries out research projects for assessing and determining the impact of and vulnerability to climate change and variability of systems of agricultural, livestock, and forestry production, and for identifying potential adaptation measures. GRAS has also developed a system of information and support for making decisions (SISTD) for preventing and managing risks associated with climate (www.inia.org.uy/gras/).
- **National Agricultural Information System (SNIA, from its Spanish acronym):** The development of the SNIA began in 2013 within the framework of the DACC-World Bank Project, and it was recently driven by the initiative called "Información Satelital para el Agro (ISAGRO)" (Agro Satellite Information) funded by the IDB. The SNIA aims to become an information platform built to improve the decision-making associated with climate variability on the part of the public and private sectors. The "layers" of the SNIA include early warning, monitoring application of agrochemicals, characterization of climatic hazards, registration of producers and companies, plans for the use and management of soils, farm and associative irrigation, traceability of cattle and relevant movements; etc.
- **Promotion of supplementary irrigation:** The MGAP has provided financial incentives for investment projects in irrigation to more than 6,000 businesses of family producers in the amount of US\$28.0 million. It has also offered tax exemptions for US\$76 million to encourage investments in irrigation equipment for more than US\$140 million.
- **Support for the generation of water sources for livestock:** The MGAP has provided support through numerous programs, including PPR, DACC, GFCC, and PG to improve adaptation of family cattle ranchers to climate variability. With a contribution of US\$18.8 million, these programs encouraged the construction of rainwater catchment structures (dams) and intra-property distribution systems that benefited more than 3,000 farmers with a total surface area of 703, 000 hectares, which represents 30% of the family cattle ranch area and 12% of the producers.
- **Promotion of the conservation and utilization of natural grasslands:** The same programs referred to in the foregoing paragraph have earmarked US\$12.0 million in total to support technologies that improve management of natural grasslands, including subdivisions, forage reservations, and the introduction of native

legumes, for the benefit of more than 1,700 family farmers in an area of 442,000 hectares.

- **Prevention, early warning and support to producers affected by climate extremes:** Through the establishment of the “Fondo Agropecuario de Emergencia (FAE)” (Agricultural and Livestock Emergency Fund) and the “Fondo de Fomento de la Granja (FFG)” (Farm Promotion Fund) nearly US\$14.0 million was released between 2012 and 2014 to assist more than 4,000 producers affected by early frosts in citriculture, hail in fruit trees and grapevines, sheep mortality by storms, and damage to beekeeping facilities due to water excess.
- **Policy adjustments to improve use of agrochemicals:** The MGAP, through the “Dirección General de Servicios Agrícolas (DGSA)” (General Directorate for Agricultural Services) in coordination with the DINAMA and the private sector, implemented a significant initiative to reduce the environmental impact of the use of agrochemicals in all phases of the pesticide cycle. This includes a set of actions associated with CSA (product registration, satellite monitoring of applications, container recycling, and promotion of biological products) that enhance adaptation and reduce emissions from the main agricultural sub-sectors.
- **Support to improve effluent and solid waste management** in intensive production of milk and meat: Complementing a series of regulatory measures with a view to reducing pollution generated by intensive livestock production activities, the MGAP granted financial support for US\$9.1 million to 1,400 family dairy producers (42% of total) for the construction of accumulation reservoirs, and purchase of equipment for the distribution of effluents for the benefit of more than 155,000 hectares (18% of the total milk production area).

The MGAP, through the UCC of OPYPA, is a focal point and has the responsibility to develop the sections pertaining to the agricultural sector in the national communications to the UNFCCC. In this sense, the Fourth National Communication is in preparation stage, and submission to the UNFCCC is expected in the coming months, in anticipation to the COP of Climate Change that will take place in Paris in December. In comparison with the third communication (published in 2010), it is expected that the Fourth Communication will place greater emphasis on the situation and needs of the agricultural sector, including the importance of continuing to develop tools and strategies that promote the adoption of technologies consistent with the fundamentals of CSA.

Also, the crosscutting actions of innovation and technological training, information management, and organization and institutional strengthening among the three pillars of CSA are promoted by the coordinated work of MGAP with INIA, the IPA and the academic sector (UDELAR/FAGRO and private academic institutions). Led by the International

Cooperation Unit, the MGAP also actively contributes to global food security through a growing number of agreements and actions of South-South cooperation.

