

Senegal: In-depth Assessment of Extension and Advisory Services

Developing Local Extension Capacity (DLEC) Project

March 2018

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ACRONYMS

ANACIM	The National Agency of Civil Aviation and Meteorology (Agence Nationale de l'Aviation Civile et de la Météorologie)
ANCAR	National Agency for Rural Advisory Services (Agence Nationale de Conseil Agricole et Rural)
ANIDA	National Agency for Agricultural Development (Agence Nationale D'insertion et de Développement Agricole)
ATCL	Association of Processors of Local Millers (Association des Transformateurs de Céréales Locales)
BRAS-PAR	Building Resilient Agro-Sylvo-Pastoral Systems in West Africa through Participatory Action Research
CAADP	Comprehensive Africa Agricultural Development Program
CCAFS	Climate Change, Agriculture and Food Security Program
CCASA	National Science Policy Dialogue Platform for Adaptation to Climate Change (Changements Climatiques et Agriculture Sénégalaise)
CINSERE	Climate Information Services for Increased Resilience and Productivity in Senegal Project
CIRAD	The French Agricultural Research Centre for International Development (Centre de Coopération Internationale en Recherche Agronomique pour le Développement)
CLCOP	Committee of Local Producer Organizations (Comité Local de Concertation des Organisations de Producteurs)
CN	Consolidation Network
CNCAS	Senegal National Agricultural Credit Bank (Caisse Nationale de Crédit Agricole du Sénégal)
CNCR	The National Council of Rural Cooperation (Conseil National de Concertation et de Coopération des Ruraux)
CNRF	National Forestry Research Center (Centre National de Recherches Forestières)
CORAF	West and Central African Council for Agricultural Research and Development
DLEC	Developing Local Extension Capacity
DRDR	Regional Directorate of Rural Development
EAS	Extension and Advisory Services

ERA	Education and Research in Agriculture
ENDA-PRONAT	Environmental Development Action for Nature Protection (Environnement Développement Action pour la Protection Naturelle des Terroirs)
FAO	Food & Agriculture Organization of the United Nations
FFS	Farmer Field Schools
FONGS	Federation of Non-Governmental Organizations in Senegal (Fédération des ONG du Sénégal)
FNDASP	National Agro-Sylvo-Pastoral Development Fund (Fonds National de Développement Agro-Sylvo-Pastoral)
FNRAA	National Agro-Food Research Fund of Senegal (Fonds National de Recherches Agricoles et Agro-Alimentaires)
FT	Farmer Trainer
GDP	Gross Domestic Product
GFRAS	Global Forum for Rural Advisory Services
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IQC	Indefinite Quantity Contract
IRD	Institute of Research for Development (Institut de Recherche pour le Développement)
IRG	International Resources Group
ISRA	Senegal Agricultural Research Institute (Institut Sénégalais de Recherches Agricoles)
LOASP	Agro-Sylvo-Pastoral Law of Senegal (La Loi Sénégalaise d'Orientation Agro-Sylvo-Pastorale)
MAER	Ministry of Agriculture and Rural Equipment (Ministère de l'Agriculture et de l'Équipement Rural)
MAFF	Management Advice for Family Farms
MT	Metric Tons

NCBA-CLUSA	National Cooperative Business Association/The Cooperative League of the United States of America
NGO	Non-Governmental Organization
NM	Naatal Mbay
PADAER	Support to Agricultural Development and Rural Entrepreneurship (Programme d'Appui au Développement Agricole et à l'Entreprenariat Rural)
PAFAO	Promotion of Family Farming in West Africa (Promotion de l'Agriculture Familiale en Afrique de l'Ouest)
PCE	Project Croissance Économique (Economic Growth Project)
PO	Producer Organization
PRACAS	The Program for the Acceleration of Senegalese Agricultural Growth (Programme de Relance et d'Accélération de la Cadence de l'Agriculture Sénégalaise)
PSE	Emerging Senegal Plan (Plan Sénégal Emergent)
RTI	Research Triangle Institute
SAED	Senegal River Development Agency (Société d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé)
SAGIC	Support to Accelerated Growth and Increased Competitiveness
SNCASP	National System of Agricultural, Forestry and Livestock Advisory Services (Système National de Conseil Agro-Sylvo-Pastoral)
SNDES	The National Strategy for Economic and Social Development (Stratégie Nationale de Développement Economique et Social)
SODAGRI	Agricultural Development Agency of Senegal (Société de Développement Agricole et Industriel du Sénégal)
SODEFITEX	The National Fiber and Textile Development Agency (Société de Développement des Fibres Textiles).
SODEVA	The National Agricultural Extension Agency (Société de Développement et de Vulgarisation Agricole)
SPRING	Strengthening Partnerships, Results, and Innovations in Nutrition Globally
SRDR	Regional Rural Development Agencies (Sociétés Régionales de Développement Rural)
USAID	United States Agency for International Development

USDA United States Department of Agriculture
USSD Unstructured Supplementary Service Data

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INTRODUCTION

Extension and advisory services (EAS) are the activities that provide the information and services needed and demanded by farmers and other actors in rural settings to assist them in developing their own technical, organizational and managerial skills and practices so as to improve their well-being (Christoplos, 2010; GFRAS, 2011). EAS are increasingly viewed as a critical input into agricultural development and are thus strongly supported by the Comprehensive Africa Agricultural Development Program (CAADP), in its implementation strategy to accelerate African agricultural growth and transformation (African Union, 2014).

The Feed the Future Developing Local Extension Capacity (DLEC) project measurably improves extension programs, policies and services by creating locally-tailored, partnership-based solutions and by mobilizing active communities of practice to advocate for scaling proven approaches. The five-year (2016-2021) project is designed to diagnose, test and share best-fit solutions for agricultural extension systems and services across the Feed the Future countries. Led by Digital Green in partnership with Care International, the International Food Policy Research Institute (IFPRI) and the Global Forum for Rural Advisory Services (GFRAS), DLEC is an action-oriented, evidence-based learning project that generates evidence through diagnostic studies and engagement activities, which in turn are used as a catalyst for mobilizing global and country-level communities of practice to advocate for improved EAS. The first stage of DLEC's work includes conducting diagnostic assessments of local EAS contexts and capacities in Feed the Future countries.

This report reviews existing documentation on EAS in Senegal to recommend areas for potential investment by the Government of Senegal, donors and other stakeholders including the private sector to strengthen the system and better serve smallholder farmers' needs. In Annex 1, it provides an assessment of the Feed the Future Naatal Mbay project's EAS strategy and makes recommendations for strengthening it. This report also addresses cross-cutting EAS issues, such as women and youth engagement, climate change resilience, food and nutrition security, and use of information and communication technologies (ICTs).

CONCEPTUAL FRAMEWORK

DLEC uses the adapted best-fit framework (Birner et al., 2009) shown in Figure 1, to guide analyses and to determine EAS areas of focus for on-the-ground activities that are within DLEC's manageable interests. We use the framework to guide DLEC's learning agenda because it outlines EAS system parameters and identifies the levers of change within it. In each country, the levers of change will differ. The best-fit framework allows us to analyze a country's EAS system, begin conversations with local stakeholders to understand the state of their EAS system and where the critical levers for change might be, and analyze and recommend systems change. The framework also enables us to compare across countries and connect country-specific cases to broader learning on EAS, to advance overall learning and apply this to other donor and government programs and priorities.

The framework identifies characteristics of EAS systems on which policy decisions must be made, and the frame conditions to be considered when making decisions. The frame conditions include: the political economy, the business/market and civil society environments, agroecology and the agricultural innovation system. The framework suggests an impact chain approach to analyze the performance and impact of EAS.

Key for DLEC are the EAS characteristics shown in the framework. Referring to Figure 1, the **governance structures and policy environment** variables (box F) refer to institutional set-up of EAS, or the “rules of the game.” The **organizational and management capacities and cultures** variables (box G) refer to capacity for provision of advisory services, and way in which the services are managed within the respective governance structures. These are essentially the “players” of the game, their abilities and the way they play.

Advisory methods (box H) are used by EAS field staff in interactions with farmers. Advisory methods can be classified according to various aspects, such as the number of clientele involved (individuals, groups); the types of decisions on which advice is provided (specific to the production of certain crops or livestock; managerial decisions; group activities, etc.); and media used (radio; internet, etc.).

Market engagement (box I) refers to the market elements that EAS can use to better serve farmers, such as aggregation, finance, price discovery, and input and output markets.

Livelihoods strategies (box J) refers to how EAS develops content to meet the unique needs of clientele and how gender roles impact farming strategies. **Community engagement** (box K) refers to EAS services based on local social institutions, mechanisms to articulate demand and community psychosocial characteristics.

The frame conditions (boxes A-E) are outside DLEC’s manageable interests. The “manageable” outcomes of this framework include the system-level performance areas (box L). The outcomes and ultimate impact at the farm household level (boxes M and N) are outside the core DLEC leader award manageable interests.

The building blocks for EAS are used in framing recommendations for engagement. They are as follows:

- ◆ Customer – farmers and their unique needs
- ◆ Content – knowledge being shared
- ◆ Methods – how information and knowledge is shared
- ◆ Provider – who shares information and knowledge

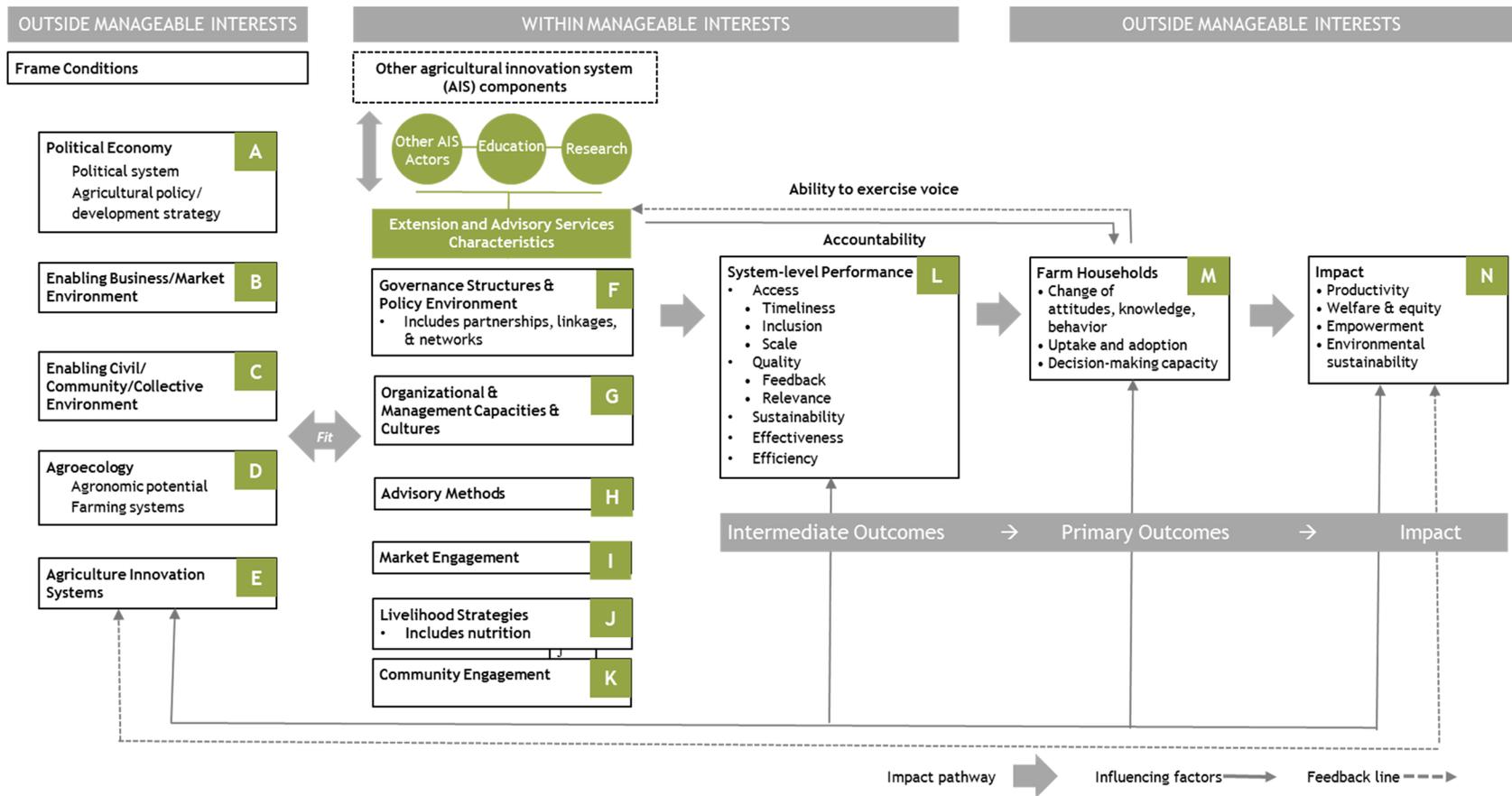


Figure 1. Conceptual Framework for the Study

Source: Adapted from Birner, et al. 2009.

METHODS

This report is based on a literature review and interviews with key stakeholders on the status of Senegal's EAS system and providers, as well as a field visit to a Naatal Mbay site. The review includes reports by Senegal governmental agencies, foreign governments, donor agencies, donor-financed projects, non-governmental organizations (NGOs), international organizations and universities. This information was supplemented by in-person and telephone interviews with selected key informants in Senegal. This report does not include any primary data or direct observation of EAS activities.

