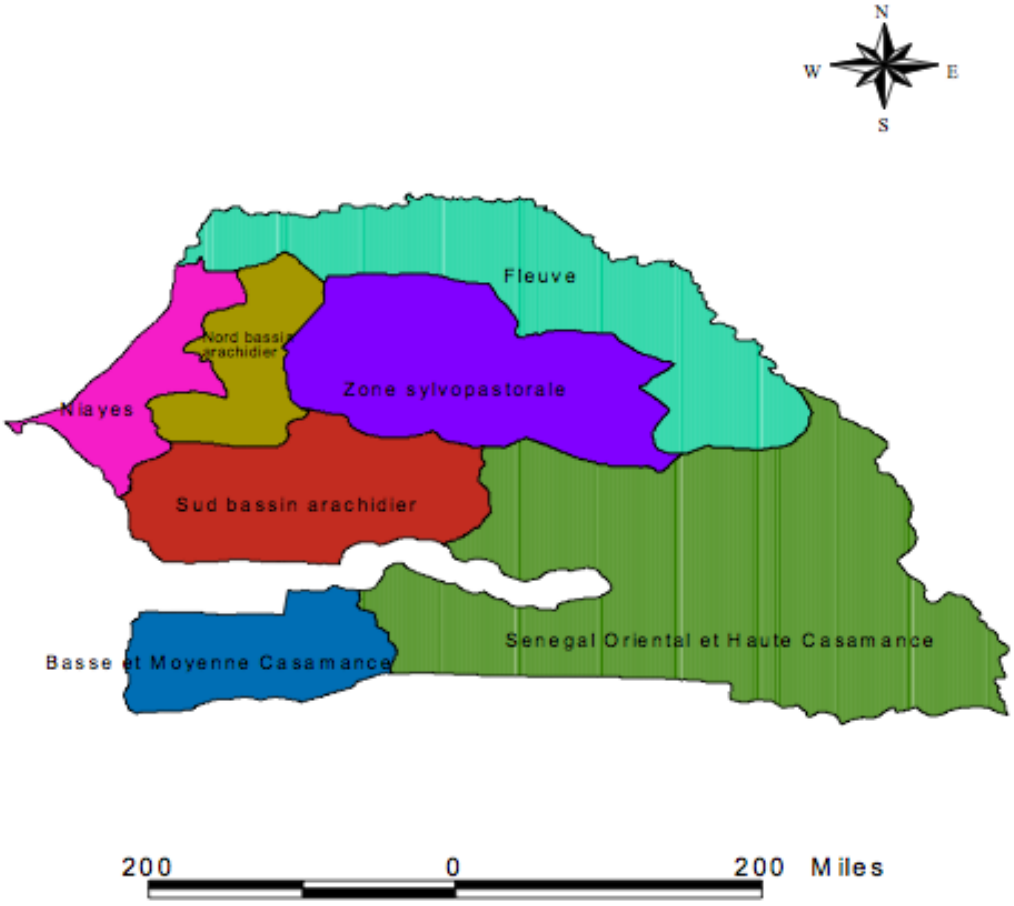
Climate-Smart Agriculture in Senegal

Supplementary material

Annex 1
Senegal's agro-ecological zones

The country is divided into six agro-ecological zones based on biophysical and socio-economic characteristics and although most crops are grown across the country some are more dominant than others in the zones:

- The River Valley (irrigated rice, vegetable growing);
- Niayes (80% of the horticulture produced in the country);
- The Groundnut Basin (groundnuts, millet);
- Sylvo-Pastoral zone (livestock);
- Eastern Senegal and Upper Casamance (rainfed rice)
- Lower Casamance (rainfed rice).



Source: Ministère de l'Environnement et du Développement Durable 2015. Contribution Prevue Determine au Niveau National.

Rainfall is the key factor that determines agriculture production as less than 5% of land cultivated is under irrigation. The agriculture economy is characterized by the dominance of smallholder farmers cultivating millet, sorghum, maize and rice for subsistence purposes. The country's main cash crops include groundnuts and cotton. Groundnuts were introduced during the colonial era

and have dominated the export market ever since. Although the groundnut is well adapted to the Sahel climate the intensity in its cultivation has led to abandoned rotations and shortening of fallow periods depleting the soil of nutrients and causing greater expansion into forested areas. In recent years as yields have begun to decrease due to poor soil conditions and climatic factors (variable precipitation and drought), farmers have taken to cultivating cowpeas which are tolerant of poor soil conditions and drought [1]. Rice production has increased steadily since the 1990s as the area under cultivation has expanded significantly due to investments in irrigation infrastructure in the River Valley which produces 70% of the domestic rice production[2, 3].

Although *maraîchage* (vegetable growing) represents a small percentage of the overall agriculture production its importance to food security and as a livelihood activity for women cannot be overlooked. The sector is also identified as the most promising agribusiness subsector due to its competitive advantage in land availability, climate and water conditions, low labour costs and proximity and capacity to supply European markets. Overcoming post-harvest losses and limited capacity to transform products for added value are key challenges limiting the development of the industry[4]. Livestock production also plays an important role in the country contributing 4.2% of the sectors GDP, which grew by 38% since 1997[5]. It is practiced extensively in the northern River Valley and Sylvo-Pastoral zones.

[1] CSE 2015. Actualisation du Decoupage et de la Caracterisation des zones Eco-Geographiques du Senegal. Dakar, Senegal.
[2] World Food Programme 2013. Climate risk and food security in Senegal: Analysis of climate impacts on food security and livelihoods.
[3] Colen, L., M. Demont, and J. Swinnen 2013. Smallholder participation in value chains: The case of domestic rice in Senegal, In: Rebuilding West Africa's Food Potential, A. Elbehri (ed.), FAO/IFAD.
[4] Brethenous, J., Dioh, S., Drago, N., Giddings, S., Olafsen, E. and Thaller, J. 2011. The Agribusiness Innovation Center of Senegal Scaling a competitive horticulture sector through value adding post-harvest processing. infoDev, Finance and Private Sector Development Department. Washington, DC: World Bank.
[5] CSE 2015. Actualisation du Decoupage et de la Caracterisation des zones Eco-Geographiques du Senegal. Dakar, Senegal.

Annex 2

Selection of agriculture production systems key for food security in Senegal (methodology and results)

For the purpose of downscaling the analysis of CSA options (practices, technologies, and services) to specific agricultural crops and livestock systems (generically named here ¨production systems¨), key systems have been selected, based on their importance to population's food security and national economy. This methodology is an amended version of the production system prioritization methods suggested by researchers at CIAT (Creamer and Parker, unpublished). The variables taken into account for the production system prioritization are related to economic, productive and nutrition quality dimensions:

- *Net Production Value* (US$ Constant 2004-2006): Reflects the importance of the production system in currency value to the economy. Formula: Production in tons) = (Net value of production in US$) / (Unit price of tons in US$/ton)
- *Production system contribution to national GDP* (US$ Constant 2004-2006): the indicator allows for a benchmark with the rest of the sectors of the national economy. Formula: (Contribution to national GDP) = (gross production value of crop) / (total gross national GDP)*100.
- *Food supply* (or dietary energy supply) (Kcal/capita/day): indicator of food security (nutrition quality). Calories is a standard measure for ensuring food quantity.
- *Protein supply quantity* (g/capita/day): indicator of food security (nutrition quality). Protein address the quality of the food, as protein affect stunting and is also an indicator of hunger.
- *Iron content* (mg of iron / 100 gr of product): indicator of food security (nutrition quality). Iron deficiency is an indicator of hidden hunger, but also a critical reflection of access to quality food. Iron deficiency represents a major global public health challenges in the world.
- *Zinc content* (mg of zinc / 100 gr of product): indicator of food security (nutrition quality). Zinc deficiency is the number one deficiency in the world and represents a major global public health challenge.
- *Vitamin A content* (IU Vitamin A / 100 gr of product): indicator of food security (nutrition quality) Deficiency of Vitamin A is an indicator of hidden hunger and represents a major global public health challenge in the world.
- Harvested area (ha) / Pastureland (ha): indicates the importance of the production system in terms of total harvested area.
- *Coefficient of variation in production* (standard deviation): Shows how production has been varying in the past years preferably (5-10). Production systems with higher variation in production systems are considered more vulnerable to climate and non-climate conditions and therefore in greater need to be prioritized. Formula: (Variation in production) = (Standard deviation) / Average for 5 years in production)

The prioritization of the agricultural production systems has been conducted in several steps:

1. First, a long list of key agricultural production systems was compiled, based on existing literature and knowledge of the country context.

