

**OXFAM AMERICA**  
RESEARCH BACKGROUNDER

# **The Influence of US Development Assistance on Local Adaptive Capacity to Climate Change**

## Insights from Senegal

Henri M. Lo and Emmanuel Tumusiime



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# OXFAM AMERICA'S RESEARCH BACKGROUNDEERS

Series editor: Kimberly Pfeifer

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## Author information and acknowledgments

Dr. Henri M. Lo is a senior lecturer at the Institute of Environmental Sciences Cheikh Anta Diop University, Dakar, Senegal. Emmanuel Tumusiime is a researcher at Oxfam America, Washington, DC.

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# ACRONYMS AND ABBREVIATIONS

AAP	African Adaptation Program
ACCRA	Africa Climate Change Resilience Alliance
ANCAR	National Agency for Agricultural and Rural Advice
ERA	Education and Research in Agriculture
CBSPs	Community Based Service Providers (CBSPs)
CCAFS	Climate Change and Food Security program
CGIAR	Consultative Group on International Agriculture Research
COMFISH	Collaborative Management for Sustainable Fisheries Future
COMNACC	Comité National pour le Changement Climatique
COMRECC	Comités Régionaux de Changements Climatiques
FTF	Feed the Future
GCCDS	Global Climate Change and Development Strategy
ICRAF	International Centre for Research in Agroforestry
IDRC	International Development Research Centre
IFAD	International Fund for Agriculture Development
IPAR	Initiative de Prospective Agricole et Rurale
ISRA	Senegalese Agricultural Research Institute
LAC	Local Adaptive Capacity
NAPA	National Adaptation Programme for Actions
PCE	Economic Growth project
UNDP-GEF	United Nations Development Program Global Environment Facility
UNEPI	United Nations Environmental Protection

# EXECUTIVE SUMMARY

Senegal is highly vulnerable to the impacts of climate change, and the overall impacts on agriculture are predicted to be negative. The US government is one of Senegal's major partners supporting the agriculture sector and integrating climate change adaptation strategies in investments. Development support has a direct influence on communities' ability to adapt in terms of what they do and how they do it. This report provides insight from Senegal into the extent to which US development assistance, particularly through the Feed the Future initiative, affects individuals' and communities' capacity to adapt to climate change and what can be done to further enhance their capacity for adaptation.

Because it is not practical to measure adaptive capacity directly, this analysis draws on the elements that contribute to local adaptive capacity in the context of a sustainable livelihoods approach and institutional support. A positive contribution to these elements is reasoned to enhance adaptive capacity. We gathered data from key stakeholders, including farmers in some FTF targeted areas, FTF project implementers, and US Agency for International Development (USAID) staff as well as local government stakeholders. Of the five FTF projects in Senegal, we focused primarily on the Agriculture and Natural Resource Management project, locally known as Wula Nafaa. However, we also held discussions with staff from other two FTF projects—Yaajeende and Economic Growth Project. For this reason, the observations in this report are not restricted to Wula Nafaa, but they are also not broad enough for us to be able to extrapolate about how effectively FTF in Senegal as a whole integrates climate change adaptation.

This research established that FTF investments contribute to building livelihood assets, particularly through sustainable land use (forest resources preservation and conservation farming) and financing for adaptation (facilitating access to credit) and innovations that increase yield. Conservation farming in particular appears to be a viable system for dry land farming in the face of increased climate change and variability; it has reportedly increased yield by 25 percent. These outcomes positively affect food security and vulnerability to the impacts of climate change.

However, farmers considered a lack of accurate, timely weather information to be a significant constraint to adaptation. For this reason facilitating small-scale farmers' access to and use of climate information should be considered a priority by local government and development partners. On the other hand, farmers perceive and practice conservation farming as a yield-increasing technology, not as a climate change adaptation strategy. This means there is little awareness of and appreciation for addressing adaptation as a fundamental problem that affects

agriculture in the long term. Development partners and the government need to create more awareness and support information sharing as a way to foster a forward-looking orientation. An important step would be to conduct climate change vulnerability assessments in every project to inform the options for strengthening vulnerable people's adaptive capacity.

Institutional capacity is one of the major challenges limiting effective integration of climate change adaptation into agricultural development plans; in Senegal, this is particularly critical at the policy level. Development partners need to support the government in developing and implementing a formal national agricultural policy that explicitly addresses climate change adaptation. It is prudent that local programs conduct thorough evaluations of the agricultural sector's vulnerability to climate variability and change in the long term, as well as potential responses.

# INTRODUCTION

As climate change and extreme weather events continue to become the norm, effective programs that help the most vulnerable people withstand their harmful impacts are more important than ever. Senegal is highly vulnerable to the impacts of climate change and extreme weather events. Climate change and variability in Senegal are typically manifested in the unpredictability of the start of the rainy season and the volume and distribution of rains.<sup>1</sup> Scientific studies have also pointed to a decline in rainfall and an increase in air temperature. For instance, average rainfall in the 2000-2009 period fell by 15 percent compared to 1920-1969, and average temperatures have increased by 0.9°C (1.62°F) since 1975.<sup>2</sup> The livelihoods of about 77 percent of the Senegalese population depend on small-scale agriculture, which is adversely affected by the consequences of climate change. Thus, investments in agriculture must focus on increasing household food security and incomes of producers while enabling their adaptation to climate change.

Rightly or wrongly, climate change and weather vagaries are blamed for low agricultural productivity and consequently the prevailing poverty in rural areas of Senegal. A report by the International Monetary Fund, in 2006, indicated that the Senegalese rural areas' contribution to national poverty levels amounted to 65 percent, with this being directly or indirectly associated with small-scale farming.<sup>3</sup> With the threat of climate change and increased extreme weather events, poverty is likely to increase nationally and especially in rural areas. Some studies have predicted that current population and agricultural trends in Senegal could lead to a 30 percent reduction in per capita cereal production by 2025, with direct impacts on poverty.<sup>4</sup> Local communities in Senegal already challenged by the threat of climate change need support and assistance from government and development partners if they are to build sustainable adaptation capacities.

Some of Senegal's development partners realize the negative effects of climate change on food security and poverty reduction. They have started supporting climate change adaptation programs in agriculture and the trend is expected to grow. However, development assistance has a direct consequence and influence on the ability of individuals and communities to adapt to climate change.<sup>5</sup> This

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1. Isidor Marcel Sène et al., "Impacts of Climate Change on the Revenues and Adaptation of Farmers in Senegal" (CEEPA Discussion Paper No. 20, Special Series on Climate Change and Agriculture in Africa, 2006).
  2. Chris Funk et al., *A Climate Trend Analysis of Senegal* (U.S. Geological Survey Fact Sheet, 2012), <http://pubs.usgs.gov/fs/2012/3123/FS123123.pdf>.
  3. International Monetary Fund, *Senegal Poverty Reduction Strategy Paper* (2006), <http://www.imf.org/external/pubs/ft/scr/2007/cr07316.pdf>.
  4. Chris Funk et al., *A Climate Trend Analysis of Senegal*.
  5. Jon Barnett, "The Effect of Aid on Capacity To Adapt to Climate Change: Insights from Niue," *Political Science* 60(1)(2008): 31-45; Tacko et al., *Climate Change and Variability in the Sahel Region: Impacts and Adaptation Strategies in the Agricultural Sector*, *Joint Report by ICRAF and UNEPI*, 2006; C. Pettengel, "Climate Change Adaptation: Enabling People



influence could be positive or negative or both, and it can therefore enhance or undermine local capacity to adapt to climate change—or it can enhance in some ways and undermine in others. If development support undermines a community’s capacity to adapt, or fails to respond to farmers’ needs, then giving more support in the same way may limit communities’ ability to adapt and can increase the communities’ vulnerability to climate change.

