



Case Study Index-Based Insurance for West Africa: Smart Agriculture Towards Food Security

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“We tend to talk about hunger in terms of data, percentages, but once you see a child dying of hunger it compels you to act and to do more. It is an obscenity and tragedy in particular because it is preventable.” Aids are not enough to curb food shortages in the continent, more resilient and sustainable programmes should be put in place in order to find a long-lasting solution. Agriculture is a big part of this new anti-famine strategy. African governments should invest more to make agriculture more resilient to shocks, modernize the agricultural sector and develop consistent crops management programmes. [Excerpt from <http://afrika-news.com/agriculture-key-africa-food-crisis/>]

Ayassor Tchambakou, Commissioner of Agriculture, Environment and Water Resources, looked out of the window of the Lomé airport, to where the plane to Abuja was parked. He would meet with the Chairman of ECOWAS¹. The meeting was central to the work his team had done over the last two and a half years surrounding [index-based insurance](#) (see Attached FAQs). Tchambakou had proposed to pilot index-based insurance for smallholder maize farmers in Nigeria to boost food production towards food security. This came after a meeting of the Food and Agriculture Advisory Committee at the ECOWAS summit in Abuja in December 2016. A Nigerian newspaper at the time quoted him saying, “We need to address how to make West African agricultural production climate-adaptive; we are paying serious attention to climate-smart agriculture – which looks at how to make our agriculture responsive to climate challenges”. The work of his team had since culminated in a report that proposed index-based insurance as a better way of helping farmers to deal with weather challenges. Then, just over two years later (February 2019), Tchambakou again travelled to Abuja to present the proposal at the ECOWAS meeting. Based on the report, Terms of References (TORs) were drafted for the Nigeria Agriculture Risk Management Strategy (2020-2025) which sought to use index insurance as part of a broader agriculture risk management strategy to address disaster risk related to climate change, irregular rainfall and persistent drought. Before signing off the TORs, the Chairman of the ECOWAS Commission had asked the question: **“What would be the role of government and how sustainable is the index-based insurance approach?”**

¹ The ECOWAS Commission is the policy implementing body of the West African region, comprising of eight French-speaking and six English-speaking countries.

Context:

In Africa, the Western African region accounts for 60% of agricultural GDP and is the biggest driver of volatility in the region (FAO, 2016). Under-developed linkages between farmers and markets, limited access to affordable and reliable high-quality seeds and fertilizer, lack of information on new agricultural technologies and best practices as well as limited risk management mechanisms inhibit agricultural productivity. As a result, the region has experienced some of the lowest per hectare crop yields in the world, and 13.5 percent of its population is undernourished (FAO, 2016).

Agricultural productivity has huge implications for food security in the ECOWAS region and low agricultural yields have become a cause for concern to the Commission. For instance, in May 2008, the then Speaker of the ECOWAS Parliament, Mahamane Ousmane, raised the issue of the looming world food crisis during the opening ceremony of the first ordinary session of the ECOWAS Parliament for 2008 in Abuja. He called for an "offensive" to be launched against food insecurity in the ECOWAS region. According to him, he was "apprehensive" in the preceding months when riots were reported in a number of ECOWAS countries on the account of the food situation. "The situation is widespread," the speaker had said, "and has sparked grave unrest with long lines of demonstrators taking to the streets. A situation where the people's basic needs are not met concerns all of us."²