2. An analysis of the selected systems´ contribution to food security and economic-productive indicators (mentioned previously) was then undertaken, to identify those production systems[6] (eight to ten) that are most relevant to food security and productivity objectives.

3. The scores of each production system in each indicator were then normalized, to adjust values measured on different scales to a common 0-1 scale, prior to averaging. This would also allow the comparison of indicators´ values within the same production system and across all production systems selected.

4. A total score for the production system was then calculated, by using a weighted average of the values of the economic, productivity, and food security indicators. Each category (economic, productivity, and food security) was given an equal weight (0.33).

   For example, the total weighted score for a production system = Average [(Economic indicators values x 0.33) + (Productivity indicators values x 0.33) + (Food security indicators values x 0.33)],

   Where the Economic indicators values = (Value of Economic indicator 1, Value of Economic indicator 2) / 2

5. Based on the final scores, the list of the production systems was then ranked and reduced to maximum 10 for further analysis.

6. The short list was then revised and validated by in-country experts, who made suggestions of regrouping systems (if the case) or removing from the list, if they were considered irrelevant for the scope of the study (for instance, not very relevant to small-scale / family farming) or if data availability for further analysis was considered an issue.

Below we present the analysis of the production systems for Senegal.

[6] The number of production systems chosen for analysis was limited to ten maximum, to ensure feasibility of the analysis within the given resources available (data availability, time for the analysis, length of the document).

Table 1a: Production system ranking in Senegal – Indicators values.

	Economic indicators		Food security indicators					Productivity indicators	
	NPV (Constant 2004-2006 USD 1000I$)	**PS Contribution to national GDP** (%)	**Food supply** (Kcal/ capita/ day)	**Protein supply quantity** (gr of protein/100 gr of product)	**Iron content** (mg of iron / 100 gr of prod.)	**Zinc content** (mg of zinc / 100 gr of prod.)	**Vitamin A content** (IU Vitamin A / 100 gr of prod.)	**Harvested area** (ha)	**Coefficient of variation in production** (standard deviation, 2009-2013)
Rice	140,642	1.05	697	13.19	2.02	1	0	127,826	0.20
Maize	28,879	0.23	207	8	2.02	2.78	13	148,805	0.34
Millet	113,793	0.89	184	22	6	3.36	0	882,921	0.22
Sorghum	20,896	0.16	78	10	1.97	3.80	0	167,441	0.40
Groundnuts	360,872	2.82	54	26	5	5	0	919,845	0.36
Livestock (bovine)	104,524	0.77	28	34	2.60	6	0	5,650,000	0.04
Horticulture (Vegetables fresh)	10,169	0.07	18	2.90	0.80	0.93	4,277	13,158	0.14
Livestock (Sheep)	46,772	0.04	15	33	1.90	6	0	5,605,000	0.09
Cassava	19,852	0.15	33	1.40	0.30	0.70	27	24,802	0.24
Cotton	16,693	0.12	0	0	0	0	0	29,215	0.24
Mango	69,212	0	10	0.80	0.20	0.50	1,082	17,574	0.13
Cowpeas	16,534	0	3	5	2	1.24	765	29,215	0.41

Source: FAOSTAT 2016 and USDA, 2016

Note: all indicators values are based on 2009-2013 averages

Table 1b: Production system ranking in Senegal – Ranked list (based on data normalization and total weighted average values)

	Economic indicators	Food security indicators	Productivity indicators	Total score (weighted)	Ranking
Rice	0.37	0.39	0.23	0.3274	6
Maize	0.06	0.27	0.42	0.2482	7
Millet	0.3	0.49	0.32	0.3698	5
Sorghum	0.04	0.27	0.5	0.2689	4
Groundnuts	1	0.5	0.52	0.6673	1
Livestock (bovine)	0.27	0.49	0.5	0.4158	2
Horticulture (vegetables fresh)	0.01	0.28	0.14	0.142	9
Livestock (sheep)	0.05	0.46	0.57	0.3574	3
Cassava	0.03	0.05	0.28	0.1197	10
Cotton	0.02	-	0	0.009	12
Mango	0.17	0.08	0.13	0.1238	11
Cowpeas	0.03	0.16	0.5	0.226	8

Annex 3
Methodology for assessing climate smartness of ongoing practices

For collecting data on CSA practices in the country (types of practices, levels of adoption, climate-smartness scores, etc.) we used several processes and methods described below.

Step 1: A first identification and initial listing of practices was carried out through *literature review* and were determined based on the feasibility of implementing them in the important production systems of the country. The list of practices was then confirmed with criteria from in-country experts (mainly agronomists with experience in the selected production systems or agricultural regions of interest in the country).

Step 2: After a first validation of the list of CSA practices identified in the country (and related to the main production systems), experts were then asked to provide, via semi-structured interviews, surveys or focus group discussions, information on where, how, and to what extent the practice is adopted in the country and the production system it is associated with.

Step 3: Experts were then asked to give qualitative evaluations of different components of the 'climate smartness' concept for each of the identified practices.

For assessing climate-smartness levels of a practice we created categories of indicators and sub-indicators related to the CSA pillars:

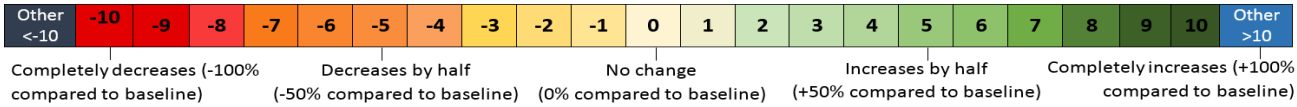
- Productivity: yield smart (yields, post-harvest loss [only for crop systems]) and income smart (income),
- Adaptation: water smart (water availability, water use efficiency, water quality, ecosystem function, soils water retention capacity), soils smart (soil disturbance), and info smart (climate risks management, climate risk prevention, agriculture diversification, local/traditional knowledge use).
- Mitigation: energy smart (energy use from fossil fuels, energy use from renewable sources), carbon smart (above-ground biomass, below-ground biomass, soil carbon stock, methane emissions [only for livestock systems], manure management), and nitrogen smart (nutrient use efficiency).

We recognize that there are many possible angles to look at when assessing the smartness of a production system, and that this list of categories and indicators is not exhaustive. However, we considered them as important entry points for adaptation and mitigation of climate change in the agricultural sector and we argue that a combination of efficient use and management of water, soils, energy, carbon and nitrogen, combined with efforts to reduce climate risks and to promote local knowledge and social capital when implementing the practice, increase the practice's likelihood to contribute to goals related to adaptation, mitigation and improved productivity.

In order to operationalize the analysis of the practice's performance in the six categories of interest, we asked experts specific questions that offer insights into the indicators mentioned

above[7]. For each indicator they gave values from -10 to 10, which can also be associated with % change (-100 % loss to 100% gain). The table below shows how the different indicators suggested were evaluated.

Table 2. Indicators for assessing climate smartness of a practice, technology or service.



Pilar	Smartness category	Indicator	Expected change (compared to baseline)	Qualitative scale explained
PRODUCTIVITY	FOOD SMART	YIELD	By implementing the practice, what are the expected changes in PS yields?	-10=completely decreases (-100% compared to baseline); -5=decreases by half (-50% compared to baseline); 0=no change; 5=increases by half (50% compared to baseline); 10=completely increases (+100% compared to baseline); OTHER: if the change is off the current scale (>-100% or >+100%)
		POST-HARVEST LOSS	By implementing the practice, what are the expected changes in crop losses experienced after harvesting?	
	INCOME SMART	INCOME	By implementing the practice, what are the expected changes in income?	
ADAPTATION	WATER SMART	WATER AVAILABILITY	By implementing the practice, what are the expected changes in the quantity of water available for agriculture?	
		WATER USE EFFICIENCY	By implementing the practice, what are the expected changes in the quantity of water used per unit of product? (Refers to water used for crop irrigation and/or livestock production).	
		WATER QUALITY	By implementing the practice, what are the expected changes in water quality?	
		ECOSYSTEM FUNCTION	By implementing the practice, what is the expected change in the water cycle equilibrium in the ecosystem? (balance between water inflow and outflow) in the ecosystem)	-10 = completely destabilizes the water balance, 0 = not change, to 10 = completely stabilizes the water balance; OTHER: if the change is off the current scale (>-100% or >+100%)
		WATER RETENTION CAPACITY OF SOILS	By implementing the practice, what are the expected changes in soil's ability to retain water?	-10=completely decreases (-100% compared to baseline); -5=decreases by half (-50% compared to baseline); 0=no change; 5=increases by half (50% compared to baseline); 10=completely increases (+100% compared to baseline); OTHER: if the change is off the current scale (>-100% or >+100%)
	SOIL SMART	SOIL DISTURBANCE	By implementing the practice, what are the expected changes in soil disturbance?	-10= completely increases levels of soil disturbance (75-100% of the area tilled, deep ploughing [>30 cm]); 0=no change; 10=completely decreases levels of soil disturbance

[7] Note that these indicators and associated questions should not be taken as absolute metrics for assessment, but they should just guide the qualitative assessment of the practice and be adapted to the context of the analysis.

