

Climate-Smart Agriculture in Argentina

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 Andrew Jarvis and Caitlin Corner-Dolloff (CIAT), Claudia Bouroncle (CATIE), and Svetlana Edmeades and Ana Bucher (World Bank). The main author of this profile was Andreea Nowak (CIAT), and the team was comprised of Miguel Lizarazo (CIAT), Pablo Imbach (CATIE), Andrew Halliday (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).

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

AACREA	Argentine Association of Regional Consortiums for Agricultural Experimentation
AAPRESID	Argentine Association of No-Till Producers
ACA	Argentine Co-operatives Association
AECID	Spanish Agency for International Development Cooperation
AF	Adaptation Fund
BCFISFL	Bio Carbon Fund Initiative for Sustainable Forest Landscapes
BMG	Bill and Melinda Gates Foundation
CAS	Southern Agricultural Council
CEPF	Critical Ecosystems Partnership Fund
CIAT	International Center for Tropical Agriculture
CIMA (UBA)	Research Center for the Sea and the Atmosphere of the University of Buenos Aires
CLUA	Climate and Land Use Alliance
CNACC	National Advisory Committee on Climate Change
CNEAyD	National Commission on Farming Emergencies and Disasters
COHIFE	Federal water Council
COFEMA	Federal Environmental Council
CONINAGRO	Inter-Cooperative Agricultural Confederation
CRA	Argentine Rural Confederations
CSA	Climate Smart Agriculture
CTF	Clean Technology Fund
DCC (SAyDS)	Climate Change Unit of the Secretariat for the Environment and Sustainable Development
DCSyLCD (SAyDS)	National Directorate of Environmental Management and Biodiversity Conservation of the Secretariat for the Environment and Sustainable Development
DNG (MAGyP)	Livestock Unit of the Ministry of Agriculture, Livestock and Fisheries
ECLAC	Economic Commission for Latin America and the Caribbean
FAA	Argentine Agricultural Federation
FAC	Argentine Carbon Fund
FAO	Food and Agriculture Organization of the United Nations
FONEDA	National Fund for the Mitigation of Agricultural Emergencies and Disasters
GHG	Greenhouse Gas Emissions
GEF	Global Environmental Fund
GIZ	German Development Agency
IAI	Inter-American Institute for Global Change Research
IBI	Index-based insurance
ICA (INTA)	Climate and Water Institute of the National Institute for Agricultural Technology
IDB	Inter-American Development Bank
IFAD	International Fund for Agricultural Development of the United Nations
IFC	International Finance Corporation
IICA	Inter-American Institute for Cooperation in Agriculture
INA	National Water Resource Institute
INTA	National Institute for Agricultural Technology
INTI	National Institute for Industrial Technology
IS (INTA)	Soils Institute of the National Institute for Agricultural Technology
JICA	Japan International Cooperation Agency
LAC	Latin America and the Caribbean
LEA	Agricultural Emergency Act
LECB	Low-Emissions Capacity Building
LUCF	Land Use Change and Forestry
MAGyP	Ministry of Agriculture, Livestock and Fisheries
MCTEIP	Ministry of Science, Technology and Productive Innovation

MECON	Ministry of Economy
MI	Ministry of Interior
NAMA	Nationally Appropriate Mitigation Actions
NAPA	National Adaptation Programs of Action
NCSS	National Climate Change Strategy
NDF	Nordic Development Fund
NDVI	Normalized Green Vegetation Index
OA – MDL	Argentine Office of the Clean Development Mechanism
OECD	Organization for Economic Co-operation and Development
OPIC	Overseas Private Investment Corporation
ORA (MAGyP)	Office for Agricultural Risk of the Ministry of Agriculture, Livestock and Fisheries
PEEA	Strategic Agrifood and Agro Industrial Plan 2010-2020
PFCI	National Federal Plan for Flood Control
PMR	Partnership for Market Readiness
PNFFRH	National Federal Plan for Water Resources
PPCR	Pilot Program for Climate Resilience
PROCISUR	Cooperative Program for the Development of Agricultural Technology in the Southern Cone
PROSAP	Provincial Agricultural Services Programme
R&D	Research and Development
RAMCC	Argentine Network of Municipalities to Confront Climate Change
R-PP	REDD+ Readiness Proposal
SAGyP	Secretariat of Agriculture, Livestock and Fisheries
SAIP	Sustainable Agriculture Initiative Platform
SAyDS	Secretariat for the Environment and Sustainable Development
SAR	Argentine Rural Society
SCCF	Special Climate Change Fund
SCF	Spanish Carbon Fund
SIIA (MAGyP)	Integrated Agricultural Information System of the Ministry of Agriculture, Livestock and Fisheries
SNPyMEDA	National System of Prevention and Mitigation of Farming Emergencies and Disasters
SMN	National Weather Forecasting Service
SRELIC	Scaling-Up Renewable Energy in Low-Income countries
SSRH	Sub-Secretariat for Water Resources
SSN	National Insurance Superintendence
MECON	Ministry of Economy
MI	Ministry of Interior
UBA	University of Buenos Aires
UCAR (MAGyP)	Unit for Rural Change of the Ministry of Agriculture, Livestock and Fisheries
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNFCCC	United Nations Framework Convention on Climate Change
TNC	The Nature Conservancy
UK-ICF	United Kingdom International Climate Fund
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
VCS	Verified Carbon Standard
WB	World Bank

Annex II: Farming systems in Argentina

The temperate mixed (Pampa) farming system (Eastern and Central Argentina) occupies almost 36% of the country's total land area. This area is known for its very fertile soils, which allow for extensive and intensive livestock and crop (maize, soybean, and wheat) production, especially in the provinces of Buenos Aires, Córdoba, and Santa Fe.

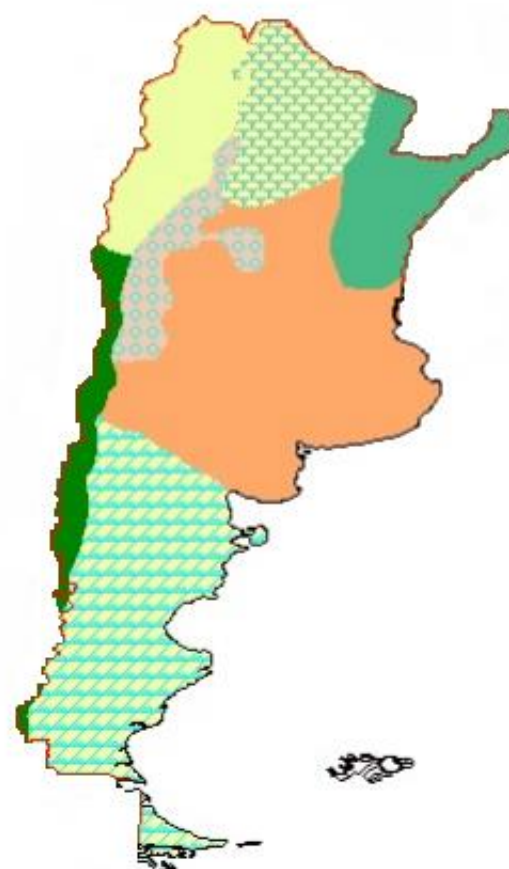
The pastoral farming system (Southern Argentina – Patagonia) extends across more than 20% of the country's territory. Climate is drier and cooler than in the Pampa region and, given the scarce reported irrigation resources for crop production, sheep and cattle ranching is the main agricultural activity.