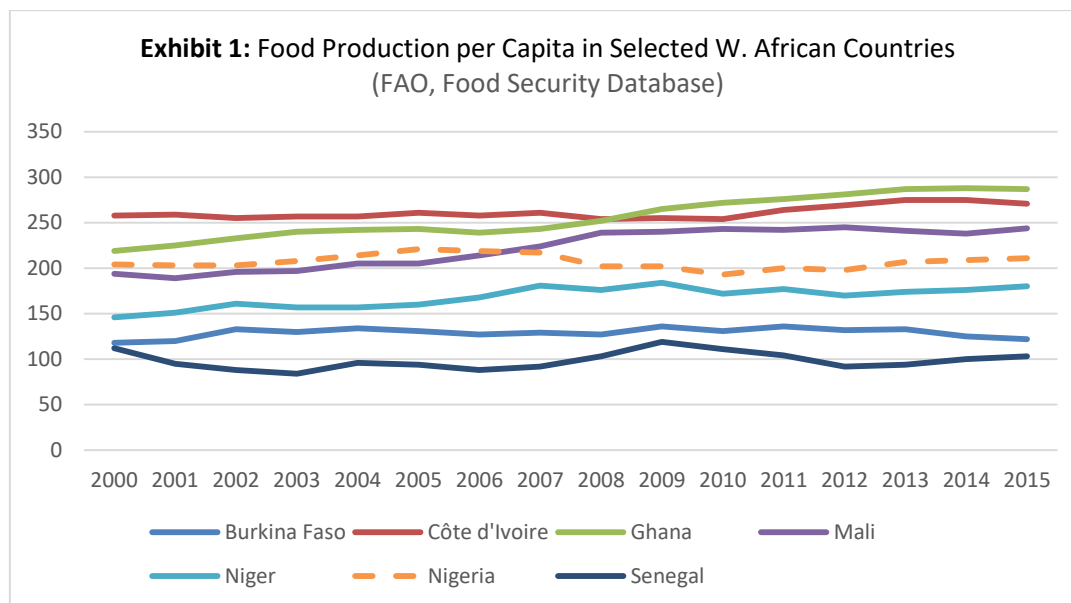
In 2012, up to 500,000 West Africans were on the brink of starvation. This was due to a drought in the region that led to failed harvests, and lack of rain that affected millions of people in eight countries in West Africa. The crisis was made worse by rising food prices and the return of 200,000 migrant workers to West Africa because of the civil wars in Libya and Ivory Coast (York, 2012).³

By 2017, nearly 250,000 children were subjected to acute malnutrition with an escalating death risk in the region. In Nigeria alone, 75,000 children's lives were at stake due to famine. Another 7.1 million people in Nigeria and the neighbouring Lake Chad area were considered "severely food insecure". According to the 2017 [GHI's report](#), 4.5 million Nigerians suffered from food

² See 'West Africa: Food Crisis - ECOWAS, Pan African MPs Call for Offensive', <https://allafrica.com/stories/200806020313.html>

³ See <https://www.theglobeandmail.com/news/world/drought-in-west-africa-threatens-millions/article4098636/>

insecurities in northeast Nigeria.⁴ Exhibit 1 shows that Nigeria trails behind several ECOWAS countries, pulling the regional food production per capita down.



Traditional approaches to improve agricultural productivity

Governments in the ECOWAS region have engaged in regional transformation initiatives to address some of the agricultural productivity challenges. For instance, the USAID has engaged in the following programs:⁵

- The West Africa Seed Program - this began in 2012 to enhance the commercial seed industry and the Alliance for Seed Industry in West Africa. The program aimed at increasing the availability of certified and drought resistant seeds for farmers from 12 percent to 25 percent of the total supply by 2017. It also sought to increase private sector seed production and to improve cross-border seed trade.
- The West Africa Fertilizer Program - also initiated in 2012, is improving fertilizer quality and availability for West African farmers. It works with the private and public sector to

⁴ The situation escalated in part because aids were hindered due to Boko Haram attacks

⁵ See <https://www.usaid.gov/west-africa-regional/agriculture-and-food-security>

assist countries to adopt ECOWAS regional fertilizer regulations and increase the availability and demand for high quality fertilizer.

But, the changing climatic conditions in the form of longer droughts and abrupt rains have become increasingly disruptive to smallholder farmers and crops. These changes often translate into immense losses, even with improved seeds and other agricultural inputs. Evidence suggests that droughts cause up to 83% of agricultural risks and cause up to 40% of a country's total economic damages (Burke et al., 2010). Thus, in the absence of insurance, a failed harvest translates into lasting negative effects on the household welfare. However, the characteristics of smallholder farmers make traditional insurance against drought unattractive.