				(e.g. no till techniques) (+100% compared to baseline); OTHER: if the change is off the current scale (>-100% or >+100%)
	INFO SMART	CLIMATE RISKS MANAGEMENT	By implementing the practice, what are the expected changes in farmers' capacity to manage climate risks?	-10=completely decreases (-100% compared to baseline); -5=decreases by half (-50% compared to baseline); 0=no change; 5=increases by half (50% compared to baseline); 10=completely increases (+100% compared to baseline); OTHER: if the change is off the current scale (>-100% or >+100%)
		CLIMATE RISKS PREVENTION	By implementing the practice, what are the expected changes in farmers' capacity to limit the exposure of the PS to climate risks?	
		AGRICULTURE DIVERSIFICATION	By implementing the practice, what are the expected changes in the level of diversification of farmers' agricultural activities on the farm?	
		LOCAL/ TRADITIONAL KNOWLEDGE	By implementing the practice, what are the expected changes in how much farmers use local and traditional knowledge for managing the farm?	
MITIGATION	ENERGY SMART	ENERGY USE (FOSSIL FUELS)	By implementing the practice, what are the expected changes in the quantity of fossil fuel energy used to manage the PS every season?	-10=completely increases (-100% compared to baseline); -5=increases by half (-50% compared to baseline); 0=no change; 5=decreases by half (50% compared to baseline); 10=completely decreases (+100% compared to baseline); OTHER: if the change is off the current scale (>-100% or >+100%)
		ENERGY USE (RENEWABLE)	By implementing the practice, what are the expected changes in the quantity of renewable energy used to manage the PS every season?	-10=completely decreases (-100% compared to baseline); -5=decreases by half (-50% compared to baseline); 0=no change; 5=increases by half (50% compared to baseline); 10=completely increases (+100% compared to baseline); OTHER: if the change is off the current scale (>-100% or >+100%)
	CARBON SMART	BIOMASS (ABOVE-GROUND)	By implementing the practice, what are the expected changes in the availability of above-ground biomass on the farm every season?	
		BIOMASS (BELOW-GROUND)	By implementing the practice, what are the expected changes in the availability of below-ground biomass on the farm every season?	
		SOIL CARBON STOCK	By implementing the practice, what are the expected changes in the quantity of organic matter accumulated in soil?	
		METHANE EMISSIONS (only for livestock PS)	By implementing the practice, what are the expected changes in the quality of animal diet?	
		MANURE MANAGEMENT	By implementing the practice, what are the expected changes in the quantity of manure that is left of pastures/fields? (-10 = much more manure left to 10 = decreased amount of manure)	
	NITROGEN SMART	NUTRIENT USE EFFICIENCY	By implementing the practice, what are the expected changes in the quantity of fertilizers used per unit of product in a season? (note: the evaluator will mention the type of fertilizer analyzed: organic / inorganic)	-10=completely increases fertilizer use (-100% compared to baseline); -5=increases by half (-50% compared to baseline); 0=no change; 5=decreases by half (50% compared to baseline); 10=completely

				decreases fertilizer use (+100% compared to baseline); OTHER: if the change is off the current scale (>-100% or >+100%)

Step 5: Then we identified high-interest practices, based on total climate-smartness score and best data available[8], to include in the Profile infographics. A comprehensive list of all practices analyzed is provided in Annex 4.

Step 6: From the literature review and expert consultations we also identified challenges and barriers to adoption and/or scaling out of the identified CSA practices, related to policies, institutions, finances, etc.

Step 7: We then studied the implementation of a CSA practice into more detail, by means of a case study.

[8] Practices were evaluations on some indicators was missing were not taken on the priority list.

Annex 4

Long list of CSA practices adopted in Senegal (Table 3)

practice #	**Practice** name	# of evaluations	% of **harvested area** / % **land use** area of total ag. area	**Agroecozone**	**Farmer predominance** 1: Small scale; 2: Medium Scale; 3: Large scale	**Practice adoption** (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	Dimensions averages								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
IRRIGATED RICE															
1	System of Rice Intensification	5	2%	Sylvo-Pastoral zone	1, Some 2, 3	2	5.0	5.8	3.4	7.0	3.4	1.8	6.4	-3.5	3.6
1		4	2%	River Valley	1, Some 2, 3	2	3.1	7.3	3.7	6	4	1.5	6.4	-4	3.5
1		2	2%	Lower and middle Casamance	1,2, Some: 3	2	2.8	4.5	4.2	5.0	5.0	0.0	0.7	ND	3.2
1		***11***	***2%***	***ALL REGIONS***	***1,2 Some: 3***	***2***	***3.6***	***5.9***	***3.8***	***6.0***	***4.1***	***1.1***	***4.5***	***-3.8***	***3.1***
2	Certified salt-tolerant varieties	1	2%	River Valley	1,2	1	0.0	5.0	2.0	ND	-2.0	ND	ND	ND	1.3
2		1	2%	Lower and middle Casamance	1,2	1	-1.0	6.0	1.0	ND	-2.0	ND	ND	ND	1.0
2		***2***	***2%***	***ALL REGIONS***	***1,2, Some: 3***	***1***	***-0.5***	***5.5***	***1.5***	***ND***	***-2.0***	***ND***	***ND***	***ND***	***1.1***
3	Community seed banks	1	2%	Lower and middle Casamance	2,3	3	2.0	3.0	0.0	0.0	3.3	0.0	2.3	-10.0	0.1
3		1	2%	River Valley	2,3	3	4.0	6.0	0.0	0.0	5.0	0.0	3.3	-10.0	1.0
3		***2***	***2%***	***ALL REGIONS***	***2,3***	***3***	***3.0***	***4.5***	***0.0***	***0.0***	***4.2***	***0.0***	***2.8***	***-10.0***	***0.6***
4	Producer networks	1	2%	Lower and middle Casamance	1,2	3	ND	ND	ND	ND	4.3	ND	ND	-10.0	-2.9
4		1	2%	River Valley	1,2	3	ND	ND	ND	ND	5.3	ND	ND	-10.0	-2/6
4		***2***	***2%***	***ALL REGIONS***	***1,2***	***3***	***ND***	***ND***	***ND***	***ND***	***4.8***	***ND***	***ND***	***-10.0***	***-2.6***
5	Certified drought-resistant varieties	1	2%	Sylvo-Pastoral zone	2,3	2	1.0	8.0	4.5	7.0	6.8	ND	8.7	-10.0	3.7
5		1	2%	River Valley	2,3	2	1.0	6.0	3.8	5.0	5.8	ND	7.3	-10.0	2.7
5		***2***	***2%***	***ALL REGIONS***	***2,3***	***2***	***1.0***	***7.0***	***4.1***	***6.0***	***6.3***	***ND***	***8.0***	***-10.0***	***3.2***
6		2	2%	Sylvo-Pastoral zone	1,2,3	2	5.5	6.5	6	ND	1	-3	0	7	3.3