The US government (through the US Agency for International Development, or USAID) is one of the Senegalese government’s major partners in providing support to the agriculture sector, including with respect to supporting adaptation to climate change and variability. US funding of the agriculture sector of Senegal has increased significantly since 2009 (Figure 1), following the launch of the Feed the Future (FTF) initiative, a US government initiative aimed at supporting low-income countries in their efforts to improve agricultural productivity, nutrition, and household income.<sup>6</sup> By 2016, FTF will invest more than \$149 million in five projects in Senegal supporting agricultural and fisheries production, nutrition, agricultural research, and economic growth.<sup>7</sup>

A number of investments are being implemented under FTF with climate adaptation objectives. In fact, according to the Senegal FTF multi-year investment plan, supporting natural resource management and adaptation to climate change is a core component of the FTF interventions.<sup>8</sup> However, little is known about the extent to which FTF projects and programs enhance the capacity of local communities and households to adapt to climate change, if at all, and how the interventions fit within the national plans for adaptation to climate change. Given the context of climate change impacts in Senegal, Oxfam America sought to understand whether and how FTF in Senegal improves small-scale farmers’ ability to adapt to the effects of climate change. FTF is of particular interest as it represents an important food security program in Senegal from a major donor and has prioritized climate change adaptation as a critical issue in investments. Lessons learned from this program could inform other agriculture development initiatives in Senegal.

This report provides insight from Senegal into whether and how US development assistance, particularly through Feed the Future, affects individuals’ and communities’ adaptive capacity to climate change. Specifically, the study analyzes the extent to which FTF investments in Senegal contribute to local adaptation to climate change and support the country’s local adaptation strategies, and assess whether these strategies build farmers’ capacity to adapt to climate

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*Living in Poverty to Adapt*, (Oxfam Research Report, 2010), <http://www.oxfam.org/sites/www.oxfam.org/files/climate-change-adaptation-summary-apr2010.pdf>.

6. Feed the Future is President Barack Obama’s global hunger and food security initiative and the US government’s contribution to agriculture development in low-income countries agreed at the L’Aquila G-8 Summit in 2009. For more details on FTF, see: <http://www.feedthefuture.gov/>.

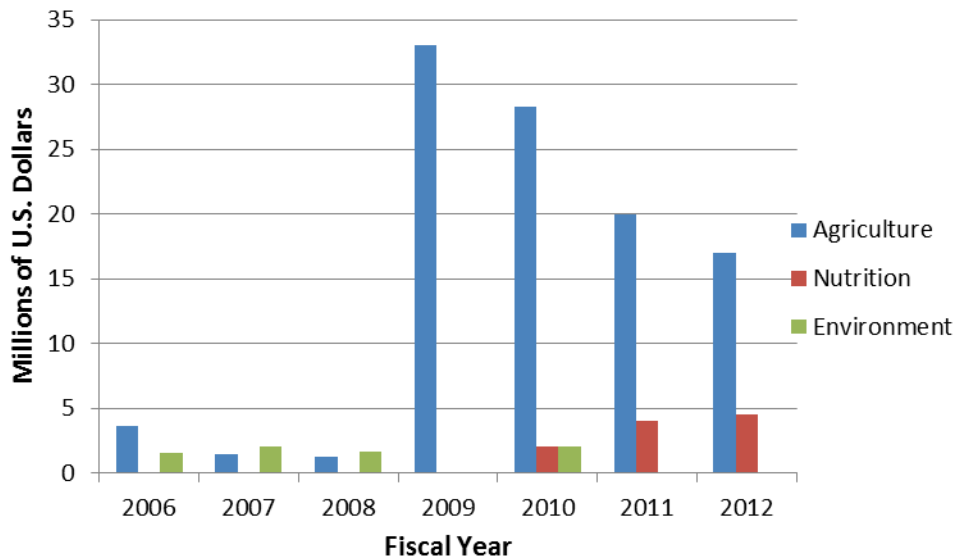
7. Interview with USAID Senegal, July 2012.

8. The Senegal FTF multi-year investment plan can be accessed at: <http://www.feedthefuture.gov/sites/default/files/country/strategies/files/SenegalFTFMulti-YearStrategy.pdf>.

change in the long term. The report also provides suggestions and recommendations about where improvements can be made to make FTF projects and investments more effective in meeting the needs of the targeted communities. The research also provides lessons to Oxfam America’s Rural Resilience Initiative in Senegal.

This research is not an impact evaluation of FTF in Senegal as a whole or of an individual project. Rather the research allows us to draw conclusions from what is happening in the field and attract the attention of stakeholders (policy makers, donors, project designers and implementers and the development community), who can learn from such experiences. The ultimate goal is to improve programming and implementation of development interventions.

**Figure 1: Planned U.S. Foreign Development Assistance for Food Security in Senegal 2006-2012.<sup>9</sup>**



The rest of the report is organized as follows. In the next sub section, we contextualize climate adaptation as a development issue. This is followed by a framework used to assess adaptive capacity. In section three, we discuss the climate change discourse in Senegal, particularly the vulnerability of small-holder farmers and institutional efforts to address this vulnerability. The section also elaborates on the approach of Feed the Future in Senegal. Section four presents the description of research sites and methodology of data collection and analysis. In the penultimate

9. [http://foreignassistance.gov/OU.aspx?OUID=207&FY=2006&AgencyID=0&budTab=tab\\_Bud\\_Planned&tabID=tab\\_sct\\_Peace\\_Planned](http://foreignassistance.gov/OU.aspx?OUID=207&FY=2006&AgencyID=0&budTab=tab_Bud_Planned&tabID=tab_sct_Peace_Planned).

section we present and discuss the results of our surveys. The report ends with conclusions and recommendations.

## ADAPTIVE CAPACITY IN THE DEVELOPMENT CONTEXT

The understanding that vulnerability to climate change is based on exposure to climate threats that can be anticipated has put adaptation high on the development agenda.<sup>10</sup> This emphasis is partly the result of recognition of the influence of human activities on climate change. It is also due to the realization that the impacts of climate change undermine the sustainability of livelihoods and inhibit sustainable development. In particular, development agencies view adaptation as an integral part of “good development” driven by an understanding that effective development aid can not only address poverty but also help reduce overall vulnerability to climate change.

Although climate change is happening globally, the impacts are more localized and fall disproportionately on low-income countries with little to no resources to adapt. Communities and individuals highly affected are those dependent on climate sensitive-livelihoods—typically small-scale farmers in rural areas dependent on agriculture. The need to effectively support such communities and individuals has become even more urgent with the recognition that traditional adaptation mechanisms have weakened and will be insufficient to withstand increased strains induced not only by climate change and inclement weather but also by increased population growth, unequal resource distribution, and globalization.

Many types of actions are taking place to address adaptation to climate change and variability. They are occurring at the local, sub national and national level. . Some respond to the impacts of climate change and others address overall vulnerability and poverty. However, whether they take place at the sub-national or national the level, the extent to which actions respond to local needs determines their effectiveness. Oxfam recognizes that local communities are at the center of adaptation and that the success of efforts to address climate change impacts hinges on their awareness of the issue, ownership of the process of adaptation, and the capacity to undertake and maintain adaptation activities.

For the most part, however, institutions through which national governments in low-income countries and donors have acted often do not lead to participatory

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10. Barry Smit and Olga Pilifosova, “From Adaptation to Adaptive Capacity and Vulnerability Reduction,” in *Climate Change, Adaptive Capacity and Development*, ed. Joel B. Smith et al. (London: Imperial College Press, 2003).

approaches nor do they support individuals' agency. Rather, they focus mostly on fostering adaptation through technological interventions and introductions of new crop varieties. Studies show that these have often not been successful, and adoption has been very low among small-scale, resource-poor farmers.<sup>11</sup> Autonomous adaptation approaches have remained mostly the purview of civil society organizations, whereas many national governments in low-income countries remain devoted to top-down multi-sectoral approaches and developing characteristics and indicators at the national level with little to no analysis on the local level.

Oxfam America commissioned this research on the premise that there is a close link between good development and adaptation, but if development aid is to help local communities build sustainable adaptation practices, practitioners must understand and build on local practices and institutions. Ultimately, this requires representing the interests and experiences of local communities in national and sub-national plans and policies, as well as in development projects.

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11. Serigne Tacko Kandji, et al., *Climate Change and Variability in the Sahel Region: Impacts and Adaptation Strategies in the Agricultural Sector* (Joint Report by ICRAF and UNEP, 2006).