Characteristics of smallholder farmers

Smallholder farmers often do not have access to insurance for their farms. The main obstacle is that traditional agricultural insurance relies on on-farm monitoring of losses that are evaluated through farm inspections. Moreover, transaction costs to insure one acre are similar to insuring a 200-acre farm. But the premiums from the one-acre farm would never cover the related transaction costs. Subsequently, it becomes almost impossible for the smallholder farmers to pay the premiums from traditional agricultural insurers.

Smallholder farmers are highly price sensitive and face limited access to finance - even with the abundance of microfinance institutions (MFIs). This liquidity constraint translates into lack agricultural inputs such as disease resistant seeds, fertilizers and irrigation tools. It also implies that they cannot expand their production and improve productivity. Moreover, agricultural lenders particularly worry about high rates of default in the event of drought. Thus, the high covariance of weather risks, coupled with the lack of collateral, makes it difficult for smallholder farmers to access credit and insurance products.

Smallholder farmers have limited access to information on agricultural interventions especially in remote areas. Relatedly, the low levels of financial literacy make them hesitant to trust unknown financial products and financial institutions with their money. This compromises take-up and continued membership in insurance schemes

Farmers also face poor markets for their produce, which compromises their incomes as they sell in sub-optimal conditions. Uncertainty of markets further compromises their participation in the insurance markets since this has implications for affordability and continued participation in insurance schemes.

Before planting (ex-ante), farmers are often highly risk averse and do not wish to invest in higher yielding inputs (such as high-quality seeds or fertilizers) because they would lose this investment and the money paid for such inputs in the event of a failed harvest. With this, farmers tend to under-invest in their farms, adopting a low investment low yielding strategies which in turn leads to yield gaps. This can become a vicious cycle, where farmers struggle to grow their output (yield) and remain in poverty. Evidence has shown by offering farmers access to credit plus risk mitigation instruments such as insurance, it can incentivize them to invest in their farms and grow their output (and ultimately livelihood).

Towards a sustainable strategy

Tchambakou, from his team's research, knew that when done well, index insurance can provide significant benefits to both governments and farmers. For smallholder farmers, who plant on as little as one acre, they can obtain insurance policies to shield them from significant financial losses when drought or excess rain are expected to wreak havoc on their harvests. This insurance provides them with pay-outs during bad years, and thus protects them from losing their investments in the farm. Index-based insurance therefore is a method of de-risking the agriculture sector for farmers. In turn, index-insurance policies can be used as collateral, thereby unlocking access to credit and investment. Finally, index-based insurance can also increase financial inclusion through linking farmers to financial institutions and promoting the insurance culture (not only in the agriculture sector).

For Governments, index insurance enables them to transfer agricultural risk to the private sector, which has the capital and expertise to manage it. It has the potential of reducing the impact of agricultural shocks on the fiscus, by reducing the need for *ad hoc* grain distribution when a disaster hits. Such shocks reduce agricultural output, which in turn can reduce GDP. At the same time, often there is an implicit expectation of Governments to respond to agricultural shocks and

support farmers through provision of *ad hoc* support (relief aid, food distribution). These responses must be financed through budget reallocations, which interrupts the budget planning cycle and diverts resources from high yielding investments. It is often the case that a response is delayed, which in turn destroys household welfare and can drive the vulnerable into poverty.

Evidence has shown that for agriculture insurance programs to achieve large scale and be sustainable, both the government and private sector must play a joint role, through a public-private partnership. Mahul & Stutley (2010) argue that the following market and regulatory impediments can be addressed to help farmers complement their risk management activities with potentially cost-effective financial tools such as insurance.

Systemic Risk: One of the central arguments for government intervention in the provision, administration, and oversight of agricultural insurance programs involves the presence of systemic risk (that is, risk that affects a large number of economic units, such as farmers and herders, simultaneously). The systemic component of agricultural risks can generate major losses in the portfolio of agricultural insurers. Estimated probable maximum losses for major events, such as those occurring once every hundred years, may exceed average expected losses by many times and seriously affect the financial solvency of insurance companies. Public intervention would be justified because no private reinsurer or pool of reinsurers has the capacity to cover such a large liability when the risks, even though small, may be difficult to diversify.

