

Political will and public will for climate-smart agriculture in Senegal

Opportunities for agricultural transformation

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Eric D. Raile and Linda M. Young

*Department of Political Science,
Montana State University, Bozeman, Montana, USA*

Adama Sarr

Center for Ecological Monitoring, Dakar, Senegal

Samba Mbaye

Universite Gaston Berger, Saint-Louis, Senegal

Amber N.W. Raile

*Jake Jabs College of Business & Entrepreneurship,
Montana State University, Bozeman, Montana, USA*

Lena Wooldridge

*Department of Political Science,
Montana State University, Bozeman, Montana, USA*

Diaminatou Sanogo

National Center for Forestry Research, Dakar, Senegal, and

Lori Ann Post

*Buehler Center for Health Policy and Economics,
Northwestern University, Evanston, Illinois, USA*

Abstract

Purpose – Agriculture must transform as climate change progresses. The international community has promoted climate-smart agriculture (CSA) as a set of solutions. Previous analyses of opportunities for scaling up CSA have not looked closely at building political and social support for policies, practices and programs. The purpose of this paper is to fill that gap in the case study country of Senegal.

Design/methodology/approach – The study applies the conceptual definitions, operationalizations and assessment targets from the political will and public will (PPW) approach to social change. Semi-structured interviews and documents constitute the sources of data and information.

Findings – The analysis identifies opportunities to generate political will for supplying an enabling environment for the widespread adoption of CSA. On the public will side, the analysis identifies opportunities to generate and channel demand for CSA.

Research limitations/implications – Researchers investigated some definitional components more completely than others due to resource and access constraints. Further, the context specificity of the components limits generalizability of certain findings.

Social implications – Social structures may need to change for successful adoption of certain CSA innovations, but improved agricultural outcomes are likely to result.



Originality/value – This examination of crucial elements for scaling up CSA efforts constitutes the most extensive application of the PPW approach to date, thus providing an example of this generalizable method.

Keywords Africa, Community development, Climatic hazards, Senegal, Adoption of innovations, Agricultural transformation, Climate-smart agriculture, Political will and public will

Paper type Research paper

1. Introduction

The need to transform agriculture to adapt to climate change is already urgent for some low-income countries. Senegal, for example, is suffering from rising temperatures, flooding and greater variability in precipitation and seasons (Jalloh *et al.*, 2013; National Agency for Civil Aviation and Meteorology of Senegal *et al.*, 2013; Bonilla-Findj *et al.*, 2016; Feed the Future, 2016). Over one-half of households in Senegal are living in multidimensional poverty, about one-third in “severe” multidimensional poverty, and about one-third on a daily income below the US equivalent of \$1.25 per day (UNDP, 2016). Ultimately, many Senegalese are living on the edge of survival and are quite vulnerable to perturbations. At its core, climate change is a set of serious perturbations. For households and populations growing their own food, these perturbations become even more immediately dangerous.

As a consequence, experts assert that countries like Senegal need to take advantage of opportunities to enhance their food security. In recent years, the global community has begun using the term “climate-smart agriculture” (CSA) to label various agricultural policies, practices and programs aimed at dealing with climate variability (FAO, 2013). The current project applies the political will and public will (PPW) approach for evaluating social change (Post *et al.*, 2010; Raile *et al.*, 2014; Raile, Raile and Post, 2018) to the examination of opportunities and obstacles as they relate to CSA. The primary aim of this study is to address the following research question:

RQ1. What opportunities exist for generating PPW for the adoption of CSA practices and policies in Senegal?

Secondary questions examine what would be required to scale up CSA efforts, as well as the potential roles for policy and agribusiness entrepreneurs in doing so. Widespread adoption of CSA would constitute a fundamental transformation in the practice of agriculture in Senegal.

The methods and approach for this study are relatively unconventional for agricultural economics. The primary methods are interviews and the examination of documents, with the goal of assessing information against the definitional components within the PPW approach. The study applies a descriptive analytical framework but also includes case study and action research elements. While more quantitative analysis underlies parts of the larger project, this particular piece focuses on identification of opportunities for transformation. Consequently, this piece emphasizes more comprehensive listings of problem and solution understandings. Without the resources for a mass survey, the goal here is more in line with contextual understanding than generalization of results. The former is a goal that is typical of qualitative research (see Bryman, 2016). However, the overall subject matter is firmly within the domain of economics. For various reasons (e.g. limited information, input supply difficulties, infrastructure problems, risk aversion, tradition, etc.), a widespread market for CSA is unlikely to emerge quickly on its own. Governmental supply of an enabling environment might help considerably. Further, while experts might see benefits clearly outpacing costs for adoption of CSA, the case will need to be made to producers. What are the opportunities for stimulating public demand for such an enabling environment? More conventionally, opportunities may also exist for stimulating demand for the information, goods and services necessary to transform agriculture along CSA lines.

The prospective benefits of this research extend to theory and methods and to global improvement of food security. This study provides an example for applying the PPW

approach, which can be employed by researchers and practitioners as action research for achieving systemic change (Raile, Raile and Post, 2018). Other authors have used the definitions and certain elements of the PPW approach in subject areas like inter-ethnic violence (Fiedler, 2018) and corruption (Hope, 2017). However, this study represents the most complete application of the PPW definitions and elements to date. Further, though contexts are highly important, the examination of PPW for CSA efforts in Senegal should enhance understanding of problem–solution linkages and agenda crowding more generally.

2. Background

Conceptual definitions of political will (Post *et al.*, 2010) and public will (Raile *et al.*, 2014) are the foundation of the PPW approach. The authors provide operationalizations, assessment targets and ideas about measurement for each of the definitional components. Application of the PPW approach enables identification of specific strengths and insufficiencies in political and public support for social change. However, the approach also recognizes that PPW can vary across geographic areas, issue areas, specific initiatives and groups of people. Further, the PPW approach focuses on participatory communication processes and emphasizes the importance of stakeholders sharing common problem and solution definitions in order to achieve social change.