# FRAMEWORK FOR ASSESSING ADAPTIVE CAPACITY

The climate change literature contains many definitions of adaptive capacity, which reflects the considerable amount of research conducted on the subject as well as experiences from ongoing programming. For this report, we use the definition of the Intergovernmental Panel on Climate Change, which states that adaptive capacity is:

[The] ability of a system (*at any scale: national, community, household, or individual*) to be actively involved in the process of change in order to minimize the negative impacts of (*or reduce society's vulnerability to*) climate change and maximize any potential benefits from the changing climate, and or cope with the consequences.<sup>12</sup>

Theoretically, “adaptive capacity” is a system’s ability to adjust to, prepare for, and diminish present threats while enhancing its ability to address new risks. In practice, these abilities are manifested through adaptations represented by the different livelihood strategies that individuals or communities pursue. The local context in which adaptations take place determines their effectiveness. Adaptive capacity is therefore an inherently local process. Our aim in this report is not to score adaptations or quantify effects of different adaptation strategies. Rather, we focus on understanding the ways in which communities’ experiences are affected by development aid, and we take stock of these influences on improving adaptive capacity.

Conceptually, this assessment is based on the local adaptive capacity (LAC) framework. This framework fits the development context of adaptation and has been used by development practitioners, particularly the Africa Climate Change Resilience Alliance (ACCRA),<sup>13</sup> as a tool to gauge and improve the design of development and humanitarian interventions. The LAC framework provides a basis for determining whether development assistance is putting communities or households on a positive course for greater adaptability to climate change or not. There are two inter-related elements central to the LAC framework: sustainable Livelihoods Assets, on one hand, and supporting institutions, on the other.

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12. IPCC TAR, *Climate Change 2001: Impacts, Adaptation and Vulnerability* (IPCC Third Assessment Report, Cambridge University Press, 2001); Catherine Pettengel, *Climate Change Adaptation: Enabling People Living in Poverty to Adapt* (Oxfam Research Report, 2010), <http://policy-practice.oxfam.org.uk/publications/climate-change-adaptation-enabling-people-living-in-poverty-to-adapt-111978>.

13. ACCRA is a consortium made up of Oxfam Great Britain, the Overseas Development Institute, Save the Children Alliance, Care International, and World Vision International and funded by DFID.

Sustainable livelihoods assets are depicted by five livelihood types of capital: financial, physical, human, social, and natural.<sup>14</sup> The five types of capital are assumed to enable individuals and communities to pursue different strategies for making a living and coping with stressors. Degradation of these types of capital, either by climate change stressors and or non-climatic stressors, increases the vulnerability of the affected community or household, while positive impacts on each of the five types of capital should enhance the adaptive capacity of the household or system. The sustainable livelihoods framework is useful in clarifying what households and communities need to adapt.

Institutions, on the other hand, are important for fostering a system's adaptability.<sup>15</sup> Douglass North refers to institutions as "rules of the game" that structure social interactions.<sup>16</sup> In the context of adaptation to climate change, institutions are recognized for structuring environmental risk and therefore the nature of climate change impacts. They create incentives within which individual and collective actions unfold. And they're the medium through which external interventions reinforce or undermine existing adaptation practices.<sup>17</sup> In general, institutions enable or constrain ordered thought, expectations, and actions by imposing form on human activities and behavior (See Hodgson 2006). Institutions may be formal or informal and established at the local, regional, or national level, where the institution functions.<sup>18</sup> Examples of formal institutions include government policies and laws. Informal institutions may include resource networks and women's and youth groups, as well as culturally established norms.

Since institutions cannot be measured as easily as assets can, elements such as the level of participation in decision-making and the extent to which individual and group voices are heard are used as proxies in determining the direction of a community's adaptive capacity. We also assess existing government policies and the macro environment for addressing adaptation to climate change in Senegal.

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14. Ben Wisner et al., *At Risk*. (London: Routledge, 2004). See also Barry Smit and Johanna Wandel, "Adaptation, Adaptive Capacity and Vulnerability," *Global Environmental Change* 16, no. 3 (2006): 282-92; Tim Frankenberger et al., "Enhancing Resilience to Food Security Shocks in Africa" (discussion paper, 2012), [http://www.fsnnetwork.org/sites/default/files/discussion\\_paper\\_usaid\\_dfid\\_wb\\_nov\\_8\\_2012.pdf](http://www.fsnnetwork.org/sites/default/files/discussion_paper_usaid_dfid_wb_nov_8_2012.pdf).
  15. Lindsey Jones, *Towards a Characterization of Adaptive Capacity: A Framework for Analyzing Adaptive Capacity at the Local Level* (ODI, 2010), <http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/6353.pdf>; Pettengel, *Climate Change Adaptation*; Smit and Wandel, "Adaptation, Adaptive Capacity and Vulnerability," 282-92.
  16. Douglass C. North, "Institutions," *Journal of Economic Perspectives* 5, no. 1 (1991): 97-112.; see also Geoffrey M. Hodgson, "What Are Institutions?," *Journal of Economic Issues* 40, no. 1 (2006): 1-25.
  17. Arun Agrawal, *The Role of Local Institutions in Adaptation to Climate Change* (International Forestry Research and Institutions Program Working Paper, 2008, W08I-3).
  18. Todd A. Crane, *The Role of Local Institutions in Adaptive Processes to Climate Variability: The Cases of Southern Ethiopia and Southern Mali* (Oxfam Research Report, Jan. 2013), <http://www.oxfam.org/sites/www.oxfam.org/files/rr-local-institutions-adaptive-climate-ethiopia-mali-080213-en.pdf>.

# CLIMATE CHANGE DISCOURSE IN SENEGAL

## VULNERABILITY TO CLIMATE CHANGE AND ADAPTATION IN SENEGAL

For Senegal, poverty and food insecurity are caused mainly by low agricultural productivity.<sup>19</sup> The vast majority of farmers are smallholders, growing cash crops (peanuts and cotton) and subsistence crops (millet, sorghum, corn, and rice), and rearing some livestock. Agricultural production is mostly rain-fed, with just 5 percent of the land under irrigation. The rainy season is limited to three to four months, from June to September and the rains highly fluctuate. The problem with rainfall has been less one of amount and more one of regularity and distribution. The vulnerability of farm households to the impacts of climate change and variability is primarily due to this strong dependence of agriculture on irregular rainfall, which also is a major barrier to agricultural intensification in the region. The vulnerability due to dependence on rainfall is exacerbated by non-climate factors, which, in reality, are the main drivers of rural communities' extreme poverty.

Small-scale farmers' vulnerability to the effects of climate change also results from the lack of technical capacity (including education and technology) and the lack of investment in rural infrastructure (transportation and storage). The lack of technical capacity leads to degraded eco-systems while poor infrastructure results in limited access to markets. Additionally, the lack of a clear government agricultural policy that explicitly supports small-scale farmers' access to inputs, credit, and markets exacerbates their vulnerability. In a broader sense, climate change and variability are additional stressors that combine with the inherent vulnerability of peasant agriculture. The food self-sufficiency policy adopted by the Senegalese government may be jeopardized if resilience strategies are not identified and implemented in time.

Senegal receives considerable support from both bilateral and multilateral development partners. They understand the severe effects on agriculture that result from climate change and are investing directly in agriculture to boost production while also supporting programs to adapt to or mitigate high climate vulnerability and risk. Their support of adaptation in particular includes current

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19. Banque Ouest-Africaine de Développement, *Changements Climatiques et sécurité alimentaire dans la zone UEMOA: défis, impacts, enjeux actuels et futurs, Rapport final* (2010); see also Isidor Marcel Sène, Mbaya Diop, and Alioune Dieng, *Impacts of Climate Change on the Revenues and Adaptation of Farmers in Senegal* (CEEPA Discussion Paper No. 20, Special Series on Climate Change and Agriculture in Africa, 2006).

initiatives that support conservation and restoration of water resources, degraded agricultural lands as well as inshore and coastal areas. Key development partners supporting these initiatives include the Netherlands government, the US government, the International Development Research Centre (IDRC), and the UNDP Global Environment Facility (UNDP-GEF).<sup>20</sup> Other partners include Japan, which finances the African Adaptation Program (AAP) implemented by UNDP, IFAD with the Support Program for Agricultural sectors (PAFAs), and the Walloon Region and the Francophonie supporting the FastStart project dedicated to addressing climate risks by controlling water on small farms.

Most of the ongoing climate adaptation initiatives supported by donors are drawn from the Senegal NAPA. However, these multi-donor and multi-sectoral responses lack the coordination that could maximize synergy between donor programs. Moreover, many of these projects are not only scattered but they also do not address specific technical and institutional barriers that undermine farmers' adaptive capacity. Although the government of Senegal has formulated a National Economic and Social Development Strategy (the *Stratégie Nationale de Développement Economique et Sociale*), there is no systematic assessment of how climate change could undermine the objectives targeted in this strategy, or what the additional costs of adaptation would imply in the different sectors.