The irrigated farming system (West) has allowed for the intensification of agriculture in the region, which has generally been commercially oriented (grapevines).

The cereal-livestock (Campos) farming system (Northeastern provinces - Misiones, Corrientes, and Entre Ríos) is a relatively new agricultural region. The area is oriented towards livestock production but also produces tea, mate leaves, citrus, rice, and, to a lesser extent, maize, sunflower, sorghum, and wheat.

The high-altitude mixed (Central Andes) farming system, (Northwestern provinces - Jujuy, Salta, Catamarca, la Rioja, San Juan) is mainly dedicated to the production of sugarcane, tobacco, horticulture, and tropical fruit.

The extensive dry land mixed (Gran Chaco) farming system (Northern provinces - Formosa, Chaco, Santiago del Estero) is less suitable for crop (soy, maize, etc.) production due to its semi-arid climate and soil quality conditions.



Country Boundary



Farming Systems



Irrigated



Cereal-livestock (Campos)



Temperate mixed (Pampas)



Extensive dryland mixed (Gran Chaco)



High altitude mixed (Central Andes)



Pastoral



Sparse (forest)

Source:

Dixon, J. A., Gibbon, D. P., & Gulliver, A. 2001. *Farming systems and poverty: improving farmers livelihoods in a changing world*. Rome: Food and Agriculture Organization

Annex III: Trends in agricultural production in Argentina

The main changes in land use in Argentina have been related to the expansion of agricultural area into pastures and forests in marginal areas (Northeast and Northwest)¹ and the replacement of cereals with oil-seeds, among others. Cropland area has increased two-fold and crop production has increased five-fold in the past three to four decades, trends driven by the increased value of crops relative to livestock (Lence, 2010). More crops are now produced and higher yields obtained, while livestock activities have been replaced or shifted to marginal areas less suitable for agricultural activities such as the semiarid areas of San Luis, Mendoza, the Northwest, (Salta, Tucuman, Santiago del Estero), and the Northeast (Chaco, Formosa, Corrientes).

Maize production has increased almost four-fold, from 5.8 million tons/year in 1972 to 21 million tons in 2012. Wheat production doubled between 1972 and 2004, from 8 million to 16 million tons. Production dramatically decreased after 2004, following the implementation of agricultural policies such as high export taxes that discouraged producers from exporting wheat. On the other hand, soybean, a crop unknown in the agricultural landscape of the country in the early 1970s, gained popularity rapidly due to the increased international demand, reaching production levels double those of maize by 2012 (40 million tons) and increasing harvested area by almost 260% (from 68,000 ha in 1972 to 17.6 million hectares in 2012).

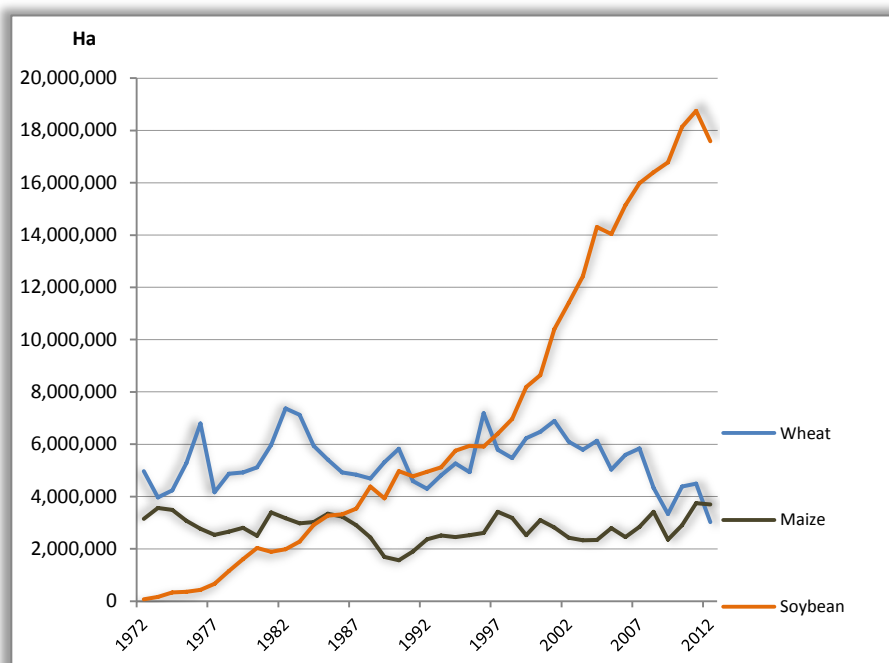


Figure 1 Evolution of **harvested area** for main crops, 1972-2012.

Source: FAOSTAT, 2014

¹ This, in many cases resulted in deforestation (especially in the Chaco region)