practice #	Practice name	# of evaluations	% of harvested area / % land use area of total ag. area	Agroecozone	Farmer predominance 1: Small scale; 2: Medium Scale; 3: Large scale	Practice adoption (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	Dimensions averages								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
6	Certified short-cycle varieties	2	2%	River Valley	1,2,3	2	5.5	7.0	7.0	ND	1.3	-4.0	0.0	7.0	3.4
6		**4**	**2%**	**ALL REGIONS**	**1,2,3**	**2**	**5.5**	**6.8**	**6.5**	**ND**	**1.2**	**-3.5**	**0.0**	**7.0**	**3.3**
7	Management of soil salinity (drainage and flooding, organic matter addition)	2	2%	Sylvo-Pastoral zone	1,2,3	3	4.0	8.5	7.3	7.0	6.4	ND	6.8	-1.0	5.6
7		2	2%	River Valley	1,2,3	3	3.75	8	7.4	5	5.9	ND	6.5	-1	5.1
7		***4***	***2%***	***ALL REGIONS***	***1,2,3***	***3***	***3.9***	***8.3***	***7.3***	***6.0***	***6.1***	***ND***	***6.7***	***-1.0***	***5.3***
8	Storage and conservation techniques	*1*	*2%*	Sylvo-Pastoral zone	1,2,3	3	7.0	9.0	8.0	ND	ND	ND	ND	ND	8.0
8		*1*	*2%*	River Valley	1,2,3	3	7.0	9.0	8.0	ND	ND	ND	ND	ND	8.0
8		***2***	***2%***	***ALL REGIONS***	***1,2,3***	***3***	***7.0***	***9.0***	***8.0***	***ND***	***ND***	***ND***	***ND***	***ND***	***8.0***
CEREALS (MAIZE, MILLET, SORGHUM)															
1	Climate information systems (crop calendars, seasonal forecasts and early warning systems)	1	28%	Sylvo-Pastoral zone	1,2,3	3	5.0	4.0	2.0	2.0	6.0	3.0	4.5	6.0	4.1
1		11	28%	Groundnut Basin	1,2,3	2	4.2	3.3	2.0	5.0	5.1	4.5	3.5	2.6	3.8
1		**12**	**28%**	**ALL REGIONS**	**1,2,3**	**3**	**4.6**	**3.7**	**2.0**	**3.5**	**5.6**	**3.8**	**4.0**	**4.3**	**3.9**
2	Agroforestry	1	28%	Sylvo-Pastoral zone	1	1	2.0	3.0	3.8	4.0	3.5	2.0	2.0	3.0	2.6
2		3	28%	Groundnut Basin	2, Some: 1	1	0.0	4.7	4.1	3.3	5.2	0.2	5.8	3.3	3.3
2		***4***	***28%***	***ALL REGIONS***	***1,2***	***1***	***1.0***	***3.8***	***4.0***	***0.3***	***4.3***	***-0.9***	***3.9***	***3.2***	***2.9***
3		1	28%	Sylvo-Pastoral zone	1	1	3.0	6.0	2.8	0.0	4.5	3.0	2.5	3.0	3.1

practice #	Practice name	# of evaluations	% of harvested area / % land use area of total ag. area	Agroecozone	Farmer predominance 1: Small scale; 2: Medium Scale; 3: Large scale	Practice adoption (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	Dimensions averages								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
3	Certified short-cycle varieties	9	28%	Groundnut Basin	1,2,3	2	6.3	6.0	2.4	0.0	3.7	3.0	2.3	0.8	3.1
3		**10**	**28%**	**ALL REGIONS**	**1, Some: 2.3**	**2**	**4.7**	**6.0**	**2.6**	**0.0**	**4.1**	**3.0**	**2.4**	**1.9**	3.1
4	Good agricultural practices (weeding, fire control)	**2**	**28%**	**Groundnut Basin**	**1.2**	**3**	**7.0**	**6.5**	**3.8**	**2.5**	**5.4**	**4.0**	**7.3**	**4.0**	**5.1**
5	Producer networks	**4**	**28%**	**Groundnut Basin**	**1,2 Some: 3**	**2**	**4.5**	**3.0**	**4.0**	**3.0**	**4.5**	**3.3**	**3.2**	**2.5**	**3.5**
6	Assisted natural regeneration	**8**	**28%**	**Groundnut Basin**	**1 Some: 2**	**2**	**3.7**	**3.3**	**3.1**	**3.8**	**4.0**	**3.8**	**3.4**	**3.3**	**3.5**
7	Composting using biodigesters	**4**	**28%**	**Groundnut Basin**	**1 Some: 2, 3**	**2**	**7.0**	**7.5**	**2.0**	**6.5**	**3.9**	**7.3**	**5.8**	**6.5**	**5.8**
MANGO															
1	Drip irrigation	1	1%	Groundnut Basin	2,3	1	7.0	8.0	7.6	2.0	6.3	2.5	5.0	6.0	5.5
1		1	1%	Niayes	2,3	1	5.0	7.0	7.6	2.0	5.0	2.5	5.0	ND	4.9
1		***2***	***1%***	***ALL REGIONS***	***2,3***	***1***	***6.0***	***7.5***	***7.6***	***2.0***	***5.6***	***2.5***	***5.0***	***6.0***	***5.3***
2	Pruning	1	1%	*Groundnut Basin*	2,3	2	7.5	7.0	3.0	3.0	2.3	3.0	3.3	3.0	4.0
2		1	1%	Niayes	1,2	2	7.0	7.0	3.0	3.0	2.3	3.0	3.3	3.0	3.9
2		***2***	***1%***	***ALL REGIONS***	***2, Some: 1,3***	***2***	***7.3***	***7.0***	***3.0***	***3.0***	***2.3***	***3.0***	***3.3***	***3.0***	***4.0***
3	Mulching	1	1%	*Groundnut Basin*	1,2	2	2.0	3.0	2.2	1.0	1.8	2.0	2.0	ND	2.4
3		2	1%	Niayes	1,2	3	4.0	3.0	4.3	1.0	2.0	2.0	2.8	ND	2.4
3		***3***	***1%***	***ALL REGIONS***	***1,2***	***3***	***3.0***	***3.0***	***3.3***	***1.0***	***1.9***	***2.0***	***2.4***	***ND***	***2.4***
4	Grafting	1	1%	*Groundnut Basin*	1,2	3	2.5	5.0	-0.8	0.0	-0.3	-1.0	0.8	2.0	1.1
4		1	1%	Niayes	1,2	3	2.5	5.0	-0.8	0.0	-0.3	-1.0	0.8	3.0	1.1
4		***2***	***1%***	***ALL REGIONS***	***1,2***	***3***	***2.5***	***5.0***	***-0.8***	***0.0***	***-0.3***	***-1.0***	***0.8***	***2.5***	***1.1***

practice #	**Practice** name	# of evaluations	% of **harvested area** / % **land use** area of total ag. area	**Agroecozone**	**Farmer predominance** 1: Small scale; 2: Medium Scale; 3: Large scale	**Practice adoption** (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	**Dimensions averages**								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
5	Composting	***6***	***1%***	***Niayes***	***2, Some: 1,3***	***1***	***4***	***6***	***3.8***	***4.0***	***3***	***1.5***	***1.25***	***1.5***	***3.2***
6	Intercropping with cassava	***1***	***1%***	***Niayes***	***1,2***	***3***	***ND***	***ND***	***ND***	***ND***	***ND***	***ND***	***ND***	***ND***	***ND***
7	Use of organic fertilizer	***5***	***1%***	***Niayes***	***1,2,3***	***2.2***	***7***	***7.5***	***5***	***ND***	***3***	***ND***	***5***	***-1***	***4.4***
GROUNDNUTS															
1	Use of organic fertilizer	*2*	21%	Sylvo-Pastoral zone	2,3, Some: 1	2	3.0	5.0	2.4	3.5	3.4	1.5	2.0	2.0	2.8
1		*2*	21%	Groundnut Basin	1, 2, Some: 3	2	4	6.5	1.6	4.5	3.9	1	2.6	ND	3.4
		4	***21%***	***ALL REGIONS***	***1, 2, Some: 3***	***2***	***3.5***	***5.8***	***2.0***	***4.0***	***3.6***	***1.3***	***2.3***	***2.0***	***3.1***
2	Intercropping with cowpeas	1	21%	Sylvo-Pastoral zone	1	2	0.5	2.0	2.0	0.0	2.8	2.0	2.0	2.0	1.7
2		1	21%	*Groundnut Basin*	1	2	0.5	1.0	1.2	0.0	1.8	2.0	1.5	ND	1.1
		2	***21%***	***ALL REGIONS***	***1***	***2***	***0.5***	***1.5***	***1.6***	***0.0***	***2.3***	***2.0***	***1.8***	***2.0***	***1.5***
3	Producer networks	*2*	*21%*	Sylvo-Pastoral zone	1, 2, Some: 3	2	3.0	3.0	0.0	2.0	3.2	2.5	1.8	6.0	2.7
3		*2*	*21%*	*Groundnut Basin*	1, 2, Some: 3	2	4	3	0	2	3.7	2.5	2.3	ND	2.5
		4	***21%***	***ALL REGIONS***	***1, 2, Some: 3***	***2***	***3.5***	***3.0***	***0.0***	***2.0***	***3.5***	***2.5***	***2.0***	***6.0***	***2.8***
4	Living fence with food-bearing tree (hibiscous, moringa)	1	21%	Sylvo-Pastoral zone	1,2	3	0.0	1.0	0.0	0.0	1.3	0.0	1.5	ND	0.5
4		1	21%	Groundnut Basin	1,2	3	0.0	1.0	0.0	0.0	1.3	0.0	1.5	ND	0.5
		2	***21%***	***ALL REGIONS***	***1,2***	***3***	***0.0***	***1.0***	***0.0***	***0.0***	***1.3***	***0.0***	***1.5***	***ND***	***0.5***
5	Stone bunds	1	21%	Sylvo-Pastoral zone	1,2	1	3.5	4.0	5.2	2.0	5.5	4.5	5.8	7.0	4.7
5		1	21%	Groundnut Basin	1,2	1	4.0	5.0	6.2	5.0	6.8	4.5	6.8	ND	5.5
		2	***21%***	***ALL REGIONS***	***1,2***	***1***	***3.8***	***4.5***	***5.7***	***3.5***	***6.1***	***4.5***	***6.3***	***7.0***	***5.2***
6		2	21%	Sylvo-Pastoral zone	1 Some: 2, 3	2	6.0	6.0	3.0	2.0	4.8	2.0	4.4	4.0	4.0

