Multi-stakeholder Partnership Project on Climate and Disaster Risk Financing in Senegal

Project

Index-based insurance in Senegal: presentation of the sector and overview of stakeholder engagement in the political dialogue

ENDA-Energy:

September

2020

List of acronyms and abbreviations

AFD: French Development Agency

ARS: Sahel Crop Insurance

CIDA: Canadian International Development Agency

ACEP: Alliance for Credit and Savings for Production

ANACIM: National Agency for Civil Aviation and Meteorology

BAME: Bureau of Macroeconomic Analysis

BOAD: West African Development Bank

CDPAI: Committee for the Development and Promotion of Index-Based Insurance

CIMA: Inter-African Conference of Insurance Markets

CINSERE: Climate Information Service for Increased Resilience

CMS: Crédit Mutuel du Sénégal

CNAAS: National Agricultural Insurance Company for Development

CRCA: Regional Insurance Control Commission

ENSA: National Higher School of Agriculture

IFAD: International Fund for Agricultural Development

ILRI: International Livestock Research Institute

ISRA: Senegalese Institute for Agricultural Research

LBA: The Agricultural Bank

LOASP: Agro-Sylvo-Pastoral Orientation Law

MAER: Ministry of Agriculture and Rural Development (MAER)

MEDD: Ministry of the Environment and Sustainable Development

MEPA: Ministry of Livestock and Animal Production

NDVI: Normalized Difference Vegetation Index

OSIRIS: Integrated Service Offer in Rural Areas for Social Inclusion

WFP: World Food Programme

PAMECAS: Partnership for Mobilizing Savings and Credit in Senegal

PNDA: National Agricultural Development Plan

PNDE: National Livestock Development Plan

SOGAS: Senegal Slaughterhouse Management Company

UCAD: Cheikh Anta Diop University

EU: European Union

UGB: Gaston Berger University

USAID: United States Agency for International Development

SUMMARY

Introduction

Index-based agricultural insurance is a way to manage agricultural risks by creating an index that triggers compensation instead of actual damage. The underlying idea is a strong correlation between the state of nature and the index. For example, if agricultural income depends on the final state of crops, which in turn depends on climatic parameters, all other things being equal, then insuring harvests is equivalent to insuring against climatic hazards. Furthermore, the advantage of this type of insurance is that it eliminates moral hazard and adverse selection, which negatively characterize traditional insurance systems. Indeed, the index that triggers compensation is assumed to be accessible, verifiable, and defined transparently. Under no circumstances should stakeholders be able to influence its values. Conceptually, the most general term for this type of insurance is "index-based agricultural insurance." This is a sort of abbreviation for the longer expression "index-based agricultural insurance." The specific form that index-based agricultural insurance takes depends on the type of index that triggers compensation. Apart from the yield index, which provides coverage for an average yield, climate indices are mainly based on water balance, vegetation, cumulative rainfall, or temperature (Sarr *et al.,* 2012).

I. Index-based insurance or climate insurance: the key concepts

1. Agricultural microinsurance, index-based microinsurance and microinsurance indexed agricultural

By analogy with microfinance, microinsurance consists of implementing means enabling populations excluded from the traditional financial system to protect themselves against risks to their person, their property, or their activities.

a. Agricultural micro-insurance

These are means by which rural producers can protect themselves against agricultural risks in the broadest sense, primarily those related to farming, fishing, and livestock. Like any conventional insurance, the insured capital is negotiated in advance, and compensation is only paid after the actual damage has been assessed. This entails significant costs for the insurer simply to assess the damage, which often turns out to be multivariate.

b. Index-based agricultural micro-insurance

Index-based micro-insurance for agriculture can be seen as an innovative mechanism enabling producers in developing countries without access to traditional financial systems to protect themselves against agricultural risks that lead to poor harvests. It is innovative because, unlike conventional insurance, compensation is triggered by indices validated *in advance* by the various stakeholders. These indices are correlated with damages in such a way that simply monitoring them provides real-time visibility of claims and triggers compensation payments.

c. Index-based micro-insurance

This still concerns index-based agricultural microinsurance, but in a broader sense, considering, for example, livestock through index-based livestock microinsurance. Index-based livestock insurance is not yet being tested in Senegal, but it is very common in East Africa. Indeed, after its initial foray into index-based agricultural microinsurance, index-based microinsurance is poised to expand into all sectors where it is possible to construct indices that can replicate the same mechanism.

The idea is always to offer innovative and accessible tools to populations excluded from the traditional financial system, enabling them to protect themselves against the risks they face.

2. Indices: yield indices, climate indices, and satellite indices

Several indices are used to construct index-based micro-insurance products for agriculture, particularly in developing countries. Alongside yield indices, the work of Sarr *et al.* (2012) distinguishes, based on the methods and parameters used in their construction, rainfall indices, ranging from simple cumulative rainfall to water balance, and a satellite vegetation index that can be used within insurance systems. Yield indices are classified as direct indices because they are based on a correlation with yields and are thus distinguished from climate and satellite indices, which are classified as indirect indices (Thérèse *et al.* 2014).

a. Performance indices

These are indices constructed based on the average yield of a geographical area assumed to be homogeneous in terms of agricultural characteristics. In practice, this involves calculating the average yield of the chosen geographical area after harvest and then compensating producers whose yield is below average, regardless of the cause of the yield loss. However, yield index insurance can be subject to significant spatial basis risk depending on the homogeneity and extent of the area covered by the index.

b. Climate indices

These indices use strict meteorological parameters to track the climatic conditions in which crops grow. They reflect the correlation between climate (rainfall, temperature, humidity, etc.) and the crop life cycle. Index-based agricultural insurance is sometimes referred to as climate-based agricultural insurance when it uses these indices.

c. The seasonal rainfall accumulation index:

This is a fairly simple index that uses only the cumulative rainfall for the season, comparing the amount of rain recorded at a weather station with its historical averages. Yield losses are thus assessed based on their correlation with the historical rainfall average for the area. However, this index does not take into account the distribution and frequency of rainfall, which, like the absolute total rainfall, can also have an impact on yields.

d. Water balance or water requirement indices:

The originality of these indices lies in their consideration of crop water requirements by establishing thresholds of relevance or effectiveness to identify rainfall excesses or deficits that could be detrimental to crops. These indices include the three-phase parametric drought index, which considers water requirements during the vegetation, development-flowering, and maturation phases of crops; the water deficit index, which eliminates light or insignificant rainfall; the relative evapotranspiration rate; and the crop water requirement satisfaction index.

e. Vegetation indices or satellite indices

Vegetation indices are radiometric measurements of the spatial and temporal variability of photosynthetic activity in vegetation (Caloz and Puech, 1996). The most commonly used vegetation index is the *Normalized Difference Vegetation Index* (NDVI). High values of this index indicate good vegetation vigor.

However, good plant vigor does not necessarily lead to good yields.