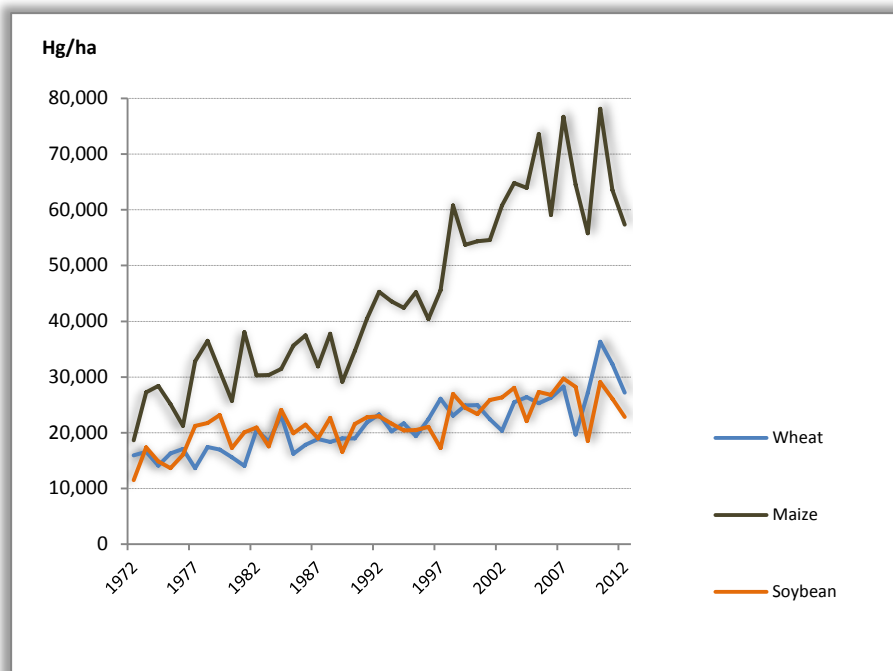


Figure 2 Evolution of **yields** of main crops, 1972-2012

Source: FAOSTAT, 2014

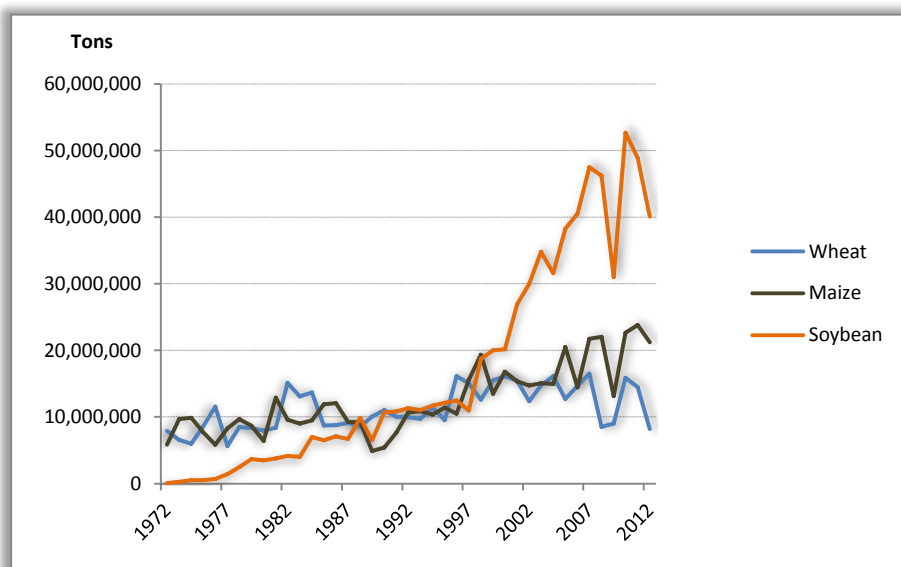


Figure 3 Evolution of **production** of main crops, 1972-2012

Source: FAOSTAT, 2014















	Maize	Soybean	Wheat		
Harvested area (ha)	0 	2 	-1 	2 	significant increase
Yields (hg/ha)	2 	1 	1 	1 	slight increase
Production (t)	1 	2 	0 	0 	no significant change
				-1 	slight decrease
				-2 	significant decrease

Table 1 Summary of changes in harvested area, yields, and production for main production systems, 1972-2012

Source: Based on FAOSTAT data

These events have been driven by regionally specific and production-system specific factors. First, an increased international market demand for these crops (principally soybean, maize, and wheat, but also sunflower) facilitated an overall expansion and intensification of agricultural activities, especially in the Pampa and its marginal areas. However, while international demand has generally incentivized farmers to increase production, fiscal and economic policies (e.g. high export taxes) have discouraged export-oriented production², another factor explaining the drops in production illustrated in Figure 3. High export taxes also explain the relatively low contribution of Argentinian beef to the global beef industry. Despite being ranked third globally in exports of beef in 2005, Argentina dropped to 11th in 2012.

The expansion of agricultural production has also been possible given favorable changes in climate conditions that allowed the expansion to previously unsuitable lands when rainfall rates there increased. Moreover, trade liberalization in the 1990s and reduction of import tariffs increased access to and use of agricultural machinery, fertilizers, and pesticides. These events were accompanied by investments in infrastructure (roads, markets, etc.) and the promotion of new agricultural technologies, such as no-till, precision agriculture, and the introduction of new crop varieties resistant to pests and diseases. For example, no-till technologies decreased soil erosion and improved soil fertility, also making marginal lands more viable for agricultural activities.

Sources:

Frank, F., Ricard, F., Viglizzo, E. 2014. Cambios en el uso de la tierra y emisión de gases invernadero. In Pascale Medina, C., de las Mercedes Zubillaga, M., Taboada, MA (Eds). Suelos, Produccion Agropecuaria y Cambio Climatico Avances en Argentina. 1st ed. Ciudad Autónoma de Buenos Aires: Ministerio de Agricultura, Ganadería y Pesca de la Nación, 2014. Available at: <http://ced.agro.uba.ar/ubatic/?q=node/79>

FAOSTAT. 2014. Country statistics for Argentina, 1972-2012. United Nations Food and Agriculture Organization (FAO): Rome

² Currently, export taxes for wheat reach 23%, for maize 30%, and soybean 35%.

Annex IV: Land ownership and characteristics of producers

According to the National Census, there were 333,477 agricultural production units in the country in 2002, 20% less than recorded by the 1988 Census. This diminishment has been registered in all regions except for Puna and Dry Chaco. Provinces in the Central, Northeast, and Pampa regions have the highest concentration of agricultural land, while provinces in Patagonia, Pampa, and the Center have the highest concentration of production units (Table 2).

The classification of agricultural producers into small-, medium-, and large-scale is determined by farm size, assets, level of mechanization, geographic location, and developments in the agricultural sector. Of all small-scale production units, 77% are concentrated in five regions: the Pampa, Mesopotamia³, the arid mountains region, the humid Chaco, and the valleys in the Northwest. Qualification as small-scale production (by cultivated area) varies between regions, depending on the above-mentioned variables. Definitions are as follows:

- < 500 ha in the Center (Córdoba, Santa Fe, Entre Ríos), the Pampa (Buenos Aires, La Pampa) and provinces of the Gran Chaco region (Formosa, Chaco, Salta, Santa Fe, and Santiago del Estero)
- <25 ha for the irrigated region of Cuyo (San Juan and Mendoza) and some provinces in the Patagonia region (Neuquén, Río Negro)
- <200 ha in the rest of the country

Recent trends show a decrease in small-scale production units in the Pampa and the subtropical Northwest and an increase in the Patagonian valleys and the Cuyo oasis.

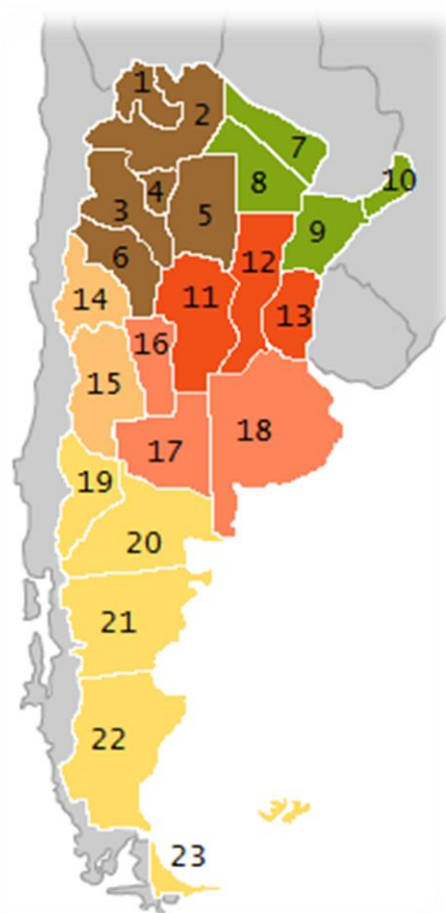


Figure 4 Classification of agricultural regions by province

	Region	Provinces
	Northwest	Jujuy (1), Salta (2), Catamarca (3), Tucumán (4), Santiago del Estero (5), La Rioja (6)
	Northeast	Formosa (7), Chaco (8), Corrientes (9), Misiones (10)
	Center	Córdoba (11), Santa Fe (12), Entre Ríos (13)
	Pampa	San Luis (16), La Pampa (17), Buenos Aires (18)
	Cuyo	San Juan (14) Mendoza (15)
	Patagonia	Neuquén (19), Río Negro (20), Chubut (21), Santa Cruz (22) and Tierra del Fuego (23)

³ The Mesopotamia region includes the provinces of Misiones, Corrientes and Entre Ríos.