The National Institute of Agricultural and Livestock Research (INIA) is a public-private institution attached to the MGAP which is partially funded with contributions from producers through a tax on agricultural and livestock exports. With a predominantly decentralized structure (that includes five experimental stations strategically located throughout the country) and highly qualified technical personnel, INIA has played a leading role in the generation of technologies for the sustainable development of agriculture and animal husbandry. In recent years, INIA successfully implemented a reform on its research strategy, which enabled it to concentrate efforts on the development of practices that combine the intensification of production systems and, at the same time, incorporate variables to adapt to the growing climate variability that the country is experiencing. Specifically, the creation of the Production and Environmental Sustainability program has made it possible to develop lines of cross-cutting research aimed to the identification of practices that promote adaptation and reduction of greenhouse gas emissions in pastoral, agricultural, and rice production systems. As part of its strategy to support the livestock sector, the INIA has been a pioneering institution in the region leading adaptive research to reduce emissions from bovine cattle.

Expanding the aforementioned reference, an important activity of the INIA in relation to CSA is the development and operation of the **“Unidad de Agro-clima y Sistemas de información (GRAS)” (Agro-climate and Information System Unit)**. The main objectives of the GRAS are the promotion, coordination, and execution of research projects and other activities related to **Climate and Climate Change** and their interaction with agricultural and forest production systems, as well as the development of **“Sistemas Modernos de Información y Soporte para la Toma de Decisiones (SISTD)” (Modern Information and Decision-Making Support Systems)** for preventing and managing climate-related risks. The SISTD uses in an integrated manner, modern tools such as remote sensing, geographic information systems (GIS), global positioning systems (GPS), and simulation models for access to, and analysis and management of information. The website of the Unit (www.inia.org.uy/gras) has more than 30,000 subscribers, including producers, technicians, and organizations. The GRAS also supplies information about climate events to public institutions, including the MGAP and SINAIE, researchers, and academics.

INIA-GRAS gives a high priority to projects and activities for assessing and determining the impact of and vulnerability to climate change and variability of areas and systems of agricultural and forestry production, and for identifying potential adaptation measures. GRAS collaborates with other specialized institutions both nationally and internationally. In addition to international support from IAI, AIACC-TWAS, START, FAO, FONTAGRO, and UNDP, there are agreements and covenants to work with INIA in Spain on remote sensing techniques. Meanwhile, the Goddard Institute for Space Studies at NASA and the International Research Institute for Climate Prediction (IRI) at Columbia University are providing advice and training for the use of new satellite remote-sensing instruments and

information of outputs of regional and global models of atmospheric circulation and climate forecasts. Studies of climate variability and change at the regional and national levels have been carried out in collaboration with INTA in Argentina, EMBRAPA in Brazil, the Agricultural Production System Research Unit (APSRU) in Australia, and the IRI.

Although there is no formal forum for cooperation between the public and the private sectors in the field of climate change and agriculture yet, there is a considerable number of private, academic, professional, and research institutions that undertake specific actions related to issues associated with climate change, in particular for the development of mechanisms of adaptation to climate variability.

As mentioned above, the sustainable intensification of agricultural production is a key pillar of the development strategy in Uruguay. Taking into consideration that the goal of sustainability extends to environmental, social, and economic dimensions, there are a large number of entities in the public, private, non-profit, and academic sectors that actively cooperate with the authorities to implement actions that will contribute to the achievement of this objective through applied research, extension, technical assistance, and training. These include institutions such as “Federación Uruguay de Consorcios Regionales de Experimentación Agropecuaria (FUCREA)” (Uruguayan Federation of Regional Consortia for Agriculture and Livestock Experimentation), “Asociación Uruguay de Siembra Directa (AUSID)” (Uruguayan Association of No-till Farmers), “Instituto Nacional de la Leche (INALE)” (The National Milk Institute), “Instituto Plan Agropecuario (IPA)” (Agricultural and Livestock Plan Institute), “Asociación Civil Campo Limpio” (Campo Limpio Civil Association), SARAS Institute, FAGRO and FIECN (UDELAR), private universities, the structure of local and central producers associations such as FR, CAF, CNFR, ARU, ANPL, SUL, ACA, and IPL, and the newly created producer organizations “Asociación Uruguay de Ganaderos del Pastizal” (AUGAP) (Uruguayan Grassland Cattle Ranchers Association) and “Alianza del Pastizal” (Grassland Alliance).