II. Agricultural Insurance in Senegal

1. The Creation of the CNAAS

The agricultural reform in the broadest sense proposed by Senegal through the Agro-Sylvo-Pastoral Orientation Law (LOASP) No. 2004-16 of June 4, 2004, emphasizes the transformation and promotion of family farms so that they move from extensive systems to intensive systems that promote rural entrepreneurship, increased productivity, food security and self-sufficiency, and poverty reduction. The National Agricultural Development Plan (PNDA) and the National Livestock Development Plan (PNDE) are developed and implemented on the basis of the LOASP, which has been the compass for agricultural policies since 2004. Even though after 16 years of existence, several of its implementing decrees are slow to be implemented, its articles 56 and 57, included in its chapter 13, title III, motivated the creation of the CNAAS on July 28, 2008, and **Ministerial Order No. 1289 dated February 10, 2009, granting it its approval.**

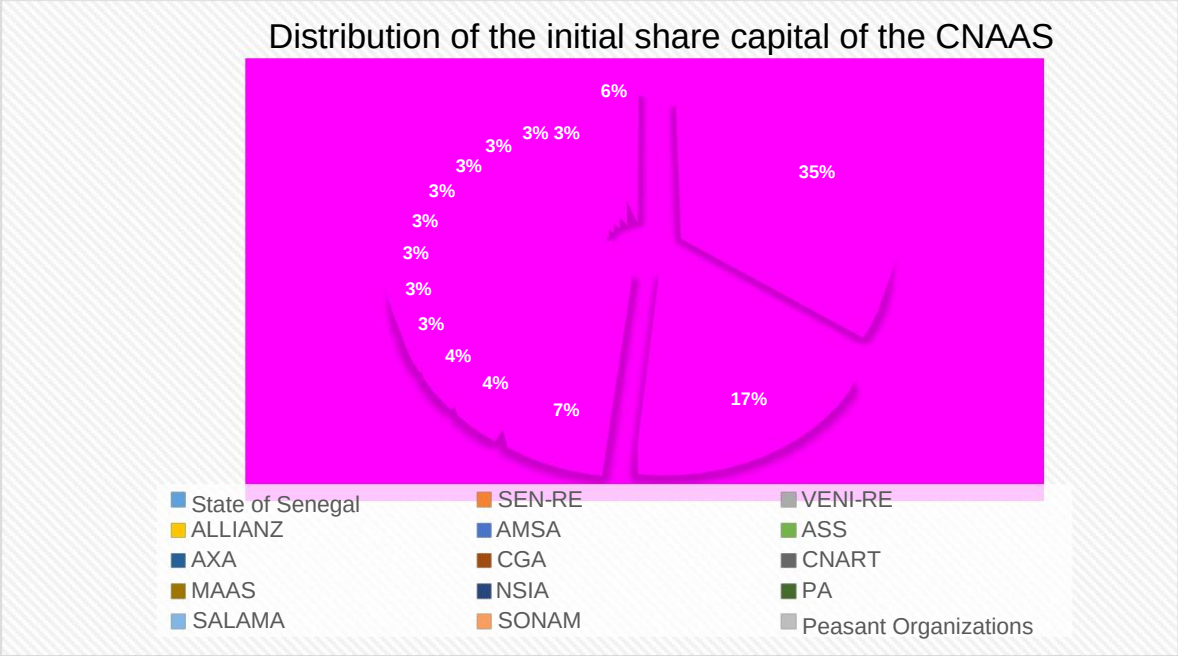
- **Article 56 of the LOASP:** Protection against natural disasters and risks related to agro-sylvo-pastoral activities is ensured by the State.
- **Article 57 of the LOASP:** The State, in consultation with the organizations agricultural professionals, defines and implements a policy to support agricultural insurance, in order to secure production, income and equipment.

CNAAS is a public-private partnership established as a public limited company (SA) with a board of directors and an initial capital of 1,500,000,000 CFA francs, distributed

between :

- the State of Senegal (36%)
- insurance and reinsurance companies (56%)
- farmers' organizations (7%)

Figure 1: Distribution of the initial share capital of the CNAAS



CNAAS obtained the favorable opinion of the Regional Insurance Control Commission (CRCA) of the Intergovernmental Conference of Insurance Markets1 CIMA during its December 2008 session held in Libreville.

" In *2016, CIMA introduced a reform that increased the minimum share capital for public limited insurance companies from 1.5 billion to 3 billion FCFA and the minimum establishment fund for mutual insurance companies from 800 million to 3 billion FCFA (see Regulation No. 007/ CIMA/ PCMA/ CE/ 2016 amending and supplementing Articles 329-3 and 330-2 of the Insurance Code relating to the share capital of public limited insurance companies and the establishment fund of mutual insurance companies). CNAAS's capital thus increased to 3 billion FCFA in 2019 and is expected to reach 5 billion FCFA in the near future, according to a statement by its Chairman of the Board of Directors (Mr. Mamadou Baïla Kane) at the last Paris International Agricultural Show in February 2020. "*

2. CNAAS products

CNAAS currently offers insurance products for farmers in the agricultural sector, primarily targeting small family farms, and for livestock farmers in the peri-urban, intensive and semi-intensive livestock sector.

Extensive or pastoral farming is not excluded for this latter product, but there are constraints.

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[1] The Inter-African Conference of Insurance Markets (CIMA) includes the following countries: Benin, Burkina Faso Burkina Faso, Cameroon, Congo, Ivory Coast, Gabon, Guinea-Bissau, Equatorial Guinea, Mali, Niger, Republic Central African Republic, Senegal, Chad, Togo.

related to mobility and the form of this insurance, which is sold as a single policy for each head of livestock, makes it less accessible and attractive to pastoral farming.

a. Agricultural insurance products

The agricultural products currently offered by CNAAS can be grouped into three main categories: crop loss insurance or classic multi-risk insurance,
Index-based crop drought insurance, and agricultural equipment insurance.

Crop loss insurance or standard multi-risk insurance

Traditional agricultural insurance is an agricultural insurance product that takes the form of an indemnity-based insurance. In other words, reimbursements in the event of a claim are made based on an assessment of the actual damage in the field and an estimate of its extent. This form of insurance was the most common practice at CNAAS between the date it received its accreditation in 2009 and the implementation of the first pilot programs in index-based agricultural insurance within the framework of the Sahel Crop Insurance (ARS) project. Specifically, under traditional crop insurance, premiums are individualized according to each farmer's level of risk exposure, and experts (such as agronomists or veterinarians) are sent by the insurer to confirm the circumstances surrounding the claim and its extent.

This type of product covers irrigated field crops: cereals (rice, maize, millet, sorghum, sesame, etc.), legumes (cowpeas), and cash crops (peanuts, cotton, etc.), as well as market garden crops (onions, processing tomatoes, potatoes, etc.). These products are offered primarily to farmers in the Senegal River Valley and those operating in the Niayes region. The risks covered include drought, bushfires or heat waves, floods or excessive rainfall, and locust infestations. Compensation is determined based on the producer's declaration, followed by an assessment and verification of the damage by an agricultural expert sent to the field. The premiums are set at 10,000 FCFA per hectare for irrigated field crops and 18,000 FCFA per hectare for market garden crops.