practice #	Practice name	# of evaluations	% of harvested area / % land use area of total ag. area	Agroecozone	Farmer predominance 1: Small scale; 2: Medium Scale; 3: Large scale	Practice adoption (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	Dimensions averages								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
6	Certified short-cycle varieties	8	21%	Groundnut Basin	2, Some: 3	3	3.4	6.4	0.4	0.4	5.4	0.7	1.5	1.0	2.4
		10	*21%*	*ALL REGIONS*	*1,2, Some: 3*	*3*	*4.7*	*6.2*	*1.7*	*1.2*	*5.1*	*1.3*	*3.0*	*2.5*	*3.2*
7	Crop rotation	*2*	*21%*	*Groundnut Basin*	*2*	*3*	*1.8*	*5.0*	*0.0*	*6.0*	*0.5*	*0.0*	*0.5*	*0.0*	*1.7*
8	Agroforestry	*2*	*21%*	*Groundnut Basin*	*1*	*1*	*1.5*	*5.0*	*2.1*	*7.0*	*3.1*	*0.0*	*4.5*	*0.0*	*2.9*
9	Assisted natural regeneration	*4*	*21%*	*Groundnut Basin*	*1, Some: 2*	*1*	*0.3*	*3.5*	*1.2*	*10.0*	*2.3*	*0.0*	*0.1*	*1.0*	*2.3*
10	Climate information systems (crop calendars, seasonal forecasts and early warning systems)	*2*	*21%*	*Groundnut Basin*	*1,2*	*2*	*2.3*	*4.0*	*1.5*	*6.5*	*2.3*	*0.0*	*4.5*	*0.0*	*2.6*
Livestock (cattle and sheep)															
1	Intensification of cultivated pastures (animals in place, improved forages)	*11*		*Sylvo-Pastoral zone*	*2, Some: 1, 3*	*1.25*	*7.4*	*8.0*	*3.8*	*3.0*	*4.7*	*ND*	*5.6*	*-3.0*	*4.2*
2	Increase number of small ruminants/chicken in	*11*		*Sylvo-Pastoral zone*	*1,2, Some: 3*	*3*	*7.0*	*8.0*	*-0.8*	*ND*	*4.6*	*ND*	*3.2*	*1.8*	*4.0*

practice #	Practice name	# of evaluations	% of harvested area / % land use area of total ag. area	Agroecozone	Farmer predominance 1: Small scale; 2: Medium Scale; 3: Large scale	Practice adoption (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	Dimensions averages								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
	livestock management														
3	Fodder banks	*5*		*Sylvo-Pastoral zone*	*3*	*1*	*9.0*	*9.0*	*6.4*	*4.0*	*4.6*	*2.0*	*6.4*	*1.3*	*5.3*
4	Manure composting for fertilization	*11*		*Sylvo-Pastoral zone*	*1 Some: 2*	*2*	*7.0*	*5.0*	*2.7*	*4.0*	*5.8*	*6.0*	*2.4*	*4.8*	*4.7*
ALTERNATIVE CROPS (CASSAVA, COWPEAS)															
1	Intercropping (cowpeas/groundnuts; cassava/maize; cowpeas/millet)	3	4%	Sylvo-Pastoral zone	1 Some: 2	2	0.7	1.0	2.5	0.0	4.0	1.0	1.6	0.5	1.4
1		3	4%	Groundnut Basin	1 Some: 2	2	1.2	1	2.3	0	4.2	1	1.9	0	1.4
1		**6**	**4%**	**ALL REGIONS**	**1 Some: 2**	**2**	**0.9**	**1.0**	**2.4**	**0.0**	**4.1**	**1.0**	**1.7**	**0.3**	**1.4**
2	Composting using biodigesters	1	4%	Sylvo-Pastoral zone	1,2,3	3	6.0	6.0	1.0	ND	2.3	ND	3.0	ND	3.7
2		1	4%	Groundnut Basin	1,2,3	3	6.0	6.0	1.5	ND	2.3	ND	3.5	7.0	4.4
2		*2*	*4%*	*ALL REGIONS*	*1,2,3*	*3*	*6.0*	*6.0*	*1.3*	*ND*	*2.3*	*ND*	*3.3*	*7.0*	*4.3*
3	Certified short-cycle varieties	2	4%	Sylvo-Pastoral zone	1,2,3	2.5	4	6	ND	0	6	ND	2.3	1	3.2
3		2	4%	Groundnut Basin	1,2,3	3	4.0	7.0	ND	0.0	6.5	ND	2.3	1.0	3.5
3		*4*	*4%*	*ALL REGIONS*	*1,2,3*	*3*	*4.0*	*6.5*	*ND*	*0.0*	*6.3*	*ND*	*2.3*	*1.0*	*3.3*
4	Use of organic fertilizer	1	4%	Sylvo-Pastoral zone	1,2,3	2	3.0	7.0	1.5	6.0	2.3	ND	5.0	6.0	2.7
4		1	4%	Groundnut Basin	1,2,3	2	3.0	7.0	2.0	6.0	2.3	ND	5.0	7.0	2.9
4		*2*	*4%*	*ALL REGIONS*	*1,2,3*	*2*	*3.0*	*7.0*	*1.8*	*6.0*	*2.3*	*ND*	*5.0*	*6.5*	*2.8*

practice #	**Practice** name	# of evaluations	% of **harvested area** / % **land use** area of total ag. area	Agroecozone	**Farmer predominance** 1: Small scale; 2: Medium Scale; 3: Large scale	**Practice adoption** (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	Dimensions averages								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
5	Conservation agriculture (Crop rotation, minimun/zero tillage, cover crops)	***2***	***4%***	***Sylvo-Pastoral zone***	***2,3***	***1***	***3.5***	***4.5***	***3.0***	***6.0***	***4.4***	***1.5***	***3.4***	***5.0***	***3.9***
HORTICULTURE															
1	Use of organic fertilizer	1	N/D	River Valley	1	3	2.5	5.0	1.8	0.0	3.8	0.0	2.5	0.0	1.9
1	Use of organic fertilizer	***5***	***N/D***	***ALL REGIONS***	***1, Some: 2, 3***	***3***	***4.8***	***5.9***	***1.7***	***0.0***	***2.5***	***0.8***	***3.4***	***1.7***	***2.6***
2	Wind breaks using living fences	1	N/D	River Valley	1,2,3	2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1
2		2	N/D	Niayes	1,2,3	2.3	4.5	6	3	0	1.75	-1	2.25	0	2.1
2		***3***	***N/D***	***ALL REGIONS***	***1,2,3***	***2***	***2.3***	***3.0***	***1.5***	***0.0***	***0.9***	***-0.5***	***1.4***	***0.0***	***1.1***
3	Composting	1	N/D	River Valley	1,2	2	5.0	3.0	0.0	0.0	0.5	0.0	0.5	0.0	1.1
3		5	N/D	Niayes	1,2 Some: 3	1	5.4	7.0	1.0	0.0	1.0	-2.0	1.0	10.0	2.9
3		***6***	***N/D***	***ALL REGIONS***	***1,2 Some: 3***	***2***	***5.2***	***5.0***	***0.5***	***0.0***	***0.8***	***-1.0***	***0.8***	***5.0***	***2.0***
4	Storage and conservation techniques	1	N/D	River Valley	1,2,3	3	2.0	5.0	0.0	0.0	4.3	0.0	0.0	3.0	1.8
4		7		Niayes	2, 3 Some: 1	2	4.9	5.9	0.0	0.0	7.5	0.7	0.0	3.0	2.7
4		***8***	***N/D***	***ALL REGIONS***	***1,2,3***	***3***	***3.4***	***5.4***	***0.0***	***0.0***	***5.9***	***0.4***	***0.0***	***3.0***	***2.3***
5	Drip irrigation	1	N/D	River Valley	1,2,3	2	1.5	3.0	0.4	5.0	2.0	2.5	2.0	0.0	2.1