RESULTS

Frame Conditions Related to Extension

Senegal is among the most stable and promising countries in the West Africa region (USAID, 2017). The government's growing investment in agriculture demonstrates its commitment to improving productivity of the sector. However, the country's poor infrastructure, chronic underinvestment, and constraining policies continue to challenge the agriculture sector, even though progress is being made in all these areas (Domgho et al., 2017; USAID, 2017).

Senegal is very poor and near the bottom of most development indicators and indices. For example, Senegal ranked 163 out of 188 on the UNDP Human Development Index in 2016, a decline from 157th in 2011 (UNDP, 2016). Over half (54 percent) of its population was below the poverty line in 2014, giving it a rank of 145 over 162 nations surveyed (Index Mundi, 2014). The literacy rate was 43 percent and life expectancy was 67 years. Nutritional indicators are particularly low with 19 percent of children under five years being stunted (a sign of chronic undernutrition) and only seven percent of children between the ages of six and 23 months receiving a minimum acceptable diet in 2013 (ANSD and MEASURE DHS, 2013).

Senegal has great potential to increase agriculture-led economic growth. The country has abundant land, motivated agricultural entrepreneurs, and access to international markets through a major port. Senegal's transportation, irrigation, communications and financial infrastructure are steadily improving, due to reasonably good governance, government and private investment, and considerable donor support. The Government of Senegal, civil society and the private sector have all demonstrated a commitment to invest in agriculture and food security and to reduce policy and regulatory constraints that limit investment. The government's investment plan, in line with their 2010 CAADP compact agreement, focuses heavily on increasing the production of rice, maize and millet, three food staples with important market potential (USAID, 2017).

As of 2014, 84 percent of Senegalese adults owned cell phones but only 15 percent owned smart phones. Among phone owners, 70 percent sent text messages, 30 percent used their phones to accept or make payments and 19 percent used them to access social networks. Ownership and use rates are likely lower for rural households than for urban ones. On ease of doing business, Senegal ranks slightly above average among African countries at 21st out of 48 surveyed.

As in many other African countries, women lag behind men in most socioeconomic categories and have less access to productive assets than men. For example, while men's literacy rate was 53 percent in 2013, the women's rate was only 34 percent (United Nations Statistics Division, 2017). Whereas

56 percent of men owned mobile phones, only 27 percent of women did so (Poulsen, 2015). Women do not yet have equal rights with men and many are struggling under the burden of significantly greater domestic responsibilities and lack of access to land, labor, capital and information. Moreover, Senegalese customary law among most ethnic groups does not allow women to inherit property, except through a man acting as an intermediary (Rubin, 2010).

Governance Structures and Policy Environment

Agricultural policy in Senegal since the 1960s has proceeded through four phases (Ndiaye, 2009; 2013a; 2013b). The first phase, 1964-1979, was socialist and involved Regional Rural Development Agencies (SRDRs, for its French acronym) providing farmers with a range of subsidized inputs and services, such as advisory services. The second was a period of structural adjustment (1979-1997). In response to withdrawal of assistance from many international donors, Senegal, like many other countries of sub-Saharan Africa, curtailed or eliminated many programs assisting farmers, such as subsidies, price controls and advisory services. Most of the SRDRs continued to operate but at reduced scale. The third phase was one of liberal interventionism (1997-2013) characterized by government interventions aimed at improving market performance, decentralization of governance giving regions more authority to manage their own affairs, an increase in NGO activity and donor-funded projects, and increased focus on gender, youth, and participatory approaches. A fourth phase, increasing productivity, food security and self-sufficiency, began in 2013 and builds on the preceding phase, with greater focus on particular value chains, such as rice, groundnuts, onions and off-season fruits and vegetables.

A key foundational policy development for advisory services was the creation in 1997 of the National Agency for Rural Advisory Services (ANCAR, for its French acronym). The National Agricultural Extension Agency (SODEVA, for its French acronym) founded in 1968 had served the groundnut basin and had a narrow definition of extension, focusing on increasing productivity at the field level through adoption of improved inputs. SODEVA had been associated with the failed, top-down training and visit program, whereas ANCAR was designed to be a bottom-up organization, responding to the needs of the country's producer organizations and helping farmers improve their decision-making capacity and management as well as increasing production. SODEVA was liquidated in 1998, and ANCAR became functional in 2001 (Ndiaye, 2013a). A critical policy is the Agro-Sylvo-Pastoral Law of Senegal (LOASP, for its French acronym) of 2004, which traces a 20-year pathway for the development of agriculture in Senegal. Title 4 of the law describes the important role to be played by strengthening the capacity of farmer organizations and developing agricultural information, education and advisory services. The law envisaged ANCAR as not only a provider of EAS, but as a coordinator of EAS, leading a National System of Agricultural, Forestry and Livestock Advisory Services (SNCASP, for its French acronym).

More recent policies bearing on the agricultural sector include:

- ◆ The National Agricultural Investment Plan (2011) under CAADP presented an investment plan for agricultural development for the period 2011 to 2015. The plan added several new objectives to previous plans including women's and youth's needs, equitable development across regions, and adaptation to climate change. (Benkahla and Oumar, 2011)
- ◆ The Emerging Senegal Plan (PSE, for its French acronym) 2013. The PSE plans development to 2035. The Program for the Acceleration of Agricultural Growth in Senegal (PRACAS, for its French acronym) aims at operationalizing PSE in the agricultural sector for

the period 2013-2017. Objectives center on priority value chains: rice, onions, groundnuts and off-season fruits and vegetables. The program aims at self-sufficiency in rice by achieving a production of 1.6 million tons by 2017, a goal criticized by some as over-ambitious. Production objectives were also fixed for the other priority value chains. Subsidies for fertilizer and improved seed were established and were 70 percent for improved seed and 55 percent for fertilizer in 2015 (IPAR, 2015). Other objectives included improving resilience of vulnerable communities and adaptation to climate change.

- ◆ The National Strategy for Economic and Social Development (SNDES, for its French acronym, 2013–2017): seeks to accelerate economic growth through increasing productivity and wealth creation with agriculture identified as a top priority.

A unique feature of Senegal is the long history and strong role, relative to other African countries, played by producer organizations (POs). The National Council of Rural Cooperation (CNCR, for its French acronym), founded in 1993 and composed of 26 farmer associations, plays an important role in Senegal in promoting cooperation among and strengthening its members and lobbying for smallholder interests with the state. In 1999, a government policy directive, the Institutional Development of the Agricultural Sector, was issued, aiming to strengthen the capacity of POs to play a lead role in development activities (Mboup and Anouilh, 2008).

Senegal's strong commitment to agricultural development is reflected by its high and growing investment in agricultural research. Agricultural research expenditures increased by over 50 percent from 2012 to 2014. Public expenditures on food and agriculture increased by 67 percent between 2010 and 2015, to 192 million CFA. There were big increases in investment in irrigation, particularly for rice along the Senegal River. Most of the increase was from foreign sources, notably the World Bank (Hummel and Aparisi, 2016).

The majority of Senegal's land mass lies within the Sahel region, which is arid and extremely prone to drought. The country is characterized by varying levels of rainfall and temperature with conditions that gradually become increasingly dry moving north from Senegal's humid, high rainfall southern regions to its northern arid zones. The strong dependence of crop production on rainfall results in highly variable production, because of high variability in both rainfall amounts and the onset and cessation of the rains (D'Alessandro et al., 2015).

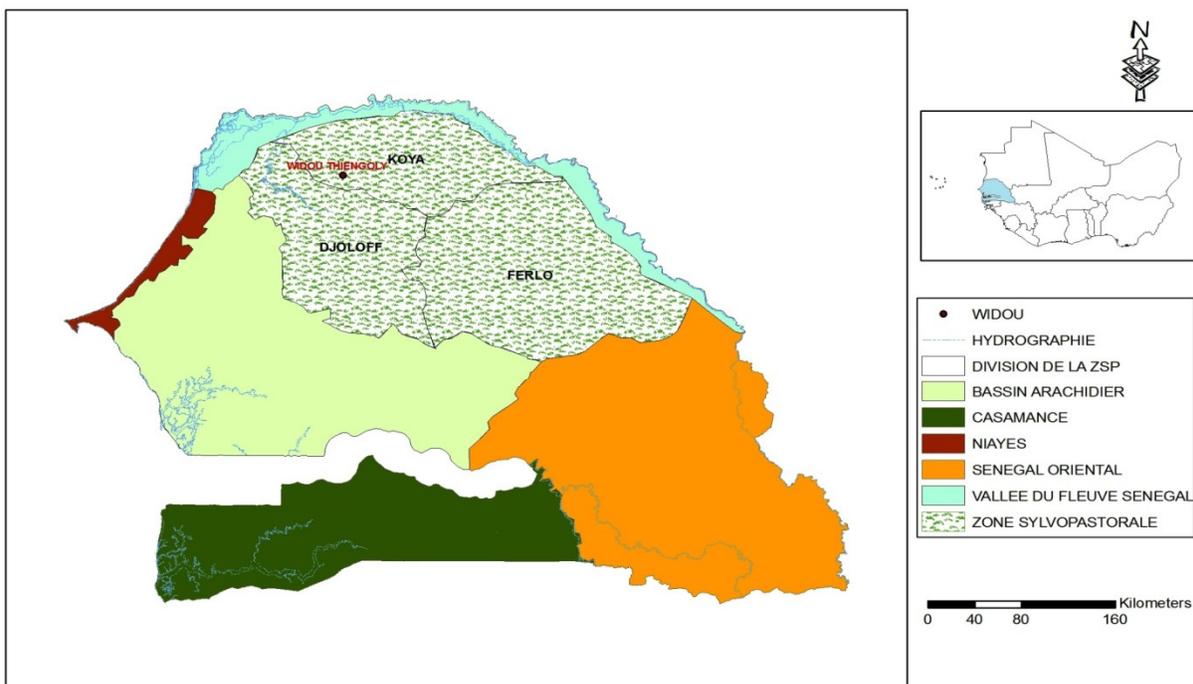
Senegal is divided into six agro-ecological zones (Figure 2). Moving from north to south, they are:

- ◆ The Senegal River valley characterized by alluvial plains and irrigated rice production.
- ◆ The Niayes on the Atlantic coast, with a temperate climate and fruit and vegetable production.
- ◆ The Sylvo-Pastoral zone of north-central Senegal with extensive livestock production.
- ◆ The Groundnut Basin of south-central Senegal, a zone of savannah dominated by groundnut and millet production.
- ◆ Eastern Senegal, characterized by savannah with trees, cotton and livestock.
- ◆ Casamance, characterized by forests and savannah with trees, rainfed rice production and diverse other crops.

The country is administratively divided into 15 regions, 45 districts (called “departments” in French), and 133 sub-districts (called “arrondissements” in French).

Senegal is generally flat with elevations less than 100 m. Although Senegal has over 19 million ha of land, over half of this is undeveloped bush and arid land used for livestock grazing; about 3.9 million hectares is suitable for arable crops. Of this, 40 percent is regularly cultivated. Roughly 10 percent of the area under cultivation receives less than 500 mm rainfall per year, effectively limiting production (D’Allesandro et al., 2015). Less than 10 percent of cultivated land is under irrigation; the main irrigated areas are along the Senegal River and in Casamance.

Most soils are vulnerable to degradation and fertility levels are declining as cultivation pressure increases.



Projection : UTM Datum : WGS 84 Z 28N

Figure 2. Map of Senegal

Source: D’Allesandro et al. 2015

The main crops cultivated are groundnuts and millet, which together account for almost 75 percent of the planted area. Maize, rice, sorghum, cowpeas and cotton make up about 25 percent and less than one percent is sown to other crops, including vegetables. Food crop production does not meet national demand, and the country imports substantial volumes of rice (1–1.2 million metric tons (MT) in recent years) and wheat. Main agricultural exports include groundnut oil, cotton and horticultural products, mainly tomatoes, green beans and mangos (D’Allesandro et al., 2015).

Crop production in Senegal essentially comprises three categories of producers (D’Allesandro et al., 2015): (1) Subsistence smallholders, who produce occasional commercial surpluses for sale, but undertake other income-generating activities, 2) Commercial smallholders, whose livelihood depends

upon the sale of cash crops, but who also produce some crops for their own consumption, and (3) Pure commercial producers.

Livestock production is significant, involving 90 percent of the rural population and accounting for 30 percent of the agricultural gross domestic product (GDP). Livestock types include cattle, sheep and goats and provide a range of products (e.g., meat and dairy) and services, such as draft power, which is used to plow 90 percent of cropped land. In spite of the high numbers of livestock, Senegal is still dependent on meat imports (D'Allesandro et al., 2015).

Agricultural systems will be significantly affected by climate change. For example, annual mean temperatures are anticipated to increase by 1.1 to 1.8 degrees Celsius by 2035, depending on the region. Crop models predict reductions in groundnut yields by five to 25 percent in areas where they are currently grown, but increases in yields of maize and rainfed rice (CIAT and BFS/USAID, 2016).