Index-based crop insurance for drought

This type of product primarily concerns rainfed agriculture, particularly major rainfed cereal crops **(rice, maize, millet, sorghum, sesame,** etc.), rainfed legume crops **(cowpeas) ,** and cash crops **(peanuts, cotton ,** etc.). The risk covered is drought (calculated based on relative evapotranspiration satellite data provided by EARS). The peanut and dryland cereal production process is divided into three phases: the **vegetative phase,** the **flowering phase ,** and the **seed maturation phase.** The duration of each phase and the associated coverage level vary depending on the crop and are detailed in the appendices. The duration of each phase and the associated coverage level were determined during meetings with peanut farmers. The main difference between conventional and index-based insurance lies in the approaches to determining and calculating losses. While for the first it is the assessment of actual damage on the ground that triggers compensation, for the second it is the values taken by

indices calculated on the basis of rainfall or evapotranspiration data which trigger compensation.

Depending on the mechanism used to design the indices that trigger compensation, we will distinguish:

- Index-based insurance based on ground-level rainfall indices - Index-based insurance based on satellite indices
- Index-based insurance based on average returns

Agricultural equipment insurance

For agricultural equipment, the insurance covers the risks of fire, machinery breakdown, and theft. For agricultural infrastructure, the insurance covers the risks of fire, water damage, and theft. For agricultural stocks or the contents of infrastructure, the insurance covers the risks of fire, water damage, theft, and pest damage.

b. Livestock insurance products

These are insurance products that cover the risk of natural or accidental livestock mortality. All types of producers can apply for this type of insurance at the various CNAAS offices throughout the country.

All-risk livestock mortality insurance offers farmers protection against the risks of natural or accidental death of livestock, or authorized slaughter. Annual coverage rates vary depending on the type of livestock, ranging from 6% to 9% of the animal's value. Coverage includes cattle, sheep, goats, horses, and pigs.

Accidental Livestock Mortality Insurance offers farmers coverage against the risk of accidental livestock death. Annual premiums vary depending on the type of livestock, ranging from 2% to 3% of the animal's value. As with all-risk mortality insurance, the livestock covered includes cattle, sheep, goats, horses, and pigs.

Poultry Mortality Insurance

It offers a guarantee against the risk of poultry death resulting from accident or disease.
Annual insurance rates vary depending on the type and season of the poultry. They range from 1.25% to 3%. Rates range from 3 to 5 CFA francs per kilogram of carcass, and the insured values are determined by mutual agreement with the poultry farmer.

c. Insurance products for activities indirectly related to livestock farming

These are insurance products designed to cover income-generating activities within the livestock value chain. They are therefore activities located at a lower level of the value chain or are simply indirectly linked to animal production.

Meat industry multi-risk insurance

It guarantees butchers and wholesalers who regularly use the services of SOGAS (Senegal Slaughterhouse Management Company) coverage against risks

total or partial seizure of animals slaughtered for reasons not attributable to them.

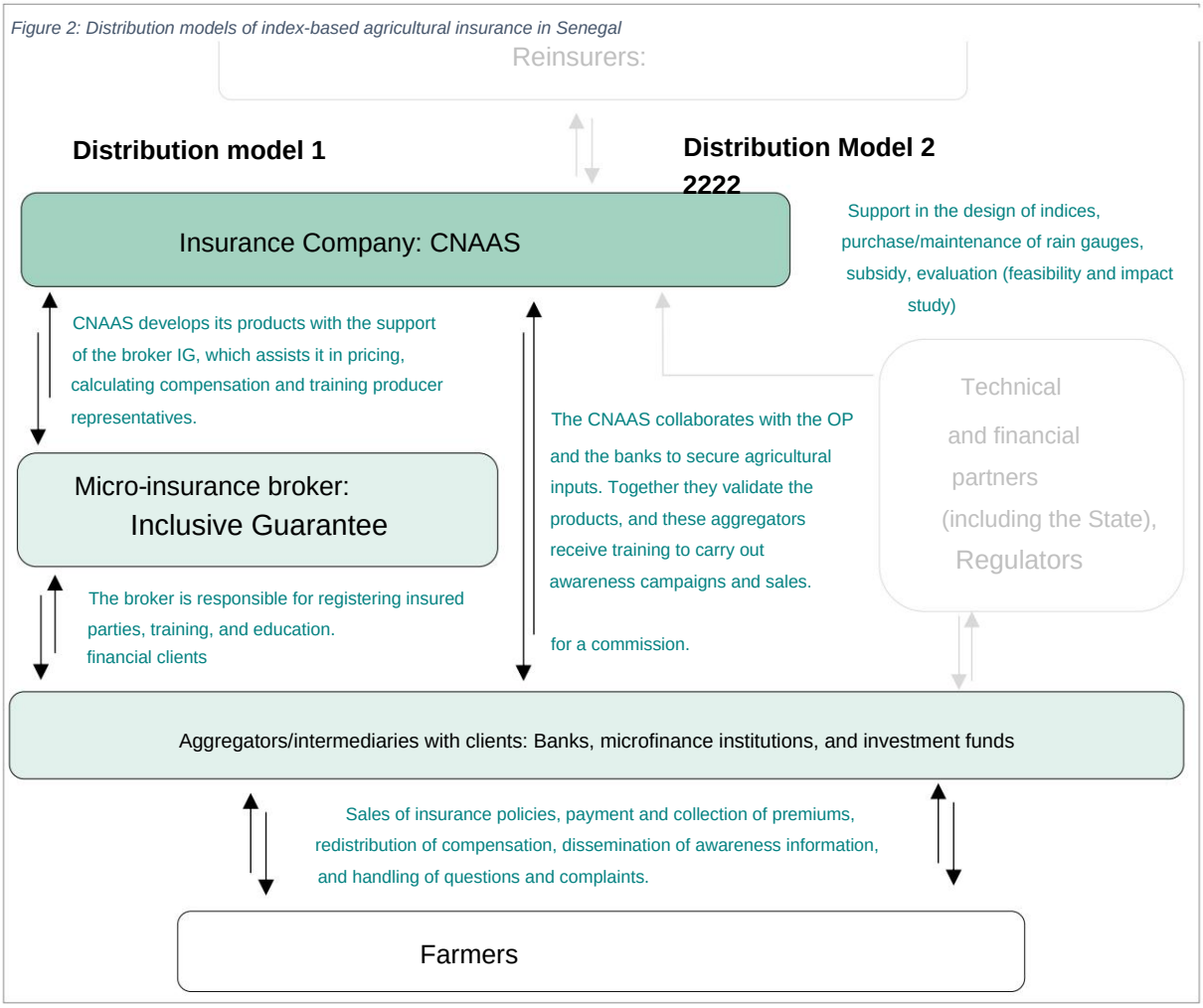
Comprehensive insurance for horse-drawn vehicles guarantees compensation in the event of accidental damage to the horse-drawn vehicle (horse and cart) and material damage caused to others by the vehicle. The premium for annual coverage averages 25,000 FCFA per horse-drawn vehicle. A revision of this policy is expected soon to include passengers.