Informational Asymmetries: The two critical informational problems that any insurance program faces are adverse selection and moral hazard. They are intimately tied to the difficulties associated with measuring risks and monitoring farmer behaviour. It may be very difficult for private entities to measure risks, collect relevant data, monitor producer behaviour, and establish and enforce underwriting guidelines. These difficulties can result in high, sometimes prohibitive, transactions costs that preclude the development of private insurance markets. Governments have a major role to play in reducing informational asymmetry. The development and maintenance of agricultural and weather databases as public goods can help insurers properly design and price agricultural insurance contracts, thus reducing adverse selection. Public extension services assisting and supervising farmers in the management of their production risks before and after the occurrence of a loss can help reduce moral hazard.

Post-disaster Assistance Programs: Governments tend to alleviate the effects of crop failures or other disasters by providing post-disaster direct compensation as a relief measure. This poses a “Samaritan’s dilemma,” whereby post-disaster aid discourages programs such as insurance, which provide more efficient financial solutions and reduce the magnitude of losses from future events.

Limited Access to International Reinsurance Markets: Access to the international reinsurance market is often limited in developing countries, particularly for specialized lines of business such as agricultural insurance. In recent years, agricultural reinsurers and brokers have shown increasing interest in developing their business in low- and middle-income countries, particularly in large countries such as China and India. Smaller countries with far fewer business opportunities may have more difficulty attracting these international companies. Reinsurers report that reinsurance capacity is available for crop and livestock programs that are properly designed and have rates that generate sufficient premium volume to cover expected losses, operating costs, and cost of capital (including profit).

Agricultural Risk Market Infrastructure: An important supply-side impediment to the provision of agricultural insurance in developing countries is the lack of infrastructure support for agricultural insurance. Government could create these public goods, such as agricultural and weather databases and crop risk models, providing domestic agricultural insurers with reliable data and quantitative tools to better assess their catastrophe risk exposure and thus design actuarially sound agricultural insurance products.

Low Risk Awareness: Farmers tend to be very aware of their production risks. However, they may exhibit “cognitive failure” in that they may underestimate the likelihood or severity of catastrophic events. Stakeholder consultations in India and Mongolia reveal that farmers and herders recall the occurrence of major past events but tend to underestimate their severity. Governments may play an important role in providing farmer awareness and education programs and in supporting the marketing and promotion programs of the private commercial insurance sector.

Lack of Insurance Culture: A commonly cited reason for the low demand for agricultural insurance in developing countries is the limited understanding of its benefits. Insurance is often

perceived as a nonviable investment, because premiums are collected every year but indemnities are paid much less frequently. The general population views insurance—particularly agricultural insurance, which, by definition, pays only when infrequent events occur — as a privilege of the rich.

Regulatory Impediments: The regulatory frameworks governing insurance markets in many low- and middle-income countries tend to be underdeveloped. As a result, regulatory overlay can in some cases, inhibit increased penetration of insurance, including agricultural insurance. Innovative agricultural insurance products, such as index-based crop insurance or para metric (weather-based) crop insurance, require an enabling regulatory framework.

However, the history of agricultural insurance programs is littered with failures. Tchambakou's team identified the following as key challenges with agri insurance:

Data: Index-based insurance relies heavily on data in order to minimise the problem of basis risk. There are three main sources of data.

- **Rainfall and satellite imagery data:** this is based on a vegetation index, which reports vegetation at different resolutions and time intervals (Laajaj & Carter, 2009). This is the cheapest and most readily available data. However, it suffers from accuracy. For instance, the vegetation index does not differentiate between pastures and cultivated land. Moreover, index estimation using this type of data can be delayed due to clouds (Leblois & Quirion, 2011). These challenges however, can be minimised by investing in remote sensors and simulating crop yields based on different climatic shocks at a local level. Rainfall data is also challenging since rain water might disappear as run-off or light rains might evaporate without reaching the roots (Leblois & Quirion, 2011).
- **Weather station data:** Designing a good insurance product requires long-term yield and weather data (Osgood et al., 2007). However, in many developing countries, weather data are missing for several seasons. Weather stations might also not capture differences in agro-economic conditions such as in areas with high weather variability like in mountain areas. In this case, investment should be made in a large number of automatic rainfall stations that cannot be manipulated. These should be installed in close proximity to the farming areas, say within 20 – 25km to increase the quality of data collected.