Attracting significant attention is often crucial for innovations to produce social change (see Post *et al.*, 2008). Scholars have sometimes differentiated between the public agenda on the one hand and the formal governmental agenda on the other (e.g. Cobb *et al.*, 1976; Eyestone, 1978; Kingdon, 2003). The former is the list of issues or conditions to which the general public is paying close attention, while the latter is the list of problems the government intends to address somehow. Importantly, these agendas have limited carrying capacity due to the logistics of governance and limits in mass attention (Carmines and Stimson, 1986; McCombs and Zhu, 1995). The limited carrying capacity of these agendas is a form of scarcity that generates a highly competitive environment for attention.

Scarcity and competition are conditions under which entrepreneurs can profit – whether more traditional business entrepreneurs or “policy entrepreneurs” or “claims makers” (Spector and Kitsuse, 2000; Mintrom and Norman, 2009). Policy entrepreneurs might work with business entrepreneurs or might pursue ideological, public interest or humanitarian goals. One prominent role of policy entrepreneurs is helping to set or build an agenda, which means to establish the agenda items and their ordering (Eyestone, 1978; Baumgartner and Jones, 1993; Kingdon, 2003). Getting an issue to achieve “problem” status (i.e. something must be done) with a spot on the agenda typically involves “problem definition” and linking the problem to a specific solution via a broader “issue frame.” Issue framing simplifies an issue area by constructing a model that excludes certain considerations and emphasizes others, thereby influencing perception of a problem (Entman, 1993; Druckman, 2004; Crow and Lawlor, 2016). Problem understandings can shift dramatically when a skilled issue framer is at work.

A policy entrepreneur trying to get a problem on the agenda usually has an associated solution in mind. The problem–solution linkage is important and should be relatively direct and logical. While problems precede solutions in traditional views of policymaking (e.g. deLeon, 1999), other scholars have allowed for solutions preceding problems (e.g. Zahariadis, 2014). Joining problems and solutions on the agenda requires waiting for necessary “focusing events” to occur or requires more proactive creation of “windows of opportunity” (Kingdon, 2003). Delays can create unfortunate situations in which the public realizes the severity and consequences of problems too late (Downs, 1972). Such a delay could have catastrophic consequences for the people of Senegal based on their vulnerability to the serious perturbations of climate change.

The potential solutions considered in this study are CSA solutions. The three elements of CSA generally recognized by the international community are “(1) sustainably increasing agricultural productivity and incomes; (2) adapting and building resilience to climate

change; and (3) reducing and/or removing greenhouse gas emissions, where appropriate” (FAO, 2013, p. ix). CSA is a systems approach to managing crops, livestock, forests and fisheries, both on the farm and in a broader institutional context; this approach calls for management of landscapes as well as adaptation of technologies, practices and policies to local conditions (FAO, 2013). CSA advocates have differentiated the concept from “conservation” or “sustainable” agriculture by pointing to its broader, more general nature (Shreeg, 2015). The prospective answer for reconciling the goals of greater agricultural productivity and reduced greenhouse gas emissions is agricultural “intensification,” or greater production per unit of inputs. This balance is particularly challenging in places like Sub-Saharan Africa, where input use (like inorganic fertilizers) is relatively low and production must increase dramatically to feed growing populations.

3. Methods

This case study of Senegal and certain regions within the country employed a mix of methods, including semi-structured interviews and the examination of documents. The primary purpose in collecting this data and information was to supply the material necessary for applying the definitional components of PPW. This research also used certain elements of stakeholder analysis (Brugha and Varvasovszky, 2000; Schmeer, 2000), as identification of stakeholders is a core task in the PPW approach (Raile, Raile and Post, 2018). Researchers reviewed documents and worked with in-country experts to identify “priority” stakeholders (Schmeer, 2000), who are also deemed experts in their respective domains. The sampling approach emphasized speaking with a variety of different types of priority stakeholders in diverse areas of the country.

Researchers conducted semi-structured interviews during two separate field research trips in Senegal. The first trip, in late 2015, focused on the capital of Dakar and multiple communities along the Senegal River Valley in the north of the country. Over five days, researchers conducted 21 semi-structured interviews involving approximately 35 speaking participants, with an average interview length under 1 h. Attendees at each interview included two researchers, an interpreter and occasionally a facilitator. The follow-up trip in late 2016 focused again on Dakar but also on the central part of the country, including the regions of Kaolack, Kaffrine, Diourbel and Thiès. Speaking with people in different parts of the country was essential because the climate-driven agricultural problems, the types of crops grown, the growing methods and a number of other factors differ from one area to another. Over five days, researchers conducted 18 semi-structured interviews involving 40 speaking participants. The average interview length was again less than 1 h. Attendees at each interview included four researchers and an interpreter.

Researchers gathered data from the same four stakeholder groups on each trip: national and local government employees (12 interviews); government and other researchers (8 interviews); agricultural producers (8 interviews); and non-governmental organizations (NGOs; 5 interviews). However, the second trip also added a category for CSA project administrators (six interviews). Researchers took field notes during the interviews and typically made audio recordings, which a few research participants refused as they were informed they could do.

The sets of questions in the semi-structured interview protocols differed somewhat across the two field research trips. The Appendix supplies language for most of these questions. In 2015, the relevant questions emphasized interviewee perspectives of major climate-driven agriculture problems, social and economic problems and nutritional problems in the country. The questions also asked about priorities and decision makers at different levels of government. In 2016, the questions again included perspectives of problems and government priorities. However, the questions this time focused more on CSA projects and their linkages to problems as understood. Consequently, the protocol included questions regarding knowledge

of the CSA projects, messaging and information about CSA projects, and perceptions about problems addressed or potentially addressed by CSA projects.