3. Index-based insurance distribution model in Senegal

Compared to traditional insurance, index-based insurance is a complex product in both its design and implementation, generally involving three direct actors: the clients who sign contracts with the insurer and pay premiums; the insurer who receives the premiums and commits to providing reimbursement in the event of a claim; and the index developers. In fact, insurers purchase the index from specialized institutions and sometimes through a broker, especially when they are entering the market.

Since the introduction of index-based insurance in Senegal in 2012, we can distinguish two distribution methods for index-based agricultural insurance, primarily distinguished by the intermediation between the CNAAS (National Agricultural Insurance Fund) and aggregators, notably through the microinsurance broker Planet Guarantee, now known as Inclusive Guarantee. The following figure, inspired by Syll and Weingaërtner (2016), presents a summary diagram of these two distribution methods.

Figure 2: Distribution models of index-based agricultural insurance in Senegal



Distribution methods can be summarized into two main types. In both cases, CNAAS uses an aggregator intermediary (which aggregates customer demand to offer insurance). The only difference is that CNAAS has delegated part of its portfolio concerning certain aggregators to Inclusive Guarantee. Inclusive Guarantee collects premiums for CNAAS and conducts training and awareness-raising activities.

The CNAAS is responsible for ensuring that the managers of these aggregators provide reimbursements to their members or clients. However, for most of its clients or aggregators, the CNAAS manages its portfolio directly. It collects premiums directly and provides training for these clients itself.

In the second distribution model, the aggregator acts as an intermediary between producers and the insurer. This intermediary can be a credit institution, a farmers' organization, or any other formal institution to which the producers are affiliated. Often, the aggregator offers insurance as part of a package of products it already provides: insurance + credit, insurance + seeds + fertilizer, etc. The intermediary may decide to make insurance mandatory for accessing its other services or leave the choice to its clients or members. While in the early years of CNAAS's index-based insurance offering, individual producers affiliated with aggregating producers' organizations (POs) and microfinance institutions (MFIs) signed individual contracts with CNAAS and paid the premiums, currently, contracts have mostly taken the form of comprehensive portfolio insurance contracts signed between CNAAS and the aggregator. This is referred to as portfolio insurance because it is no longer the producer who is insured, but the bank or PO to which they are affiliated. This protects the bank's portfolio against drought risks because it works with clients or members who are exposed to these risks. These clients, from whom the premium is collected, are thus indirectly insured, in that the bank or the credit union does not have to repay part of their loan in the event of a claim, as the bank or credit union is reimbursed by the insurer.

It is important to emphasize, however, that there is no standard distribution method or universal mechanism for implementing index-based insurance. This is precisely what makes the product unique: it takes into account the agro-climatic realities of the area it aims to cover and its potential in terms of existing socio-economic networks (producer organizations) for disseminating the product. The forms of the product are, in fact, diverse and depend on the characteristics of the target areas. For example, the WFP and Oxfam R4 program, which operates in southern and eastern Senegal, requires beneficiaries to pay through community work for the first few years of their subscription.

III. Scaling up or increasing power

Index-based agricultural insurance in Senegal

Because index-based agricultural insurance is used as a development tool (IFAD and WFP, 2010) and, in this sense, offers low premiums to reach small producers, it needs to reach a large number of clients to be profitable. This is in the

In the search for a solution to weak demand, the concept of scaling up emerged. It simply refers to reaching a sufficiently large number of subscribers to move beyond the small-scale experimentation phase. Scaling up will therefore be effective when insurers are able to reach a number of subscribers that guarantees the system's sustainability without the support of the financial partners who currently back the sector. In concrete terms,

Two methods of scaling up index-based agricultural insurance can be identified. The first, which we call spatial or horizontal scaling up, would involve reaching several clients of the same status in a given locality, regardless of the agricultural sector.
The second, which we call scaling up vertical, consists of reaching all actors of different statuses on the same value chain or agricultural sector (producers, input suppliers, credit institutions, industrial processors, distributors, etc.) as soon as the risks can be transferred to them by the producers who constitute their members or customers.

"Currently, CNAAS bases its strategy for scaling up agricultural insurance primarily on the implementation of programs
linking agricultural insurance with producer loan coverage will highlight the importance of banks as a driver of insurance promotion, with a level of institutional structure that guarantees stability (approximately 53% of production in 2017 was linked to credit). Premiums issued will be independent of one-off programs (in 2017, only 4.6% of production was linked to partnership programs) and will instead be associated with long-term structures such as financial institutions (LBA, CMS, PAMECAS, ACEP, etc.), thus ensuring more stable growth over the long term.

(Source: Interview with CNAAS, 2020)

1. Meso-insurance

The term "meso-insurance" is used in agricultural microinsurance to refer to contracts signed between insurers and a representative of a producer group, known as an aggregator. The challenge of scaling up led to this initiative, which involves leveraging farmers' organizations, microfinance institutions, input suppliers, and processing companies to reach the largest possible number of farmers.

a. At the level of farmers' organizations (FOs)

With producer organizations (POs), insurers can reach all producers within the organization who are eligible for index-linked insurance. Eligibility depends on whether or not the index covers the geographical area where the PO member's field is located. This increases the product's distribution reach, and at the same time, the PO handles premium collection and...

the distribution of compensation, which at the same time reduces transaction costs for the insurer.

b. At the level of Microfinance Institutions (MFIs)

With microfinance institutions (MFIs), agricultural loans are often targeted to ensure repayment in the event of a disaster. Indeed, in the event of a shock, producers with low incomes may struggle to repay loans, thus transferring the burden of the disaster to the MFIs. Under these conditions, insurance guarantees producers access to credit and the ability to take on additional risk by adopting higher levels of investment thanks to the availability of secure financing. On the other hand, the MFI is also assured of recovering its loans in the event of a disaster. Ideally, to accelerate the scaling up of this system, MFIs would make insurance mandatory to secure agricultural loans. This is the case for some MFIs operating in areas with high default rates, such as the LBA (Agricultural Bank of Senegal) branch in the north of the country and, more recently, in the peanut basin, also for agricultural loans granted to the irrigated rice sector and winter crops.

However, mandatory insurance could lead to some applicants withdrawing from Crédit Agricole who might consider the interest rates too high. This would create a crowding-out effect that negatively impacts financial inclusion.

c. At the level of input suppliers and processing industries

Input suppliers (IS) are often forced by farmers to provide credit for their products until harvest time, under conditions of liquidity constraints. Similarly, industrial processors (IPs) sometimes finance production in order to purchase the harvests later. In the event of a disaster, the consequences can be negative for these suppliers.

