Risk assessment and management to enable access to credit for livestock actors

Abdrahmane Wane1,2 and Aliou Diouf Mballo3
1Centre de coopération internationale en recherche agronomique pour le développement (CIRAD)
2International Livestock Research Institute (ILRI), PO BOX 30709, Nairobi, Kenya. a.wane@cgiar.org
3Agricultural Statistics GSARS, Statistics Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Rome, Italy.

Abstract

Credit rationing remains a major concern for livestock value chain stakeholders, in particular for smallholders for whom poor access to credit is one of the principal constraints on their activities. To date, the mismatch between credit supply and demand is usually tackled in sub-Saharan Africa (SSA) through the intrinsic attributes of credit applicants and very seldom, or never, through the prism of unavoidable multifaceted livestock risk management with a view to moving forward to an enabling environment. This is the approach adopted in this paper, which focuses on livestock risk assessment and management in Senegal, as well as on a thorough literature review, secondary data analysis, and interviews with public and private corporations and national and international research institutions working in the livestock sector. After the identification, quantification, impact assessment and prioritization of multifaceted livestock risks, we demonstrate how risk management contributes to the emergence of an enabling environment and stimulates access to credit.

Keywords: credit rationing, risk assessment, risk management, credit access, Senegal

Introduction

Between 2000 and 2012, Senegal’s livestock sector contributed an average of 30% of agricultural gross domestic product (GDP) and 4.2% of total GDP, with average annual growth of 6.1% (Niang and Mbaye 2013). Livestock production activity supports nearly 350,000 families, equivalent to three million individuals (Niang and Mbaye 2013), just over a quarter of the total population.

Given the large proportion of rural households keeping small and large ruminant livestock, the role of ruminant livestock in improving farmers’ cash income and livelihoods is limited by the weak access to technologies and innovations which are themselves largely dependent on the availability of timely and adequate credit. Many small farmers are credit-rationed (Reyes and Lensink 2011).

As elsewhere in SSA, access to credit for many smallholders in the livestock sector in Senegal is limited, constraining the growth of the sector. Beyond household attributes that could seem to be determinant for credit access, the risky
livestock environment limits access to finance and ultimately constrains its productivity, which requires investments from value chain and financial actors. The mismatch between the supply of credit and real investment needs, which is often attributed to logistical challenges, is also partly rooted in the high level of multifaceted risks. Most of the empirical literature focuses only on household attributes to explain credit rationing. However, it would also be useful to produce an evidence-based risk analysis of the Sahelian livestock sector to provide useful information for an enabling environment.

The purpose of our contribution is to demonstrate how livestock risk management should contribute to enable a livestock environment and facilitate access to credit. Section 1 introduces a theoretical framework to credit rationing. Section 2 provides a livestock risk assessment in Senegal and describes initiatives developed for risk management. Section 3 describes how to move forward for an enabling environment in order to increase the supply of credit.

Conceptual framework for measuring credit rationing

The supply and demand of credit are sometimes misaligned, and even thought to be irreconcilable. According to the seminal work of Stiglitz and Weiss (1981), then the important contribution of Jaffee and Stiglitz (1990), credit rationing occurs in situations with asymmetric information, in which lenders are not able to discriminate between high-quality and low-quality borrower attributes, thus leading to a non-Walrasian equilibrium that implies an excess demand for loanable funds. The term ‘credit rationing’ is mainly used in two circumstances: first, when some of a homogeneous group of applicants receive a loan and others do not, regardless of the level of interest rates they consent to pay; and second, when there are identifiable social groups in the population unable to obtain loans at any interest rates and whatever the volume of available credit (Stiglitz and Weiss, 1981). In other words, a potential borrower is credit rationed if their private demand for credit persistently exceeds the loan amount offered by the lender (Petrick 2005). However, linking credit rationing exclusively to asymmetric information has been strongly disputed as, empirically, this situation could inversely lead to a situation of over-lending (De Meza and Webb 1987, 2000; Bonnet et al. 2016).

In addition, the literature widely addresses the causes of credit rationing. Beyond asymmetry of information, credit rationing may arise from the difficulties in overcoming excessive transaction costs, situations of poverty, costs associated with screening, monitoring and enforcement, collateralization issues and a risky environment in rural areas, mainly in developing countries (Binswanger and Rosenzweig 1986; Hoff and Stiglitz 1993; Ghatak and Guinnane 1999; Petrick 2005).