Other development assistance strengthens Senegal's capacity to cope with climate change through programs and projects that extend human research capacity, particularly through student exchange programs between Senegalese people and donor partners, and also through the creation of academic programs dedicated to increasing understanding of climate change and vulnerability. For instance, a doctoral program in climate change economics has been launched by the West African Science Service Center on Climate Change and Adapted Land Use (WASCAL), financed exclusively by the German government. Partners' support also includes mitigation programs and projects.

## THE NATIONAL ADAPTATION PROGRAMME OF ACTION IN SENEGAL

Senegal developed its National Adaptation Programme of Action (NAPA) in 2006, following the recommendation to least-developed countries to create policy frameworks that enable them to communicate more clearly about their vulnerabilities and priorities for adaptation.<sup>21</sup> The Senegalese NAPA identify three sectors as priorities—agriculture, water resources, and coastal zone management. These sectors support about 70 percent of the Senegalese population, according

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20. GEF provides small grants of up to \$50,000 at the farm level.

21. For details on Senegal's NAPA plan see: Plan d'action national pour l'adaptation aux changements climatiques—Senegal, 2006, <http://unfccc.int/resource/docs/napa/sen01f.pdf>.



to Senegal's poverty reduction strategy paper. Senegal's NAPA stresses that it is the poorest rural and fishing communities which are most vulnerable to a warming climate.

Implementation of the NAPA is being led by National Committee on Climate Change (Comité National pour le Changement Climatique, or COMNACC), in the Ministry of the Environment and the Protection of Nature (Ministère de l'Environnement et de la Protection de la Nature). Although a number of smaller adaptation projects are underway, the government's overall response to climate change seems tentative and lacks a systematic and comprehensive implementation strategy integrated within the country's development programs.

To a large extent, the NAPA document of Senegal functions more like a suggestion box from which different partners draw to develop their projects, without an overall consistency and synergizing between programs. Yet Senegal's NAPA does not explicitly indicate how to strengthen the current adaptation options. At the local level, each of Senegal's 14 regions has put in place a regional committee of climate change (Comités Régionaux de Changements Climatiques-COMRECC) that supposedly is made up of the main development stakeholders of the region, including civil servants, local elected people, civil society organizations, and private sector actors). Although these committees have been installed in Tambacounda and Kédougou, our study regions, as well as in the other twelve regions, they lack a strategic plan to enable them to meaningfully carry out their roles. Such a plan could be an opportunity for a more comprehensive response to challenges posed by climate change and for better synergy and partnerships between the stakeholders, including projects, local governments, research institutes, farmers, and civil society organizations.

Despite the absence of a comprehensive plan for implementing the NAPA, many interventions, supported by development partners are underway that aim to address climate change adaptation through development plans. The US Feed the Future initiative is one intervention that appears particularly focused on integrating climate change adaptation into its agriculture and food security projects. Integration of climate change strategies in food security programs is a welcome development. However, while development partners promise to integrate climate change adaptation strategies in their programs, implementation of strategies that build farmer's capacity to adapt to climate change is not inevitable. Oxfam America sought to understand how FTF programs contribute to small-scale farmers' capacity to adapt to climate change in Senegal. A focus on FTF is of particular interest as it represents one of the major food security development programs in Senegal from a major donor and has prioritized climate change adaptation in investments as a critical and crosscutting issue; hence, lessons learned from this program could inform other agriculture development initiatives in Senegal.

## FEED THE FUTURE IN SENEGAL AND CLIMATE ADAPTATION

According to the USAID/Senegal FTF multi-year investment strategy, Feed the Future's strategic objective is to increase the income and improve the nutritional status of an estimated 445,000 Senegalese households (mostly of small-holder farmers). It intends to achieve this objective by making core investments in scaled-up essential-nutrition actions, increasing agricultural productivity, enhancing policy reform, and improving infrastructure and access to finance, as well as building human resource capacity.<sup>22</sup>

One of the FTF's strategic investment objectives is to integrate climate change adaptation approaches and improved natural resource management in project plans and implementation actions to ensure the sustainability of FTF investments. The adaptation efforts are aimed at protecting investments from the impacts of climate change, maintaining development gains, and contributing to economic security. These strategic objectives are elucidated in USAID's medium term Global Climate Change and Development Strategy (GCCDS) which lays out priority activities from 2012 through 2016.<sup>23</sup>

GCCDS is a positive step by USAID to make climate change a central and cross-cutting issue in its foreign assistance portfolio. Adaptation is one of the three pillars of GCCDS, together with mitigation and clean energy activities. More specifically, GCCS identifies three broad categories of adaptation activities that will contribute to the adaptation pillar as:

**“Improving access to science and analysis for adaptation decision making; establishing effective governance systems, which will involve supporting engagement, coordination, and participation; and identifying and piloting actions that increase climate resilience”<sup>24</sup>**

In Senegal, a number of climate adaptation strategies are being implemented, mostly as part of the broader food security and agriculture development programs. In a commitment to ensure that FTF investments' impact on climate change adaptation and natural resource management are tracked, USAID/FTF developed indicators to monitor progress.<sup>25</sup> Progress will be assessed against:

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22. See USAID–Senegal's FTF multi-year investment strategy at <http://www.feedthefuture.gov/sites/default/files/country/strategies/files/SenegalFTFMulti-YearStrategy.pdf>.

23. For details, see “USAID Climate Change and Development Strategy: 2012-2016”, [http://transition.usaid.gov/our\\_work/policy\\_planning\\_and\\_learning/documents/GCCS.pdf](http://transition.usaid.gov/our_work/policy_planning_and_learning/documents/GCCS.pdf).

24. Ibid.

25. For details on measuring Natural Resources Management and Climate Change Adaptability under Feed the Future, see [http://feedthefuture.gov/sites/default/files/resource/files/Volume7\\_FTFNRM.pdf](http://feedthefuture.gov/sites/default/files/resource/files/Volume7_FTFNRM.pdf).

- The number of hectares of agricultural lands showing improved biophysical conditions. Specific interest under this indicator is to measure the increase in soil carbon over time of land-based projects;
- The number of stakeholders, mainly producers, implementing risk-reducing practices to improve resilience to climate change;
- The number of stakeholders using climate information in their decision making. The stakeholders considered under this indicator are the policy/decision makers—individuals involved in planning, designing and implementation of projects, writing policy and regulations, as well as development practitioners;
- Number of water resources sustainability accessed.<sup>26</sup>

The FTF climate adaptation indicators precede the GCCDS indicators. This research established, however, that beginning in 2012, FTF projects are also accountable against result outcomes developed under the GCCDS, of which the second and third FTF indicators are mandatory. In general, the indicators are elaborate for purposes of scientific and quantitative assessment or monitoring, which in part, indicate USAID and FTF are paying considerable attention to climate change adaptation and adaptation benefits. From a practical view, the challenge for program implementers/USAID is accurately establishing baseline measures. Project implementers' annual reports show the indicators are being tracked, especially the first three.

In this study, we do not focus on assessing the extent to which the indicators above have been achieved. Rather, we explore what actions are being taken to realize the indicators and how they affect local adaptive capacity or resilience to climate change impacts.

Five FTF-supported projects in Senegal are identified both with links to improving agriculture, food security, and climate change adaptation. The projects include:<sup>27</sup>

1. The Agriculture and Natural Resource Management (AG/NRM) project, known locally as Wula Nafaa. Wula Nafaa existed before FTF and focused mostly on natural resource management. With FTF, its activities have expanded to agriculture with a threefold objective: to increase productivity, improve food security, and help farmers cope with climate change.<sup>28</sup>
2. The Yaajeende project, which intervenes across the spectrum of food security in terms of availability (production), access, utilizations (nutrition), and governance.

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26. Ibid.