Actors. The farmer may find himself unable to repay the inputs loaned at the beginning of the season, let alone supply/ sell to the ITs the portion of the production initially agreed upon. In this context, insurance distributed at the FI level to cover loaned products and at the IT level to cover the financing granted at the beginning of the season allows all producers registered with these two aggregators to be reached. However, in these forms of meso-insurance, financial education for clients to understand that it is the loan that is covered may be necessary, thus increasing the cost of the product. Indeed, the lack of financial education has led some producers in certain experiments to demand a share of the premium with the MFIs, for the simple reason that it is the lenders who benefit from reimbursements in the event of claims, who are merely repaying the creditors for the loans initially granted to the farmers.

2. The basic risk: a limit to manage to secure scaling up

Alongside all the advantages expected *a priori* from index-based insurance, it presents a major limitation known as basis risk. In this section, we introduce the concept of basis risk, focusing on the different types of basis risks identified by specialists and the literature on index-based agricultural insurance.

a. Positive basis risk and negative basis risk

The index that triggers compensation under index-based insurance is calculated from historical rainfall or satellite data. Its development involves climate data providers and agronomists specializing in the relationship between technical production methods and climatic conditions. Thresholds are then set to trigger compensation if the index falls outside an agreed-upon range. The location of the rain gauge is chosen to cover an area with homogeneous climatic characteristics. This could be, for example, a reference village that serves as a focal point for neighboring villages with which it is assumed to have similar rainfall. However, these choices are not always universally accepted. Indeed, perfect homogeneity does not exist within the areas, especially with regard to rainfall.

Furthermore, the index does not fully reflect the reality on the ground. Its values are not perfectly correlated with actual damage. We speak of a negative basis risk when a loss related to the risk covered by the index is actually observed, even though the index itself did not identify the loss. Conversely, if the index reports a claim and triggers potential compensation without any damage being observed on the ground, we speak of a positive basis risk.

b. Geographic basis risk and idiosyncratic basis risk

The most challenging limitation of index-based agricultural insurance is basis risk, which is the variability in the relationship between the loss value measured by the climate index and the actual loss incurred by the producer (Collier et al. 2009). Basis risk is explained by spatial variation in climate variables (especially in areas with local microclimates): this can be referred to as geographic basis risk; but also by differences in management practices, soil quality, or crop variety: idiosyncratic basis risk. Because losses are not individualized and the premium rate is the same for all policyholders, they will always bear the basis risk. According to Collier et al. (2009), a well-designed index-based agricultural insurance product can reduce (but not eliminate) basis risk. In particular, the index must reflect spatially correlated losses such as droughts or extreme temperatures. These authors further argue that the basis risk could be even lower if index-based insurance were defined solely to cover risks inherent in climate events. However, producers exhibit a cognitive bias that leads them to underestimate the likelihood of a climate disaster. Consequently, they do not take all the appropriate measures to prepare for it. They place greater emphasis on conventional risks than on risks of natural origin. Thus, they will only accept index-based insurance if it also covers these individual risks. Therefore, defining a climate insurance contract requires a balance between minimizing the basis risk and satisfying the demand for broader coverage, which can sometimes extend even beyond climate risks.

4. Review of actors involved in risk insurance in the agricultural sector

We distinguish two types of actors: first there are the actors who are directly involved in the implementation of index-based agricultural insurance projects and programs, then there are the actors who are involved in the political dialogue but who do not carry out activities related to making climate insurance products available to producers.

1. Implementing Actors

To date, six index-based agricultural insurance programs have existed in Senegal.
However, even though these programs differ in their approaches to offering this product to producers (labor-based premiums, premiums linked to credit or agricultural inputs, etc.), they all offer the same product as CNAAS, the sole insurer in the Senegalese agricultural insurance market. We will now present the various players in index-based agricultural insurance in Senegal and provide an overview of the six projects launched since 2012.

In 2009, amidst discussions on the prospects for developing index-based agricultural insurance in Senegal, the World Bank produced a report for the Senegalese government on the potential for developing such a product at the national level (The World Bank, 2009). The report's main findings showed that private insurers had no experience in agricultural insurance in Senegal and no understanding of the rural economy. Only the CNAAS (National Agricultural Insurance Company of Senegal), established in 2008, was able to operate in this sector, but it lacked both the expertise and the resources necessary to develop index-based insurance products independently. Generally speaking, index-based agricultural insurance programs in developing countries involve multiple stakeholders: policyholders, an insurer, a reinsurer, a coordinator (if necessary), technical partners, and promoters or financial partners. In Senegal, these actors included, among others:

1. Subscribers: Individual producers, Microfinance Institutions, Organizations
   Peasant women
2. Insurer: CNAAS (National Agricultural Insurance Company of Senegal)
3. Reinsurers: the example of Swiss Re and Africa Re
4. Broker: Planet Guarantee Senegal
5. Technical partners: CIRAD, IRI *(International Research Institute* of Columbia University), ANACIM (National Agency for Civil Aviation and Meteorology), ISRA (Senegalese Institute for Agricultural Research)
6. Promoters or financial partners: IFC/GIIF, AFD (French Development Agency) Development), Grameen Crédit Agricole Foundation, WFP (World Food Programme) CIDA (Canadian International Development Agency) primarily

not forgetting the Senegalese State which subsidizes agricultural insurance premiums up to 50%, a unique commitment of its kind in West Africa.

a. The insurer,

CNAAS is currently the only insurer providing index-based agricultural insurance in Senegal. It signs contracts to receive premiums and pay out claims in most of the projects launched. It works closely with the coordinator, *Planet Guarantee,* as Planet Guarantee previously possessed the necessary expertise to develop and market the product. However, *Planet Guarantee's* monopoly on index design during the initial pilot years is waning with the establishment of a group of index design experts by the World Food Programme (WFP). This group aims to provide CNAAS with local expertise capable of producing high-quality indices.

b. The broker

Coordination between stakeholders in the design and marketing of agricultural insurance is central to any index-based system. In Senegal, this coordination has so far been handled by *Planet Guarantee,* an accredited brokerage and consulting firm specializing in microinsurance. Planet Guarantee commissions the design of the indices from technical partners, develops the insurance product, and handles its marketing on behalf of the CNAAS (National Agricultural Insurance Fund) for a percentage of each premium sold.

c. Customers

Subscription to index-based insurance with the CNAAS takes place at two levels: at the micro level, contracts are signed by individual producers with varying degrees of involvement from intermediary aggregators; at the macro level, farmers' organizations
Microcredit institutions, acting as aggregators at the micro level, sign portfolio insurance contracts at the meso level. Indeed, even though producers ultimately bear the premium, access to the product often depends on the governance of these intermediary institutions to which they are affiliated. In other words, it is these institutions, through their leaders, that decide whether to allow their members access to these products by acting as an entry point for the insurer. This is how the idea of developing an index-based agricultural insurance contract, to which intermediaries subscribe directly to protect themselves against the risks they incur while working with members or clients exposed to covariant risks, was implemented. This currently allows CNAAS to insure part of the portfolios of LBA, CMS, and ACEP, which are exposed to drought risk.