Agricultural Innovation System

The agricultural innovation system in Senegal comprises four main groups of actors (Figure 3):

Research Institutions

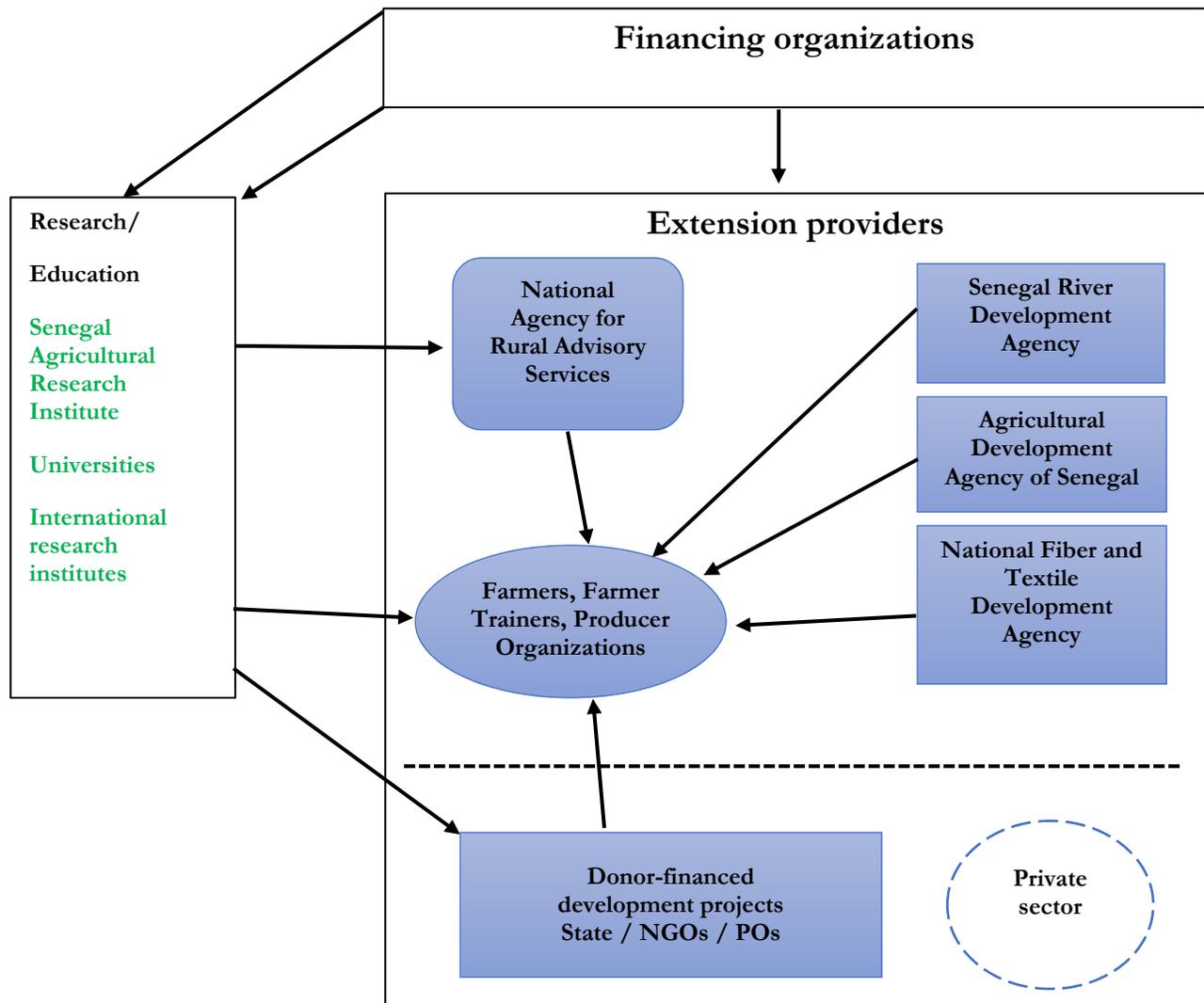
Spending on agricultural research in Senegal has increased significantly in recent years, as funding from the World Bank has increased. Spending in 2014 was at 1.15 percent of agricultural GDP, above the minimum target set by the African Union and high relative to other West African countries. However, staffing is low relative to other African countries of its size. To facilitate an increase, the government doubled researchers' salaries in 2012 and approved recruitment and training of 10 researchers per year over the next 10 years.

The Senegal Institute of Agricultural Research (ISRA, for its French acronym) is the most prominent actor, with a mission for creating scientific knowledge and developing technological innovations, tools and approaches for improving the agricultural sector. ISRA is under the Ministry of Agriculture and Rural Equipment (MAER, for its French acronym), but has its own autonomous administration.

Other actors in agricultural research include the Institute of Food Technology and the Universities of Dakar, Thies, Saint Louis and Ziguinchor. Some private companies also conduct research. For example, TROPICASEM, a private seed company operating throughout West Africa, conducts research on improved vegetable varieties and also produces and markets seed. ISRA and Senegalese universities partner with many international research organizations (e.g., Africa Rice Centre and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) of the CGIAR and advanced research institutes and universities in Europe (e.g., the Institute for Research on Development, France) and North America (e.g., University of Florida) to conduct agricultural research in Senegal.

Extension and Advisory Services

These comprise five categories, each of which is described in detail in the next section:



Note: Arrows point one way because feedback loops tend to be weak.

Figure 3. The Agricultural Innovation System in Senegal

Source: Authors

1. ANCAR is the national governmental organization for conducting extension and advisory services, with extension staff in each of Senegal's 45 districts and 190 counties. There was a 24 percent vacancy rate in 2017; this has been a chronic problem due to lack of funds to pay salaries of new staff.
2. SRDRs were established by the government to operate in particular zones and on particular themes (e.g., the Senegal River Development Agency (SAED, for its French acronym) in the Senegal River Valley for development of irrigated agriculture there). In addition to extension services, these organizations provide a range of support including infrastructural development and supply of inputs.
3. Development projects implemented by government agencies, national or international NGOs or private firms. These projects are usually funded by particular donor agencies,

focus on a particular area and are of limited duration. Such projects include Naatal Mbay implemented by Research Triangle Institute (RTI)¹ and funded by USAID.

4. Producer organizations are common throughout Senegal and are often federated at the local, regional and in a few cases, at the national level. For example, the Federation of Non-Governmental Organizations (FONGS, for its French acronym) comprises 31 farmer associations. Such federations lobby the government on behalf of members, manage development projects and sometimes provide services to members, such as advisory services.
5. Only a few private companies, such as Mlouma described below, offer advisory services to farmers.

Agricultural Education Institutions

Three universities give degrees in agriculture: Gaston Berger University (St. Louis), University of Thies (Thies) and Assane Seck University (Ziguinchor). No university gives a degree in agricultural extension. Five other institutions give diplomas in particular agricultural subject areas: The Advanced School for Applied Economics (Dakar), Institute of Food Technology (Dakar), National Water and Forestry Training Center (Djibélor), the Professional Horticulture Training Center (Dakar) and the National Animal Breeding Training Center (St. Louis). Others provide general training in agriculture: The National Advanced School for Agriculture (Thies), the Advanced Institute of Agricultural and Rural Training (Bambey) and the Emile Badiane Agricultural Training School (Binona). Most institutions do not give any training in agricultural extension. Rather, all of the training tends to be in agricultural sciences.

The Community Service Law (Law no. 18 of 2014) establishes the legal and institutional authorization for universities to establish outreach programs to work with local communities. As a result, and with the assistance of donor-funding, agricultural universities have started working in development projects assisting farmers, including offering them advisory services.

The innovation system also includes many other actors. Private-sector participants along commodity value chains include produce traders and processors, input suppliers and service providers (e.g., providers of credit, agricultural information, and agricultural insurance). The system also includes organizations funding research and extension such as:

- ◆ the National Agro-Food Research Fund of Senegal (FNRAA, for its French acronym), a government agency established in 2004 that mostly funds research, but has recently started funding diffusion as well,
- ◆ the National Fund for Agro-Sylvo-Pastoral Development (FNDASP, for its French acronym) which has just been established and started funding scaling and value chain projects, and
- ◆ donor agencies, both bilateral and multilateral (e.g., the World Bank-funded West African Productivity Program)

¹ RTI acquired IRG in January 2017. The contract was novated in October 2017. Project reports cited prior to contract novation are maintained as IRG, while general references to Naatal Mbay project implementation are noted as RTI.

Extension and Advisory Services System

Historical Perspective

Ndaye (2013a; 2013b) presents three phases in the evolution of agricultural advisory approaches in Senegal since 1965:

1965-1990: Productivity-enhancing approaches of SRDRs. SRDRs had EAS that focused on distributing subsidized inputs, such as seeds and fertilizers, and raising productivity at the field level. This approach had widespread support among donors. For example, USAID provided such assistance to SAED and to SODEVA during the 1970s (Franzel, 1979).

1990-2001: Training and Visit approach by SRDRs and multi-faceted approaches by NGOs: With the support of the World Bank, SRDRs adopted the Training and Visit approach, a highly structured approach in which extension staff train groups of farmers on the use of improved agricultural technologies. NGOs implemented a range of different approaches, including participatory approaches. Also, POs were gaining in strength and stature and governmental development planning began to involve POs and local government. For the first time, development programs began to focus on gender and youth.

2001 to present: Agricultural advisory services, producer empowerment, farm management advisory and value chain approaches: This phase was characterized by the development of ANCAR as the national extension service and NGO/donor-funded project advisory services using a range of approaches, such as farm management advisory approaches, emphasizing a systems approach to helping families meet their needs, and value chain approaches involving interventions in input markets, output markets and processing in addition to field production. POs gained in membership and influence and farmer federations, such as FONGS, began implementing development projects and participating in the design and implementation of research and extension programs.

Major EAS Providers

Government

ANCAR was formed in 1997 and given the role of providing advisory services throughout the country. ANCAR's mission is to provide a national system of rural and agricultural advisory services through improving advisory service delivery, harmonizing advisory methods, and facilitating a network of public and private advisory services.

ANCAR is a parastatal led by the national government (51 percent of capital) with representation from POs (28 percent), private sector (14 percent), and local government (seven percent). At the time of its creation, the government envisaged that over time the role of the state would diminish and POs would be the major capital provider. However, neither the POs nor the other entities have had the means to contribute, so the national government pays nearly all of ANCAR's costs. ANCAR is directed by an Administrative Council composed of representatives of the four types of participating organizations and names a director general to manage it. Its mandates, in addition to providing advisory services, are to provide inputs, credit, marketing and processing services. However, it does not perform these functions; rather, it helps link farmers to providers of these services. A major feature of its approach was to replace the hierarchical top-down model of extension with one that was participatory, demand-driven and that brought together the various

partners involved in the smallholder sector. This approach was also seen as complimentary to the new policy of decentralization that the government was undertaking.

With operations in all 15 of the country's administrative regions, ANCAR is quite decentralized, with its regional directorates given considerable autonomy in designing advisory systems appropriate for their areas and farmers. Staff at the regional directorates include a team of technical specialists (including in some cases a monitoring and evaluation specialist) to support the field teams (about three per region). ANCAR field teams are based at the district level, of which there are 45 in Senegal. The teams are composed of three to four extension staff, supported by two to three subject matter specialists of different disciplines. They conduct participatory diagnostic assessments of farmers and other stakeholders to ensure that their program of work is demand-driven. However, their grasp of participatory methods is sometimes weak (reported by a key informant).

Key principles of ANCAR's approach are that it is holistic (takes into account rural non-agricultural activities, e.g., petty trade, as well as agricultural ones), demand-driven, participatory, decentralized, inter-disciplinary and pluralistic (involving a range of different actors). An important feature is that advisory services are offered through a contract between ANCAR and POs. The contract specifies the financial contribution that the PO will make. As of 2009, ANCAR had signed 3,800 contracts with POs for provision of services. Most POs lacked funds to contribute, but those that could pay were able to increase ANCAR's extension budget by about 20 percent. ANCAR uses its own funds to provide services to farmers not organized in POs. ANCAR has 156 extension staff, including 144 field extension staff and 12 managers (one per region).

Regional and National Rural Development Agencies

ANIDA. Founded in 2006, the National Agency for Agricultural Development's (ANIDA, for its French acronym) objective is to create large, modern farms in "community agricultural domains," primarily to serve as employment opportunities for rural youth and to promote agricultural development. Twelve such domains are in operation, and include over 100 farms. ANIDA employs 70 extension agents, who are supervised by 12 extension managers. Donors include the African Development Bank and the governments of Senegal, Spain and Brazil.

SAED. Founded in 1965, SAED's main concerns have been developing irrigation infrastructure and promoting irrigated rice in the Senegal and Falémé River Valleys. However, the Agency has other activities as well, including input supply, processing, marketing and promoting youth and women entrepreneurship, the development of producer organizations and the cultivation of vegetables, such as onions and tomatoes. The Agency's advisory service employs 85 field extension staff equipped with motorbikes and 12 supervisors, who have four-wheel drive vehicles. Extension activities include participatory diagnosis, needs assessment, implementing activities and monitoring and evaluation. SAED receives funding from the government and is currently managing seven donor-financed projects funded by the African Development Bank, the French Development Agency, the Japanese International Cooperation Agency, the Korea International Cooperation Agency, the Kuwait Fund, the Saudi Fund for Development and the World Bank.

SODAGRI. The Agricultural Development Agency of Senegal (SODAGRI, for its French acronym) promotes irrigated agriculture, mainly rice, along the Anambe River of southern Senegal. SODAGRI constructs irrigation systems and promotes irrigated production. Its extension service employs 10 extension specialists and 20 extension agents.

SODEFITEX. The National Fiber and Textile Development Agency (SODEFITEX, for its French acronym) was established in 1974 to promote cotton development in southeastern Senegal. SODEFITEX is a public-private partnership with the French company, Geocoton, owning a minority share. Farmers access inputs and credit and market their cotton through SODEFITEX. Gradually the agency has evolved to more broadly serve farmers through other interventions as well such as livestock, cereals and vegetable production, farm management services, and literacy campaigns. SODEFITEX employs 26 extension managers and 83 extension agents.