27. Interview with USAID/FTF staff, July 24, 2012.

28. See also <http://senegal.usaid.gov/en/node/383>.

3. The Economic Growth project (PCE). This project aims to reinforce the contribution of agriculture to economic growth; its activities include insurance mechanisms based on climate indices to manage the risks.
4. Collaborative Management for Sustainable Fisheries Future, COMFISH. COMFISH aims to instigate reforms in the fisheries sector to achieve sustainability and biodiversity, improved governance, gender equity, and adaptation to climate change impacts.
5. Education and Research in Agriculture (ERA): Under ERA, FTF targets to build the human and institutional capacity of Senegal to support technological advances in agriculture.<sup>29</sup>

Although each of the FTF projects in Senegal may have connections to enhancing adaptive capacity to climate change, our primary investigation focused on the Wula Nafaa project. However, we also spoke with stakeholders—including project implementers, NGOs, and USAID staff—involved with Yaajeende and PCE projects. The discussion in this study is therefore broader in the context of supporting climate change adaptation under FTF in Senegal. We note, however, that Wula-Nafaa’s new agricultural component under FTF is primarily driven by food security considerations, whereas climate change adaptation can be considered a co-benefit of the investment but also as something that is necessary to prevent the erosion of gains achieved from the investment.

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29. <http://senegal.usaid.gov/en/node/514>.

# RESEARCH SITES AND DATA COLLECTION

## STUDY AREA

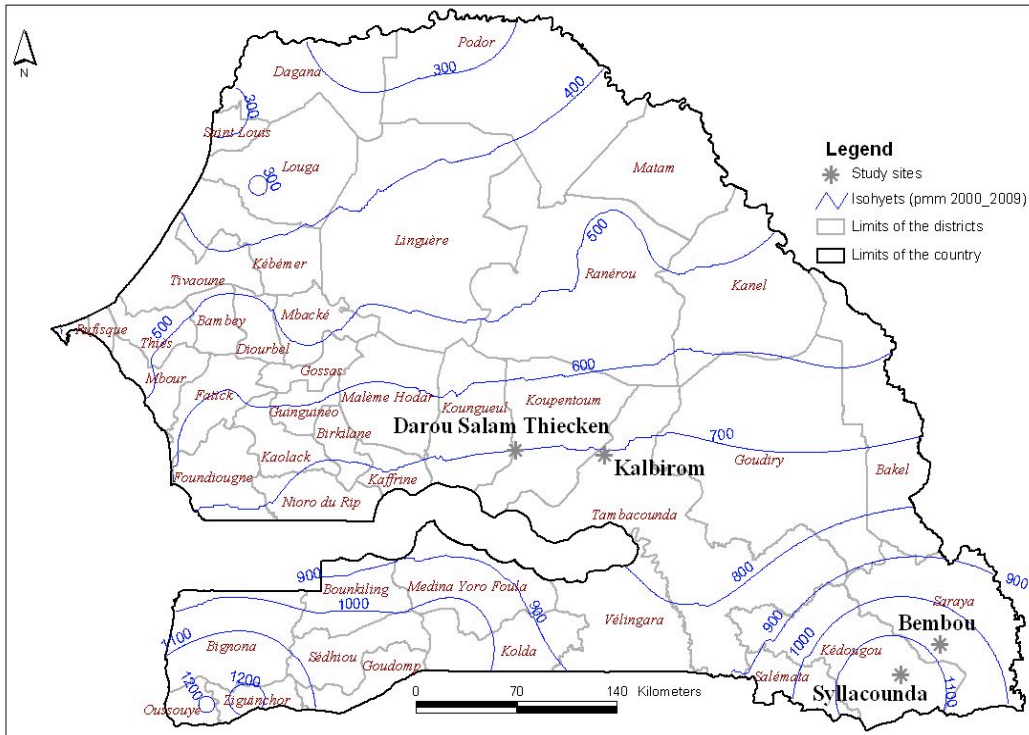
The study areas are two villages in Senegal's Tambacounda region and two villages in the Kedougou region. The villages were purposively chosen because they lie within the Wula Nafaa project's operation area. We relied on it as an FTF case study, particularly because of its stated integrated approach to addressing climate change adaptation issues in agriculture. Among the villages where Wula Naafa FTF intervention is ongoing, the four villages were chosen based on:

- their diversity of productive activities (agriculture, livestock, small business, and forest products harvesting);
- the level of exposure and sensitivity of activities to climate variability and change;
- initiatives underway in response to environmental hazards; and
- Wula Nafaa's level of intervention.

The villages in the research represent a diverse set of livelihoods and threats posed by climate change and variability. In consultation with stakeholders in the area (mainly La Lumière NGO, Wula Nafaa project facilitators, and government technical officers), we chose the following villages: Syllacounda and Bembou in the region of Kedougou, and Kalbiron and Darou Salam Thieckène in the region of Tambacounda (See Figure 1).

From an agro-ecological point of view, Tambacounda and Kedougou regions are rich and diverse. They are endowed with natural resources, including agricultural land, water, forest, and minerals. Although the rains have declined significantly, these regions are still among the most humid in the country, with the major quantity of the rain falling between June and October in a normal year. These rains enable the cultivation of different crops—such as maize, millet, rice, fonio, cotton, and vegetables. Despite being richly endowed with natural resources, Tambacounda and Kedougou remain among the poorest regions in Senegal. Poor infrastructure and longstanding underinvestment in agriculture continue to challenge the agricultural sector in these regions and across rural Senegal more generally.

**Figure 1: Administrative regions and Rainfall distribution in Senegal**



## DATA COLLECTION TECHNIQUES

We used two methods to collect data for this study. We synthesized and analyzed secondary data. And we interviewed farmers (in focus groups and individuals), community leaders, NGO field agents and FTF project staff, and government and USAID technical staff. And we included field visit observations. Data were collected using a semi-structured survey tool. Interviews and group discussions with farmers elicited information about perceived and real threats to their agricultural livelihoods in the context of climate change and weather variability, farmers' livelihood strategies, and coping mechanisms as well as their expectations to adapt. Open-ended interviews with stakeholders were conducted to obtain additional information on climate change risk management strategies undertaken or planned.

This analysis draws from interviews with 40 individuals (13 women and 27 men) and seven focus-group interviews; four of the groups were made up exclusively of female farmers, with one such group in each of the four study villages. The groups include Wakilaaré and Gnaguigni, in Bembou; Fasangkoumé, in Syllacounda; and Liguey and Sope Khadim in Darou Salam Thieckèn. The research team also visited farmlands to observe initiatives and practices in

relation with water management and soil conservation considered to be adaptation options.

In addition to focus group and individual farmer interviews, we held meetings with staff of La Lumière, an NGO; Oxfam America's R4 Rural Resilience Initiative staff; Wula Nafaa staff (four people), Yaajeende project staff (one person), PCE project staff (three people), the regional bodies of the ministry in charge of the environment, the agriculture and forestry services, the Rural Council, the Regional Development Agency, and the World Food Programme (WFP). In Dakar, we met with officials from the Direction de l'Environnement, USAID staff focusing on FTF (agriculture and natural resource management), and researchers from the Initiative de Prospective Agricole et Rurale (IPAR), an agricultural policy think tank.

## LIMITATIONS

We acknowledge some limitations. First, primary data were collected on one FTF project (Wula Nafaa) in two regions within the same agro-ecological zone, while FTF in Senegal has a nation-wide scope. Therefore, our observations are not intended to paint a picture of US FTF activities as a whole. Second, at the time of our interviews, some FTF activities were in the early stage. Progress is bound to occur. We acknowledge the implications of these limitations in our result presentation and discussion and note potential progress from recent reports.

# RESULTS AND DISCUSSION

Following the conceptual framework (see section 2), we present and discuss results along two dimensions: access to and control of livelihood assets, and institutions. We focus on the kind of assets smallholder farmers rely on to cope with and recover from shocks, including climate change, and how development aid affects the livelihood assets together with institutions. However, in exploring how development interventions influence the capacity to respond to changing climate, it is important to first understand the climate changes communities face and how people are dealing with the consequences of these changes.

## OBSERVED CLIMATE RISKS AND THEIR IMPACTS ON SMALL-SCALE FARMING

From interviews, small scale farmers characterized the current climate-related disturbances and threats to their livelihoods as irregular and variable rainfall that is typically poorly distributed particularly in a season. These disturbances include late onset of effective rainy season; shortened and shifted rainy season; and dry spells that have become more frequent and unpredictable. In addition to the irregular and variable rains, farmers note the increased occurrence of extreme events, particularly rains with heavier and more frequent winds. Other threats that women farmer in particular, noted have increased include pests, mainly desert locusts, and to some extent grain-eating birds and weeds, especially striga.