practice #	**Practice** name	# of evaluations	% of **harvested area** / % **land use** area of total ag. area	**Agroecozone**	**Farmer predominance** 1: Small scale; 2: Medium Scale; 3: Large scale	**Practice adoption** (of country's ag. area) 1: <30% 2: 30-60% 3: >60%	**Dimensions averages**								CLIMATE SMARTNESS
							YIELD	INCOME	WATER	SOIL	INFO	ENERGY	CARBON	NUTRIENT	
5		8	N/D	Niayes	2, 3 Some: 1	2.125	6.2	6	4.4	0.7	2.3	2.5	3	1.4	3.3
5		***9***	***N/D***	***ALL REGIONS***	***1,2,3***	***2***	***3.9***	***4.5***	***2.4***	***2.9***	***2.2***	***2.5***	***2.5***	***0.7***	***2.7***

Annex 5

Institutions for CSA in Senegal (methodology and results)

A stakeholder mapping exercise was conducted in order to identify the main actors engaged in CSA - related activities. The stakeholders represent actors (institutions, both public and private) that have an explicit or implicit interest in CSA in the country.

Criteria for stakeholder selection:

- Is related to one or more of the themes or related sectors: agriculture, climate change, forestry, environment, natural resource management, rural/ sustainable development
- Has a national or sub-national (federal/state/province/ departmental) mandate. Represents a governmental, non-governmental or private institution (including farmers organization, trade union)
- Its engagement in CSA is related to one of the following activities:
    - production of knowledge and information related to CSA (research)
    - provision of financial and non-financial incentives for CSA promotion and/ or scale-out (financing)
    - development and promotion of CSA technologies and practices (technological development)
    - development of policies and strategies that enable on-field CSA implementation and/or scale out (policy and institutional support)

The stakeholder mapping exercise consisted of data collection on specific names CSA activities/ projects of the given institution, mandate, CSA-related activities carried out, activity category, type of CSA support, the larger project the activity is part of, including budget and implementation partners (if information is available). However, for space restriction - reasons, when displaying it, the information was condensed into a Venn diagram that groups stakeholders. The three circles represent the primary focus of the institution's theme mandate, i.e. adaptation, mitigation and productivity, while the intersection points of the circles indicate the extent to which a certain institution focuses on more than one CSA pillar, which would represent the ideal form of support for CSA.

The information in the Venn diagram is only aimed at giving a general, orientative picture of the primary focus of the institution's focus on productivity, adaptation, and/or mitigation topics. The method is a way of simplifying the information and displaying it into a reader-friendly format, but is not scientifically rigorous, and hence does not reflect any mathematical relation between the variables. Moreover, the classification of the institutions according to the three CSA pillars is not straightforward. One institution can fall into various intersection points of the Venn circles, depending on author's or the interviewee's interpretation of the reality; at the same time, an institution can have an explicit mandate on productivity increase, but an implicit mandate to work on increasing farmers' resilience. The final judgement belongs to the author, and is reviewed by in-country experts on the given topic, to ensure accuracy of data interpreted.

Table 4. Institutions for CSA in Senegal

Institution name	Level of operation	Type of the institution	Actual sector(s) of operation	Types of CSA activities	Forms and degree of engagement in CSA: dark green = a lot; light green= a little; yellow= at all				Engagement in CSA pillars (types) (A, P, M)	Most relevant CSA initiatives of the institution						
					Information sharing & extension	Financial & non-financial incentives	Technology dev. %& Innovation	Policy support		Name of the initiative	Duration	Implementing institutions	Funder	Beneficiaries (type)	Geographical focus	Agricultural sub-system focus
Ministry of Agriculture and Rural Equipment (MAER)	national	government	agriculture, rural/sustainable development	Promotes best agriculture practices, work with ANACIM (climate information)					A+P	Agricultural Productivity in Western Africa Programme (PPAAO)	2007 - 2014	MARE	World Bank	smallholder famers	National	maize, millet, groundnut
National Committee on Climate Change (COMNACC)	national	multi-stakeholder	climate change	Information sharing on climate change adaptation					A+ M	Participation in climate discussions, review of the communication reports, oversees the Science-Policy Platform for food security and adaptation in agriculture	N/A	COMNACC	CCAFS	farmers, public, decision makers	National	N/A
Ministry of Environment and Sustainable Development (MEDD)	national	government	climate change, forestry, environment, natural resource management	Sets the the national climate change policy, national adaptation plans, prepares the UNFCCC reports					A+ M	Agriculture and Natural Resource Management Programme USAID Wula Nafaa (PAGRN Wuula Nafaa)	2003 - 2013	National committees and agencies; African Development Foundation (ADF), NGOs and institutes: IDEE Casamance, VECO, Africa Rice Center, West Africa Seed Alliance, UICN, WWF, Fongoli Savanna Chimpanze, Institut Jane Goodall.	USAID	rural communities, farmers	Tambacounda, Kédougou, Kolda, Sédhiou, Ziguinchor,	Millet, maize, sorghum and vegetable production

National Meteorological Agency (ANACIM)	national	government	climate change, aviation and weather	Distribution of weather information to farmers, training of farmers/coops					A+P	Leading the CCAFS Climate-Smart Villages. Distribution of climate information and field tests.	2011 started	ANACIM	CCAFS	smallholder farmers	Kafferine	millet, groundnuts
Ecological Monitoring Centre (CSE)	national	government	climate change, environment, NRM	Studies on land use and environment and distribute best practices to communities					A+P+M	Cartographic inventories of practices and land management	3.00	CSE	EU	MAER, MEDD	National	All
Senegalese Institute for Agriculture Research (ISRA)	regional, local	academia (research)	agriculture, climate change	Develops resistant seed varieties; Crop modeling; Post-harvest techniques; Agroforestry					A+P	Identification of agriculture practices to strengthen resilience in 3 zones	2012 - 2014	ISRA/CSE/Tetra Tech	USAID	USAID for programming	Cassamance; Groundnut Basin,	Rice, livestock, groundnuts, cereals
Ministry of Livestock and Animal Production (MEPA)	national	government	agriculture (livestock)	Promotion of good agricultural practices					A+P	Project to support food security and livestock	2010 - 2016	MEPA	Global Agricultural Fund; AFD	smallholder farmers	Louga, Matame,	livestock
Directorate of Waters, Forests, Hunting and Soil (DEFCCS)	national	government	Climate change, forestry, soil degradation	Provide trees to farmers for facilitating agroforestry practices;					A+M	Programme Agriculture-Gestion des Ressources Naturelles	2008 - 2013	EFCCS	USAID (27 million)	smallholder farmers	Kaolack, Fatick,	Cereales and horticulture
Oxfam International (Oxfam)	local	non-government	agriculture, climate change, rural/sustainable development	Improving access and control to livelihoods to increase incomes and ensure food security.					A+P	R4 Rural Resilience Initiative	2012 launched	Oxfam/WFP	Swiss RE, Rockefeller Foundation	Smallholder farmers	Tambacounda	cereals and groundnuts

World Food Programme (WFP)	local	non-government	agriculture, climate	Build resilience of communities, crop insurance and Risk Reduction					A+P	R4 Rural Resilience Initiative	2012 launched	Oxfam/WFP	USAID	smallholder farmers	Tambacounda	cereals and groundnuts
United States Agency for International Development (USAID)	local	donor	agriculture, rural/sustainable development	Agriculture best practices, agriculture insurance, promotion of certified seeds and strengthening value chains.					P	Feed the future-Nataal Mbay	2015 - 2018	International Resource Group	USAID	Smallholder farmers	north river valley, south and central regions	millet, maize, rain fed rice, irrigated rice
African Development Bank (ADB)	local	donor	Ag, rural/ sust. dev	Promoting projects with CC components					P	Small Local Irrigation Schemes Support Project (PAPIL)	F1: 2006 2011; F2: 2011 2013	Ministère des Ecovillages, des Bassins de Rétention, des Lacs Artificiels et de la Pisciculture	AFD (F1); AFD and Islamic Development Bank (F2)	Rural communities, farmers pastoralists	Fatick, Tambacounda,	Rice farming and livestock
World Bank (WB)	local	donor	agriculture, rural/sustainable development	Project supporting agriculture resilience					P	Project for Inclusive Development and Sustainable Agribusiness in Senegal (PDIDAS)	2015 - 2021	Senegal River Delta Lands and Valleys and Faleme Valleys Operation Development Corporation (SAED) ,Investment Promotion and Big Works Agency; Great Green Wall National Agency (ANGMV)	World Bank and Global Environmnet Facility	smallholder farmers	St. Louis, Louga	various- market oriented, horticulture
International Fund for Agricultural Development (IFAD)	local	donor	agriculture, climate change, rural/sustainable development	Supports crop diversification and value chain to improve food security and income					P	Agricultural Value Chains Support Project – Extension (PAFA-E)	2013 - 2021		IFAD, Global Environmental Facility	smallholder farmers	Groundnut Bassin and Sylvo-	millet, sorghum, cowpeas, hibiscous and

Notes:

Information sharing and extension refers to offering/ facilitating climate and market information, as well as research and development, extension services, trainings, farmer field schools, etc.