Development Projects

Two of USAID Senegal’s most important Feed the Future EAS projects are described in detail below. Other projects under USAID’s Feed the Future Initiative having an important EAS component are described in Table 1. The USAID projects are administered by US-based firms or other types of organizations (e.g., universities or international research centers).

Table 1. USAID Agricultural Development Projects with EAS Activities

Name, Amount (if available), Time-Frame, Implementer	Project Description Highlighting Extension and Advisory Services
Farmer-to-Farmer for Agriculture Education and Training Project , Feed the Future Initiative, 2013-2018, Winrock	Volunteers from the U.S. agricultural sector provide short-term technical assistance (usually 2-4 weeks), including extension and advisory services to Senegalese institutions and producer organizations to strengthen local capacity. Topical areas of technical assistance include business skills, marketing strategies, conservation agriculture, organizational strengthening, processing and storage.
Education and Research in Agriculture (ERA) Feed the Future Initiative, 2011-2019, Virginia Tech University	A research and education project based on the U.S. land grant model. Assists Senegalese agricultural universities to implement outreach projects that provide advisory services to producer organizations. Helps universities to provide technical assistance, training and advisory services to the National Platform for Women in Food Processing.
Climate Information Services for Increased Resilience and Productivity in Senegal (CINSERE) , Feed the Future Initiative, USD \$3.4 million, 2016-2019, ICRISAT and CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)	Strengthen capacity of selected service providers to provide climate information services to farmers to support their decision making.
Strengthening Partnerships, Results and Innovations in Nutrition Globally (SPRING) , 2016-2018, JSI Research and Training Institute	Scale up high-impact nutrition practices and policies and improve maternal and child nutrition outcomes. Related to EAS, SPRING delivers both nutrition-specific and nutrition-sensitive agricultural interventions. The project operates in Kaolack, Fatick, Kaffrine, Sedhiou and Ziguinchor Regions.

Source: Authors

Selected projects with EAS components funded by other donors are presented in Table 2. Some of these projects are administered by the Senegal government whereas others are administered by other organizations, which usually collaborate closely with government agencies in implementation.

Table 2. Selected Projects Funded by Donors other than USAID with Important EAS Activities

Name, Donor, Amount (if known), Time-Frame, Implementer	Project description highlighting Extension and Advisory Services
Agricultural Value Chains Support Project , International Fund for Agricultural Development (IFAD), USD \$50.4 million, 2008-2019, MAER	Objective is to expand smallholder access to effective services, inputs, technologies and markets focusing on youth, women and their organizations. Interventions at various points along value chains including processing, mechanization, input supply and marketing. Project is active in Louga, Diourbel, Kaolack, Kaffrine and Fatick Regions.
Support to Agricultural Development and Rural Entrepreneurship (PADAER, for its French acronym) , IFAD and the Spanish Agency for International Development Co-operation, USD \$82.5 million, 2011-2018, MAER	Main areas of intervention include rural roads, irrigation systems, small enterprise development, processing and vegetable production. Project is active in Tambacounda, Kolda and Kedougou Regions. Project-supported advisory services include 47 agents working through ANCAR, SAED and Regional Directorates of Rural Development (DRDRs, for its French acronym).
Smallholder Income and Nutrition Enhancement , funded and implemented by Heifer International and ChildFund International, 2012-2017	The project assists 5,700 families in Thies and Diourbel Regions to improve their livelihoods through improved sheep production (NGO Aid Map, 2017).
Building Resilient Agro-Sylvo-Pastoral Systems in West Africa through Participatory Action Research (BRAS-PAR) , CCAFS, 2015-2018, World Agroforestry Centre	Developing and assessing Climate-smart Villages, innovation platforms, future farms, and farmer field schools in Kaffrine Region (CCAFS, 2017).
Millet Business Services , United States Department of Agriculture (USDA), USD \$9.6 million, 2014-2019, NCBA-CLUSA	Objective is to increase agricultural productivity of the millet value chain. Activities related to EAS include training in improving agricultural production techniques and capacity strengthening for EAS services, producers and the private sector, including agro-dealers and input providers. Project is active in Kaolack, Kaffrine and Fatick Regions.
Promoting Family Farming in West Africa (PAFAO, for its French acronym) , Foundation of France and the French Committee for International Solidarity, 2017-2020, FONGS	Boost local initiatives to increase access to food through viable and sustainable family agriculture.
Cashew Value Chain Enhancement Project , USDA, USD \$9 million, (2012-2017), International Relief and Development (now	Objective is to strengthen the cashew value chain through improving production, processing and marketing of cashew. Project

Blumont). A new phase, beginning in 2017, has started, with Shelter for Life leading the project and TechnoServe Inc. as a subcontractor.

also operates in Gambia and Guinea Bissau. Farmer field schools are the main extension method and are conducted by cashew farmer associations.

Source: Authors

USAID’s Feed the Future Naatal Mbay project (2015-2019, US \$24 million) aims to boost dissemination of productivity-enhancing technologies and facilitate market integration and investment to benefit the targeted rural population of 150,000 households. The project, implemented by RTI (previously IRG) follows up on the USAID-financed Support for Accelerated Growth and Increased Competitiveness (SAGIC) IQC contract, including Task Order #5 Economic Growth Project (or PCE for its French acronym) on agriculture (2009--2015). It operates in the same three geographic zones as PCE did, promoting the development of the value chains for irrigated rice in the Senegal River Valley in northern Senegal, and for rainfed rice, millet and maize in the Groundnut Basin in Central Senegal and in the Forest Zone in Southern Senegal. Naatal Mbay’s main focus is on:

- ◆ empowering farmer organizations and NGOs to develop capacity to train their members and develop their management skills to become trusted grain consolidation networks, and integrate these networks into competitive and sustainable grain and seed value chains;
- ◆ building the capacity of downstream value chain actors such as buyers, processors and input dealers to ensure widespread village level access to value-enhancing technologies, services, and markets;
- ◆ fostering contractual and collaborative intra-value chain linkages and public-private partnerships to develop sustainable delivery mechanisms for critical technologies, financial services and information;
- ◆ building the financial sector’s capacity to support investment in smallholder-based value chains through working capital credit, risk management and agriculture insurance mechanisms; and
- ◆ supporting local private sector-led advocacy and contributing to the wider national debate on key competitiveness and food security issues.

An important component of the project’s strategy is developing farmer-owned data systems, which empower farmers in many ways, helping them improve farm productivity, manage risk, access bank credit and obtain better prices from input suppliers and produce buyers. These are described more under the ICT section.

USAID’s Feed the Future Yaajeende project (2010-2017, USD \$40 million) aims at improving food security and reducing malnutrition in the Matam and Kédougou regions and in the Department of Bakel, an area representing the northeastern one-third of Senegal. The project was implemented by National Cooperative Business Association/The Cooperative League of the United States of America (NCBA/CLUSA) (prime awardee) and Counterpart International, Heifer International, and Sheladia Associates (sub-awardees) and was to close in late 2017. USAID | Yaajeende activities involve five major areas (Chemonics, 2014; NCBA/CLUSA, 2016):

- ◆ increasing the availability of food by improving the diversity and sustainability of agricultural production;
- ◆ increasing and diversifying revenues from agriculture by stimulating key agricultural markets and value chains;
- ◆ reducing undernutrition and ensuring a healthy diet through improved food utilization;
- ◆ improving capacity for local governance; and
- ◆ cross-cutting activities, such as expanding the role of women in the development process.

Project activities make available a wide range of new products, technologies, and innovations to rural households to strengthen food security, including livestock placement, micro-gardening, bio-reclamation of degraded land, revenue-generating activities, cereal banking, bio-fortified crops and crop varieties, improved soil management, improved methods in farm management and in farm accountancy. Many of these are facilitated by the development of community-based solution provider networks of trained community entrepreneurs to make products, services and information available to farmers (Chemonics, 2014; NCBA/CLUSA, 2016).

NGOs and Producer Organizations

Certain NGOs, both national and international ones, provide EAS to Senegalese rural households. They fund their activities through projects that they contract with national or international donors or through their own fundraising activities with private citizens in their countries. Four NGOs and producer organizations are described below and are intended to provide a representation of the broad range of NGOs and POs operating in Senegal. The first two are NGOs, the third is FONGS, and the fourth is a farmers' union. We were unable to find any farmer organizations recruiting extension staff. However, some rely on ANCAR for assistance and draw up agreements for ANCAR to provide services, even though they cannot pay for services. Some farmer organizations use farmer trainers (called *animateurs* or *relais* in French), farmers who work as volunteers or are paid small allowances for assisting extension staff and training their fellow farmers. The approach is described under Extension Methods.

Environmental Development Action for Nature Protection (ENDA-PRONAT, for its French acronym) is a Senegalese NGO founded in 1985 and funded by European NGOs. ENDA-PRONAT assists farmers to improve their livelihoods while protecting the environment through a wide range of interventions including natural resource management, improved agro-ecological practices, processing and marketing. Extension approaches include participatory action research and training, farmer field schools, farmer exchange visits and farmer trainers, who are paid an allowance for training farmers in their community. ENDA-PRONAT employs five extension specialists/managers and 12 field staff. The NGO operates in four regions: Tambacounda, Fatick, Thiès and St. Louis.

Heifer International is an international NGO with a mission to sustainably improve the socioeconomic situation of families, while observing practices that are respectful of the environment. Heifer International focuses on livestock and key programmatic areas include social capital, animal productivity and business. Heifer International and ChildFund International finance and implement the Smallholder Income and Nutrition Enhancement project (Table 1). In the USAID Yaajeende Project, Heifer International helped small farmers, particularly women, to start poultry production for home consumption and marketing. In both projects, Heifer International

uses the “pass the gift” extension approach for which it well known throughout the tropics (Heifer International, 2017). The approach is described in the Extension Methods section below.

FONGS is an umbrella group of 31 farmer associations with over 150,000 members, covering 35 of the country’s 45 districts (PPAFAO, 2017). Founded in 1976, FONGS’s objectives are to sustainably strengthen smallholder productivity, food security and the natural resource base. About 60 percent of FONGS’ budget is financed by international donors, 20 percent by the Government of Senegal and 20 percent by member organizations. Concerning EAS, FONGS’ main activity is a program of 160 farmer trainers, operating in six districts, who advise farmers on farm management, including farm and household planning, balance sheets, accounting, and determining costs and returns. This activity is part of the PFAO program, financed by the Foundation of France and the French Committee for International Solidarity. Another somewhat unique feature of FONGS activities is the emphasis they give to intermediation, that is, helping farmers and their organizations to develop relationships with technical (including input suppliers and private sector marketing agents) and financial partners.

Thiaré Farmers Union in Kaolack Region has 600 members and employs three farmer trainers. The farmer trainers are farmers whose technical backgrounds consist mainly of prior short-term training courses and training from ANCAR. The farmer trainers advise farmers through their farmer groups, which are members of the farmers’ union. They train their farmers in seeding, weed control, harvesting and preparing grain for transfer to the union warehouse.

Private Sector

There are very few instances of private companies providing EAS to farmers in Senegal. Two organizations that appear to be doing so effectively are described below.

Mlouma is a mobile phone and web-based platform offering market price information in 10 regions and used by 130,000 people. The service was started in 2012 by a local entrepreneur. In the future, they hope to facilitate purchases and sales of produce and earn a small fee for this (Le Soleil, 2017). Mlouma’s activities are described in greater detail in the section on ICTs.

Bana-Bana is a company that produces and distributes fruit juices in Senegal. About 800 women in Thiès and Kaolack Regions supply hibiscus leaves to Bana-Bana for preparation of hibiscus juice, which is bottled and marketed across Senegal and exported to France as well. The company advises leaf producers on growing, harvesting and post-harvest practices to ensure high-quality products (Tafforeau, 2016).

FNDASP wants to promote public-private partnerships in EAS and is preparing funding mechanisms to support such collaborative initiatives.

In past experience, Simpson (2012) describes the case of La Vivrière, a Dakar-based cereals purchaser, that provided funds to ANCAR to provide advisory services to farmers that the company had contracted with to purchase millet. When farmers failed to supply sufficient grain to the company to cover the costs of the fertilizer that it had supplied to them, La Vivrière abandoned efforts to work with the farmers and stopped providing funds to ANCAR to provide advisory services to them.

Coordinating Mechanisms and Incentives

Dongho et al. (2017, p. 1) report that “ISRA and the country’s agricultural extension agencies have weak cooperation linkages. Moreover, ISRA and the extension agencies compete for scarce resources rather than [collaborate] as part of a broader agricultural innovation system.” Dongo et al. (2017) argue that linkages between research and extension need to be strengthened to ensure that improved technologies released by ISRA are successfully adopted by farmers. In fact, coordination among organizations is supposed to take place through Research-Development Committees under the coordination of ANCAR in each region. These committees are made up of researchers, extension services, POs and other stakeholders and are supposed to meet periodically. We found considerable variation in stakeholder’s views about the committees’ operation and performance. Some stakeholders reported that they were operating, others that they were not operating and still others did not know about them. Apparently, some do operate and their main purpose is to identify farmers’ needs in terms of improved technologies and practices. However, others were reported not to operate, because of a lack of funds. We did find evidence of ISRA and extension staff of ANCAR and NGOs working closely together on particular problems in certain areas (e.g., on fruit fly damage to mango in Thies Region² and on agroforestry in Kaffrine Region) (Sanogo et al., 2016). These cases of collaboration appeared to be the result of the initiatives of individuals, some of whom were conducting research or development work for donor-financed projects. FNRA, for example, has a funding window in which researchers and extension staff are required to team up to submit proposals.