Unpredictability of the rainy season puts producers in a difficult position as to the management of their agricultural calendar and what crops to grow. According to interviews, re-sowing has become a common practice due to “false” starts of the rainy season, and the “abortion” of first plantings leads to significant costs in terms of wasted seed, time, and labor. Some farmers, especially men and the youth, observed that the increased frequency of weather related disturbances are leading them to withdraw from agriculture in favor of alternative activities, such as gold mining and migration to urban jobs.

Although farmers are well aware of the high risk of flooding, they increasingly situate their farms along waterways where the soil is moist and can support crop growth if there is a “thin” rainy season or a false start of seasonal rains; and few seem to take steps to adjust their farming activities. With unpredictable rains, these farms are often flooded. This is the case in the villages of Syllacounda and Bembou. Farmers in these villages point to a resurgence of this phenomenon in their community and blame this on their location opposite the mountainous Fouta



Djalon, neighboring Guinea, among others. In Kalbiron and Darou Salam Thiekène, the same phenomena are observed in lowland farms because of runoff.

The impact of climate change varies considerably from one crop to another, so it plays a role in determining farmers' production choices. Cereals, mainly corn and sorghum, which are basic foods, are highly susceptible to water deficits, especially in the flowering stage. This is why food security in this region is strongly linked to the adaptation of these crops to climate variability and change. This emphasizes farmers' need to have access not only to appropriate varietal species but also to climate information, especially seasonal forecasts. Although the Senegalese Agricultural Research Institute (ISRA) produces short cycle seed varieties of sorghum, millet, and peanuts, as well as irrigated rice, many farmers interviewed are not using such varieties because they lack access to them. From farmers' perspective, the major consequence due to climate change and increased weather variability on households is reduced harvest and hence dwindling farm income. Focus group discussions revealed that men and women are affected equally by reduced harvest and household income, but less disproportionately on children and the elderly because of the entrenched practice of taking care of them.

### Spontaneous adaptation options

Many adaptation strategies, whether in response to climate change or not, are ongoing. Below (in Table 1) is a list of the main adaptation strategies that farmers identified as ways to cope with uncertain and variable weather.

**Table 1: Adaptation Strategies to Climate Change in Tambacounda and Kedougou**

Activity	Notes
Reseeding	To respond to false start of rainfall season or droughts
Sowing in river valleys	Popular in Syllacounda and Bembou. Practice to hedge against rain deficit in a growing season
Observation of meteorological events	Appearance of red and black birds, the maturation of Borassus palms, and the heat level to predict start of rain. Also relying on Khoys—traditional forecasters
Fallowing	Field recovery and break pest cycle—mostly reported in in Kedougou
Mining, petty business, charcoal burning, migration	Diversifying the sources of income
Changing crop variety	Using short rain and drought resistant seeds
Cereal banks	Secure the production and face lean periods.
Using organic fertilizers	Substitute for commercial fertilizers.

Among the identified strategies, reseeded, sowing in river valleys, and diversification to off-farm income sources featured prominently. To increase household income, both women and men increasingly get involved in off-farm

activities. Women are increasingly engaging in petty trade such as selling charcoal and agriculture produce while men are engaging more in charcoal burning, mining, and migration to urban jobs.

Although the strategies in Table 1 may avert many of the discrete impacts of climate change, some strategies may exacerbate vulnerability. For instance, income diversification activities such as charcoal burning deplete the forestry resource base. Yet, this is vital for mitigation and adaptation. At the same time, strategies such as migration, reseeding, and sowing in river valleys are reactive rather than based on anticipated changes. Moreover, strategies that appear proactive, such as indigenous knowledge, can vary significantly and potentially mislead producers. Indeed, during focus group discussions in Syllacounda and Darou Salam Thiekène, some interviewees (especially men) questioned the accuracy of “signs” to predict rains, particularly in the case of relatively arbitrary signs, such as the appearance of red and black birds.

## SUPPORTING LIVELIHOOD ASSETS IN THE FACE OF CHANGING CLIMATE

A critical factor enhancing or undermining individual households’ adaptive capacity is access to and control of livelihood assets and resources. In this context, we discuss the small-scale producers’ adaptability to climate change by assessing their livelihood assets (natural, human, social, physical, and financial) and whether and how development support, specifically Feed the Future interventions, have contributed to creating, strengthening, and diversifying these assets.

### **Supporting natural capital: Management and governance**

Natural capital consists of the natural resource stocks from which resource flows and services useful for livelihoods are derived. Examples of natural capital are forest, land, water, fauna, and flora, as well as minerals such as gold that is abundant in the regions we studied, even though they do not benefit the most vulnerable. The relationship between access to and control of natural capital, on the one hand, and vulnerability, on the other, is especially close. The empirical evidence gathered in this research shows that Feed the Future is enhancing climate change adaptation by making an important contribution to sustainable land use in targeted communities, particularly through conservation farming and agro-forestry.

For farmers, the most important natural asset for enabling adaptation is access to and control over land. Constraints on access to land in Kedougou and Tambacounda differ. In Kedougou, land availability seems infinite—a relatively

large expanse of land for a relatively small population (6.6 inhabitants per square kilometer), and customary management of state land is still accepted. "Here there is no problem of land, you can grow here this year and the next year you move elsewhere."<sup>30</sup> However, farmers continue to concentrate their farming activities along streams and in valleys. Consequently, water ponds and rivers are under threat of siltation. In Tambacounda, however, "land hunger" prevails. Here, topography and population pressures are such that neither fallowing nor extensification is possible. The land shortage prevailing in these villages is compounded by the degradation of cropland and loss of soil fertility. As in Kedougou, temporary ponds are under threat of siltation and drying due to wind erosion as reported in Darou Salam Theckène.

Although some farmers do not see land access as a problem, their tenure on the land is not secure. Senegal has three land ownership categories: national domain; state domain (private or public, but it belongs to government); and private property. The Rural Council, which manages state land, grants "user rights" to local people. The lack of security of tenure could mean a lack of incentives to invest and use the land sustainably. In practice, however, farmers take stewardship of the land and have made improvements such as erosion controls. Land degradation is viewed as a societal problem more generally. For instance, soil erosion limits productivity and can lead to reservoir siltation. At the same time, farmers consider the benefits from working the land as incentive for good stewardship. Women farmers are more motivated by self-interest to continue using the land as incentive for good stewardship of the land. Although farmers do not cite insecurity of tenure a threat to their livelihood strategies, with an increase in mining, especially in Kedougou, insecurity could quickly occur where the state is likely to transfer user rights to investors.

Feed the Future, through Wula Nafaa, has addressed some of these challenges. The first phase of the Wula Nafaa project (2004-2008) was devoted to natural resource management through reforestation, forest management plans, assisted natural regeneration (RNA), capacity building for better governance of forest resources, and forest products valorization.<sup>31</sup> As forestry activities are ongoing, with particular focus on participatory management, Wula Nafaa has expanded its FTF activities to agriculture (i.e. conservation farming and agro forestry) that is being integrated within forestry management principles. Implicit in Wula Nafaa's approach is the understanding that risks to climate change are a result of deforestation and land degradation, and therefore can be controlled through greening the local environment. Although the approach is reasonable in terms of sustainable land use, it leaves no flexibility for situating adaptation alongside other stressors and beyond the local environment. Conservation farming in particular is labor intensive, which significantly reduces the farmers' opportunity to pursue an off-farm livelihood.

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30. Interview with Faly Danfakha, a local leader in Bembou, Kedougou.

31. Interview with Wula Nafaa official.

## **Human capital: supporting knowledge generation and information sharing**

Human capital represents the skills, knowledge, and ability that enable people to pursue different livelihood strategies and achieve sustainable livelihood objectives. Successful adaptation to climate change requires information about likely future climate change and knowledge about adaptation options and the capacity to implement suitable interventions.<sup>32</sup> This research established that farmers need appropriate information about seasonal weather forecasts to enable effective decision-making about production activities in the face of increased weather uncertainty. They also need advisory services for long-term climate change trends. However, local governments and development partners including FTF programs are more focused on strengthening the more immediate capacity of producers in terms of farming practices and technical skills.