2. The technical and financial partners committed to the development of index-based agricultural insurance

a. Public technical partners (ISRA, ANACIM and DAPSA)

Technical partners are public or private actors who participate in the
Product definition, and particularly in the definition of indices. Some of them provide the meteorological data necessary for constructing the indices. In

In our case, it mainly concerns ANACIM. It is a public agency that controls the meteorological stations, particularly rainfall stations, existing on the national territory.
It sells its data to various climate index insurance programs. This data is then made available to organizations such as ISRA and CIRAD (French Agricultural Research Centre for International Development), which develop the climate indices. For satellite indices, the main provider is the IRI at Columbia University in the United States. Promoters and financial partners are crucial to index insurance schemes in developing countries. Indeed, most programs are launched at their initiative. This is due to the complexity of the index-based agricultural insurance system. Entry costs are not always affordable for insurers and coordinators because of low demand and significant fixed entry costs related to the purchase and installation of rain gauges and the design of the indices.

b. Development partners (bilateral, multilateral and corporate cooperation) civil)

Since 2012, several initiatives have facilitated the development and distribution of index-based agricultural insurance against climate risks, primarily drought risks. These include development projects and programs in the agriculture and livestock sectors. While not exhaustive, we can cite insurance initiatives within the framework of the following projects and programs:

- The Sahel Crop Insurance (ARS) project managed by Planet Guarantee and financed mainly by the (Global Index Insurance Facility / International Finance Corporation (GIIF/IFC): the crops concerned were peanuts and maize for producers in the areas of Kaolack, Nioro, Kaffrine and Ndoffane.

- The Naatal *Mbay* project (formerly the Economic Growth Project) is a program launched and funded by USAID. The insurance product offered under this project also covered maize and millet in the Kaolack region.

- The R4 program, which is implemented by the World Food Programme in partnership with Oxfam, America: index-based insurance is considered within the framework of this project as a resilience tool for populations practicing subsistence agriculture.

- the BOAD (West African Development Bank) initiative for insurance
  Cotton sector index: The sectors concerned are cotton and maize in the
  regions of Tambacounda, Kédougou and Kolda for producers who work with SODEFITEX (Société de Développement des Fibres du Textile).
- The OSIRIS project (Integrated Rural Service Offer for Social Inclusion) funded by the EU and coordinated by the NGO Eclosio based in Thies (formerly Aide au Développement Gemboux: ADG)

- Index-based insurance for onion producers financed by CIDA, which is
  currently being launched.

c. The government through the Ministry of Finance and Budget

One of the primary actors in implementing index-based agricultural insurance against drought risks and all other agricultural risks covered to date is the government, through the Ministry of Finance and Budget. Indeed, the State of Senegal remains the main financial partner of the National Agricultural Insurance Company of Senegal through two crucial aspects:

- Participation in the CNAAS portfolio

In addition to having initiated the creation of CNAAS, which stemmed from a clear political commitment by the government to combat risks in the agricultural sector much more effectively, the State has been the company's main partner (see Figure 1 above on the distribution of CNAAS's capital). Indeed, the State of Senegal has been CNAAS's largest shareholder with 35.70% since its creation in 2008 and intends to maintain this majority shareholder position after the completion of the CNAAS capital increase process, which has just reached 3 billion CFA francs and could rise to 5 billion CFA francs by the end of 2022.

- Subsidies granted to producers

The State of Senegal, through the Ministry of Finance and Budget, subsidizes 50% of the insurance premiums offered by CNAAS. It also offers an exemption from the tax on insurance contracts to allow the most disadvantaged to access insurance and thus protect their assets.

5. Overview of the political dialogue surrounding insurance risks in agriculture and livestock farming

1. Evaluation of stakeholder participation in political dialogue

There is currently a political dialogue which allows, however imperfectly, the various actors involved in insurance against agricultural risks and more generally in climate risk management in Senegal, to meet and exchange on the different approaches, initiatives and directions to be developed for greater performance.
In the following table, we present the different actors involved in this dialogue, identify their role and try to assess their level of participation and involvement in order to get an idea of the environment in which the dialogue is taking place.
This allowed us, in the last column of the table, to make targeted recommendations presented as additional actions expected from each type of stakeholder to strengthen and sustain the dialogue.

Table 1: Evaluation of stakeholder engagement and participation in the policy dialogue on index-based livestock insurance

	Actors	**Role in the implementation of agricultural climate insurance policies**	**Expected role in the animation of the political dialogue**	**Evaluation of the participation to dialogue** [2]	**Additional actions are expected to strengthen and sustain the dialogue**
Insurers	CNAAS	Managing (climate) risk in the fields of agriculture, livestock farming and fishing	Sharing information with stakeholders (particularly civil society), providing support and commitment to research. Participating in ongoing activities. political dialogue	Very active	Sharing experiences, results, methods and strategic plans
Others Insurance Company Deprived of the Place	Axa, CNART, ALLIANZ, SEN-RE, AMSA, SNAM, NSIA, PA, ASS, etc.	To acquire a stake in the CNAAS		Little active3	To offer innovative insurance solutions.
Financial institutions	LBA, CMS, PAMECAS and other financial institutions that support family farms	Facilitating access to climate products from "insurers" and contributing to their marketing possibly link agricultural insurance to credit using different formulas adapted and relevant to producers	Share climate products and solutions distributions or linking climate insurance with credit	Enough active	Proposal of innovative marketing solutions
Civil Society (Organizations)	ASPRODEB, FNPC, RESOPP, etc.	Connecting their members with the CNAAS;	Representing the opinions of	Very active	Increase the number of feedback sessions

[2] Based on the organization of or participation in events related to agricultural insurance; the production of documents that directly or indirectly address related issues; or any other verifiable initiative that contributes to fostering dialogue on the subject. This does not include initiatives undertaken by internal structures.