Transcripts of the audio recordings were uploaded into qualitative analysis software (NVivo) for coding purposes. When transcripts were not available, researchers uploaded the typewritten field notes instead. Coding proceeded using a mixture of deductive and inductive approaches (Miles *et al.*, 2014). Questions in the semi-structured interview protocols derived directly from elements in the PPW approach. The coding nodes then tracked from these PPW elements in a deductive manner (e.g. a node for solution understandings). Within each node, however, responses from the interviewees themselves were the basis for the construction of subnodes in an inductive process (e.g. subnodes for improved water use and for organic fertilizers within solution understandings). Researchers collaboratively refined these subnodes in multiple rounds of work by reconciling any differences and by combining subnodes when possible.

4. Political will findings

The analysis begins with political will for CSA in Senegal. The formal definition of political will includes four components:

1. A sufficient set of decision makers
2. With a common understanding of a particular problem on the formal agenda
3. Is committed to supporting
4. A commonly perceived, potentially effective policy solution (Post *et al.*, 2010, p. 659).

The following subsections discuss operationalization and assessment for each of these definitional components.

4.1 *Sufficient set of decision makers*

The first component of political will is a sufficient set of decision makers, or any combination of decision makers with the ability on their own to approve and implement the necessary policies in an issue area (Post *et al.*, 2010). Assessment involves looking at institutions and factions. Senegal, a presidential republic with elements of federalism, has taken important steps toward democracy since achieving independence from France in 1960. However, the current president's party, the Alliance for the Republic, dominates the legislature with about 80 percent of the seats. The executive office remains relatively powerful and must be part of any sufficient set of decision makers.

The researchers asked stakeholders about entities or persons important in making public decisions and establishing priorities. Stakeholders agree with the influence of the president and his government (i.e. the cabinet and other important advisors), with several interviewees identifying them as being by far the most influential. Stakeholders also identify a variety of other meaningful actors. Officials at government ministries have a role in making and implementing policy. However, stakeholders sometimes see a disconnect between such centralized decision making and what happens at the district and local levels due to capacity shortages and different needs across localities. Decision-making processes sometimes include domestic NGOs, though some stakeholders express skepticism about the meaningfulness of this participation. Stakeholders also point to local decision makers like chiefs, wise men, imams, mayors and social regulators as being important. The inclusion of religious figures in this list is crucial, as some experts assert that the greatest political power resides in the "leaders of the country's Islamic Sufi brotherhoods" (Polity IV, 2010, p. 2). Influential decision makers at all levels tend to be men. In summary, the crucial actors appear to be the president's government and local leaders.

4.2 Common understanding of a particular problem on the formal agenda

The second component of political will is a common understanding of a particular problem on the formal agenda. Operationalization for this component involves looking at whether the frame and terminology for a problem show convergence across decision makers and whether a particular problem is on the formal agenda (Post *et al.*, 2010). Information availability limits the scope to the national government level. The sources of evidence are formal documents that outline government views of problems and priorities as well as stakeholder perspectives about government priorities. Information about government priorities is not a perfect proxy for government problem understandings, but such information should reasonably reflect government views of problems and their placement on the formal agenda.

The Senegalese government has laid out its general priorities in the Emerging Senegal Plan (PSE) and associated documents. As shown in Table I, the PSE's Priority Actions Plan (PAP) establishes and weights general governmental priorities, many of which relate directly to agriculture due to its importance to the economy. Agriculture represents the second highest area for expenditures through public–private partnerships in the PAP, right

Source	Priorities/Problems
Emerging Senegal Plan (PSE): Priority Actions Plan (Ministry of Economy, Finance and Planning, 2014)	General Improving living conditions (30% weight) Acceleration of economic growth or productivity (20%) Impact on local development (12%) Reducing inequality (10%) Job creation (8%) Sectorial good governance (8%) Improving the business environment (7%) Improving the management of public finances (5%)
Accelerated Program for Agriculture in Senegal (PRACAS) (Ministry of Agriculture and Rural Equipment, 2014)	Agricultural sector Construction of 3–4 grain corridors Aggregation projects for high-value agriculture and livestock Factors limiting agricultural development Low use of inputs Agricultural equipment is worn down, insufficient, and not well distributed Deficits of economic infrastructure Unsuitable financing system Marketing of products is disorganized and insufficiently regulated Low level of human capital development
Senegal's Intended Nationally Defined Contributions for the United Nations Framework Convention on Climate Change (Ministry of Environment and Sustainable Development, 2015)	Priority sectors Self-sufficiency in rice Self-sufficiency in onions Optimization of performance of groundnut sector Development of off-season fruit and vegetable sector Climate change impacts and system vulnerabilities Decreased hydrologic reserves Decreased biodiversity and ecosystem functioning Soil degradation Erosion and salinization (due to rising oceans) Reduction in tourism (largely due to coastal erosion) Decreased fishing stocks Flooding effects on habitat and health
Stakeholder interviews (September, 2015; November, 2016)	National government's top general priorities: agriculture, infrastructure, health, education National government's agricultural priorities: rice and other food self-sufficiency, water, fertilizer and seed

Table I.
Government of Senegal: problems and priorities

behind infrastructure and transport services. The Accelerated Program for Agriculture in Senegal (PRACAS) reveals government views about problems and priorities more specifically in the agricultural sector. The factors discussed as limiting agricultural development in this document (e.g. insufficient agricultural equipment and inappropriate financing system) are often not ones that CSA can solve directly. Also worth noting here is that rice self-sufficiency (i.e. growing all domestically consumed rice in the country) often occupies a prominent spot in formal documents. Political actors in Senegal are acutely aware of the threat of not having a sufficient supply of affordable rice for the country's residents (see Seck *et al.*, 2010). The real problem leading to the high-priority status of rice self-sufficiency is that a shortfall of affordable rice for consumption could destabilize the government. Being subject to the swings of international food markets is a related problem.

Table I also provides information about government views of problems related to climate change. Senegal has been active in defining its intended nationally defined contributions for the United Nations Framework Convention on Climate Change (UNFCCC). Institutional support for climate change initiatives comes from Senegal's National Climate Change Committee and from the National Science-Policy Dialogue Platform for the Adaptation of Agriculture and Food Security to Climate Change (see Feed the Future, 2016). Though not shown in Table I, PRACAS and the PAP for PSE talk about various risks related to climate change and measures to deal with them.