Adequate access to credit should contribute towards improving livestock productivity and sustain intensification activities by facilitating access to technology and innovation (Simntowe, Zeller and Diagne 2008, 2009). Adequate access to credit would contribute to farmers’ livelihoods and their ability to purchase inputs and enhance investments (Reyes and Lensink 2011). Inversely, credit-rationed agents have more incentives to invest in less risky and less productive technologies (Dercon 1996). Furthermore, credit rationing could affect rural development by preventing households from diversifying these activities and moving out of poverty (Reardon 1997; Ellis 2000).

In SSA, most of the empirical literature focuses on the determinants of households’ participation or non-participation in credit programs. This was the case in Ghana, where non-participation was strongly explained by fear of loan default and lack of savings, while the factors that significantly influence farm households’ participation are the gender status of the household head, their formal education level, farm size and membership of associations (Asante-Addo 2016). Few contributions, however, found an analysis in the linking of credit rationing to global uncertainties that characterize the rural environment in the Sahel.

Livestock risk assessment analysis in Senegal

The livestock risk assessment provides a comprehensive and quantification of livestock risks in Senegal through a holistic approach (D’Alessandro et al. 2015; Wane and Mballo 2016).
General context

The Senegal livestock sector consists of three subsystems of livestock production: a pastoral subsystem based on mobility and extensive exploitation of natural resources and providing 549,737 Tropical Livestock Units (TLUs), or 19% of ruminants (cattle, sheep, goats) in the Ferlo region that covers more than one third of the national territory; an agro-pastoral subsystem in the southeast region concentrating up to 67% of cattle and 62% of small ruminants from the year 2000 (Niang and Mbaye 2013), which are gradually developing to the detriment of transhumant pastoral subsystems; and an intensive and semi-intensive subsystem in the Niayes region mainly producing poultry, eggs, pigs and, to a lesser extent, ruminants, particularly for dairy production.

This animal production activity in Senegal is evolving in a global context of severe socio-ecosystem shocks, as well as a deficit in infrastructure, basic social and economic services and a suboptimal and unfavourable environment (only 4% of investments in the agricultural sector and difficulties enforcing legal provisions adapted to livestock dynamics). In addition to these constraints, the livestock subsector in Senegal is facing climate-related shocks that are both a direct source of loss and an aggravating factor of economic, health and political and social threats.

Methodological approach

Our study mostly tackles risk assessment rather than constraint analysis even though there are obvious links between constraints and risks. Assessing risks in the livestock sector involves risk profiling, identification and inventory of current risk management initiatives, risk quantification, multiscale impacts and prioritization in order to facilitate risk management decision-making.

We carried out a very thorough analysis of the literature related to livestock dynamics in the Sahel in general and Senegal in particular. We compiled secondary data collected by public technical services, national and international research institutions and private companies, then processed these data for statistical purposes by using various techniques (Monte Carlo simulations, extreme value theory, descriptive statistics, mapping). We interviewed each segment of the livestock value chain stakeholders to better identify their perception of livestock sector strengths, weaknesses, opportunities and threats (SWOT analysis). A prioritization approach allowed us to classify the identified risks according to their severity, frequency and potential impacts. Finally, we went back to the main livestock stakeholders through a final workshop held in Dakar in June 2016 with the objective of assessing reasons for potential discrepancy analysis.

Table 1. Characteristics of data used and analytical methods

<table>
<thead>
<tr>
<th>Types of data</th>
<th>Length of the series</th>
<th>Sources</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Monthly data, 1960–2014</td>
<td>National Civil Aviation and Meteorology Agency of Senegal (ANACIM)</td>
<td>Monte Carlo simulation and extreme value theory, time series analysis</td>
</tr>
<tr>
<td>Bushfires</td>
<td>Annual data, 2003–2013</td>
<td>Ecological Monitoring Centre (CSE)</td>
<td>Descriptive statistics, Extreme Values Theory</td>
</tr>
<tr>
<td>Animal diseases</td>
<td>2014–2015</td>
<td>Directorate of Veterinary Services (DSV)</td>
<td>Descriptive statistics, mapping</td>
</tr>
<tr>
<td>Conflicts</td>
<td>Annual data, 1960 to 2015</td>
<td>FAOSTAT (indirect measures based on the cattle decrease on some periods)</td>
<td>Descriptive statistics, Secondary data analysis</td>
</tr>
<tr>
<td>Cattle thefts</td>
<td>Directorate of Livestock—Livestock Theft Unit</td>
<td>Secondary data analysis</td>
<td></td>
</tr>
</tbody>
</table>

Risk assessment

The livestock situation in Senegal is mixed. It remains sensitive to multifaceted risks that could lead to physical and financial damage. Quantifying the financial costs of losses is truly challenging as they are subject to significant data,
statistical and model uncertainty. Using our own calculations and estimates from public and research institutions, we were able to determine the overall financial costs of the identified risks related to the Senegalese livestock sector. Under strong assumptions, the minimum average annual cost is estimated at XOF 601.05 billion (West African CFA francs), almost USD 1 billion in current values.