[3] Apart from their commitment through the CNAAS

of producers)		To serve as a liaison in education and raising awareness among producers;	producers in the debate and to provide them with the main recommendations		recommendations and results of the dialogue with grassroots producers.
NGO (Organizations) No Government ale)	Eclosio (formerly ADG), La lumière; IED Afrique; CARITAS.	Implementation of projects or policies for the development of agricultural insurance against climate risks or inclusion in agricultural development projects or strategies to combat climate change.	Coordinate the animation of the Political dialogue, Disseminate the results and work to maintain the commitment of the various parties	Inactive	Sharing experiences, contributing to the seeking solutions for improved performance and adoption.
Think Tanks, Universities and research centers and some services state techniques	IPAR, CRES, Gaston Berger University, Cheikh Anta Diop University, ENSA (National Higher School of Agriculture), ISRA (Senegalese Institute of Agricultural Research), ANACIM, ANSD, DAPSA, ILRI, IFPRI.	Produce data and results high-quality and tailored research to support the efforts of all stakeholders and to answer the various technical questions raised by the political dialogue.	Sharing research results on insurance and climate risk management in general, and taking an interest in research questions that go beyond the debate.	Enough active	To produce more scientific results on key issues related to the accessibility of insurance, its usefulness, its impact, the issue of subsidies, etc. Initiate more and more moments of sharing and discussion
State and local authorities	Ministry of Agriculture and Rural Development (MAER), Ministry of the Environment and Sustainable Development (MEDD), Ministry of Livestock	Define and direct policies for the development of agricultural insurance against climate risks; To support all initiatives undertaken by stakeholders to develop this risk management tool;	Participate in the debates, commit to the adoption and implementation of the dialogue's recommendations (based on the results of action research,	Little Active	Share public policies for agricultural development and combating climate change with stakeholders in the dialogue so that recommendations so that they can better

	and Productions Animals (MEPA)		workshop or evaluations that have been shared and validated).		integrate
Bilateral partners and multilateral	WFP, FAO, IFAD, World Bank, AfDB, BOAD, Oxfam, Canadian Cooperation, AFD, GIZ, USAID etc.	Supporting the State and local authorities in their policies for developing insurance (agricultural, livestock or fishing) against climate risks.	Participate in the dialogue by sharing experiences and lessons learned and by inviting all actors to do the same.	Quite active	Increase the sharing of experiences and strengthen the facilitation of dialogue through the organization and regular participation in sharing sessions.

Source: Consultant's Construction

2. Relevant dialogue topics for index-based risk insurance climates

a. What risks should be insured?

The risks covered by index-based insurance related to climate variability are currently limited to drought-related risks, as discussed above in the products offered by CNAAS. However, the climatic phenomena that pose problems for farmers are not limited to this single risk. Indeed, as perfectly illustrated by this particularly rainy year, which is forecasting a potentially very good 2020/2021 agricultural season, flooding has been observed in some areas, notably in the Anambé basin in Casamance. Other winter crop areas in the peanut basin also risk losing part of their production due to their exposure to flooding.

Flood insurance, in addition to drought insurance, is therefore a relevant consideration within the framework of index-based agricultural insurance. Indeed, this issue is frequently raised in policy discussions led by producer organizations and is supported by research findings that have highlighted a strong demand from local communities. It should be noted, however, that this product already exists on the supply side of traditional (or conventional) agricultural insurance. In fact, multi-risk insurance or crop loss insurance covers flooding, but it is not simply an index-based product and is therefore more expensive.

The ideal solution would therefore be to take it into account within the framework of the drought index insurance product by calibrating the indices so that they also take into account excess rainfall as is already the case for insufficient rainfall or periods of dry weather.
The debate in this direction must be initiated and supported by all stakeholders to make index-based climate risk insurance in Senegal more comprehensive and attractive.

b. The sustainability of the subsidy?

Since the creation of the CNAAS, premiums have been subsidized by the State of Senegal at a rate of 50%. This demonstrates the government's commitment to ensuring that the CNAAS plays a key role in agricultural risk management in Senegal. The CNAAS has also benefited from the support of other partners, such as those mentioned above, including the World Bank, USAID, WFP, BOAD, and CIDA, which have enabled the development of drought insurance indices, the training of CNAAS staff on this new tool, and the installation of automatic rain gauges for collecting ground rainfall data in most of the country's winter crop areas (notably the groundnut basin, Eastern Senegal, and Upper and Lower Casamance). All these combined efforts have enabled CNAAS to increase the number of its insured members from less than 500 to nearly 200,000 between 2009 and 2019, corresponding to a turnover that increased from approximately 40 million to more than 1.5 billion FCFA over the same period.

The limitations of government support for CNAAS through subsidies are becoming quite clear in the context of CNAAS's expansion. Indeed, half of CNAAS's revenue is owed annually by the Ministry of Finance and Budget. Expected payments from the government have thus increased from less than 25 million to nearly 750 million FCFA. This situation has significant consequences for the government's ability to make timely payments and, consequently, for the company's capacity to effectively mobilize these funds to continue financing its growth. The legitimate question that arises is whether the government should continue to subsidize premiums. If so, is there another way to proceed? Recent meetings within the framework of the dialogue on climate risk insurance organized by ENDA highlighted an idea from CDPAI: to explore the possibility of providing targeted subsidies to producers who need them most. Dialogue on this issue must be maintained and, above all, involve the Ministry of Finance and Budget in order for a lasting solution to be found.

found.

c. Strengthening the financial education of producers

In a recent contribution, UGB and IPAR, in collaboration with CNAAS, highlighted several obstacles related to communication about index-based agricultural insurance in Senegal. The contribution, presented as a guidance note for the project evaluating the impact of index-based agricultural insurance on farmers' living conditions, demonstrated that accurate information about how index-based insurance works and its characteristics does not always reach producers at the grassroots level, despite the efforts of CNAAS and its broker in terms of training and the production of visual communication tools. This is explained by the presence of several intermediaries between CNAAS and its end client. The graph below highlights the various sources of inefficiency identified in the dissemination of information on index-based insurance.

from the insurer to the end customer. This mainly involves leaks or distortions of information during the return of information initially shared by the CNAAS, or primarily a break in the information transmission chain before

its access to the end customer.

The dialogue between stakeholders could then focus on ways to move towards more direct communication between the client and the insurer. In collaboration with USAID/CINSERE, CNAAS is currently working with ANACIM on the implementation of a digital information platform that will allow insured producers to receive climate information and information related to the agricultural insurance products they have purchased (primarily index-based drought insurance).

Data on whether or not a producer is insured, the risks covered, the amount of coverage, the rainfall recorded within their coverage area, and ANACIM's climate forecasts could thus be sent directly to producers via audio messages and SMS. This system, which does not require

Internet access would help overcome current obstacles to raising awareness among insured producers. However, to ensure that awareness reaches beyond insured producers and is democratized, all stakeholders must engage, and traditional awareness mechanisms must be strengthened through dedicated projects and programs that directly engage producers at the grassroots level.