The researchers also asked stakeholders about their perceptions of the national government's priorities. In terms of comment frequency, stakeholders see agriculture as sharing high-priority status with infrastructure, health and education. Stakeholders often observe that agriculture (including food security) appears to be the first priority and that certain other areas (like infrastructure) are necessary for agricultural success. Other stakeholders see the primary positioning of agriculture as mostly rhetorical and believe that agriculture does not feel like the first priority at the local level. Some stakeholders believe that much of the government's expenditure on agriculture goes toward administration and subsidies. Further, some question the accuracy of decision makers' knowledge about technical problems due to a lack of effective communication with technicians, scientists and other researchers. In sum, though agriculture appears to hold a prominent spot, it is subject to considerable agenda competition from other sectors. As stated by one interviewee, "The reality is that everything is the top priority in Africa."

Among agricultural priorities, stakeholders believe that rice self-sufficiency is at the top for the government, claiming that strong consumer preferences make rice a good strategic crop. Stakeholders also point out that agricultural problem understandings and priorities sometimes differ between the national and local levels. According to these stakeholders, such differences arise when intermediaries legitimately defend their own interests or when government does not consult with farmers about problems. An example of such failure is families selling or eating certified seeds subsidized and distributed by the government. Stakeholders disagree about the level of government concern over climate change in the agricultural arena.

4.3 A commonly perceived, potentially effective solution

A third definitional component of political will is a commonly perceived, potentially effective solution. Operationalization begins with examining whether the frame and terminology for the solution show convergence across decision makers (Post *et al.*, 2010). Evidence takes the form of government policies and programs and stakeholder perspectives. Given this project's focus on CSA, the emphasis here is on government views of CSA as a solution. This component appears out of order in relation to the previous list due to the need to understand the identities of solutions before evaluating commitment to them.

Competition among agricultural programs is considerable. Stakeholders note that over 200 food security projects are currently active in Senegal, many of them driven by donors and

other external entities. Based on stakeholder observations, the government agricultural programs with the greatest visibility are in the areas of irrigation, quality and storage of fertilizer, access to machinery, access to certified seeds, processing facilities for crops and giving women opportunities and resources in agriculture. Overall, stakeholders disagree about how much the national government is promoting CSA solutions. However, government representatives see a marked increase in CSA components in recent projects. Among the more prominent projects discussed, Senegal participates in the West Africa Agricultural Productivity Program, which has a subprogram on CSA technical adoption. Additionally, the Ministry of Agriculture and Rural Equipment is working with the Senegalese Agricultural Research Institute (ISRA) on producing seed varieties better adapted to climate change and has a national program on climate change. In conjunction with external entities, the National Civil Aviation and Meteorological Authority (ANACIM) has been working on a project that uses radios to get weather information to producers (Ndiaye *et al.*, 2013; CCAFS, 2015). As discussed later, national government entities have worked closely with the climate-smart village (CSV) at Daga-Birame near Kaffrine. Finally, the government has developed adaptation options for agriculture in its intended nationally defined contributions document for the UNFCCC (Ministry of Environment and Sustainable Development, 2015, p. 15).

Given the importance of rice self-sufficiency, the natural question concerns its fit with CSA. Some stakeholders see the use of irrigation to grow rice as a reasonable adaptation to climate change. This is particularly true as the world moves into an era of greater climate uncertainty and as rice growing conditions improve in the Senegal River Valley due to shorter winters. Domestic production of rice could serve as a buffer against international market perturbations that are likely to result from climate change. However, other stakeholders emphasize opportunity costs and negative impacts. Such stakeholders mention deforestation (thereby eliminating income- and food-producing trees), loss of biodiversity, potential water overuse and the heavy demands on soil as concerns. Additionally, some believe irrigated rice systems produce too many greenhouse gases via fuel for irrigation pumps and heavy use of inorganic fertilizers. Some stakeholders also see sustainability problems with the plan and worry about increased climate vulnerability as a consequence of lesser diversification in crops. In short, many of the downsides of rice self-sufficiency may work to worsen climate-related agricultural problems and vulnerabilities.

Operationalization of a “potentially effective” solution involves looking at capacity and resources for making the solution work (Post *et al.*, 2010). On the one hand, the government provides some level of support for institutions like ISRA and ANACIM that are working on CSA initiatives. On the other hand, stakeholders identify coordination and funding problems and difficulties with scaling up successful programs. The national government lacks the capacity to manage, coordinate and communicate about all these projects, particularly given the involvement of so many external actors. Many of these projects have short time horizons, and stakeholders observe that continuing or scaling up successful projects is a challenge once external funding is gone. The national government is working to overcome these administrative difficulties by holding coordination meetings, attempting to reduce project overlap and developing innovation platforms.

4.4 *Commitment to support*

The final definitional component of political will is the level of commitment by the relevant political actors to support the identified solution(s). Operationalization here emphasizes the credibility and level of obligation produced by statements about particular solutions, as well as the incentives and disincentives for the political actors (Post *et al.*, 2010). Overall, Senegal in recent years has met its obligation under 2003s Maputo Declaration on Agriculture and Food Security to devote over 10 percent its national budget to agriculture (Ministry of Agriculture, 2013), which provides general evidence of commitment. More specifically, the

public claims about rice self-sufficiency are highly visible and come from the most prominent officials in the national government. Rice self-sufficiency has long had the backing of an influential figure – Papa Abdoulaye Seck (Mohapatra, 2014). The former head of the Africa Rice Center, Seck, is now the Minister of Agriculture and Rural Equipment. As for the public claims being binding, the latest plan for rice self-sufficiency is built on top of a series of failed attempts, including 2008s Grand Offensive for Agriculture. Conversely, programs more explicitly about CSA have not received as much publicity from the national government to this point. In terms of incentives, strong consumer preferences for affordable rice and widespread agreement about the wisdom of the plan for rice self-sufficiency put pressure on policymakers to follow through with the plan. Pressure for CSA programs is not so cohesive. In short, then, the commitment to rice self-sufficiency is a clear and meaningful one, while commitments to CSA programs are presently weaker and more ambiguous.