### Risk prioritization

On the basis of criteria of severity, frequency and impacts, the scores obtained made it possible to prioritize risks related to the livestock sector: the dominant risk with a score of 5 is bushfires, followed by risks related to animal health (4.6), rainfall (3.84), markets (2.52), conflicts (1.81) and locust invasion (1.31).

<table>
<thead>
<tr>
<th>Risks</th>
<th>Worst-case scenario severity</th>
<th>Average frequency</th>
<th>Average severity</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushfires</td>
<td>Very high</td>
<td>Very high</td>
<td>Very high</td>
<td>5.00</td>
</tr>
<tr>
<td>Animal diseases</td>
<td>Very high</td>
<td>Very high</td>
<td>Very high</td>
<td>4.60</td>
</tr>
<tr>
<td>Climate</td>
<td>Very high</td>
<td>Medium</td>
<td>Very high</td>
<td>3.84</td>
</tr>
<tr>
<td>Markets</td>
<td>Very low</td>
<td>Very high</td>
<td>Very low</td>
<td>2.62</td>
</tr>
<tr>
<td>Conflicts</td>
<td>Medium</td>
<td>Very low</td>
<td>Very low</td>
<td>1.81</td>
</tr>
<tr>
<td>Locust invasion</td>
<td>Very low</td>
<td>Very low</td>
<td>Very low</td>
<td>1.31</td>
</tr>
</tbody>
</table>

Depending on the agro-ecological regions specifically monitored as the main livestock areas, the hierarchy is changing due to the socio-ecosystemic realities: bushfires are a repetitive and very high risk in all livestock areas. Risks related to input deficits are high in the Niayes and Ferlo regions. Regarding rainfall variations, only the southeast region seems to be more or less protected from this phenomenon. Conflicts have recently had a greater effect on the very sensitive region of the Ferlo, closer to northern Mali and Mauritania. It is also important to consider the persistent internal conflicts in Casamance, the southern region of the country.

### Risk management to make progress towards creating an enabling environment

In the risky livestock environment, the government of Senegal (GoS) has historically and successively taken global and specific approaches to livestock sector development to help rural populations in general, and people living with livestock in particular, to cope with persistent risks.

In terms of general measures, public authorities launched two umbrella documents to support livestock sector development for 2011–2015: the Accelerated growth strategy document and the Economic and social policy paper. These documents develop options and strategies aimed at securing pastoral and agro-pastoral farming systems and fostering farms capable of meeting the challenges of internal demand for animal products with the main objectives of increasing livestock productivity, productions and incomes in Senegal. This was operationalized through the National Plan for the Development of Livestock (PNDE), validated in June 2013, as a provision of the Agro-Sylvo-Pastoral Act (LOASP) promulgated on 4 June 2004.

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1 Risk scoring is used, following the risk assessment methodology developed by the International Fund for Agricultural Development-the Platform for Agricultural Risk Management. The frequency, average severity and worst-case scenario were scored and weighted based on the following formula to reflect the greater importance of average losses as a better indicator for the long-term cost of risk: Risk score = 0.75 * (average severity * frequency) + 0.5 * 0.25 * worst case
Other multi-sectoral initiatives were launched in 1998 with the establishment of the National Food Security Council (CNSA) attached to the prime minister's office and responsible for regular assessing of the food and nutritional situation of the Senegalese population.

In addition, through the National adaptation programmes of action (NAPAs) adopted in 2006, the GoS is pursuing the objective of reducing the vulnerability of production systems and better anticipating risks that could arise from climatic disturbances.

In order to facilitate access to credit for livestock professionals, the GoS set up a Stabilization Support Fund on 6 November 2007 but this did not start operations until June 2009. Measures have taken the form of various instruments: a guarantee fund to provide the banks and financial institutions with coverage for counterparty risks of up to 50% of loss-related loans; the interest rate subsidy fund to enable livestock professionals to benefit from the lowest rates in the agricultural sector; a Credit Fund to refinance the financing institutions approved by the fund; and a line of credit based on Islamic finance.

However, this coherent institutional network has not always succeeded in totally protecting the country from a number of threats in the livestock subsector. Some of these threats have been specifically addressed.