Table 2 Characterization of agricultural production units (APUs) (ha and #) by regions and provinces

Agricultural region	Province	Number of small-scale APUs (#)	Average land area of small-scale APUs (ha)	% of small-scale production units out of the total number of APUs in the region (#)	Land area of total small-scale APUs (ha)	% of land area of small-scale APUs out of the total land area of total APUs (ha)
Northeast	Corrientes	10,929	56	72	611,688	9
	Chaco	12,983	128	77	1,666,491	28
	Formosa	7,290	126	73	919,939	18
	Misiones	24,249	33	87	791,422	38
Total Northeast		55,451		83	3,989,540	20
Northwest	Catamarca	7,671	41	84	312,961	20
	Jujuy	7,647	52	85	398,593	31
	La Rioja	6,709	100	83	672,621	22
	Salta	7,470	68	73	505,426	12
	Santiago del Estero	17,453	49	83	849,289	16
	Tucumán	7,734	26	78	203,715	18
Total Northwest		54,684		96	2,942,605	19
Center	Córdoba	14,517	154	55	2,230,924	18
	Santa Fe	17,056	132	61	2,254,657	20
	Entre Ríos	15,829	94	73	1,482,868	23
Total Center		47,402		63	5,968,449	20
Pampa	Buenos Aires	27,168	148	53	4,029,070	16
	La Pampa	3,503	255	45	893,477	7
	San Luis	2,706	238	63	642,697	12
Total Pampa		33,377		53	5,565,244	13
Cuyo	Mendoza	15,315	14	50	216,958	3
	San Juan	3,506	13	41	45,594	6
Total Cuyo		18,821		52	262,552	4
Patagonia	Chubut	2,015	932	54	1,878,945	10
	Neuquén	3,308	59	59	196,298	9
	Rio Negro	3,716	710	50	2,639,292	18
	Santa Cruz	73	988	8	72,134	0
	Tierra del Fuego	21	218	23	4,582	0
Total Patagonia		9,133		66	4,791,251	8
Total	Total regions	218,868	188	68	23,519,641	14

Source: INDEC, 2002

Table 3 Participation of small-scale producers in main production systems

Production system	Total number of APU for production system	Total small-scale APUs	Percentage of small-scale production units out of total number of APUs (100%)
Maize	69,750	49,161	70
Soybean	52,795	28,328	54
Wheat	38,867	18,536	48
Livestock (cattle)	9,123,063*	1,642,151**	19

Source: INDEC, 2002

* Represents number of livestock heads owned by large-scale producers

** Represents number of livestock heads owned by small-scale producers

Sources:

INDEC. 2002. *Censo Nacional Agropecuario 2002*. República Argentina: Instituto Nacional de Estadística y Censos

Obschatko, E.S. de., Foti, M.P., Román, M. 2007. *Los pequeños productores en la República Argentina: importancia en la producción agropecuaria y en el empleo en base al censo nacional agropecuario 2002*. 2a ed. República Argentina: Secretaría Agricultura, Ganadería, Pesca y Alimentos. Dirección de Desarrollo Agropecuario; Instituto Interamericano de Cooperación para la Agricultura- Argentina, 127 p.

Annex V: Methodology for the selection of production systems

Table 4 Selection of main production system for the study

Production System	Contribution to GDP*	Net Production Value (constant 2004-2006 1000 I\$) (1000 Int. \$)*	Calories (kcal/capita/day)**	Variation in production*	Harvested area*	Total (weighted)	Ranking
Soybeans	0.263	11727037	62.8	0.2	17,522,557	5849932	1
Meat (cattle)	0.168	7638397	346.2	0.1	N/A	1527749	2
Maize	0.064	2425411	81.8	0.2	3,222,444	1129587	3
Wheat	0.039	1689377	765.4	0.3	3,909,472	1119923	4
Milk, whole fresh cow	0.074	3383332	163.4	0.3	N/A	676699	5
Grapes	0.033	1521630	2.2	0.1	223,342	348995	8
Sunflower seed	0.020	897417	240.8	0.3	1,890,187	557569	6
Sugar cane	0.019	865846	405.4	0.0	216,563	216563	10
Sorghum	0.011	283476	N/A	0.4	735,071	203710	11
Lemons and limes	0.011	509855	4.2	0.1	47,208	111413	13
Eggs, hen, in shell	0.010	451237	34.2	0.1	N/A	90254	15
Apples	0.010	449638	16.6	0.1	43,353	98602	14
Rice, paddy	0.009	387560	70.8	0.2	216,949	120916	12
Barley	0.008	302332	N/A	0.5	927,005	245868	9
Potatoes	0.008	332520	63.6	0.1	70,087	80534	17
Meat (chicken)	0.049	2224661	125.8	0.0	N/A	444957	7
Meat (pig)	0.010	445644	51.2	0.0	N/A	89139	16

MAIZE

Argentina produces an average of 11 million tons of maize a year on 3.7 million hectares of land. It contributes 2% to global maize production (between 60% and 70% of total maize produced) and is the world's second largest maize exporter. More than 80% of total production is used for animal feed, while the remaining 20% is used for human consumption and biofuel production.

The main agricultural region (the provinces of Córdoba, Buenos Aires, and Santa Fe) accounts for more than 80% of total maize production. In this region, as a response to increased national and international demand for forages, medium- and large-scale farmers have gradually replaced traditional practices with CSA practices including the use of modern machinery and technology, improved varieties⁴ and hybrids⁵, use of fertilizers, agrochemicals (herbicides and pesticides), and new management techniques such as rotations with soybean, direct



Figure 5 Maize: Production regions

Source: INTAGRO 2014

⁴ Adapted to different ecological and climatic characteristics (subtropical, temperate and cold climates)

⁵ Currently, 95-99% of total commercial maize in Argentina is hybrid. These are more resilient to water stress (during flowering) and crop diseases and give higher yields.

seeding, integrated pest management, precision agriculture, adjusted planting times, etc. This technological package has contributed to a significant increase in yields, from roughly 1,570 kg/ha in 1980 to 5,735 kg/ha in 2012.