5. Public will findings

The analysis continues with public will for CSA in Senegal. The formal definition for public will includes five components that run roughly parallel to those for political will:

1. Social system
2. Shared recognition of a particular problem
3. Resolve to address the situation
4. In a particular way
5. Through sustained collective action (Raile *et al.*, 2014, p. 111).

The following subsections discuss operationalization and assessment for each of the definitional components.

5.1 *Social system*

The first component of public will is the existence of a social system, or “a set of interrelated units that are engaged in joint problem solving to accomplish a common goal” (Rogers, 2003, p. 23). Operationalization of this component involves looking for “interconnected people, groups, organizations, or subsystems” (Raile *et al.*, 2014, p. 112). Building large social systems in a developing country is often challenging due to obstacles for flows of information, money or anything else linking members. In Africa, local language differences can also constitute a barrier. Though broad social systems might be ideal for adopting CSA innovations in a widespread manner that would constitute agricultural transformation, presently the social systems operating in this issue area in Senegal tend to be local or externally driven or a combination of the two.

Assessment of this component typically involves looking at association of people through information or other flows and examining social identities and cleavages (Raile *et al.*, 2014). The country is multiethnic and multilingual, with Wolof, Pular and Serer ethnic groups making up significant portions of the population. The country is almost entirely Muslim. Village-level organization is common, with leadership assuming various forms: chiefs, mayors, religious authorities, etc. When examining developing countries, the analyst must also consider the participation of outside entities like multilateral organizations, international non-governmental organizations and donor countries. Based on the interviews, stakeholders generally see little direct influence of external entities on priorities and decision making at the national level in Senegal. However, stakeholders do see strong roles for external entities in implementing programs locally. Such implementation work represents an opportunity to influence priorities and decisions by becoming part of locally based social systems.

Despite the difficulties of building broader social systems, community radio constitutes a success story in Senegal. In total, 7m Senegalese people in rural areas can access climate

information provided in local languages (Sanogo *et al.*, 2016). The researchers interviewed personnel from multiple radio stations, some of which grew out of local development projects. The radio stations serve as platforms for experts, local technicians and practitioners to communicate about effective agricultural practices and to share scientific, marketing and other forms of information. Additionally, the information provided by the earlier-mentioned ANACIM radio project includes forecasts and rainy season predictions – information also shared via text messages to mobile phones. In short, community radio stations are very much creating social systems given the way they are linking populations through information flows, though some stakeholders have concerns about politicization of community radio.

5.2 *Shared recognition of a particular problem*

The second component of public will is shared recognition of a particular problem. Operationalization starts with “a common belief something should be done about the situation” and the use of a “similar frame and terminology” for the problem (Raile *et al.*, 2014, p. 112). Assessment can proceed by looking at “attitudes and beliefs about problem status,” the “nature and volume of expressions of concern” and converging “beliefs about the situation and its causes” (Raile *et al.*, 2014, p. 112). As this component is the in-depth focus of a recently published companion paper (Raile, Young, Bonabana-Wabbi, Kirinya, Mbaye, Wooldridge, Raile and Post, 2018), the current paper spends less time on it.

Based on the first-round interview data, inadequate rainfall and variability in precipitation and seasons are the climate-driven agricultural problems most “ripe” to be addressed based on frequency and breadth of mentions among stakeholders who could form potential publics (Raile, Young, Bonabana-Wabbi, Kirinya, Mbaye, Wooldridge, Raile and Post, 2018). However, these problems compete with a number of other climate-driven agricultural problems like seawater intrusion, deforestation and loss of biodiversity (Raile, Young, Bonabana-Wabbi, Kirinya, Mbaye, Wooldridge, Raile and Post, 2018). All these problems also compete for public agenda space with socioeconomic and infrastructure problems like urban migration, insufficient irrigation, lack of mechanization, access to water and persistence of traditional agricultural methods (Raile, Young, Bonabana-Wabbi, Kirinya, Mbaye, Wooldridge, Raile and Post, 2018). The researchers asked the same types of questions during the second round of field research, and perceptions of the foremost climate-driven agricultural problems again center on inconsistent and insufficient water supply for crops. According to the second-round stakeholders, competing socioeconomic and infrastructure problems include the spotty availability of high-quality seed and fertilizer, unemployment, poverty and disadvantages for women in agriculture.

Table II supplies a comprehensive list of the problems mentioned by stakeholders, as divided into the following four categories: agricultural practice, socioeconomic and infrastructure, communication and administration and nutrition. These four categories emerged through a team-based, iterative coding process. The table demonstrates the degree of competition for attention on public agendas. The other noteworthy aspect of the table is that CSA could feasibly address many of the problems listed if linked effectively to the types of solutions discussed in Section 5.4 (e.g. using drought- or flood-resistant seeds to deal with precipitation variability). Again, a comprehensive listing seems more appropriate here to the goal of identifying opportunities.