Financial and non-financial incentives refers to index-based insurance schemes, input subsidy, micro lending, tax exemption, commercialization and marketing opportunities, etc.

Technology development / Innovation refers to scientific discovery and research - irrigation technologies, improved seed varieties

Policy support refers to the development of policies, strategies, and programs that enable on-field CSA implementation and/or scale out

ADAPTATION: increase farmers' resilience to climate change and/or variability

PRODUCTIVITY: maintaining/ increasing yields; increase farmers' income

MITIGATION: reduce GHG emissions from agricultural activities

Annex 6: Policies for CSA in Senegal (methodology and results)

The policy mapping exercise refers to the identification of main policies, strategies and national (governmental) programs that fulfill several criteria:

- are related to one or more institutions identified in the stakeholders mapping exercise
- are related to at one of the three CSA pillars (e.g. Productivity, Adaptation, Mitigation)
- belong to one of the following policy-making stages:
    - *In formulation* (meaning that the policy is in the design/ consultation process)
    - *Legally formalized/ policy established* (the policy/ strategy has already been enacted), mechanisms are set up at national level for policy to process)
    - *Actively implemented* (has been established and there are visible outcomes already).

National Communications to the UNFCCC have been considered key strategies to enable CSA, since they demonstrate country's compliance with global commitments to climate change action (in this case, the Kyoto Protocol). These Communications provide valuable information on emissions and removals of greenhouse gases (GHGs) and details of the activities the country has undertaken to implement the Convention (reducing emissions, increasing resilience to climate change). Additional data refers to vulnerability assessment, financial resources and transfer of technology, and education, training and public awareness; policies and measures related to climate change. Such information is also essential for guiding national policy and action in different sectors, including agriculture.

Own GHG accounting methodologies have also been considered key strategies for enabling CSA adoption and/or scale out, for their ability to capture country-specific emissions data.
In addition to the above mentioned policies, the study targeted the mapping of policies that have a certain relation with the agricultural sector:

● National Action Plan for Adaptation (NAPAs),
● Nationally Appropriate Mitigation Actions (NAMAs),
● National agricultural development and food security plans,
● National development plans
● P overty reduction strategies papers natural resource management plans (where reference to the agricultural sector is made), etc.

Additionally, the integration of certain policies and strategies into different CSA pillars is also dependent on the author's and reviewer' interpretation, since the focus of some policies on the three CSA pillars can oftentimes be implicitly, but not explicitly expressed in the policy's description.

Table 5. Policies for CSA in Senegal

Policy / strategy / program	Acting institution	Year of issue	Scope	Areas of focus / Objectives of the policy/ strategy/ program addresses	CSA focus	Target beneficiaries of the policy	Policy cycle 1) In formulation 2) Legally formalized 3) Actively implemented	Examples of outputs / outcomes of the policy
United Nations Framework Convention on Climate Change (UNFCCC)	MEDD	1994	international	Address climate change	Mitigation	National population	3	Senegal submitted the first and second national communication and is preparing the third; CDM projects
Kyoto Protocol (KP)	MEDD	2002	international	Address climate change	Mitigation	National population	3	
Comprehensive Africa Agriculture Development Programme (CADAP)	MAER	2003	regional	Food security, poverty alleviation	Productivity and Food Security	Farmers	3	Prepared their investment plan (PIA)
Accelerated Program for Agriculture in Senegal (PRACAS)	MAER	2014 - 2020	national, departmental, local	To increase rain fed rice production and irrigated rice production by 20% by 2020	Productivity	Farmers	3	Donors and NGOs are designing projects to support the objectives of the PRACAS (e.g.: PRADER project); The government has invested CFA 331 655 990 545 to encourage private sector participation in the industry.
National Forest Policy 2005-2025 (PFS)	MEDD	2005 - 2025	national	Poverty reduction by promoting sustainable management and conservation of biodiversity and forest resources, meeting the needs of the population. Alignment with other policies and conventions (desertification and climate change)	Productivity of forests	Farmers, rural communities, populations living near forests, enterprises working in forestry	2	Some pilots where communities are organized to manage forest resources sustainably.

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National Adaptation Programme of Action (NAPA)	MEDD	2006	national	Priority areas for climate change adaptation: coastal zones, water infrastructure, and agriculture sectors. It also outlines priority adaptation responses: restoration of mangrove swamps, reforestation, biological stabilization of sand dunes, protection against beach erosion, salinization prevention measures, irrigation and water conservation projects, soil fertility restoration, crop alternatives, education.	Adaptation - Agriculture is one sector identified	National population	2	The plan lacks a clear implementation strategy.
National Action Programme Against Desertification (PNLCD)	MEDD	1989	national	Addresses desertification	Productivity	National population	3	The Great Green Wall Program was adopted as a mitigation effort, and the national forestry plans were developed with the aim of reducing degradation
National Action Programme Against Desertification (PAN/lCD)	MEDD	1998	national	Addresses desertification	Productivity	National population	3	Builds off the PAN/LCD
National Strategy for Sustainable Development (SNDD)	MEDD	2005	national	To contribute to sustainable development and meet the MDG	Adaptation	National population	2	Development of the National Policy for Sustainable Development

Table 5. Policies for CSA in Senegal

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Environment Code (Law 2001-01) (CE)	MEDD	2001	national	Establishing that all citizens have the right to live in a healthy environment, but are also responsible for its protection. Thus, environmental conservation must be integrated in national policies addressing socio-economic development and cultural issues.	Adaptation	National population	3	Has led to the development of environmental management plans and sectorial plans.
National Adaptation Plan (NAP)	MEDD	in design	national	Address climate change and climate adaptation	Adaptation	National population	1	No data
Senegal Agriculture Investment Plan (PIA)	MAER	2011 - 2015	national	Financing to increase production	Productivity	Farmers	3	Budget allocated
Intended Nationally Determined Contributions (INDC)	MEDD	2015	national	Identifies priority areas for climate mitigation and potential areas for GHG reductions and costs	Mitigation	National population	1	Budget has been identified for projects
Emerging Senegal Plan (PSE)	Government of Senegal	2013	national	Economic growth of the country; investments in the agricultural sector	Productivity	National population	3	Establishment of the Fonds national de développement agro-Sylvo-pastoral et halieutique
National Program for Agriculture Development (PNDA)	MAER	2009 - 2015	national	Increased and enhanced productivity of the sector	Productivity	Farmers	3	No data

Table 5. Policies for CSA in Senegal

Policy / strategy / program	Acting institution	Year of issue	Scope	Areas of focus / Objectives of the policy/ strategy/ program addresses	CSA focus	Target beneficiaries of the policy	Policy cycle 1) In formulation 2) Legally formalized 3) Actively implemented	Examples of outputs / outcomes of the policy
National Plan for Livestock Development (PNDE)	MEDD	2012	national/ eco-zones	To increase the productivity of the livestock sector in each of the eco-zones. The solutions are designed to increase productivity and maintain environmental integration	Productivity, Adaptation	Farmers	3	Farmers are increasingly implementing "Forage Units" and integrating agriculture/livestock as recommendations in the plan; Access to credit through CNAS specifically for implementing actions in the plan
Great Push Forward for Agriculture, Food, and Abundance (GOANA)	MAER	2008	national	To achieve food self-sufficiency for Senegal by 2015. To this end, the plan set ambitious yearly production targets for the country's main food and export crops, as well as for dairy and meat. Rice production was set to grow by more than 250 % in one year, while cassava production was targeted to grow nearly tenfold, and groundnut production was slated to triple.	Productivity	Farmers	3	The program is valued at CFAF 345 billion, provides farmers with equipment and heavily subsidized seeds (75%) and fertilizer (50%). It also makes 500,000 ha of so-called Domaines agricoles partagés (irrigated land) available to farmers at no charge. Promotes private-sector production of certified seed from several high-yielding varieties developed by ISRA. Farmers have access to subsidized seeds and fertilizer
Agriculture, Forestry, and Livestock Act (LOASP)	MEPA	2004	national/ regional	To increase productivity and commercialization of the livestock sector - from family farming to large-scale commercialization.	Productivity	Farmers	3	Establishment of the Fonds d'appui à la stabulation (FONSTAB)