<table>
<thead>
<tr>
<th>Risks</th>
<th>Risk management procedures and instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushfires</td>
<td>Every year, much of Senegal is affected by bushfires, which have a considerable impact on the development of the vegetation. The CNSA, a national entity whose core activities include environmental monitoring, natural resources management and conducting environmental impact assessments, was charged to monitor fires by remote sensing since 1990 with a view to help the Directorate of Waters, Forests, Hunting and Wildlife conservation to identify and manage bushfires.</td>
</tr>
<tr>
<td>Animal diseases</td>
<td>The CNSA has set up a National Epidemiological Surveillance System (NESS) to monitor priority diseases. This surveillance system is carried out through a passive surveillance based on field reports, entered in a data sheet and sent to the veterinary laboratory of The Senegalese Institute for Agricultural Research (ISRA) for confirmation or invalidation and an active surveillance based on the follow-up of a network of sentinel herds and during periods of risk, samples are taken and analysed following a very rigorous quantitative protocol.</td>
</tr>
<tr>
<td>Climate and feeding</td>
<td>As of July 28, 2008, an initiative resulting from a public private partnership (PPP) resulted in the establishment of the National Fund of Agricultural Insurance of Senegal (CNAAS), a public limited company. For the 'livestock' component, the CNAAS aimed to gradually cover the national herd with an average unit premium of 5% of the animal's value, i.e. 2.5% to be paid by the farmer. Amongst instruments, there is a 'rainfall deficit' policy that combines traditional and index insurance programs. However, given the persistent intensity of climate shocks, the CNSA has undertaken a complementary initiative by investing in the programming and implementation of a disaster risk management system based on the Livestock Safeguarding Operation that organizes distribution of feed supplements to protect at-risk breeding livestock (lactating females, calves). In addition, some risks have been transferred to the Pan-African drought index insurance facility under the Agricultural risk capacity (ARC) initiative, a joint venture launched by the African Union to provide parametric insurance to cover climate shocks. The ARC uses satellite data sets to monitor rainy seasons, followed by a Water Satisfaction Index developed by the Food and Agriculture Organization of the United Nations (FAO) as a drought indicator, and estimates potentially threatened populations to establish emergency response costs.</td>
</tr>
<tr>
<td>Markets</td>
<td>While receiving technical and financial support from the World Food Programme, the Commissariat for Food Security (CSA) develops monthly bulletins on agricultural markets, expanded to include price monitoring on sentinel cattle markets. Beyond this, the CSA also has the duty of regulating the markets for local cereals, providing transversal studies and taking appropriate measures for the decision-making process.</td>
</tr>
<tr>
<td>Cattle theft</td>
<td>With the growing concern over livestock theft, the CNSA has set up the Livestock Theft Unit, a structure attached to the cabinet of the Ministry of Livestock to provide a framework for the implementation of policies and reforms. Livestock thefts are subject to passive surveillance based on the reports of thefts reported at the level of the gendarmerie services which establish hand-rails recorded on cards sent to the Directorate of Livestock.</td>
</tr>
<tr>
<td>Conflict</td>
<td>Beyond the multiple consultation frameworks locally initiated throughout the country, Senegal needed a long-term vision to secure pastoral land. In March 2013, the new authorities of Senegal decided to initiate the process of drawing up a pastoral code with the aim of enabling the country to have a legal framework updated and adapted to current realities of livestock in Senegal. The Senegalese Pastoral Code will make it possible to update all existing laws and to formalize the livestock development framework in Senegal.</td>
</tr>
</tbody>
</table>
Population-specific discussion and conclusion

In Senegal, smallholders’ attributes, along with uncertainty in outcomes, general socio-economic context (prices, rural practices, political and logistical challenges), environmental risks and the potential risk aversion of decision-makers, contribute both to limit access to finance and to constrain livestock productivity. To insufflate a real growth dynamic in the sector, livestock stakeholders have to invest, and in most cases, they depend on credit to do that. However, credit rationing, due also to persistent risks in the livestock sector, is one reason for the mismatch between credit supply and demand. The link between overall persistent risks and reduction of available credit is very weakly addressed even if in Senegal, this was already evoked during the 1988–91 banking crisis, showing how drought precipitated the closure of seven banks (Caprio and Klingebiel, 1996).

Policy developments in recent years seem to be moving forward towards creating an enabling environment. For risk mitigation, risk transfer, and risk coping, GoS launched various initiatives to address different degrees of severity. Amongst them, livestock insurance development, as a risk transfer instrument, should contribute both to reducing vulnerability by giving compensation options against economic losses that prevent smallholders in particular from using suboptimal coping strategies that further weaken a precarious food and nutritional status, or keep people away from limited basic infrastructures (school, health centres, markets etc.); and to developing productivity through revitalized investments.

In conceptual terms, the time has also come to begin thinking seriously about the best way to go beyond short-term loans and to design dynamic models that allow decision-making under uncertainty and incorporate long-term borrowing with a view to stabilizing the emerging of a real business environment.

References


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