5.3 *Resolve to address the situation*

The third component of public will is resolve to address the situation. “Perceived collective efficacy” (i.e. what groups believe they can achieve) and “willingness to commit significant resources” are means of operationalizing this component (Raile *et al.*, 2014, p. 112). Assessment of the latter can involve evaluation of “credible commitments to expend resources” and “stakeholder incentives and motivations” (Raile *et al.*, 2014, p. 112). According to stakeholders, the problem of sustaining programs or projects after donor funding or technical assistance has disappeared can detract from collective efficacy for

<i>Agricultural practice</i>	<i>Socioeconomic and infrastructure</i>
Biodiversity loss	Crop marketing/trading difficulties
Crops	Education quality and availability
Low quality	Gender related
Low yields/productivity	Childcare responsibilities
Deforestation	Marginalization of women
Ecological fragility	Physical exhaustion
Inputs (seeds, fertilizer)	Healthcare (quality and availability)
Adulteration	Housing (quality and availability)
Limited availability	Inadequate investment
Livestock	Irrigation capacity and price
Diseases	Lack of agricultural mechanization
Flooding deaths	Lack of crop insurance
Insufficient food/grazing land	Lack of crop refrigeration and storage
Pests increasing (species, numbers)	Lack of repair capacity for machinery
Soil erosion	Potable water shortages
Soil quality low/degrading	Poverty
Temperatures increasing	Rural-urban migration
Use of traditional agricultural methods	Sanitation
Water	Transportation and distribution difficulties
Increased evaporation	Unemployment and low wages
Increased variability in rainfall	
Insufficient rainfall	
Salinization as sea levels rise	
<i>Communication and administration</i>	<i>Nutrition</i>
Coordination across projects/programs	Food quality
Excess government overhead costs	Food quantity
Farmer participation in projects	Iron deficiency
Lack of buy-in and ownership	Lack of variety in diet
Flawed government statistics	Lethargy
Government subsidization of export crops	Months without food
Inability to communicate problems upward	Protein deficiency
Inability to communicate solutions upward	Undernourishment
Inappropriate use of government funds	Vegetable deficiency
Inter-institutional cooperation difficulties	
Lack of farmer organizations	
Lack of women's organizations	
Low funding for research	
Marketing information shortfalls	
NGOs' focus on own employees	
Subsidized inputs (seeds, fertilizer)	
Insufficient quantities distributed	
Low quality	
Resold or eaten	
Translation of science/research	
Transmission of knowledge	

Table II.
Stakeholder problem understandings related to agriculture (comprehensive alphabetical listing)

social systems. Conversely, the success of community radio and of some local demonstration projects has clearly empowered some social systems. In terms of credible commitments, the researchers observe willingness on the part of families and villages to make sacrifices to enable program success. They are willing to contribute labor and to make investments and changes to working structures. Individuals and families risk a lot by reorganizing work structures and practices. The incentives and motivations for families or villages can be complex, but the consequences of inaction here potentially include starvation. Though resistance to change and risk aversion can be common among agricultural families, the need for food security and for a basic income are strong motivators.

5.4 In a particular way

The fourth component of public will is a commonly perceived solution to the problem. Operationalization and assessment here emphasize convergence on a solution frame and associated language among members of the social system (Raile *et al.*, 2014, p. 112). Much of the interviewing for the second round focused on perceptions of CSA solutions. Some stakeholders (typically producers) have only heard of CSA, others have knowledge but say CSA is in its early stages, and some (like certain researchers or CSA project administrators) know a great deal. Given their lack of exposure, some stakeholders do not really address CSA as a solution. However, other stakeholders, including producers and other targets of CSA projects, are able to talk about innovations they see most closely linked to CSA principles. Food security projects that emphasize agroforestry and tree growth, improved water use, organic fertilizers and climate-adapted seed varieties emerge most prominently in the interview data (again by frequency and breadth). Table III summarizes the types of projects that fall into these categories.

A crucial question is the extent to which such CSA solutions fit with stakeholder views of important problems. Given the breadth of the CSA concept, the types of projects listed in Table III have logical linkages to a range of problems in Table II. For example, CSA projects that involve planting or preserving trees map well to certain climate-driven agricultural problems mentioned prominently by stakeholders (e.g. inadequate rainfall, deforestation and loss of biodiversity). The types of projects in Table III also help with other important agricultural problems mentioned by stakeholders like the low quality of soils. However, CSA cannot address certain infrastructure problems like the unavailability of reliable and high-quality seeds and machinery. Items in Table III also map to some of the infrastructure and socioeconomic problems mentioned by stakeholders, though the linkages are more indirect. For example, CSA often requires additional labor to enhance productivity. This need for additional labor potentially helps with urban migration, unemployment rates and some agricultural disadvantages for women. Also, more efficient water use can decrease problems of access to water, and sharing the fruits of increased productivity can reduce poverty. In summary, CSA projects potentially fit as solutions to many kinds of problems as understood by the various types of stakeholders consulted for this study.

Another important consideration is that feasible and optimal solutions depend on local needs. For example, the Senegal River in the north is a good source of water for irrigation, while the Saloum River in central Senegal cannot be used for irrigation due to its high salinity. Other areas of the country are too distant from rivers and irrigation canals, so irrigation in these places depends on borehole wells. In other places, even drip irrigation is not feasible, so producers must rely on alternative solutions for water retention like no-till farming, agroforestry and retention basins. Such contingencies also extend to individuals within a community, as experiences with the effects of climate change can differ based on social position (Kristjanson *et al.*, 2015).

Agroforestry and tree growth	Improved water use
Integrated crop systems with trees	Drip and other forms of irrigation
Restrictions on cutting down trees	Water towers for storage
Shrubs for water retention and fixing of organic materials	Linking seeding and fertilizer application to weather forecasts
Big Green Wall to prevent desertification	Planting vegetables with low water needs
Fuel-efficient stoves (to save trees)	Water retention basins
Pruning of trees	
Organic fertilizers	Climate-adapted seed varieties
Natural organic composts	Drought-resistant seeds
Cheap organic fertilizers	Flood-resistant seeds
Elimination of slash-and-burn agriculture	
No-till agriculture	

Table III.
Stakeholder views of
CSA project elements

5.5 *Through sustained collective action*

The final component of public will is an intention to sustain collective action to implement change. Operationalization for this component involves looking at “commitment to collective action” and “intention to sustain collective action” (Raile *et al.*, 2014, p. 112). Targets for assessment are “evidence of group formalization and identification,” “stability over time of beliefs and attitudes” and “level of publicity of commitments” (Raile *et al.*, 2014, p. 112). At the local level, social systems are often pre-existing, though external actors may become part of these local social systems. Assessing the stability of beliefs and attitudes related to CSA solutions would require more time, especially given the relative newness of CSA. However, project participants have clear incentives (e.g. food security) to remain engaged. Producers place a lot of weight on successful demonstration projects for CSA practices and techniques that require little capital to implement. This support seems likely to persist, though reversion to old ways is possible. The level of publicity of commitments looks different in the developing world given the limited forums for proclaiming views. However, the willingness of villagers to spread news of CSA innovations to neighboring villages, a phenomenon witnessed on multiple occasions, does serve as an important public statement of sorts.