Organizations conducting extension activities in particular areas often have little linkage or coordination with each other. The government’s 2004 Agro-Sylvo-Pastoral Orientation Law of Senegal had instituted SNCASP to be led by ANCAR, that would coordinate EAS among different agencies. However, SNCASP was never implemented and as a result, ANCAR does not serve as a coordinating agency. The reason it was never implemented is not clear, but possible reasons include lack of agreement on what organization should coordinate EAS.³

The problem of a lack of coordination among EAS actors is widely recognized and discussed (Agunga et al., 2014). Several stakeholders interviewed for this report suggested that either ANCAR or another organization, such as FNDASP, needs to take the lead in coordinating and harmonizing EAS activities and messages.

In fact, we identified three instances where platforms of actors had been formed to promote exchanges of experience and coordination in particular areas and to address particular themes, often with backing from donor institutions. The National Science Policy Dialogue Platform for Adaptation to Climate Change (CCASA/Senegal, for its French acronym) is supported by CCAFS and has initiated 11 local platforms at district or commune level across the country (CIAT and BFS/USAID, 2016; see <http://ccasa-senegal.org/>). In Kaffrine, ISRA helped initiate an innovation platform focusing on forestry and agroforestry issues, as part of a project financed by The West and Central African Council for Agricultural Research and Development (CORAF) and CCAFS/ICRISAT (Sanogo et al., 2016a). A third example is that of the Task Force TaFaé, which brings together organizations promoting agroecology in Senegal, such as The French Agricultural Research Centre for International Development (CIRAD, for its French acronym), The Mixed Laboratory for Ecological Intensification, Cheikh Anta Diop University, Institute of Research for

² Governmental stakeholder personal interview, July 2017

³ Governmental stakeholder personal interview, July 2017

Development (IRD), Food & Agriculture Organization of the United Nations (FAO), and various NGOs and farmer organizations. In all three cases, the organizers reported that the platforms were operating effectively.

Organizational and Management Capacities and Cultures

Among the public sector and NGO extension providers, most managerial staff and extension specialists have M.Sc. or B.Sc. degrees in agriculture whereas field agents generally have diplomas from agricultural training institutes. Staff salaries are similar across the different public-sector agencies, but considerably lower than those in ISRA.

ANCAR field staff have motorcycles and managerial staff have access to four-wheel drive vehicles. The situation is similar in NGOs, such as ENDA PRONAT. In other organizations, such as SODAGRI, field staff only have bicycles. In ANCAR, only those working with donor-funded projects have laptop computers. In NGOs such as ENDA PRONAT, all field staff have laptops. Lack of resources for conducting extension work is sometimes a problem for agents working in public agencies like ANCAR, but not if they are working in a donor-financed project (Agunga et al., 2014).

Performance management systems are absent in most of the public-sector organizations. For example, ANADER and SAED have no such systems, and incentives to perform well on the job are weak. There are no opportunities for further education or paths to career development. Where extension staff are working in donor-financed projects, there are often opportunities to participate in short-term courses on topics related to the project.

Performance evaluation measures for public extension providers focus on distribution of inputs, such as seed and fertilizer, rather than on the performance of particular extension programs, uptake of technologies or other outcomes. This is because many view extension services' mandate as simply to distribute inputs and partly because it is so easy to measure the quantity of inputs distributed relative to other more difficult measures, such as numbers of farmers adopting or area covered by a particular crop variety. That said, there are important exceptions to this narrow view of extension. For example, as mentioned above, ANCAR's views of extension are that it is holistic, demand-driven and participatory. Moreover, the objective of the farm management approach to extension, promoted by FONGS and SODEFITEX and described in the section on EAS methods, is to improve farmers' decision-making capacity to help them meet their goals and not just to promote input use. This broader view of extension, as a means of educating farmers, developing their skills and responding to their needs, is still not widely understood in Senegal's agricultural sector.

Whereas most extension staff have strong training in agriculture, only a few have been trained in the "soft skills" of extension, that is, communication, facilitation, extension methods and informal adult education. This lack of training is partly because such courses are not available in universities and training institutes, and because of a general view that anyone knowledgeable about agriculture is capable of training farmers. The demand for training in soft skills of extension is high among extension staff. For example, Ndiaye et al. (2015) found that 80 percent of extension staff felt that communication is necessary for development and that 84 percent felt that development facilitators need communication training.

Bravo-Ureta et al. (2012) claimed that the post-secondary agricultural education system in Senegal does not produce graduates with adequate skills for becoming extension staff or for supporting the

Senegalese agribusiness sector. They claim that the system consists of different types of institutions, where each has specific mandates and governance schemes, and lacks the integration and interdisciplinary approach necessary to produce the professionals that are needed.

Ngaide and Chambaz (2007) reported that 10.9 percent of Senegal's extension staff working at the local level were female. They did not specify what exactly the term "local" meant or whether this figure only pertains to public extension or whether it is for all types of extension. More recent data on the proportion of female extension staff are not available.

The total number of extension agents across sectors in Senegal, based on the numbers given above, is around 500, not counting all the managers. Senegal has a strong tradition of farmer trainers, who tally about 9,100 (including community nutrition volunteers). Given that there are other extension providers not reported on in this report, particularly NGOs, these numbers should be viewed as minimum estimates of total numbers of extension agents and farmer trainers. Further details on extension providers in Senegal, including current numbers, can be found in the stakeholder mapping matrix that will be made available online⁴.

Delivery Strategies and Learning Approaches

As in many countries across Africa, agricultural extension is often viewed by policymakers and stakeholders in the agricultural sector as simply a means for improving the delivery of key production technologies to farmers. This perspective has two negative connotations. First, the implication that needs assessments are not really needed since the problem, lack of improved technology, is obvious. Second, training and recognition of other key areas affecting adoption such as marketing, entrepreneurship and how to communicate with farmers are ignored.

In fact, while both connotations are common in development initiatives in Senegal, many efforts are underway to solve them. Many organizations conduct some type of needs assessment, often involving the use of participatory methods in which farmers in groups identify their needs and share their knowledge with development practitioners. As mentioned above, some observers note that the grasp of participatory methods is sometimes weak and the actual approaches used may not in fact be very participatory. Second, extension agencies are increasingly incorporating marketing, nutrition and other key topics into their programs, to complement training on production technologies. These initiatives will be discussed below under in the livelihoods and marketing sections. But one area where little progress has been made is on training extension staff in communication and facilitation, the "soft skills" of extension (Agunga et al., 2014 and stakeholder interviews). No B.Sc. or M.Sc. programs in agricultural extension exist, and courses in the subject at the universities or training institutes are scarce. Most extension agents have not had any training in communication or facilitation.

Extension Approaches

Whereas a common debate in extension literature is whether extensionists should work with groups or with individuals, in Senegal some organizations are raising a third option, to work through associations of groups. For example, Naatal Mbay often contracts with associations of POs and supports them in working with their member POs and farmers. FONGS also works through its member PO associations in assisting POs and farmers. Both initiatives provide technical assistance

⁴ Data from an older study can be found at <http://www.g-fras.org/en/world-wide-extension-study/africa/western-africa/senegal.html>.

to the federations to help them strengthen their capacity in such areas as financial management, service provision and monitoring and evaluation.

Some of the key extension approaches used in Senegal are described below.

Farmer-to-farmer extension is one of the most common extension approaches; farmer trainers are trained by extension staff and are responsible for assisting extension staff and training their fellow farmers, who are often members of the same farmer group as the farmer trainer. SODIFITEX has 1,737 farmer trainers trained in production technologies and 1,826 trained in farm management. PADAER works with 527 farmer trainers and FONGS with 200. Naatal Mbay, and the partners through which it contracts, work with 4,199 farmer trainers who promote adoption of improved practices among members of their POs and neighboring POs. FONGS farmer trainers, in addition to training their fellow group members in improved agricultural practices, also pass messages between the organizations and farmers they work with, conduct monitoring exercises, and link farmers to other services, such as credit. Many of the farmer trainers go on to become leaders in their farmer organizations (PPAFAO, 2017). Farmer trainers generally work part time and are paid a small stipend. For example, Naatal Mbay pays its farmer trainers 50,000 CFA (about USD \$90) per month over nine months of the year. In other cases, for instance, Yaajeende's community nutrition volunteers, no stipend is paid. ANCAR, ENDA-PRONAT, Heifer International, and Thiaré Farmers Union also use farmer trainers.

Whereas the original intention was for farmer trainers to remain farmers and perform as farmer trainers as a civic duty, many of them are able to engage as farmer trainers for two or more organizations and thus become full-time farmer trainers. The consensus among stakeholders that we interviewed was that the farmer trainer approach is effective in helping extension staff reach more farmers and in promoting improved practices. However, stakeholders noted a number of problems: conflicts caused by different organizations offering farmer trainers different benefits or giving them conflicting advice, farmer trainers distancing themselves from farmers and conflicts between extension staff and farmer trainers.

Farmer field schools (FFS) is a group-based adult learning approach at a physical location, often a cropped field, that teaches farmers how to experiment and solve problems independently. Several organizations reported using FFS, such as ENDA-PRONAT, in promoting agro-ecological practices in four regions, and BRAS-PAR in testing and promoting climate smart agricultural practices in Kaffrine Region (Sanogo et al., 2016b). ANCAR also reported using FFS though it was not clear whether it was using the approach on its own or in collaboration with other organizations. All three organizations reported using agro-ecosystems analysis, often considered a critical component of FFS, in their FFS trainings. Cashew farmer associations were also reported to use farmer field schools, as part of a USDA project strengthening cashew value chains.

Farm management advisory services, such as Management Advice for Family Farms (MAFF) (Faure et al., 2015), are used in many countries of francophone West Africa. These approaches use learning and decision-making processes aimed at strengthening farm families' entrepreneurial skills, decision making and capacities to manage all the resources of their households (land, labor, inputs, money, crops, livestock, off-farm). Whereas FFS and value chain approaches generally focus on a single enterprise at a time, farm management services help farmers manage the farm as a whole entity, highlighting the interactions among different enterprises. Organizations using such services include FONGS and SODEFITEX.

Demonstration plots are also considered by many extension services to be important means for exposing farmers to new practices. Depending on the program, demonstration plots are hosted by farmer leaders, farmer trainers or managed by extension staff on public land. IRG (2015a) claimed that demonstration plots are particularly useful when managed by farmers rather than extension staff, because farmers respond better to claims of other farmers than to technical staff. Further, demonstration plots sometimes double as seed multiplication plots, thereby increasing their value.

Other common approaches include farmer exchange visits, agricultural fairs and “pass the gift,” an approach introduced by Heifer International in which a farm family receiving an animal gift passes on the first female offspring, and information and skills on how to care for the animal, to another in need. Yaajeende pioneered several other approaches, such as community multipliers (networks of community seed producers), communication campaigns and community-based solution providers, that is, trained community entrepreneurs who make products, services and information available to farmers.

ICT and Mass Media Approaches

ICT and mass media approaches are not widely used in Senegal, relative to other African countries. Ndiaye, (2015) reported that according to a survey of 25 extension staff in the Senegal River Valley and Niayes in 2013, most extension staff have access to ICTs (72 percent had cell phones, 64 percent had email accounts, 48 percent had laptop computers and 40 percent had access to desktop computers). However, they were using these for personal purposes and not as tools for reaching farmers. ICT availability has increased greatly since 2013, but we found that most extension staff were still not using ICT in their field work.

One important use of ICT for accessing agricultural information is that of Mlouma, a mobile phone and web-based platform offering market price information in 10 regions and used by 130,000 people. Using an Unstructured Supplementary Service Data (USSD) service in partnership with the Orange mobile network, buyers and sellers are able to get price information using their basic cell phones. Others with access to the internet use the web-based service.

Mlouma employs 15 agents throughout the country, who collect price and market information on 50 different crops and products and promote the service among producers and traders. Mlouma finances itself by earning a proportion of the costs paid by the users to Orange (25 CFA for price information on a particular day; weekly and monthly subscriptions are also available). Mlouma also earns money from NGOs for training producers on how to use the service. Men predominate among users, but Mlouma has several initiatives to target women. For example, Mlouma is currently planning with the USAID ERA project to train female millet traders in four cities to use the service for buying millet and selling millet products. Mlouma also helps buyers and sellers link to each other through the service and in the future, they hope to facilitate purchases and sales of produce and earn a small fee for this (Le Soleil, 2017).

We were unable to identify a functioning call center where farmers could call to ask for information about farm practices. Mlouma tested having a call center, so that people could call in for price and market information, but found that the service was too expensive to be profitable.

Another promising use of ICT is that of Naatal Mbay, which has pioneered the use of tablets and smart phones to help POs collect, analyze and use information for farmers to improve the productivity of their farms and to access services. Originally working with producer networks on basic digital data literacy, Naatal Mbay supported farmers to collect and analyze production data

using well known software applications such as Excel, Word, and Dropbox. Subsequently, Naatal Mbay piloted the introduction of digital technologies by leveraging Dimagi's CommCare health sector data collection system, well known in Senegal. Naatal Mbay worked with Dimagi to adapt the smartphone app to the agricultural sector, resulting in the CommAgri app. At the center of the effort, the data bases are owned and managed by farmer organizations and give information to actors at different scales (e.g., to the farmer on plot and farm performance (cultivated area, yields/ha, profitability) and to the PO and networks of POs on their performance (quantities produced and marketed, produce quality indicators)). Farmers and their organizations use these data in negotiating with input providers and produce buyers/processors; this information helps secure lower prices for inputs and higher prices for produce than would otherwise be the case. Even more promising, accurate data about their enterprises helps farmers and POs access other services, such as credit from banks and crop insurance from insurance providers. Some organizations are earning money training other organizations on how to collect and use data to improve their farm enterprises (IRG, 2015b; IRG, 2016a).