SOYBEAN

During the past ten years, soybean production in Argentina increased by almost 80% as a consequence of global demand for biofuel and oils, but also due to increased production efficiency and changes in soil and crop management techniques. Soybean is currently cultivated on 17.6 million hectares of land mainly in the core agricultural region (Cordoba, Buenos Aires, Santa Fe, Entre Rios, and La Pampa), but also regions in the North (Chaco, Salta, Santiago del Estero and Tucuman), predominantly by large-scale soybean producers.

In these regions, the main CSA practices adopted for the crop are related to conservation agriculture: no-till or direct seeding (more than 80% of the land cultivated with soybean), crop rotation and precision agriculture. Contour cropping has also been adopted, but to a lesser extent. Additionally, there are several certification schemes to incentivize producers' conformity to social and environmental standards, such as the Round Table on Responsible Soy, Soya Plus, and direct-seeding certification granted by AAPRESID. In general, small and medium-scale producers are not familiar with the requirements of these certifications or cannot afford certification and management costs. The need to improve storage infrastructure, adopt integrated pest management techniques, improve crop water management⁶, and monitor agrochemical use has also been observed, but small- and medium-scale producers do not have adequate incentives (whether financial or knowledge-based) to initiate such activities.

WHEAT

Wheat currently occupies approximately 13% of the total cultivated area in Argentina and is mainly produced in the core agricultural region (Pampa). Wheat yields increased in the last decade (Figure 2, Annex III) due to the incorporation of new high-yielding hybrids, increased use of fertilizers and pesticides, use of pest management techniques, and adoption of management practices aimed at increasing water efficiency and soil quality such as direct seeding, crop rotation, and precision agriculture.



Figure 6 Soybean: Production regions
Source: INTAGRO 2014



Figure 7 Wheat: Production regions
Source: INTAGRO 2014

⁶ For instance, in the Salta province, cases of waste burning are still being registered, while waste management programmes in the core soybean region do not reach all producers.

Sources:

FAOSTAT. 2014. Argentina Country Statistics, 2008-2012 averages (NPV, Variation in production, harvested area) and 2005-2009 averages (kcal/capita/day)

INTAGRO. 2014. Mapas zonas de cultivo. Available at: <http://www.intagro.com>

Rossi, AD. 2007. Evolución de los cultivares de maíz utilizados en la Argentina. Facultad de Ciencias Agrarias, Universidad Nacional de Rosario. Available at: <http://www.fcagr.unr.edu.ar/Extension/Agromensajes/22/1AM22.htm>

Annex VI: Expected impacts of climate changes on yield, water balance and diseases for selected crops for 2080

Table 5 Expected impacts of climate change on main production systems in the Pampean region (La Pampa, Buenos Aires, Entre Rios, Santa Fe and Cordoba) by 2080

	Without CO2 effects		With CO2 effects	
IPCC Socioeconomic scenario ⁷	A2	B2	A2	B2
Maize	- 9 %	- 6 %	+ 19 %	+ 119 %
Soybean	- 14 %	+ 3 %	+ 67 %	+ 68 %
Wheat	- 4 %	- 3 %	+ 14 %	+ 6 %

Source: Government of Argentina 2007

Table 6 Expected impacts of climate change on main production systems by 2080

<i>Production system</i>	<i>Changes in yields - impact and region⁸</i>	<i>Water balance - impact and regions⁹</i>	<i>Diseases</i>
Maize	La Pampa Entre Rios	Central Pampa	Increased frequency of plant hoppers' attacks, especially towards the end of the century
	Chaco Salta		
Soybean	La Pampa Salta Buenos Aires	Pampa region	Increased cases of crop diseases at maturity (Western Pampa)
	Chaco		
Wheat	Chaco Parts of La Pampa Córdoba Salta Buenos Aires	Northwest of the country, Central-Southern Pampa	Increased crop exposure to <i>Fusariosis</i> disease (Southern Pampa)
	Santa Fe Entre Rios		

	Significant increase
	Moderate increase
	No significant change
	Moderate decrease
	Significant decrease

Source: Murgida et al. 2014

Sources:

Government of Argentina. 2007. Segunda Comunicación Nacional de la República Argentina a la Convención Marco de las Naciones Unidas sobre Cambio Climático. República Argentina.

Murgida, A.M., Travasso, M. I., González, S., Rodríguez, G. R. 2014. *Evaluación de impactos del cambio climático sobre la producción agrícola en la Argentina.* CEPAL

⁷ The A2 scenario refers to

⁸ Considering CO2 effects on crops

⁹ Considering regional averages for the A2 and B2 scenarios

Annex VII: CSA practices in Argentina: a detailed list

Table 7 CSA Practices for crop production systems

CSA Practice	Crops related to the practice	Agricultural region	Adoption rate					
			No data	1–20%	21 – 40 %	41–60 %	61–80 %	>81 %
Accurate pesticide application	Grains	Pampa					✓	
Accurate pesticide application	Soybean, Kidney bean, Maize, Sorghum	Northwest					✓	
Beneficial organisms (Parasitic wasps, Entomopathogenic fungus Nematodes, etc.)	Grains	Pampa				✓		
Bio fertilizers	Grains	Pampa		✓				
Bio-pesticides (<i>Bacillus thuringiensis</i> , botanical extracts)	Grains	Pampa				✓		
Building partnerships and alliances	Grains	Pampa					✓	
Community structures for product storage	Grains	Pampa		✓				
Community supported agriculture	Grains	Pampa		✓				
Compost	Grains	Pampa		✓				
Conservation agriculture	Grains (Soybean, Maize, Wheat)	Pampa				✓		
Cover crops (winter crops)	Wheat – Oat – Barley	Northwest				✓		
Crop rotation	Soybean – kidney bean – maize – sorghum	Northwest				✓		
Crop rotation	various	Gran Chaco, Pampa				✓		
Crop rotation with 50% grasses	Extensive crops (Soybean, Maize)	Northwest and Northeast			✓			
Demonstration farms	Grains	Pampa			✓			
Direct seeding	Soybean, Kidney bean, Maize, Sorghum	Northwest						✓
Direct seeding	Grains	Pampa						✓
Disease and parasites resistance and tolerance	Soybean, Kidney bean, Maize, Sorghum	Northwest					✓	
Enhanced agricultural extension	Grains	Pampa				✓		
Farmer field schools, farmer-to-farmer trainings	Grains	Pampa				✓		
Farmer field schools, farmer-to-farmer trainings	Soybean, Kidney bean, Maize, Sorghum	Northwest					✓	
Farmers networks	Soybean, Kidney bean, Maize, Sorghum	Northwest				✓		
Farmers networks	Grains	Pampa					✓	
Good agricultural practices	Fruits	Mountainous valleys			✓			
Identification of storage places and markets	Soybean, Kidney bean, Maize, Sorghum	Northwest					✓	
Improve transport and infrastructure for marketing	Grains	Pampa		✓				