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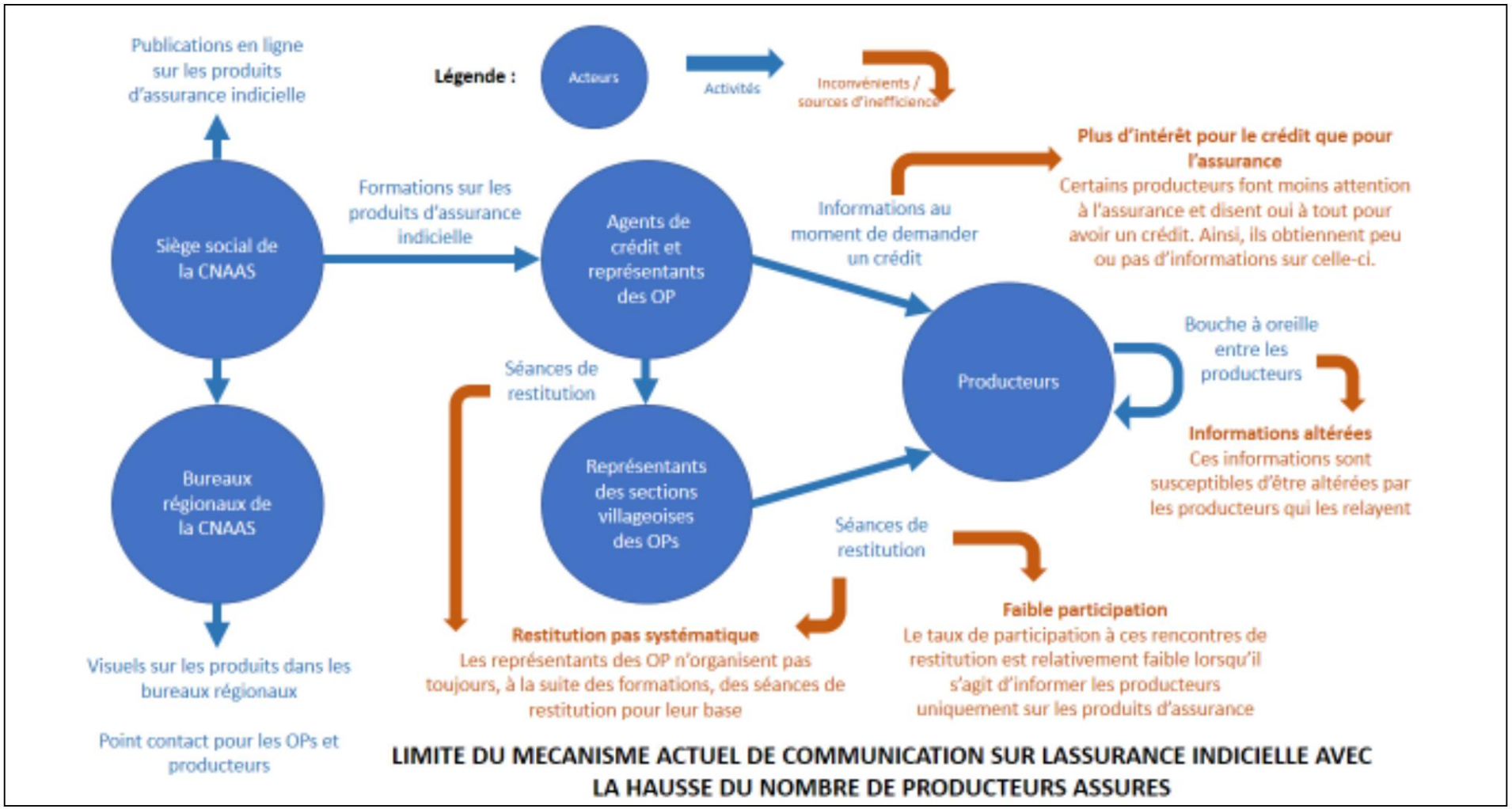
Figure 3: Sources of inefficiency in the communication mechanism for index-linked insurance



d. The problem of developing index-based livestock insurance

Index-based livestock insurance has not yet been implemented in Senegal eight years after the introduction of index-based agricultural insurance. However, discussions on the relevance of this product for Senegalese livestock farming and benchmarking with existing models in East Africa have fueled the political dialogue on this subject. For the past three years, this dialogue has been primarily driven by the BRACED program for resilience, within the framework of various projects such as securing livestock mobility corridors, as well as the recent study on pastoral herders' perceptions of index-based livestock insurance conducted by IPAR (Syll, 2019). The main questions in the current debate on index-based livestock insurance focus on how to ensure that pastoral herders benefit from it in a context marked by high livestock mobility, which is also a means of resilience for adapting to the risks of drought. Indeed, the index-based insurance model to be proposed for livestock farming, and more specifically for pastoral livestock farming, should in no way reduce or replace existing traditional mechanisms, especially if these have already proven their effectiveness. The political debate must therefore continue and be informed by research findings such as the feasibility study recently launched by the International Livestock Research Institute (ILRI).

3. Dialogue platforms on index-based agricultural insurance

a. The CDPAI: a space for exchange with limited scope

The Committee for the Development and Promotion of Index-Based Agricultural Insurance (CDPAI) was established at the inception of index-based agricultural insurance to harmonize the interventions of various initiatives, including those of the World Bank through the GIIF, the WFP and Oxam through the R4 program, and USAID through Naatal Mbay. The committee served as a platform for exchange, meeting every three to four months under the chairmanship of the CNAAS. Its members were the direct stakeholders implementing projects or programs with an index-based insurance component, or the organizations with which they collaborated in such projects or programs. These included ISRA and ANACIM.

b. Sharing workshops within the framework of projects and programs

As part of implementation initiatives by development partners, sharing workshops are often planned to present the results of programs and projects and potentially produce capitalization documents. For example, the World Food Programme (WFP), in collaboration with the National Agricultural Credit Fund (CNAAS), organized *a day of sharing and reflection on index-based insurance in Senegal on November 15, 2017, at the Radisson Blu Hotel in Dakar, as part of the R4 project.* Similarly, USAID/ Nataal Mbay produced a capitalization document on agricultural insurance in general and index-based insurance in particular at the end of the project, in collaboration with IPAR.

c. Scientific research

Alongside programs and projects implementing index-based agricultural insurance, there are also research projects that have tried to draw lessons and have attempted to...

Sharing to contribute to political dialogue. This includes, in addition to feasibility studies for various projects and programs, impact assessments of the R4 program in Senegal, the impact assessment of the link between index-based insurance and agricultural credit that UGB is currently implementing, the feasibility study of index-based livestock insurance conducted by the BRACED program for resilience, the feasibility study on the same subject recently launched by ILRI, the study on the perceptions of pastoral herders also carried out by the BRACED program, and the study on the comparison of index-based insurance indices launched by INRA but which could not be completed. Alongside these research projects, dissertations and theses have been completed in various institutions, notably at the Bureau of Macroeconomic Analysis (BAME) of ISRA, ENSAE, UCAD, and UGB. These contributions have also fueled the dialogue at several levels.

Conclusion

Agricultural insurance has now earned its place as a necessary, even indispensable, component in strategies for managing climate risks affecting agriculture.
It is not presented as a panacea, but beyond assessment and prevention, ex-post climate risk management cannot do without it in its current form of index-based agricultural insurance. Even if adaptation to climate change can extend to a modification of production systems, it is not sufficient to guarantee zero risk. In this respect, index-based agricultural insurance offers two main advantages identified in the IFAD and WFP report (2010) and reiterated by Thérèse et al.

(2014). It can be used as "a disaster relief tool" and as "a driver of development, even of poverty reduction." As a disaster relief tool, it helps safeguard people's livelihoods by providing faster responses; and as a driver of development and poverty reduction, it helps secure and then increase [for example].

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