During the interviews with farmers and agricultural technical staff, they repeatedly indicated that the major constraint to planning agricultural production activities is the lack of access to information, namely agro-climate and weather information. Forecasts are not readily available to producers. Asked about this problem, Boubacar Kamissokho, an expert from the Société de développement des fibres textiles (SODEFITEX) who is in charge of cotton production in Tambacounda, indicated he uses information provided by “Khoys,” or traditional forecasters, in his extension operations in the absence of data from the National Agency for Civil Aviation and Meteorology (ANACIM). Boubacar, like many other farmers we interviewed, contends that knowledge of weather patterns could significantly reduce the risk of climate change and variability, yet this has not been really treated as a priority by local government and development partners. In fact, respondents indicated there is no weather forecast information provided through the FTF program (Wula Nafaa or Yaajeende).

The significance of weather forecasts has been examined by the Climate Change and Food Security program (CCAFS) of the Consultative Group on International Agriculture Research (CGIAR) climate program. The pilot program aimed to empower farmers to better understand and use probabilistic seasonal climate information in the Kaffrine district, located in the peanut-growing region of Senegal (west of Tambacounda). Results reported from the CCAFS experiment indicated that seasonal climate forecasts have significant potential to improve agricultural management and livelihoods for small-holder farmers.<sup>33</sup>

However, there are several impediments to scaling up the use and dissemination of weather forecasts and climate-related information to benefit small-holder farmers.<sup>34</sup> These include:

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32. Pettengel, Climate Change Adaptation.

33. For details on this pilot project see <http://ccafs.cgiar.org/blog/putting-climate-forecasts-farmers-hands>.

34. Arame Tall, ed., “Identifying Good Practice in the Provision of Climate Services for Farmers in Africa and South Asia (Background paper for the workshop “Scaling Up Climate Services for Farmers in Africa and South Asia,” Senegal, Dec.

- Delivery: Providing timely access to remote rural communities with marginal infrastructure;
- Salience: Tailoring content, scale, format, and lead time to farm decision-making;
- Legitimacy: Giving farmers an effective voice in the design and delivery of climate services;
- Equity: Ensuring that women, poor people, and socially marginalized groups are served.

Despite its limited scale, the CCAFS pilot demonstrates good practice and valuable insights for development programming. US FTF projects like Wula Nafaa could partner with CCAFS and take innovative approaches to make progress with small-holder farmers in Tambacounda and Kedougou.

By contrast, the FTF programs through Wula Nafaa and Yaajeende have helped to introduce agricultural practices and technical skills that could contribute significantly to agricultural adaptation in these regions. According to a technical staff member of Wula Nafaa, conservation farming (CF) maximizes yield and environmental benefits. It is also a viable system for dry land farming, as the amount of rainfall dwindles in the face of climate change. However, farmers who have adopted CF indicated they have done so purely on grounds that it increases yield, not as a climate adaptation strategy. This suggests that the pressing concern among farmers is not responding to climate change and variability but rather the household's immediate food security. This attitude leaves little awareness of and room for addressing adaptation as a fundamental problem affecting agriculture in the medium to long term. Wula Nafaa sources reported that CF has increased yields by about 25 percent, a perception also held by many farmers we interviewed who are involved in CF.

Despite its potential benefits, interviewees indicated that CF is labor intensive, which has been one reason it is not widely adopted. Some farmers we spoke to, like Khalifa Ndao, deputy manager of the cereal bank in Kalbiron, indicated that they find CF time taxing and almost impossible to combine with other livelihood activities and thus is an obstacle to economic diversification. However, early adopters are often a minority group (of farmers) ready to try out new things with caution before the innovation becomes mainstream.<sup>35</sup>

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2012), [http://scalingup.iri.columbia.edu/uploads/1/5/8/6/15865360/white\\_paper\\_good\\_practices\\_in\\_scaling\\_up\\_climate\\_services\\_for\\_farmers.pdf](http://scalingup.iri.columbia.edu/uploads/1/5/8/6/15865360/white_paper_good_practices_in_scaling_up_climate_services_for_farmers.pdf).

35. Genesis T. Yengoh, Armah Frederick Ato, and G.E. Mats Svensson, "Technology Adoption in Small-Scale Agriculture: The Case of Cameroon and Ghana," *Science, Technology & Innovation Studies* 5, no.2 (2009): 111-131; see also M. Everett Rogers, *Diffusion of Innovation* (New York: Free Press, 1995).

## **Physical capital: Building infrastructure**

Physical capital implied in the context of adaptation to climate change includes man-made assets such as basic infrastructure that helps people meet their basic needs and be more productive, such as public roads and bridges, market systems, water supply, and irrigation systems, among others. It also includes producer goods, such as tools and equipment, seed, fertilizers, storage facilities among others.

Farmers lack adequate tools to work the soil, especially in Kedougou region where the soils are rocky. Hand held hoes are proving insufficient.<sup>36</sup> Low seed quality is another major problem that farmers in these villages face and that undermines their effort to build a resilient agriculture. Both producers and government technical services recognize that peanut seeds are especially poor quality. In response to this problem, the new administration of President Macky Sall announced the renewal of seed capital as a priority, as well as the timely availability of seeds at affordable prices. In Darou Salam Tchekène, however, farmers revealed that middlemen get hold of the inputs and sell them for more than the state-fixed prices. To increase accessibility of affordable fertilizers, the Yaajeende project planned to develop a network of community-based solution providers, which are local private sector institutions or businesses with connections to input providers at the local level and provide products and know-how to farmers. At the time of this survey, these plans remained on paper only.

Because of inadequate or lacking storage facilities in the areas we studied, a significant amount of the agricultural produce is spoiled, or farmers are forced to sell when supply is high and prices low. Support for better storage arrangements, at the community level is needed. At cereal bank in Kalbiron, membership is increasing, suggesting high demand for storage services. This cereal bank is the result of the collaboration among villagers, with support from the Canadian government through WFP and the National Agency for Agricultural and Rural Advice (ANCAR). This pilot program of community cereal banks, in combination with warehouses promoted by the Yaajeende project, appears to be a suitable response for securing the production.

## **Access to finance to pay for adaptation**

Financial resources are important for adaptation activities, both at the farm and institutional level. Limited income from farming makes it difficult for farmers to accumulate savings that could be used in financing local adaptation initiatives. In interviews, farmers often digressed to talk about their financial problems, particularly limited access to credit, reliable markets for their produce, access to quality seeds (mainly hybrids), and commercial fertilizers. At the institutional level, the lack of financial resources explains in part the difficulties in

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36. Wula Nafaa and PCE had plans to introduce “ripper” hoes that can plow with animal traction.

implementing the NAPA as a whole program. Our research established that the FTF projects—PCE and Yaajeende—are making significant contributions to improving access to financing.

Interviewees indicated financial services exist but are expensive and not diversified to meet farmers' needs. Farmers interviewed mentioned the availability of funding sources such as the Crédit Mutuel du Sénégal (CMS), a bank located in Tambacounda, the credit component of ANCAR, and other rural saving programs, such as the Oxfam Saving for Change (SfC) program. Although the ANCAR program seems flexible in terms of access and repayment periods, farmers say the loans are usually not modeled on applicants' business cycles. Local saving programs like SfC are more local and increase access to finance in timely fashion and for activities that may not be covered by formal lending institutions though the amount lent is often not much.

The FTF Yaajeende project includes a component that promotes access to financial services. The approach is to connect producers to microfinance lending institutions through Community Based Service Providers (CBSPs). CBSPs are elected community members providing services in the agriculture value chain including aggregating farmers for input purchase and crop marketing as well as dissemination of farming knowledge. According to an official from USAID and PCE, the PCE project has invested in increasing the availability of seed production, including millet, corn, and rice, with higher yields and climate resilience.

Other programs in the region include the pilot program of weather-index-based insurance implemented by PCE and WFP in conjunction with Oxfam America's R4: Rural Resilience program.<sup>37</sup> WFP receives funds for this program from USAID but not as part of FTF. Index insurance is an innovation through which payout is based on a meteorological index (rainfall) that corresponds to potential losses.<sup>38</sup> According to information from project reports (and validated by an interview with a key informant), the PCE project is building the capacity of involved institutions and stakeholders; this has included training volunteer farmers in production risk, insurance principles, and corn index insurance management procedures. When effectively implemented, the R4 program and the initiative by PCE could be instrumental in addressing climate change related risks.

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37. For information on Oxfam's R4 project see [http://www.oxfamamerica.org/files/r4-report-april-junefinal\\_lo\\_res.pdf](http://www.oxfamamerica.org/files/r4-report-april-junefinal_lo_res.pdf); see also <http://www.oxfamamerica.org/files/r4-report-jan-march-2012-lowres-051612.pdf>.