Improved fallow	Soybean, Kidney bean, Maize, Sorghum	Northwest					✓	
Improved fallow	Grains	Pampa				✓		
Improved on-farm crop storage (i.e. silos, bins)	Grains	Pampa						✓
Improved on-farm crop storage (i.e. silos, bins)	Soybean, Kidney bean, Maize, Sorghum	Northwest					✓	
Improvement of crop nutritional values	Soybean, Kidney bean, Maize, Sorghum	Northwest				✓		
Intercropping	Wheat and Soybean and Wheat + Maize	Southeast of Buenos Aires Province (Tandil)		✓				
Labeling schemes (i.e. GAP and GMP adoption)	Grains	Pampa		✓				
Land tenure / property rights	Grains	Pampa						✓
Mulching	Grains	Pampa		✓				
Natural rhythm insects	Grains	Pampa			✓			
On farm value-added products	Grains	Pampa		✓				
Permaculture	Soybean, extensive agriculture	Pampa					✓	
Planting cross slope	Soybean, Kidney bean, Maize, Sorghum	Northwest				✓		
Planting cross slope	Grains	Pampa					✓	
Precision agriculture	Soybean, Maize, Wheat	West of Buenos Aires Province; Eastern Pampa			✓			
Precision management of N - Application	Grains	Pampa			✓			
Precision management of N - Quantity	Grains	Pampa				✓		
Precision management of N - Time	Maize	Northwest		✓			✓	
Precision management of N - Time	Grains	Pampa						
Recyclable packages with bio-material	Grains	Pampa						✓
Reduced burning of crop residues	Grains	Pampa		✓				✓
Reduced burning of crop residues	Maize, Sorghum	Northwest						
Seasonal adapted planting time (early/late planting)	Grains	Pampa					✓	
Soil inoculants	Grains	Pampa						✓
Strengthened environmental regulations for production and waste disposal	Grains	Pampa		✓				
Summer fallow	Wheat - Chickpeas	Northwest				✓		
Supporting product and process innovation	Grains	Pampa					✓	
Terracing	Grains	Pampa				✓		
Tractors, combines other machinery	Grains	Pampa		✓				
Trap crops	Grains	Pampa				✓		

Weather forecasts – early warning systems	Soybean, Kidney bean, Maize, Sorghum	Northwest					✓	
Weather forecasts – early warning systems	Grains	Pampa		✓				

Source: own compilation of information from expert opinion

Table 8 CSA Practices for livestock systems

CSA Practice	Type	Agricultural region	Adoption rate					
			No data	1–20%	21–40%	41–60%	61–80%	>81%
Animal waste composting	Milk	Pampa	✓					
Biodigestores for biogas	Milk	Pampa	✓					
Bio solids	Meat	Pampa		✓				
Disease surveillance (Sentinel screening of herds, information campaigns, quarantine)	Milk	Pampa					✓	
Fuel efficient engines and machinery	Milk	Pampa		✓				
Grass-legume associations	Milk	Pampa				✓		
Improved forages-based feeding	Milk	Pampa						✓
Lagoons	Milk	Pampa					✓	
Photovoltaic panels	Milk	Pampa					✓	
Rotational grazing	Milk	Pampa						✓
Silage and nutritional blocks	Milk	Pampa						✓
Silvopastoral systems	Meat	Northeast and Northwest				✓		
Solar collectors	Milk	Pampa		✓				
Stocking density management (i.e. herd size/land area)	Milk	Pampa					✓	
Wind mills	Meat	Pampa						✓
Zero grazing	Meat	Pampa		✓				

Source: own compilation of information from expert opinion

Annex VIII: Synthesis of the engagement of main institutions in CSA

Table 9 Summary of institutions engaged in climate change and agriculture development action

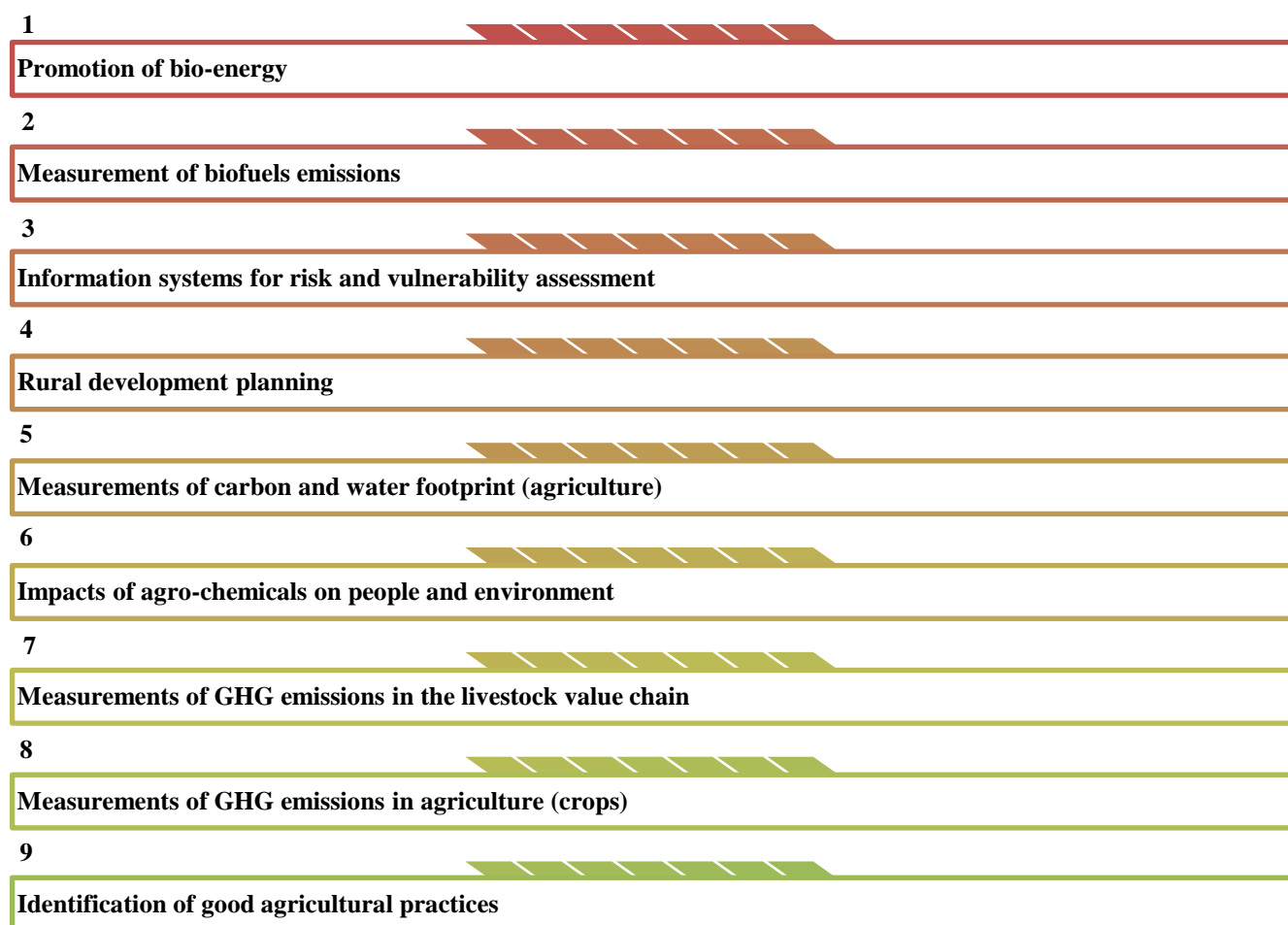
Information for decision-making	Local and regional climate monitoring (agro-climatic network for monitoring climate variables and dissemination of information to producers)	ICA-INTA – collecting agro-meteorological data; weekly information on state of crops, yields, gains and losses, etc. SMN : agro-meteorological newsletter; weekly precipitation and temperature monitoring; ENSO projections ORA : Monitoring of water resources and desertification for wheat, maize, sunflower, soybean in the Pampa region
	Socioeconomic monitoring (evaluation of economic impacts of climate change, monitoring economic variables, support in the commercialization of products, etc.)	INTA-IS : Provision of soil information, integrated soil management MAGyP : economic quantification of climate impacts; economic evaluation of adaptation measures in different productive sectors and regions in the country; analysis of costs and profitability of productive sectors
	Production and market monitoring	MAGyP – weekly information related to state of crops, surfaces, yields, gains and losses, etc. ORA : analysis of market risks for productive systems
	Agricultural zoning; risk maps	ORA, INTA, SMN : risk and hydrological stress maps for crops in the Pampa region; Risk maps of ENSO impacts on temperature and crop yield indices ORA : Information Systems for the Integrated Management of Agricultural Risk
Financial and non-financial support	Support for family farming	MAGyP, INTA : technical assistance, training related to the production, commercialization of agricultural products, social organization, etc.)
	Agricultural insurances and management of financial resources	SSN : crop insurances against hails and storms ORA : preparing a law for agricultural insurances that also cover catastrophes
	Financial support	CNEA : crediting and taxing benefits for producers who experience losses less than 100 % from floods, climate events and natural disasters (Law 22913) ORA : pilot subsidy programs on hail insurances DNG- MAGyP : subsidies for forages purchase, vaccination, rescheduling of borrowings in times of droughts and other climate adversities PROSAP – MAGyP : financial support for investments in alluvial defenses, rehabilitation of watersheds, etc.
Integrated water and soil resource management		ORA : monitoring of soil water reserves for wheat, maize, sunflower and soybean in the Pampa region PROSAP : development of risks programs to increase the use of water resources; programs directed to improvements of water use efficiency and productivity; implementation of policies to avoid loss of natural resources INTA (IS, ICA) – integrated water and soil resource management
Training and technology transfer		MAGyP, INTA, CONICET, Universities, ICA : Strengthening of research INTA, AAPRESID, AACREA : research, technological adaptation and transfer ORA : capacity building in management of climate risks and evaluation of climate variability