Senegal has a regular agricultural program called *Disso* on the radio service of its national broadcasting system that is aimed toward informing the public about agricultural news. However, no regular programs target farmers to provide them with information about technologies and other innovations. Some organizations do use radio to publicize their activities and promote practices. For example, SPRING partners with six local radio stations to regularly produce and air 60-second spots on high-impact nutrition practices in Kaolack, Fatick, and Kaffrine regions. Women in Kaffrine region identified community radio (using Wolof or another local language) as a preferred source for receiving agricultural information (Poulsen, 2015).

Climate information is broadcast to farmers through 82 rural community radio stations, as well as through SMS messages, reaching 3.9 million rural people (CCAFS, 2015). CCAFS (2015) also provides evidence that farmers use climate forecasts to adjust their choice of crop varieties and planting dates. The Senegalese National Meteorological Agency (ANACIM) has the primary responsibility for developing climate information services and is assisted by CINSERE. Naatal Mbay (and earlier PCE) introduced rain gauge technology to support appropriate planting times, and expanded the program to include automated rain data collection. Automated rain gauges now provide rainfall data for ANACIM's database and support rain-index insurance programs available to farmers.

We were unable to find any systematic use of videos as a tool for helping farmers learn about farming practices. PCE experimented with low-cost videos for extending reach of farmer trainers, using cell phones and small cameras. Extension staff and some farmer trainers were trained to make videos (IRG, 2015a). The program was not expanded because farmers' lack of knowledge of the improved production practices the project was promoting (e.g., improved seed and fertilizers) was not considered as important a constraint to improving farm income as other constraints, such as access to inputs, credit, and markets.

Market Engagement

Market engagement in the context of EAS is concerned with farmers' access to credit, market-related advice, market linkages, quality inputs, group development and output markets. Some of the key problems that limit market engagement in Senegal are poor infrastructure (particularly poor roads and lack of electricity and storage facilities), the lack of information on quantities, quality and

profitability, geographic dispersion of supply channels, and the high risk associated with production, prices and contracts.

Several EAS providers emphasize market engagement in their activities and use a range of approaches. For example, SAED trains youth and women in entrepreneurship, FONGS helps link farmers to credit agencies and PADAER links farmers to processors. ERA helps Senegalese universities to provide technical assistance, training and advisory services to the National Platform for Women in Food Processing. However, a major problem limiting EAS providers in general from promoting marketing is that their staff lack expertise, training and experience in this area. The activities of two EAS providers are highlighted below.

Whereas ANCAR agents often lack training and skills in marketing, Simpson (2012) reported that they play an important role in linking farmers in Kaolack Region to 25 of Senegal's largest cereal buyers, who are members of the Association of Processors of Local Millers (ATCL, for its French acronym). The agents organized field visits for ATCL members to visit farmer groups to negotiate sales and, in some cases, contracts. ANCAR staff also provided further support, such as providing market price information, to those ATCL members and farmer organizations that contract with them. ATCL members reported being appreciative of the role that ANCAR agents play in ensuring that farmers provide grain of high quality and for providing local market information on which price premiums are based. Concerning marketing, ANCAR is also involved in initiatives to improve product quality (milk and honey) and help the Committee of Local Producer Organizations (CLCOP, for its French acronym) to establish a traceability system in the groundnuts value chain.

Naatal Mbay's marketing approach focuses on developing the capacity of farmer associations in particular areas to become trusted grain consolidation networks, and integrating these networks into competitive and sustainable grain and seed value chains. The main approach to helping them do so is through assisting them to develop digital-based information systems, providing them with information on cultivated areas, yields, quantities available for marketing and costs and returns. Annual group debriefings using seasonal data at the network, regional and zonal levels serve as opportunities to link to markets. The databases and debriefings in turn, help the farmer associations access services, such as bank credit and insurance for their members as well as monitoring produce quality and traceability and obtaining better prices for inputs and produce sold. The project also helps strengthen the capacity of other value chain actors, such as processors, buyers, input dealers, banks and other service providers, with the aim to improve smallholders' access, through their associations, to technologies, credit and other services and markets. Such activities include developing product quality codes linked to market needs for value chain actors, facilitating contracting arrangements between farmers and millers, and providing best practice training on buyer contracts, input procurement and crop financing.

Access to credit is a key problem for Senegalese farmers. The project links closely with the Senegal National Agricultural Credit Bank (CNCAS) in helping to improve farmers' reimbursement rates (up from 70 percent to 95 percent after adoption of a payment in-kind arrangement) and a quadrupling of credit volume in the Senegal River Valley between 2012 and 2016, benefitting 33,000 farmers. PO membership facilitates access to credit, so helping strengthen POs is another project objective. Naatal Mbay is also helping CNCAS to develop a phone app to track reimbursement rates in real time (IRG, 2016a).

Two companies were identified that provide market information to farmers: Mlouma and Manobí. Both provide information via the web and mobile phones. Mlouma as described above in the

sections on Extension methods and ICT methods reaches 130,000 farmers in 10 regions. We were unable to obtain information about Manobi's activities.

The cases described above give examples of the ways extension services in Senegal can improve marketing systems to benefit smallholders. The interventions involve not only training farmers and their organizations, but identifying constraints along the value chain (from input supply to consumption) and working with various organizations and market actors. Successful EAS interventions in marketing require that extension providers commit to helping solve marketing problems, and, then, do some if not all of the following: partner with organizations with marketing expertise, recruit staff with expertise in marketing and train their own staff in marketing. Only a few organizations are presently doing so.

Livelihood Strategies

Whereas the primary focus in most Senegalese extension agencies is on the use of improved inputs (e.g., seed and fertilizer) for increasing crop yields, there is considerable activity on other areas critical to improving rural livelihoods. Most organizations appeared to have focal persons specializing in gender and programs and initiatives targeting women. Public extension systems, such as ANCAR, SAED and SODAGRI, all have focal persons working on gender. They lead activities on gender as well as trying to ensure that gender is taken into account in all activities. SAED has an initiative on women entrepreneurship. ERA helps universities to provide technical assistance, training and advisory services to the National Platform for Women in Food Processing to help improve women's incomes. Yaajeende strengthens the leadership and entrepreneurial skills of women.

Yet women appear to be underrepresented among EAS staff and farmer trainers. The proportion of women in field extension positions is probably now higher than the 2007 figure of 10.9 percent mentioned above, but still appears to be low. The proportion of farmer trainers who are women is not known, but data are available from Naatal Mbay for 2016/17 that show that it varies considerably by enterprise. For enterprises such as rainfed rice, in which women play an important role, 53 percent of farmer trainers are female. In contrast, in male-dominated enterprises like irrigated rice, maize and millet, the proportions range from nine percent to 15 percent. The overall proportion of women among all of Naatal Mbay farmer trainers is 22 percent. Female participation in training programs varied accordingly, with 64 percent of beneficiaries being female in rainfed rice, but only about 30 percent for the other cereals (IRG, 2016a).

Whereas there is broad understanding and acceptance of the need to increase women's role in EAS and improve access of EAS to women, there is less understanding of how to do so.

“Women's empowerment requires specifically tailored actions (IRG, 2016, p. 25);” it does not happen by itself. For example, Naatal Mbay has reduced the amount of travel required for female extension staff, since they usually have heavy domestic responsibilities, in order to attract more women to join their staff. They are also encouraging their partner organizations to do the same.

Aside from improving crop yields, marketing and gender, no other subject areas (such as adaptation to climate change, natural resources management, nutrition or programs for youths) appear to have been mainstreamed across many projects. Rather, these subject areas are emphasized by only a few organizations that give them the highest priority. Thus, nutrition is championed by SPRING and

Yaajeende, youth development by ANIDA, climate change adaptation by CINSERE and BRAS-PAR, and natural resource management by ENDA-PRONAT and Yaajeende.

Community Engagement

As mentioned above, POs, and associations of POs in particular, are stronger than those in other countries. Development projects, such as Naatal Mbay, have contributed to their strengthening and, as a result, some EAS providers, like Naatal Mbay and FONGs, no longer need to work directly with farmers or even with POs, but can rather work through associations of POs instead. For example, Naatal Mbay reached about 83,000 households in 2016, but employed only 16 field staff. They were able to reach so many farmers because they contract with 123 other organizations, most of which are associations of POs, that cumulatively have 170,000 members. Naatal Mbay also provides assistance to many of the associations to help them improve their management and overall performance. Similarly, FONGs works through its 35 associations of POs, which have 150,000 members, providing assistance to them in such areas as farm management and in helping them developing relationships with service providers including input suppliers, private marketing agents and financial partners.

Nearly all organizations visited conduct some form of needs assessments with farmers, often called participatory diagnostic exercises, that involve participatory interviewing and learning techniques. A somewhat smaller number of organizations had formal mechanisms for obtaining feedback from farmers on the performance of the practices they were promoting. These involved participatory evaluations, surveys, feedback meetings or innovation platforms. Several organizations stated that they rely on their farmer trainers to provide input into their organization's priorities in working with farmers and feedback on interventions. We were unable to assess the quality of these mechanisms

An identified weakness in ANCAR and many other extension services in Senegal is that recommendations to farmers focus almost exclusively on increasing crop yields; little attention is paid to helping farmers manage risk (Ndiaye, 2015). Risks faced by farmers include climate variation, policies (such as changes in subsidies), and pest and disease risks, which may also be related to climate. Coping measures include mitigating risk (e.g., better weather forecasting), adaptation (e.g., growing drought resistant crops and crop varieties, even if they have lower potential yields) and transfer measures (e.g., insurance). Ndiaye (2015) found that 80 percent of Senegalese extension staff interviewed felt that training in risk management was necessary for them yet such training is not available at universities or in in-service training.

CONCLUSIONS AND RECOMMENDATIONS

The EAS systems of Senegal have the following strengths and weaknesses. The strengths can be seen as entry points or drivers of success for improving the extension system in the country.

Strengths

1. Government policies in place supporting agricultural development
2. Recent increases in government and donor investment in the agricultural sector

3. Multiple financing mechanisms for EAS at both the national level (FNRAA and FNDASP) and international level
4. Strong POs and federations of POs at the national and regional levels
5. Community Service Law of 2014 authorizing universities to provide advisory services to community organizations (the USAID ERA project supports these activities)
6. Programs of farmer-to-farmer extension in place in many organizations (although often paid for by donor organizations), involving farmer trainers to supplement the limited number of professional extension staff available

Weaknesses

1. Lack of a comprehensive national extension policy, which has contributed to the lack of coordination among extension providers and low funding and profile of public extension services
2. Low profile and status of agricultural extension relative to agricultural research; low profile of ANCAR relative to ISRA and low status of ANCAR relative to SRDRs
3. Related to the above, the links between ISRA and ANCAR are viewed by many stakeholders as being weak; there appeared to be little collaboration in identifying farmer problems, conducting research on solutions or evaluating results of dissemination efforts
4. Lack of coordination among actors conducting EAS, particularly at local level
5. Absence of performance management systems for public sector staff, few or no incentives to perform well, and lack opportunities for continuing education or career development
6. Lack of a feedback culture in EAS; researchers and extensionists have no systematic ways to collect, analyze and feedback information on the performance of recommended practices (the degree to which farmers adopt them, the modifications farmers make in taking them up, constraints inhibiting adoption)
7. Low use of ICTs in EAS (e.g., radio, television, SMS, smart phone applications)
8. Absence of research results on performance of advisory methods (No one really knows which advisory methods are performing well or poorly)
9. Weak involvement of universities in EAS and little training for university students in extension (e.g., there are no degree programs and few course offerings on extension)

Below are recommendations for various stakeholders to consider for improving EAS. This includes a range of stakeholders involved in EAS from extension actors to national government to donors. Further validation of this report and the resulting recommendations with Senegalese stakeholders would be useful before taking action. To decide which stakeholder should carry a recommendation forward requires discussion among them and depends on each one's willingness, capability, resources and commitment. Possible organizations that could consider leading in acting on recommendations are shown in parentheses following each one.

Governance Structures and Policy Environment

1. Develop a national extension policy. Formulating such a policy would serve two purposes. First it would provide the way forward for Senegal's national EAS system, specify how coordination among EAS providers could be improved and define the role of ANCAR in the system. Second it would raise the profile of ANCAR and EAS among Senegalese policymakers and stakeholders in the agricultural sector, thus helping improve ANCAR and the system's credibility and mobilize resources for EAS. Third it can help promote a broader view of extension as a means of improving farmers' skills and decision-making capacity and not just to promote use of improved seed and fertilizer. DLEC, if requested, may be in a position to help facilitate the process of developing a national extension policy (donors, policymakers).
2. Develop a policy on coordination among EAS providers. An alternative, less ambitious option than developing a national extension policy would be to develop a policy specifically on how coordination and harmonization among EAS providers could be improved at both the national and local level. This would involve (1) assessing the performance of existing platforms for coordination such as the Task Force TaFaé and the Research-Development Cells, assessing why past proposals to coordinate and harmonize were not successful, such as the implementation of SNCASP and (2) assessing which organization or structure (e.g., a committee of organizations) would be best suited to oversee coordination and harmonization (donors, policymakers).
3. Issue funding calls for which ISRA and EAS providers must collaborate. Currently ISRA and ANCAR compete for funds from agencies, such as FNRAA and FNDSP. In order to encourage collaboration, such agencies should expand funding windows in which ISRA researchers and ANCAR (and other EAS providers) extension staff prepare joint proposals to disseminate new technologies to farmers in a particular locale, working with a particular PO, and obtain farmers' feedback. Grantees should attend workshops on innovation systems and participatory monitoring and evaluation of technology adoption, focusing on feedback loops and effective research and extension linkages for successful technology adaptation and adoption (FNRAA, FNDSP, policymakers, donors).