38. For more information about index-based insurance, see S.J. Vermeulen et al., *Agriculture, Food Security and Climate Change: Outlook for Knowledge, Tools and Action* (CCAFS Report 3. Copenhagen, Denmark: CGIAR-ESSP Program on Climate Change, Agriculture and Food Security, 2010), [http://ccafs.cgiar.org/sites/default/files/pdf/ccafs\\_report\\_3-low-res\\_final.pdf](http://ccafs.cgiar.org/sites/default/files/pdf/ccafs_report_3-low-res_final.pdf).

## **Social capital**

Social capital is the set of social resources developed through networks and connectedness, membership in more formalized groups—political, religious, cultural, and economic—as well as relationships of trust, reciprocity, and exchange. In the context of adaptation, social capital is the process and networks of sharing risk and costs associated with shocks and stresses. Noteworthy, most agriculture development programs are not designed to enhance social capital or report change in social capital as a program outcome, but understanding social relations in a community is pivotal to a program’s success.

Social cohesion is quite strong in Bembou and Kalbiron but quite weak in Syllacounda. In Kalbiron, good social cohesion has enabled farmers to establish a cooperative local seed bank that has proven to be an important part of post-harvest loss management. In addition, Bembou and Kalbiron farmers have been able to pool their efforts to gain greater access to funding and training that is otherwise beyond the reach of individual farmers. Through this risk- and cost-sharing strategy, they have also been able to establish successful community operations, such as setting up firewalls that are very important in protecting villages from forest fires and other assets that are necessary for adaptation.

In Syllacounda, it seems to be the opposite: Poor social cohesion hinders sharing of opportunities for effective adaptation. For instance, during one of our focus group discussions, a controversy broke out after we asked who benefits from FTF investments and why. Farmers accused the son of the village chief of monopolizing information and controlling the choice of recipients. This has implications for how adaptation assets and opportunities are distributed in the community and how power relations affect the equitable distribution of these assets. To improve reach and targeting, power relations in targeted communities must be considered as part of project implementation. In the areas we surveyed, Wula Nafaa has supported existing farmer groups and also started new ones. These community-based organizations are platforms for learning, collective action, and interaction between individuals; and hence, increasing the ability to rely on one another and share information.

## **INSTITUTIONS**

### **Governmental bodies, policies, and programs for adaptation**

The structural adjustment programs implemented in Senegal in the 1990s have led to major changes in the development approach and the configuration of relations in rural areas, particularly within the agricultural sector. Centralized programs that used to be implemented by the government have been replaced by more autonomous regional departments. Consequently, most of the



institutions accompanying the Ministry of Agriculture (MoA) in its mission to foster sustainable agriculture in rural areas have more of supporting and advisory roles and less programming, prioritization, and implementation roles. These roles are with the Regional Rural Development Directorates (DRDR) and the Rural Development Departmental Services (SDDR), which are the decentralized bodies of the MoA.

The role of SDDR and DRDR in fostering resilience to climate change is not obvious, and the two bodies lack the technical knowledge and resource capacity that could support adaptation at the institutional level. Structurally, the SDDR and DRDR are the two bodies responsible for monitoring the implementation of agricultural policy and helping to mainstream climate change issues; identifying and addressing farmers' capacity and training needs; and supporting research and dissemination.

ANCAR is another institution established to support farmers. ANCAR is a national directorate with regional branches. It was created in 1997 to play a leadership role with regard to the extension and implementation of the Agro-pastoralism bill (Loi d'Orientation Agro-Sylvo-Pastorale); provide farm and rural advisory services; and implementing activities according to the value chain approach defined in the National Program of Investment in Agriculture (PNIA). At this time, ANCAR's role seems to be limited to coaching and evaluating projects and programs implemented by local partners. However, it has great potential for playing a service-provider role in agriculture in general. ANCAR could also mediate the provision of technical services for programs and projects. In particular, it could play the role of technical wing for the DRDR and SDDR by supporting farmers in identifying and addressing their need for knowledge and skills; organizing technology transfer and experimentation; and helping in the monitoring, evaluation, and scaling-up of adaptation options.

The major challenges for greater adaptation of small-scale agriculture and smallholder farming are more institutional than technical deficiencies. The first handicap is the lack of a formal national agricultural policy that explicitly integrates climate change adaptation and interactions with other sectors. The second problem is that the NAPA identifies the top three priority areas in agriculture but does not define specific actions that take the local context into account. It also fails to place the most at-risk communities, including the farmers, at the heart of the decision-making process. In the urgently needed revision process of the NAPA, the government of Senegal should consider the community-based approach and, as stated by Dejene et al.,<sup>39</sup> ensure that science-based responses be embedded in local knowledge, practices, and circumstances, both biophysical and socio-economic. It should further ensure that they are wanted, understood, and adoptable by the farmers and that they

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39. Alemneh Dejene et al., *Strengthening Capacity for Climate Change Adaption in Agriculture: Experiences and Lessons from Lesotho* (Environment and Natural Resources Management Series 18, Food and Agriculture Organization of the United Nations, Rome, 2011).

actually lead to improved livelihoods. The capacity of the national government must be strengthened; at the same time, local government stakeholders in the regional departments must also make adaptation more of a local process.

# CONCLUSION AND RECOMMENDATIONS

Development assistance influences the ability of individuals and communities to adapt to climate change. Development assistance can facilitate adaptive capacity to climate change and variability by channeling information and resources into communities for effective adaptation. Development aid is particularly well situated to promoting interactions across scales, building flexibility into institutions, and providing space for collective learning that can lead to innovative, effective adaptation to climate change. This report provides insight from Senegal into the extent to which US development assistance, particularly through the Feed the Future initiative, affects individuals' and communities' adaptive capacity to climate change.

Evidence generated from this study shows that US development support to the agricultural sector of Senegal, particularly through Feed the Future, is making an important contribution to increasing agricultural production and climate change adaptation among targeted households. Feed the Future contributes to livelihood asset building, particularly sustainable land use (through forest resources preservation and conservation farming) and technological innovations that increase yields. These are reducing vulnerability to the impacts of climate change.

Conservation farming, promoted under Feed the Future, has increased yields among beneficiary households. At the same time, farmers recognize that seasonal weather forecasts are the most critical tool to enable better planning and timing of agricultural activities in the face of increased uncertainty. Existing constraints on access to weather forecasts lead to inadequate or no information services. Facilitating small-scale farmers' access to and use of climate information should be considered a priority by local government and development partners.

During discussions, farmers often talked about their problems, particularly limited access to credit to purchase good-quality seeds and fertilizers and reliable markets for their produce. Under FTF, some of these problems, especially access to credit, are being addressed by the PCE and Yaajeende projects, though at the time of this research, these services were not yet accessible to the farmers we interviewed. Facilitating access to affordable and flexible credit needs to be considered a priority alongside promotion of agro-technologies in development programs.

Many of the farmers we interviewed do not perceive and practice conservation farming as a climate change adaptation strategy. Rather, conservation farming is being practiced as a yield increasing technology. Under this consideration, there is little awareness of and room for addressing adaptation as a fundamental problem affecting agriculture. At the same time, the scientific understanding of agro-forestry and conservation farming—namely, that it is the solution to the perceived environmental problem—leaves no room for situating adaptation alongside other stressors. This may unnecessarily limit the adaptive capacity of targeted communities.

Capacity building is one of the major challenges in addressing climate variability and change. It is particularly critical to ensure better integration of climate adaptation in development plans. Two major avenues emerge where development partners can support the government of Senegal for greater resilience of small-scale agriculture. The first one is to support the government in developing and implementing a formal national agriculture policy that identifies where the challenges of climate change interact with other sectors. The second is building the capacity of regional and local actors to better program and monitor projects.

As Senegal's NAPA is somewhat of a suggestion box of climate adaptation activities from which donor partners' draw, it is difficult to gauge systematically the extent of its implementation. In spite of the shortcomings of project support, our analysis shows that activities and programs under FTF in Senegal appear consistent with the country's national plans, including the PNIA and NAPA priorities. However, given that the NAPA is based on limited information on climate forecasts, strategies based on NAPA may be limited in the long term. There is a need to review the NAPA in particular to take into consideration emerging issues and better forecasts. More generally, a thorough evaluation of the agricultural sector's long-term vulnerability to climate variability and change, and potential responses, including institutional reforms, should be addressed with the utmost urgency.

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