- **Area yields data:** This provides high quality data, which reduces basis risk. For instance, in maize crop insurance, numerous farms are picked at random. Yield data is collected for a good and bad harvest over a long time as well as input use. The more samples from farms the better. While this approach provides high quality data, it is also extremely costly since it requires regular monitoring of farms.

Thus, a good insurance product should be flexible to consider farm location, household land management practices, long-term location specific yields and input use data, and historical rainfall information. It should be regularly updated and modified based on seasonal weather forecasts while remaining affordable (Tadesse, Shiferaw & Erenstein, 2015).

Awareness: Many smallholder farmers are not familiar with the operations of index-based insurance or insurance in general. Farmers also lack financial literacy to enable them navigate the complexities of the insurance market.

Cost of insurance: Given that farmers are often liquidity constrained, it is challenging to design a product that will be financially appealing to them yet sufficient to cover their agricultural losses. Combining the insurance with the promise of access to finance therefore provides a mechanism to insurance attractive.

Achieving scale (selling enough policies): The sustainability of the programme is dependent on larger numbers of farmers subscribing and remaining in the programme. Evidence shows that this is not easy to achieve.

Thus, in his proposal to the Commissioner, Tchambakou knew that he needed convincing solutions to these challenges.

The Problem:

Tchambakou is aware of some form of weather-index insurance pilots in the French-speaking countries of ECOWAS. However, it's too early to draw lessons in terms of sustainability or the roles of the respective countries. Nigeria's private sector is keen to come on board and they insist on collecting their own data, although they have only a few weather stations, which has implications for basis risk. On the other hand, the Nigerian Meteorological Department has rainfall data dating back to 1937 but the yield data is questionable. Additionally, there is some yield data at various research institutes which have been conducting research on agricultural output in some regions of the country, but this data is not readily available. Tchambakou ponders over the cost estimates in Exhibit 2. He further reflects on the challenges of farmers and the possibility of supporting them. But, what level of support would be sustainable, given the fiscal strain in the ECOWAS region as a whole?

Exhibit 2: Some Estimates for Satellite and weather station-based weather index insurance for maize and cotton					
Country	Benin	Burkina Faso	Mali	Senegal	Rwanda
*Average cost of insurance as a % of value of insured inputs	12.1 10.1 (cotton)	10.8	11.5	13.3 11.2 (cotton)	8.5
Value of portfolio (\$)	134 056	672 609	2.5million	458 304	23 million
Source: PlaNet Guarantee. *Premium includes up to 5% fees and related charges above risk premium					

Tchambakou has identified three key stakeholders who have an interest in this program – the government, farmers and the private sector. He anticipated key questions that would need to be addressed for each group.

Farmers	Private sector	Government
<ol style="list-style-type: none"> 1. What does the group see as the key challenges and constraints for farmers, which would need to be addressed to increase take up of insurance. 2. What role should the government play in supporting up-take of insurance? 3. To increase the likelihood of private sector participation, scale is needed. What delivery channels for agri-insurance would you recommend to increase uptake? 	<ol style="list-style-type: none"> 1. What are the key motivators for the private sector to participate in the program? 2. What mechanisms would you recommend to strengthen the quality of the government’s agricultural statistics? 3. What role should private sector play in supporting up-take of insurance? 4. What delivery channels would you look to develop to increase scale of take up and premium volume? 5. What will your KPIs be to measure performance and success? 	<ol style="list-style-type: none"> 1. List the key policy objectives, which agricultural insurance can support you (the Gov’t) achieve. 2. Of the areas described in the case study, which would you be willing to support with public funds? 3. What role should the government play in supporting up-take of insurance? 4. What is your exit strategy? 5. What role should Gov’t play in data collection? 6. What will your KPIs be to measure performance and success?