Organizational and Management Capacities and Cultures

4. Establish performance management systems. ANCAR and other public extension providers need to establish performance management systems for their staff including establishing performance-based incentives to reward staff and identifying opportunities for their staff for continuing education or career development (ANCAR, MAER, donors).
5. Establish departments of Agricultural Education, Extension and Leadership at Senegal's agricultural universities and training institutes. Demand for graduates from such departments would be high among extension providers, including government, NGOs, farmer organizations and the private sector (universities, Ministry of Higher Education, Research and Innovation).
6. Train extension staff in the soft skills of extension, such as communication, facilitation, extension approaches and informal adult education. Courses need to be provided as in-

service training and as foundational training in universities and training institutes as well (donors, policymakers, extension providers, universities and training institutes).

7. Strengthen ANCAR's communications unit to develop training materials for a range of audiences including ones for farmers and extension staff and brochures describing ANCAR's activities and achievements for policymakers. These communication products will help improve ANCAR's impact with farmers, as well as raising awareness of ANCAR's important role among policymakers and other stakeholders in the agricultural sector. The unit should also collect training materials from EAS providers in Senegal and serve as a national repository for EAS training materials, making them available to all EAS providers (ANCAR, MAER, donors).

Advisory Methods

8. Conduct research on the impact and effectiveness of selected extension approaches. The assessment should include both quantitative evidence (evidence on changes in knowledge, attitudes and practices) and qualitative research (e.g., what are farmers' perceptions of the approach?). Impact studies should include both the overall impact of an approach (e.g., what difference does having a farmer trainer in the village make) as well as specific modifications of an approach (e.g., do farmer trainers improve their performance in promoting adoption in response to particular low-cost incentives?). Social scientists in universities and ISRA should be encouraged to lead this research (donors, extension providers, university and ISRA social scientists).
9. Increase the testing and use of ICT methods in EAS, drawing on experiences in neighboring countries (e.g., videos (Access Agriculture in Benin), SMS messages and call centers.) (Donors, EAS providers and university staff).
10. Support existing ICT services (e.g., Mlouma and Manobi) to increase their reach to marginalized groups (e.g., women, youth) and the quality of the services they offer to farmers (donors, MAER, ANCAR, EAS providers).
11. Develop radio shows for farmers aimed at solving their problems, exchanging experiences and introducing them to improved practices. Valuable lessons on how to start, maintain and finance such shows can be obtained from Radio Action Impact (Mali) and Farm Radio International (Canada) (policymakers, MARE, ANCAR, Radio Disso).
12. Organize a national meeting for EAS providers on the role of farmer trainers in EAS. Objectives would be to share experiences among organizations on good and bad practices related to the method and make recommendations to policy makers on whether any standardization of methods in implementing the approach are needed. Possible topics could include selecting farmer trainers, payments of stipends and allowances to farmer trainers, non-financial ways to incentivize them, whether a farmer trainer should work for more than one organization, and how to increase the number of female and young farmer trainers (ANCAR, donors, EAS providers).

Market Engagement

13. Train extension staff and students in marketing, entrepreneurship and business. Courses at the university level and in-service training for extension staff in these areas are needed, so staff will be able to advise farmers and help link them to input suppliers, markets and financial and business services. The Catholic Relief Services Farmbook and FAO's Farmer Business Schools are two models that should be considered, and the Global Forum for Rural Advisory Services has free modules on these topics (EAS providers, universities and training institutes, and donors).
14. Help farmers solve their marketing problems by doing some if not all of the following: partner with organizations with marketing expertise, recruit staff with expertise in marketing and train their own staff in marketing (EAS providers).

Livelihood Strategies and Community Engagement

15. Promote nutrition-specific and nutrition-sensitive agricultural interventions, building on Yaaeende and SPRING's experiences. Extend the interventions nationwide, tailoring them, where appropriate, to local preferences, needs and circumstances (donors, policymakers, EAS providers).
16. Increase the number of women accepted into and trained in agricultural universities and training institutes by offering them special conditions and incentives, such as scholarships (policymakers, universities and training institutes).
17. Recruit higher numbers of women in EAS by offering them special facilities (e.g., child-care) and recognizing their need to work close to their homes and travel less (EAS providers).
18. Increase the number of female farmer trainers, by providing gender training to those selecting farmer trainers, targeting women's groups, promoting couples to take on the position of farmer trainers instead of just the man, and ensuring that work and training conditions are conducive to female participation. Similar measures should be taken to increase the number of young farmer trainers (EAS providers).

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ANNEX 1. AN ASSESSMENT OF NAATAL MBAY'S EAS SYSTEM

Background

USAID's Feed the Future Naatal Mbay project (2016-2019, USD \$24 million) aims to boost dissemination of productivity-enhancing technologies and facilitate market integration and investment to benefit the targeted rural population of 150,000 households. The project, implemented by RTI, follows up on USAID-financed Economic Growth Project (PCE, for its French acronym) (2009-2014). It operates in the same three geographic zones as PCE did, promoting the development of the value chains for irrigated rice in the Senegal River Valley, northern Senegal, for millet and maize in the Lower Saloum, Central Senegal, and for rainfed rice and maize in the Forest Zone, Southern Senegal. Naatal Mbay's main focus is on (IRG, 2016a p. 2):

- ◆ empowering farmer organizations and NGOs to develop capacity to train their members and develop their management skills to become trusted grain consolidation networks, integrating these networks into competitive and sustainable grain and seed value chains;
- ◆ building the capacity of downstream value chain actors, such as buyers, processors and input dealers to ensure widespread village-level access to value enhancing technologies, services and markets;
- ◆ fostering contractual and collaborative intra-value chain linkages and public-private partnerships to develop sustainable delivery mechanisms for critical technologies, financial services and information;
- ◆ building the financial sector's capacity to support investment in smallholder-based value chains through working capital credit, risk management and agriculture insurance mechanisms; and
- ◆ supporting local private sector led advocacy and contributing to the wider national debate on key competitiveness and food security issues.

The objective of this annex is to assess the project's extension approach, achievements, factors affecting achievements and recommendations for the future, including proposals for a possible next phase which would start in early 2019.

Naatal Mbay's Extension Approach

A unique feature of Naatal Mbay (NM) is that it does not work directly with farmers or even with individual producer organizations; rather it works through 123 consolidation networks (CNs), most of which are associations of producer organizations, but also include NGOs and private firms. The 123 CNs employ 136 database managers, 580 field staff and work with 4,199 farmer trainers⁵, part-time, para-professionals responsible for training their peers, both in groups in which they are members as well as other neighboring groups. Farmer leaders, that is, farmers who lead POs, are also part of the system since they often host demonstration plots. The CNs serve 179,000 farmers

⁵ NM calls these farmers "lead farmers". We prefer a term that refers to what they do (farmer trainers or farmer promoters) rather than a term like "lead farmers" which refers to their status. In any case, the term in French, "animateur" is a good one and is similar to the word "promoter" in English.

(IRG, 2016a). Figure A1 shows how NM works through CNs, CN field staff, farmer trainers and farmer leaders to ensure that farmers have access to information and advisory services.

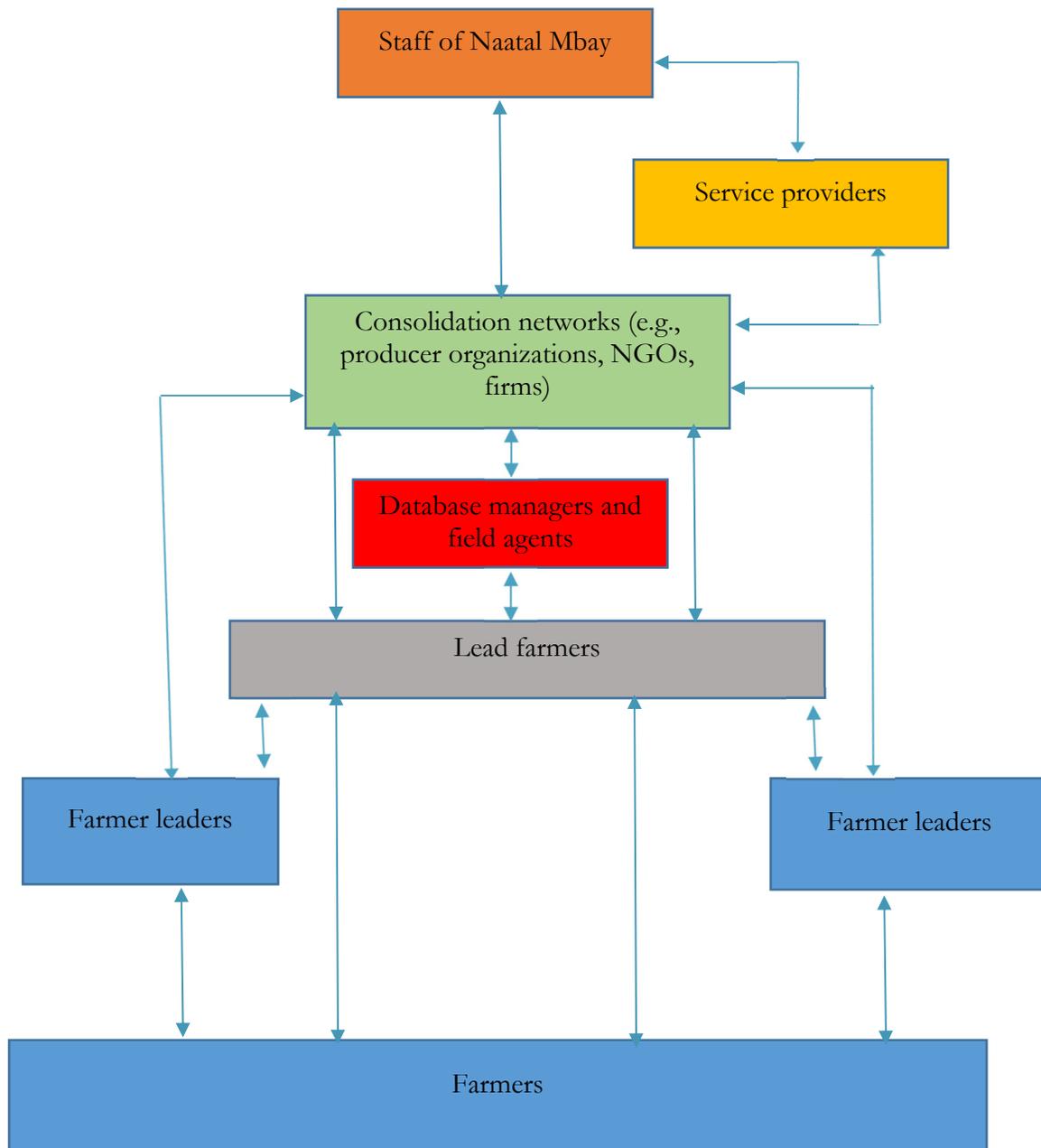


Figure 4. Organigram of Naatal Mbay's extension approach (arrows indicate main reporting pathways)

Source: Authors

An important component of the project's extension strategy is developing farmer-owned data systems which provide farmers with information about their farms, both physical measures, such as GPS field surveying for estimating areas and yields, and management data such as costs and returns. The system also provides POs and networks with important information on their performance (e.g., quantities produced and marketed and produce quality indicators). The database also includes data

on farmers' external environment (e.g., rainfall and weather forecasts). Each of the CNs is responsible for developing their own data systems which serve as a foundation for supporting farmers to improve their production practices. Some of the larger CNs use the CommAgri app on tablets and smart phones to ensure that farmers understand and benefit from the system.

An important extension approach at the producer level involves what the project calls “field school training” emphasizing that the training is practical and field-based, involving the 2,020 demonstration plots. The training does not include agroecosystem analysis per se, as is emphasized in many farmer field school approaches. NM training for farmers focuses on improving crop productivity using technologies (e.g., improved seed and fertilizer), business skills (e.g., analysis of costs and returns), marketing (e.g., produce quality codes) and on using farm-specific data from the data system for improving enterprise performance. Two other important extension methods are (1) end-of-season debriefing workshops during which stakeholders exchange lessons and experiences and plan for the following agricultural season, and (2) cross-site visits of farmers, particularly so that farmers from less commercial sites can learn from farmers in more commercial sites. The project has also tested videos, made by extension staff and farmer trainers, as tools for training farmers.

NM also collaborates with other projects, such as SPRING and CINSERE so that farmers can access information about nutrition and climate change. In the 2017/18 season, NM will begin training farmers on organic fertilization, conservation agriculture and natural resource management techniques (IRG, 2016b).