Sustained collective action may be unnecessary if adoption of CSA practices happens in piecemeal fashion. A farmer only needs to learn about a smaller innovation somehow – whether from watching a neighbor or from listening to community radio or an agricultural extension agent. Sustained use of such an innovation also requires the producer seeing profit in the activity. This model of change would not require public will but is worth mentioning here.

6. The Daga-Birame climate-smart village

This section provides a brief discussion of the Daga-Birame CSV in Senegal as a concrete application for some of the findings and ideas in the previous sections. The researchers spoke with Daga-Birame villagers, associated researchers from ISRA, and other stakeholders concerned with the project. The CSV is an example of a project that meets local needs in a holistic manner, involving both new agricultural practices and a commitment to social change (see Sanogo *et al.*, 2016). The robust involvement of the national government via entities like ISRA and ANACIM indicates a considerable level of political will for this specific CSA project. The willingness of the chief of Daga-Birame to donate his own land to enable success of the CSV is a clear manifestation of political will at the local level.

In terms of building a social system, the project has demonstrated a substantial commitment to participatory research in that villagers have had strong input from the start and testing of techniques has proceeded in inclusive ways. The broader social system appears to be strong, with villagers praising the involvement of ISRA in particular. As a result of training efforts, the villagers have significantly altered their production practices, and have adopted new crops. They have a good working knowledge of climate-driven agricultural problems and of the ways in which the CSV is addressing these problems (i.e. problem–solution linkages). The project’s components include creation of a village development plan, use of local knowledge and institutions, use of a variety of climate-smart technologies and use of climate information services (Sanogo *et al.*, 2016). In terms of resolve and sustainability, the villagers identify rather strongly with the project and frequently mention the importance of the shared, collective work. The substantial changes made to work structures suggest a new equilibrium that is unlikely to change easily.

While the CSV clearly has much working in its favor in terms of PPW, what is required to scale up this approach in Senegal and beyond? While others have usefully considered the issue of scaling up the CSV (Sanogo *et al.*, 2016), they have not done so through the PPW lens. Clearly, political support would need to remain and likely grow given an increased workload for organizations like ISRA and ANACIM. Policy entrepreneurs would need to ensure that key political leaders understand the problem–solution linkages and their own incentives.

Further injection of external resources would also be necessary. International actors like the CGIAR Research Program on Climate Change, Agriculture and Food Security; the World Agroforestry Centre; and the International Crops Research Institute for the Semi-Arid Tropics have worked with the Daga-Birame CSV. The project is seeking an additional \$10m to expand the project to 100 more villages in Senegal (Sanogo *et al.*, 2016). Supporting this type of program would fit with recommendations to scale up local demonstration programs that have proven effective (e.g. see Easterly, 2006; Karlan and Appel, 2012) and with a recent major evaluation of the US government's Feed the Future initiative (USAID, 2016). If properly incentivized, the private agribusiness sector (e.g. information providers, equipment suppliers and financiers) could drive some of the expansion and could pick up when donor funding diminishes.

In terms of other PPW elements, a participatory, bottom-up approach adds to social system development and the consequent likelihood of success. Effective training and dissemination of information are also crucial for building public will. These activities can inform and persuade producers about problem–solution linkages in the climate-agriculture issue area, which also helps build supportive social systems. However, scaling up informational and training activities will require resources. Truly diffusing CSA will also require commitment on the part of local producers. Economic benefits might be enough on their own for change to persist, but transformative change like that undertaken by the CSV requires a significant commitment from farm households.

7. Conclusion and implications

This final section of the paper considers opportunities for agricultural transformation via CSA in Senegal, beginning with a summary of the findings and discussion of the relationship between political will and public will. The section then discusses opportunities for policy and agribusiness entrepreneurs. The paper ends with consideration of potential research extensions and of the usefulness of the PPW approach.

7.1 Summary

In terms of political will for CSA in Senegal, agriculture is an important priority for the national government. Agriculture competes with economics/finance, infrastructure, health and education for space on the formal agenda but also has strong linkages to such areas. Senegal has participated actively in international efforts and has supported domestic institutions and programs working on climate-related agriculture problems. Consequently, the government has created something of an enabling environment for addressing these types of problems. However, rice self-sufficiency (which in some ways does not fit well with CSA) appears to be the single most important agricultural priority, and some agricultural problems listed in prominent government documents are not directly solvable with CSA. Additionally, some stakeholders remain skeptical of the real importance to the national government of agriculture (apart from a few select commodities) and of dealing with climate change. Government work with CSA programs has increased, but stakeholders worry about tradeoffs and the capacity of government to do it all.

Looking next at public will, social systems supportive of CSA can emerge despite logistical obstacles. Stakeholders identify a variety of climate-driven agricultural problems and often hold views of CSA projects consistent with solving those problems. Given the stakes, commitments to these solutions can be strong and ongoing even when they carry significant costs. However, collective efficacy is sometimes lacking due to resource and administrative shortfalls. Additionally, local needs will determine whether solving these problems is as important as a priority like rice self-sufficiency.

CSA provides a good example of political will and public will complementing one another, with each contributing different necessary elements. Some of the necessary support emerges from national policies and programs, while other support emerges from

local publics. The national government supplies important goods (e.g. technical advice, support for community radio, channeling of funding from donors and inputs like seeds) that fit with CSA objectives. In a complementary manner, communities can demonstrate public will through flexible implementation and willingness to take risks and adopt innovations. Many local stakeholders have problems that may motivate them to do so. External actors can provide technical assistance and funding as demonstrations of their support.