Source: **IICA, CAS, RADPA. 2010.** *Principales Políticas sobre Cambio Climático en los Países del Consejo Agropecuario del Sur (CAS)*. Santiago: IICA, CAS, REDPA.\

Annex IX: The National Programme on Smart Agriculture: Key themes

In March 2011 the Secretariat of Agriculture, Livestock, and Fisheries (SAGyP) created a policy framework to promote sustainable and efficient agricultural production through State Act 120/2011. This move culminated in the Program on Smart Agriculture ("Agricultura Inteligente"), aimed at strengthening a competitive and efficient agricultural sector that achieves environmental sustainability while being mindful of national and global food security goals. Even though climate change is not the main focus of this initiative, a number of projects being formulated and/or implemented as part of the program are related to the CSA pillars (Figure 8).

Figure 8 Smart Agriculture Program: Lines of Action

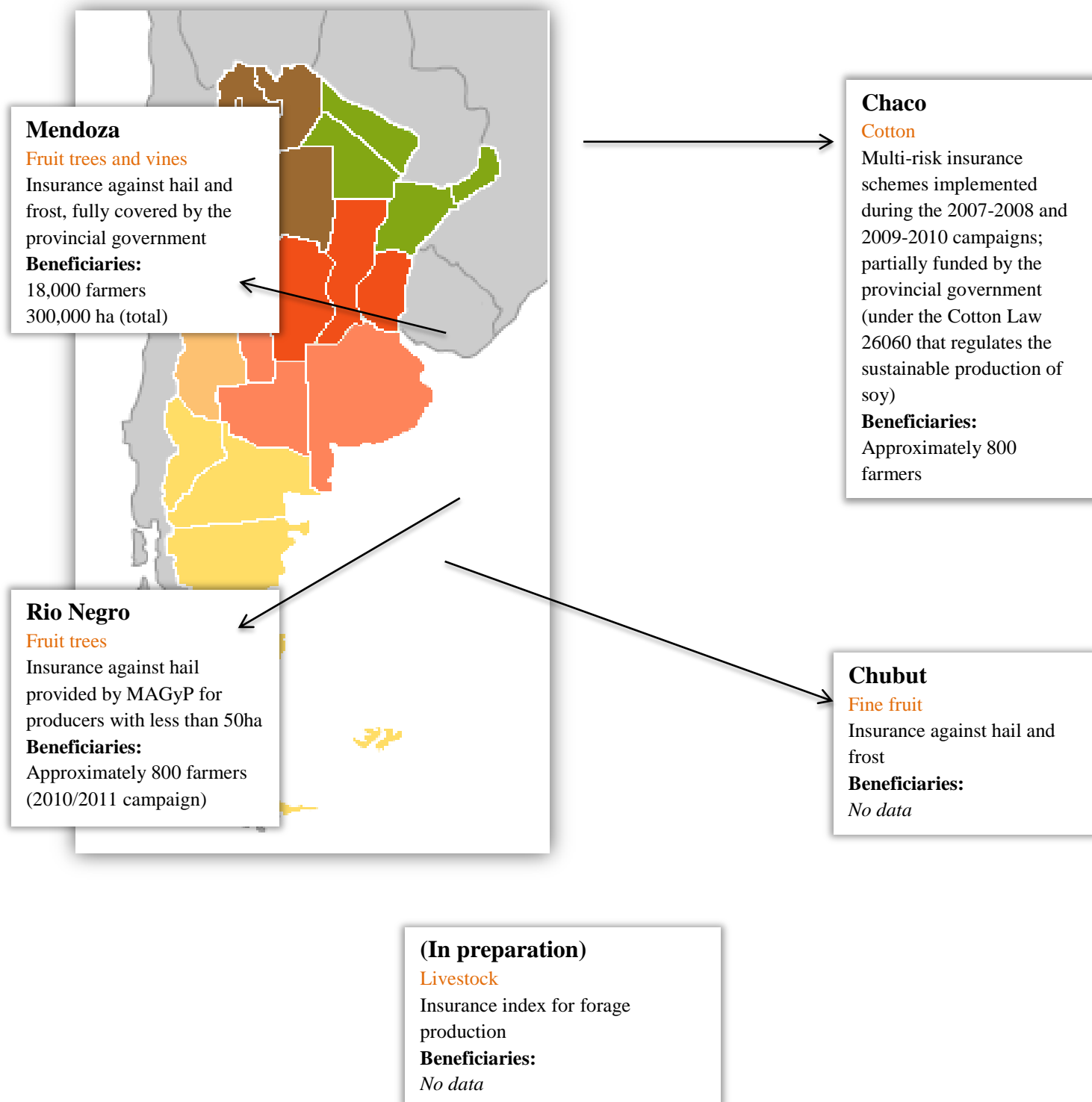


Source:

Basso, L. R., Medina, C.P., Obschatko, E. S. de., Patiño, J.P. 2013. *Agricultura Inteligente: la iniciativa de la Argentina para la sustentabilidad en la producción de alimentos y energía*. Republica de Argentina: Ministerio de Agricultura, Ganadería y Pesca de la Nación, Instituto Interamericano de Cooperación para la Agricultura., 124 pp.

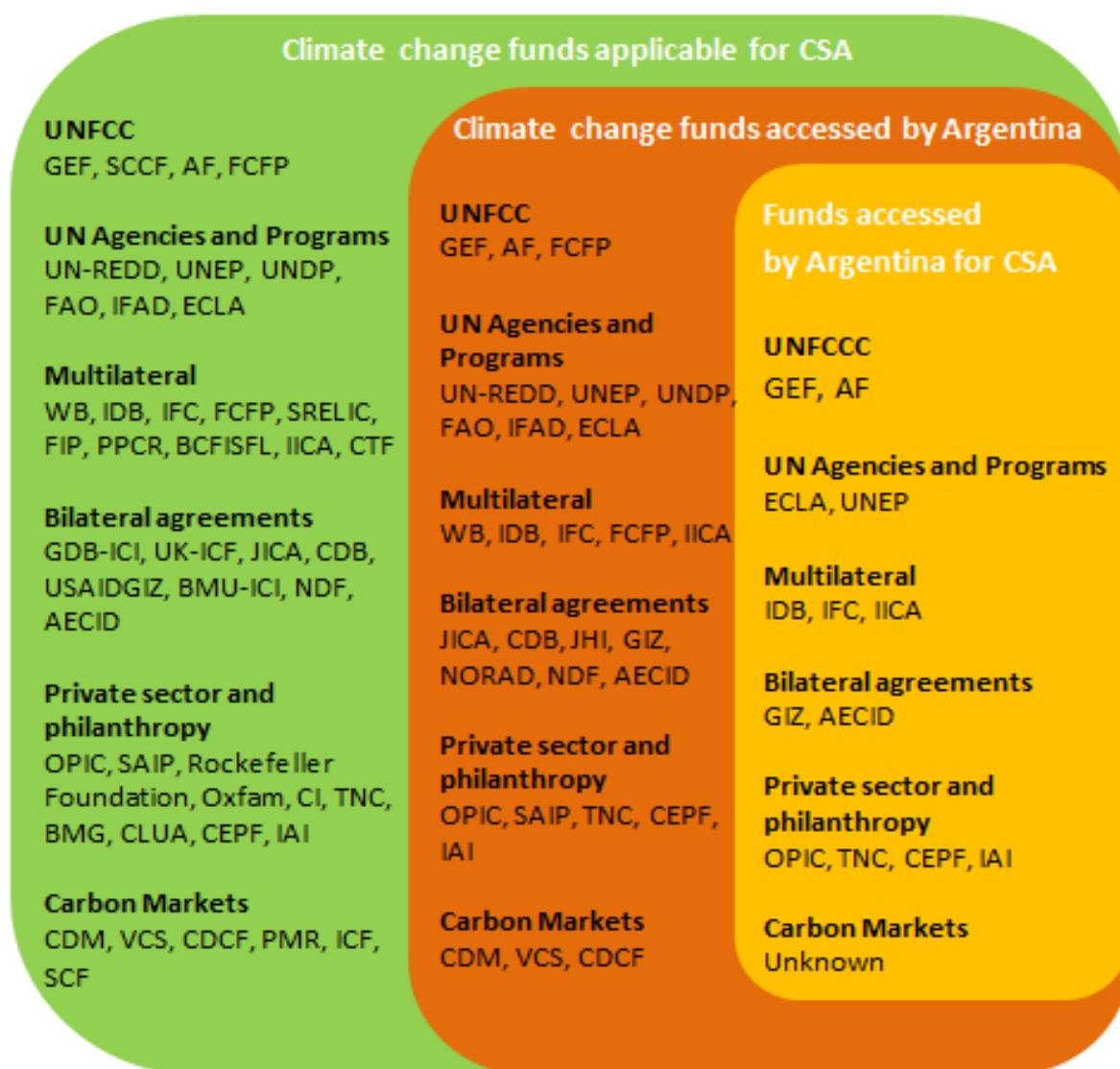
Annex X: Pilot insurance schemes for small-scale producers in Argentina

Figure 9 Pilot insurance schemes for small-scale producers in Argentina (ORA-MAGyP)



Annex XI: Use of International Climate-Smart Funding in Argentina

Figure 10 Use of international climate-smart funding in Argentina



Source: Author's compilation, based on interviews and literature review

Table 10 Examples of support for CSA activities

Source of funding	Uses of funds / themes
The Adaptation Fund	Increased resilience of small-scale producers in Northeastern Argentina
The Global Environmental Facility (GEF)	Climate change (51.4% of total projects funded), biodiversity and soil degradation. No specific project related to agriculture
The Clean Development Mechanism	No project related to agriculture has been approved yet, due to failure to meet the additionally criteria
The World Bank (WB)	Forestry, agriculture and rural development. No explicit focus related to the topic of agriculture and climate change
The Inter-American Development Bank (IDB)	Rural infrastructure development, food systems, and strengthening of regional economies. The next phase of the Provincial Agricultural Services Program (PROSAP III) is expected to explicitly include climate adaptation and mitigation actions in agriculture.
United Nations Food and Agriculture Organization (FAO)	Capacity strengthening and awareness raising related to good agricultural practices for small-scale producers. Other topics are related to rural development and poverty alleviation, food security, natural resource management and biodiversity conservation, biofuels, etc.
The International Fund for Agricultural Development (IFAD)	Small-scale agricultural production and rural development in regions outside the Pampa (North, Northeast and Northwest)
The United Nations Environmental Programme (UNEP)	Analysis of climate change impacts on key crops in Argentina
The Inter-American Institute for Cooperation in Agriculture (IICA)	Climate change awareness raising (generation, access, and interpretation of climate information, as well as on the identification and planning of local adaptation strategies); mapping of stakeholders in agriculture and climate change in Argentina

Source: Author's compilation, based on interviews and literature review