The project employs a value chain approach and thus intervenes at various points along the value chain, linking farmers to input markets (e.g., seed, fertilizer), output markets (e.g., monitoring produce quality, aggregating produce) and to services (e.g., credit, insurance, climate information). The project facilitates the exchange of information between service providers on the one hand and farmers and their organizations, to help them determine how to link together effectively.

NM also strives to empower women as EAS providers and to promote women's access to EAS, particularly following the Women's Economic Empowerment Strategy that was conducted for the project in 2016 (IRG, 2016c). NM seeks to recruit more women in leadership positions, as extension staff and to increase the proportion of female trainees. It also encourages and requires its partners to do so as part of their contracting processes with them.

Naatal Mbay Achievements

NM's achievements, as reported in its 2016 and 2017 annual reports include:

- ◆ By 2016, 78,332 (42 percent women) farmers attended productivity trainings, 33,000 received assistance to access loans, and 18,000 received insurance with their loans.
- ◆ By 2016, 66,497 farmers applied improved technological and management practices (all using certified seed) over 82,000 ha. Sixty-one percent of the area cultivated is under contract farming, which means that farmers are able to secure inputs on credit that is paid for when their output is marketed.
- ◆ The number of farm households benefitting from the project increased to 106,000 in 2017, up from 43,529 at the close of PCE in 2015.

- ◆ NM reported five percent to 26 percent increases between 2015 and 2016 in the proportion of women among all participants benefiting in the three value chains: maize, millet and irrigated rice.
- ◆ Efforts to transfer some of the extension costs from the project to Senegalese institutions achieved some success as miller-led organizations in the Senegal River Valley agreed to cover costs of extension and database management. CNs in other locations are also implementing cost-recovery strategies.

An important achievement underlying the above accomplishments is the strengthened capacity of farmer organizations to better serve their farmers through accessing inputs at lower prices, selling produce at higher prices and accessing services such as credit, insurance and climate, agricultural and market information. Whereas NM has helped facilitate the linkages between banks and farmer organizations for provision of credit and some of the arrangements that make the system work (e.g., in kind payments on loans), the fact that repayment rates have risen to 95 percent in the Senegal River Valley demonstrate the ability of farmers and their organizations to meet the requirements of participating and benefiting from commercial agriculture. By the end of 2016, most networks were able to manage their own credit and repayment systems.

Factors Contributing to Achievements from NM Extension Work

The three major features of NM's extension strategy mentioned above, working through partners, assisting CNs to develop farmer-owned data systems, and building linkages along the value chain have each contributed importantly to NM's achievements. The advantage of working through partners is that NM's nine extension staff are able to have much greater reach and efficiency relative to a model in which they employ hundreds of field staff. A potential weakness of the NM approach is that they have less control over extension activities, since field staff do not work for the project. However, since the contracting periods with these networks is on an annual basis, the project is able, over time, to weed out ineffective contractors and reward effective ones. Working through partners also allows for flexibility, so that the project can focus on bigger issues that individual partners cannot solve alone (e.g., building linkages and testing arrangements with banks for credit and insurance). Moreover, over time, performance improves as poorly performing partners are weeded out and better performing organizations are able to access more resources (not necessarily from NM, but from banks and others) and perform even better. Moreover, the competition among organizations for NM contracts incentivizes CNs to improve performance. The approach also lends itself to sustainability, as the CNs will continue to operate after the project ends.

The project's strategy to develop farmer-owned data systems empowers farmers in many ways, providing them with information to improve farm productivity, raise produce quality so as to obtain better prices, manage risk, access bank credit and obtain better prices from input suppliers and produce buyers. The data system is a potent supply chain management tool for accessing credit and establishing contract farming arrangements, through which farmers are able to pay back loans in kind at harvest time. The strengthened capacity of farmer organizations underlying the achievements is in part a result of the project's assistance to them in developing effective management information systems and how to make use of them.

Value chain interventions not only solve key bottlenecks at the production level (e.g., lack of credit), but actually provide farmers with incentives, such as lower fertilizer prices through collective purchasing and greater availability/profitability of fertilizer when obtained through credit, for further

investment. These value chain activities, while not essentially extension activities, do rely on advisory services to ensure that they perform well, because farmers need information on how such systems work and on production and marketing performance that the data system provides.

Naatal Mbay's collaboration with other projects, such as CINSERE and SPRING, not only reduces the costs of operation for the other projects, but also improves decision making and profitability for NM farmers, increasing the returns to NM's investment in extension.

Several external factors outside the project's control, it should be noted, have contributed to the success of the project's extension system. For example, government support for agricultural development and particularly rice development has been strong, rice prices have been high, and the last two rainy seasons have been favorable. On the other hand, global maize prices have fallen, reducing maize prices in Senegal and making it difficult for farmers to market their maize.

Recommendations

Given the short time available for discussions with NM staff and understanding the project and its context, the recommendations below should be considered as options that the project should consider rather than as prescriptions.

Governance and Organizational Management and Capacity

1. Assess the role that EAS have played, highlighting capacity strengthening activities, in generating project achievements thus far. We propose that an outside EAS specialist or two-person team be invited to conduct this short-term study, which would serve several purposes: (a) assess how NM's services and activities could be strengthened to make greater progress in meeting objectives and ensuring sustainability following the end of the project in 2019 and (b) document NM's methods and achievements for sharing with other projects and initiatives both inside and outside Senegal. This latter objective was also the purpose of IRG's report on PCE's farmer-owned extension services (IRG, 2015a) but an update would be extremely useful, given the many advances since then. A detailed terms of reference for this assessment is presented as an annex to this annex.
2. Assess the degree to which extension systems of different CNs are sustainable using sustainability performance indicators. NM is assessing the sustainability of CNs as reported in the 2016 annual report. It should consider using sustainability performance indicators, such as the stage gate framework that Technoserve uses for assessing the sustainability of POs in East Africa. The system involves setting criteria and scoring performance periodically on each criterion. It is useful for helping POs and program implementers to identify sustainability gaps, to develop operational plans for achieving sustainability, and to assess PO progress toward sustainability over time.⁶ The system also involves determining when a PO has graduated and no longer needs assistance from projects.

EAS Methods

3. Optimize use of farmer trainers. Farmer trainers are a common extension approach among NM's CNs. IRG (2015a) reported that they are more cost-effective than systems relying on large numbers of extension staff. But there appears to be many issues concerning their

⁶ See Ndwiga, J., Mutinda, G., Kinuthia, E., Kariuki, J., Omondi I. and Baltenweck, I. (2015) Producer Organization Sustainability Assessment: User's manual. East Africa Dairy Development Project. Heifer International, Nairobi, Kenya. Nd

effectiveness and practices adopted in other countries should be considered for improving their performance. Measures that should be considered include

- ◆ low-cost, non-financial incentives, such as contests and public recognition by local authorities
 - ◆ establishing different levels of farmer trainers and non-financial rewards (e.g., titles, certificates, badges) for advancing from one level to the next
 - ◆ limiting farmer trainers to serve for a single organization or project, instead of working for several at the same time
 - ◆ term limits to ensure new persons, particularly women and youth, have opportunities to train others
 - ◆ reviewing selection criteria, to ensure that interest and ability to train and network are as important as farming expertise
 - ◆ measures to increase the numbers of female farmer trainers (see below under livelihoods)
 - ◆ locating demonstrations on farmer trainers' farms, instead of or in addition to those at farmer leaders' farms
4. Test impact of alternative extension approaches. Where extension providers are unsure which extension approaches work best, it is often possible to test their effectiveness using simple randomized controlled trials. For example, whether to locate demonstration plots at farmer leaders' or farmer trainers' farms can be tested by randomly allocating plots to members of the two groups and then testing the impact of the plots using various criteria, such as quality of the demonstration, numbers of farmers visiting and uptake of the practice in the village.
5. Test new extension approaches, such as videos suited to newly-introduced practices. In 2017, NM is starting extension training in several new practices: conservation agriculture, organic fertilizer and natural resources management. These practices are fundamentally different than the practices NM has mainly been promoting (improved seeds and fertilizers) in that farmers are unfamiliar with them and they require learning new skills. Videos made with smart phones or small cameras are likely to be a cost-effective method for teaching farmers about new technologies such as these. NM has tested videos before, but they are much less important for introducing new crop varieties and mineral fertilizers, technologies that farmers are already often familiar with, than they are for practices that farmers are unfamiliar with and that require learning new skills. NM should examine digital video services used under SPRING – with its emphasis in Senegal on using local resources– to build capacity around videos for educating farmers and promoting techniques in the value chains they work on. NM could also benefit from working with Digital Green, which has considerable experience developing the capacity of extension services to use videos and other ICTs in a wide range of countries across the tropics.

Market Engagement, Livelihood Strategies and Community Engagement

6. Reinforce climate smart agriculture and introduce agroforestry to NM's extension training. NM's crop production extension activities at the farm level have focused on increasing use of improved seeds and fertilizer, supplemented by climate smart agricultural practices such

as short-cycle varieties, the diffusion of climate forecasts and a rain-index insurance backed by a rainfall data collection and sharing system. Whereas this approach focusing on short-term productivity gains and managing climate risks is understandable as a starting point, a broader, natural resource management approach is needed to better manage risk and sustain productivity over the longer term. In 2017, NM is incorporating organic fertilization, conservation agriculture and natural resource management techniques into its extension training. It should also consider agroforestry, which has been tested and is being disseminated in Senegal. ISRA's National Forestry Research Center (CNRF, for its French acronym) is a leading institution in Senegal promoting agroforestry and has projects in Kaffrine Region. The practices it is promoting include windbreaks, planting grafted fruit trees that mature more quickly than local varieties (baobab, tamarind, jujube (*Ziziphus mauritiana* or 'sii dem'), farmer managed natural tree regeneration and the production, processing and marketing of tree products such as baobab powder (Sanogo et al. 2016a,b). Of course, NM and its partners would have to assess the interests of farmers in these practices and their appropriateness for the various ecozones that the project works in.

7. Improve women's access to extension. Whereas NM has made significant progress in raising the proportion of female beneficiaries and female employees, one area where it can help improve women's access to extension is by increasing the proportion of female farmer trainers, which currently is 22 percent. There is considerable evidence that female farmer trainers train more women than do men (Davis et al., 2016). NM should consider adopting measures that have helped extension providers in other countries to increase the proportion of female farmer trainers to 50 percent, including (1) providing gender training to those selecting farmer trainers, (2) targeting women's groups, (3) promoting couples to take on the position of farmer trainers instead of just the man, and (4) ensuring that work and training conditions are conducive to female participation. Similar measures can also be undertaken to increase the proportion of youths that are farmer trainers.

ANNEX 2. PROPOSED FOLLOW-UP ASSESSMENT: EXTENSION APPROACHES AND CAPACITY STRENGTHENING IN NAATAL MBAY

Background:

The Naatal Mbay project aims to boost dissemination of productivity-enhancing technologies that facilitate market integration and investment that benefit the targeted rural population of 150,000 households. This is achieved through

- ◆ empowering grassroots farmer organizations and NGOs to develop a capacity to train their members and develop their management skills to become trusted grain consolidation networks, and integrating these networks into competitive and sustainable grain and seed value chains;
- ◆ building the capacity of downstream value chain actors such as buyers, processors and input dealers to ensure widespread village level access to value enhancing technologies, services, and markets;
- ◆ Fostering contractual and collaborative intra-value chain linkages and public private partnerships to develop sustainable delivery mechanisms for critical technologies, financial services and information;
- ◆ Building the financial sector's capacity to support investment in smallholder-based value chains through working capital credit, risk management and agriculture insurance mechanisms; and
- ◆ Supporting local private sector led advocacy and contribution to the wider national debate on key competitiveness and food security issues.

Whereas the project has considerable documentation on progress achieved through the above activities, it could benefit greatly by having external extension specialists look specifically at the role that advisory services and capacity strengthening activities have played in generating achievements, how these services and activities could be strengthened to make greater progress in meeting objectives and how the sustainability of these can be ensured following the end of the project in 2019.

Objective: Document the achievements of Naatal Mbay's extension and capacity strengthening approaches and

- ◆ assess key factors contributing to project achievements thus far,
- ◆ analyze remaining challenges,
- ◆ propose ways to improve performance in meeting project goals and
- ◆ determine pathway to sustainability so that extension and capacity strengthening mechanisms can continue to help producer networks, organizations and rural households to continue accruing benefits after the close of the project.

The key mechanisms to assess in the context of the above objectives are

- ◆ The farmer-led extension model, which includes field agents, farmer trainers, farmer leaders and database managers.
- ◆ The data system owned and managed by farmer organizations giving information to actors at different scales (e.g., field, farm, producer organization, producer network) that farmers and their organizations can use in negotiation with service providers (e.g., banks, input suppliers, produce buyers/processors) and in earning money training other groups.
- ◆ The system for strengthening farmer organizations in value chain innovations needed for urban marketing including quality control (e.g., moisture content, not mixing varieties), branding, bulking and collective marketing.
- ◆ Feedback mechanisms whereby farmers and other value chain participants evaluate project interventions and propose modifications or new areas to emphasize.
- ◆ Measures taken to strengthen the capacity of women and youth and improve their access to information and services.

The consultants' report will be valuable for value chain and extension projects in other countries as well as for the Naatal Mbay project itself.

Method: A two-person team will spend two weeks in Senegal visiting field sites and interviewing project staff, key informants and beneficiaries. Ideally, the two should have, between them, expertise in value chains, community-based extension, producer organizations, and ICT in extension. Both should be fluent in French. The consultancies should be for one month each, to cover literature review and report writing in addition to the field work.