7.2 Opportunities for entrepreneurs

Opportunities exist for policy entrepreneurs and agribusiness entrepreneurs in this issue area. Despite heavy competition, CSA approaches and the types of problems they can address make strong claims for agenda status. Policy entrepreneurs have opportunities to join prominent problems and CSA solutions and to generate corresponding political support for such initiatives, especially if they focus on problems like drought and variable precipitation. Based on the interview data, policy entrepreneurs should also promote understanding of the linkages between environmental problems and poverty. Additionally, policy entrepreneurs are likely to find greater success if they use effective messengers already in place, such as community radio and ISRA. Producers may receive information from a variety of sources, and figuring out which ones they trust most is important.

Policy entrepreneurs should also be aware of obstacles like agenda competition and coordinating across projects. Further, policy entrepreneurs must be aware of the dangers of dilution and the fact that CSA is not a viable solution for all the problems on the public and political agendas. CSA is many different things – a variety of strategies, policies and techniques (Steenwerth *et al.*, 2014) – and some are bound to work better than others for a particular locality. As a result, participatory methods and techniques (Odugbemi and Jacobson, 2008; Hacker, 2013) that involve local populations from the start are more likely to be effective. This means empowering local populations and having them participate in the demonstration of solutions. Despite the initial upfront costs, the overall cost effectiveness of such participatory programs may be better in the long run – if supported by appropriate technical assistance.

Agribusiness entrepreneurs, on the other hand, can look toward supplying the goods, services and information that producers need to solve their problems. Table II, with its stakeholder-generated list of problem understandings, should provide useful information in this respect. Table III provides more direct ideas about the types of goods and services that agribusiness entrepreneurs might supply. More traditional opportunities exist in providing goods like irrigation equipment, solar panels for water pumps, trees and shrubs, climate-adapted seeds and organic fertilizers. The provision of financing for the adoption of new CSA technologies represents another opportunity. Less orthodox opportunities are also evident. Much of CSA amounts to learning new practices. Though agribusiness entrepreneurs would need to earn the trust of producers, the dissemination of information about CSA practices across the entire country will be a tremendous job. On-site training and demonstration plots will be necessary, though community radio can also disseminate information. Donors will want to invest in solutions that the private sector can provide as CSA efforts scale up, which means that donor funding could be available now for solid problem/solution pairings.

7.3 Research extensions and usefulness

This study is subject to certain limitations but provides opportunities for future work. First, resource and access restraints prevented researchers from investigating some components as completely as others. For example, assessing the stability of beliefs and attitudes over time would require more of a longitudinal study. A more systematic review of promotional materials for CSA programs could yield extra insights, as well. Calculations that compare the cost effectiveness of bottom-up and holistic programs against other types of programs seem potentially useful, as well. Second, the analysis has generated additional questions for

the researchers. For example, how does political will interact across different levels (e.g. international, national, regional and local)? Also, what does it mean to have political will when some influential actors are external? The PPW approach has not yet addressed such sovereignty questions. Finally, the context specificity of the components limits generalizability of certain findings. Similar research in other contexts would provide useful information about the degree of generalizability.

Overall, application of the analytical framework for PPW has proved useful as a means of evaluating a social change project and identifying ways to move forward. The framework allows for the integration of existing data and newly collected data in a way that provides a clearer picture of the opportunities for social change in a specific context. The PPW approach helps in sorting through the congruence between a crowded agenda for government decision makers and a multiplicity of problems experienced by citizens. The approach also recognizes features of human behavior in ways that should facilitate long-lasting changes. Finally, application of the PPW approach has enabled identification of opportunities for agricultural transformation and the potential roles for policy and agribusiness entrepreneurs in such transformation.

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Appendix. Examples of semi-structured interview questions

Notes: Due to space limitations, this appendix does not list all interview questions. For example, this list excludes questions about the spread of information and certain obstacles to adoption. Complete question sets are available from the authors upon request. "F1" indicates the question was used in the first field research trip, while "F2" indicates the second trip. Questions differed somewhat across stakeholder groups on the second trip. Questions for CSA project administrators (generally not listed below) focused on: the nature of the project, the populations and problems targeted, language used in discussing problems and solutions, and resource and capacity issues.

Problems

- F1: what do you think are major climate problems related to agriculture in your country, if any, either now or in the future? (Question repeated for: nutrition problems, economic problems related to agriculture and social problems related to agriculture)
- F2 (government, project administrators): what are the biggest problems facing the people of Senegal?
- F2 (producers): what are the biggest problems for you and your family personally on a daily basis? (Question repeated for producers' region of Senegal and country as a whole and for agriculture-related problems at all three levels)

Priorities

- F1: where does agriculture fit among government priorities? (Question repeated for CSA)
- F2 (government): what are the biggest priorities overall for the government of Senegal right now? (Question repeated for agricultural priorities)
- F2 (producers): what are the biggest priorities overall for the government of Senegal right now? What problems does the government see as most important to solve? (Question repeated for agricultural priorities of government)
- F2 (all groups): what are the priorities against which CSA projects are competing for attention or resources at the national level? At the regional or local level?
- F2 (government): how do government priorities differ across the national and regional levels?

CSA as solution

- F1: what do you think about what you hear the term "climate-smart agriculture?"
- F1: what types of agricultural problems do you think CSA innovations might help to lessen, if any? (Question repeated for economic and social problems)
- F2 (government): are you familiar with CSA projects in Senegal? If so, what do you know about these projects?
- F2 (project participants): how is the CSA project helping you with the problems facing you and your family? What problems do you think the project will help to reduce or solve?

Important actors

- F1: what organization or people are most influential in determining where agriculture fits among government priorities?
- F1: who do you think are crucial people or organizations in making decisions about the adoption of agricultural innovations?
- F2 (government): how influential are external donors in shaping government priorities?

Corresponding author

Eric D. Raile can be contacted at: eric.raile@montana.edu

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