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Policy / strategy / program	Acting institution	Year of issue	Scope	Areas of focus / Objectives of the policy/ strategy/ program addresses	CSA focus	Target beneficiaries of the policy	Policy cycle 1) In formulation 2) Legally formalized 3) Actively implemented	Examples of outputs / outcomes of the policy
National Strategy on Economic and Social Development (SNDES)	Government of Senegal	2012 - 2017	national	To boost agricultural productivity	Productivity	National population	3	The Strategy provides for a substantial increase in annual budget receipts expected to rise from CFAF 1569 billion in 2012 to CFAF 2206 billion in 2017. Total expenditure will rise from CFAF 2 190 billion in 2012 to 2 CFAF 912 billion in 2017. As a result, public finances should improve in 2017 with a global budget balance below 3.6% of GDP in 2017, against 5.9% projected in 2012.
Forestry Action Plan of Senegal (PAFS)	DEFCCS	1993	national	Forest management and participatory and integration of forestry into rural development	Productivity	Rural communities	3	Control over forestry resources was passed on to local councils; Training to communities on management
National Environmental Action Plan (PNAE)	MEDD	1995	national	Sustainable economic growth	Productivity	National population	3	Elaboration of the "Annuaire sur l'Environnement et les Ressources Naturelles du Sénégal" to support planning with reliable data
National Strategy of Climate Change in Senegal (NCCS)	MEDD	2014 - 2018	national	Actions to reduce deforestation and land degradation, erosion, to promote land restoration, to enhance institutional and technical capacity for building resilience, promotion of eco-villages	Adaptation and Mitigation	National population	1	No data

Annex 7
Assessing CSA finances

Rationale for looking at financing opportunities
CSA promotes integration across productive sectors for synergistic development, in other words landscape investment. There are over 235 funds for landscape investment (Clarvis, 2014). The existence of a finance action group for CSA adoption and the large number of landscape applicable funds is proof that funding for CSA is growing and increasingly available.

Classification of funds
The goal of the CSA finance analysis is to identify current funds being accessed for CSA adoption in a country and highlight potential new funding sources. To do this, a list of important international funds was delimited from the CSA finance section in FAO (2013) and from the 21 selected funds in Clarvis (2014).

A list of "key funds" from Clarvis (2014) was designed to equitably represent public, private and Public Private Partnership (PPP) initiatives, as well as "entry points". To make the selection, we looked at the list of 17 adaptation funds first, then at the mitigation funds, then development funds and so on. Within each sub-list, we identified the public fund with the highest financing availability. Then, we identified the private fund with the highest financing availability as our second key funds. And, if available, the PPP funds with the highest financing available. When there is only one source per entry point (e.g. only public funds available in adaptation) we only included the top 1. We did this for each sub list of entry points to identify a total of 21 key funds. This list represents the different funding aspects of CSA as well as the contribution from different sectors of donors.

Information on national funds were obtained from direct interviews with government officials and national NGOs. The funds that were considered in the national category were the ones related to loans, insurance, subsidies and other investments directly at farmers or at national and state governments.

In the case where a country was not making use of a fund at the national or international level, it was considered a potential fund. A potential fund would be a tentative source of financial incentives for CSA adoption, whether for national, state and local level governments or directly aimed at farmers.

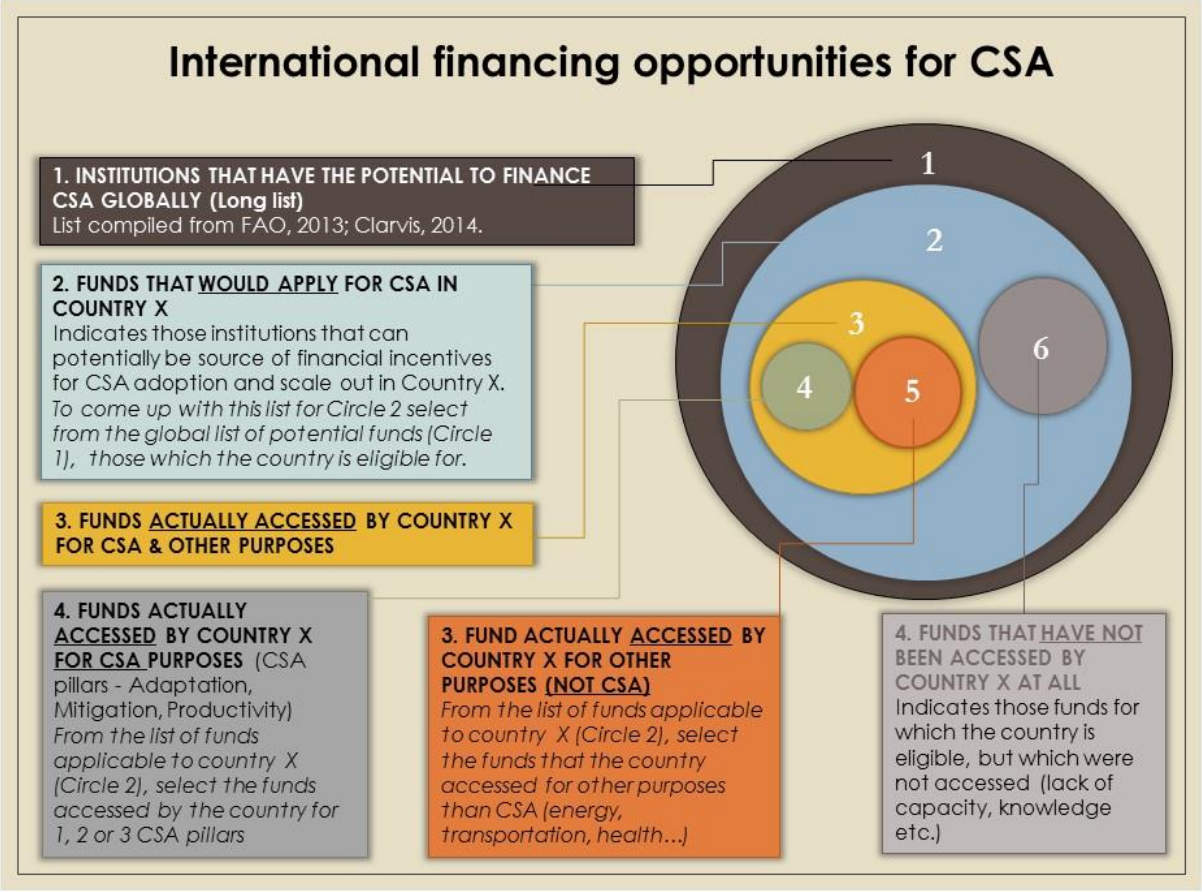
Selection and analysis of funds
Internet research was performed to identify ongoing funding and potential funding. It was determined whether countries had or had not received financial support by consulting the official webpages of funds. Depending on data availability, the following information related to the country's access to funds for productivity and mitigation or adaptation in agriculture was sought:

- Name of CSA related projects;
- Sectors targeted (fishing, forestry, livestock, agriculture, landscape);

- Data on whether the fund served to achieve other purposes outside of agriculture (e.g. energy);

In the CSA Country Profile infographic, funds are shown based on whether a country has accessed them or not. And the answers to the questions in the methodology presented above serve as the basis for the text analysis where information worth highlighting is presented.

An important assumption in this methodology is that increasing the number of funders is a good approach to increase CSA scale up. There might be cases where current funders could increase their financial support to meet CSA needs. Therefore accessing additional funders support does not necessarily mean that CSA scale up will increase. A key limitation on the methodology is that this research was highly dependent on information available on internet. Our research depended on how current a web page was in relation to projects and funding being developed with countries.



Source: CIAT (unpublished)