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# FEASIBILITY STUDY ON CLIMATE RISK INSURANCE

## SIERRA LEONE



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# List of Abbreviations

<b>AEZ</b>	Agro Ecological Zone
<b>AFSL</b>	Agriculture, Food Support and Livelihoods
<b>ARC</b>	African Risk Capacity
<b>CHIRPS</b>	Climate Hazards Group InfraRed Precipitation with Station data
<b>CRI</b>	Climate Risk Insurance
<b>FAW</b>	Fall Army Worms
<b>ILO</b>	International Labour Organization
<b>IMERG</b>	Integrated Multi-satellitE Retrievals for GPM
<b>IVS</b>	Inland Valley Swamps
<b>MFI</b>	Micro-Finance Institution
<b>MoA</b>	Ministry of Agriculture
<b>MoF</b>	Ministry of Finance
<b>MOU</b>	Memorandum of Understanding
<b>MSMEs</b>	Micro Small and Medium Enterprise
<b>NDMO</b>	National Disaster Management Office
<b>NFF</b>	National Federation of Farmers
<b>SDU</b>	Service Delivery Unit
<b>SLARI</b>	Sierra Leone Agriculture Research
<b>SLeCAD</b>	Sierra Leone Chamber for Agribusiness Development
<b>SLICOM</b>	Sierra Leone Insurance Commission
<b>SLMet</b>	Sierra Leone Meteorological Agency
<b>SMEDA</b>	Sierra Leone Small and Medium Enterprises Development Agency
<b>TAMSAT</b>	Tropical Application of Meteorology Using Satellite and ground-based observation
<b>UNCDF</b>	United Nations Capital Development Fund
<b>UNDP</b>	United Nations Development Programme

# 1. Agriculture Sector Overview

The agriculture sector, including livestock and forestry, is a critical component of the economy of Sierra Leone.<sup>1234</sup> It employs about two-thirds of the labour force and contributes more than 60 percent of GDP. The main farming system in Sierra Leone is subsistence farming which is still mainly rain-fed and characterized by low productivity.

The agriculture sector is dominated by smallholder subsistence farmers utilizing local traditional tools with outdated methods and limited farm inputs. However, a few commercial agricultural companies operate in the production of biofuels and energy, palm oil, timber, rice, sorghum, growing, and canning pineapples, manufacturing juice concentrates, and agriculture-machinery contracting services.



## Main Crops

Rice is the main crop produced in Sierra Leone. The second staple food crop grown across the country is cassava. Other major annual food crops include sorghum, maize, millet, sweet potato, and groundnut. The main tree crop is the oil palm, used for its perennial fruit that can be processed into palm oil and sap which can be transformed into palm wine. The other main perennial crops are citrus, sugarcane, cocoa, coffee, and coconut. Tubers and leaves are consumed by households and cassava products (gari, flour, and chips), are in high demand in urban areas. Cocoa beans and coffee are the main export crops.

## Livestock

Common livestock in Sierra Leone are cattle, sheep, goats, pigs, and poultry. Poultry rearing consists mainly of chickens, with some guinea fowl and Muscovy ducks. Most of the animals are owned by households in the Northern Province, especially in Koinadugu, Kambia, Bombali, and Port Loko districts. The marine fisheries of Sierra Leone are divided into two major sectors:

- Artisanal fishing operating in estuaries and inshore waters and extending from the shoreline to a depth of 20–40 m.
- Industrial fishing, operating in the open deeper waters.



## Agroecological Zones

The country has a total area of 71,740 square km. It has four distinct regions- coastal mangroves, woodland, upland plateau, and mountains, and a tropical climate receiving around 2,500 mm of rain a year.<sup>56</sup> The land resource of Sierra Leone has been classified into five distinct agro-ecological zones as follows:

- Uplands: moderately well to well-drained soils of varying depth. This covers about 6.1 m.ha or 84% of the land
- Inland Valley Swamps (IVS): fairly flat, poorly drained depressions between adjacent uplands –675,000 ha (9%)
- Mangrove Swamps: land adjacent to the coast or along estuarine rivers subject to inundation by tidal brackish water, 215, 000 ha (3%)
- Bolilands: low-lying inland depressions subject to flooding during the wet season - 120,000 ha (2%)
- Flood plains: located along major rivers, flooded periodically during the wet season – 110,000 ha (2%)

## 2. Key Risks

Sierra Leone's agriculture is constantly under threat from climatic fluctuations such as droughts, floods, and changing rainfall patterns – threats that are widely expected to increase as a result of climate change.<sup>7</sup> Infrastructure in many areas, and in particular the rural road network and electricity grid, are inadequate and do not create a holistic enabling environment for agribusiness.

Fires, which are used as a means of land clearing, are problematic for those operating in the agriculture sector.



Climate change has led to a rise in global temperatures, which has resulted in severe droughts and uncertain rainfall patterns in Sierra Leone. These unpredictable weather conditions pose a significant challenge to the country's socio-economic activities, particularly since many people rely on subsistence agriculture as a vital part of the economy. Droughts can negatively impact economic productivity and livelihoods and increase the risk of food insecurity.



Landslides are a significant risk in Sierra Leone<sup>8,9</sup>. On August 14, 2017, a devastating landslide and flooding disaster ripped through Sierra Leone's capital city, Freetown. Before the landslide, Freetown experienced three successive days of intense and heavy rainfall which caused part of Sugar Loaf Mountain – the highest peak in the Northwestern Area Peninsula – to collapse. A total of 6000 people were affected; 1141 persons died or were missing and 3000 people lost their homes.



Floods have lately become a major risk in the country. The heavy downpour of rain causes flooding in some areas. For example, torrential rains in the first and second weeks of September 2015 caused extensive damage in and around Freetown, largely due to rivers bursting their banks. The flooding caused widespread displacement and destruction, affecting more than 20,000 people.<sup>10,11,12,13</sup> On 24 June 2017, a heavy downpour of rain flooded two towns of Largor Jasawabu in the Nongowa Chiefdom and Foindu Mameima in the Lower Bambara Chiefdom, near Kenema. Torrential rainfall in the month of August 2017 led to widespread flooding across different parts of Freetown City, including Karningo, Kamayama, Dwarzark, Kroo Bay, Congo Town, Kissy Brook, and Culvert community in Granville Brook.

# 3. Supply Side Market Assessment

## 3.1 Insurance Landscape and Insurer's Perspectives

As of June 2018, the insurance regulatory body, Sierra Leone Insurance Commission (SLICOM), has been connecting farmers to cooperatives that would allow them to benefit from insurance schemes. Currently, Sierra Leone has no reported agricultural insurance or microinsurance schemes, and there are no specific regulations in place for these segments.

By July 2023, Sierra Leone has recorded twelve insurance companies, one reinsurance company, and sixteen registered insurance brokers operating in Sierra Leone. Among these, are experienced composite insurers like Aureol Insurance Company, which has been operating for 36 years.<sup>14</sup> However, these insurers do not have any specific products for agricultural or climate risks.<sup>15</sup> Some insurers expressed interest in developing and implementing microinsurance products, particularly in the areas of life and health, through group policies with savings groups. There are also some initiatives ongoing related to primary health insurance for school children.<sup>16</sup>

However, because Insurers also have some experience with insuring agricultural equipment for agribusinesses<sup>17</sup>, they are also interested in technical assistance related to machinery breakdown coverage (e.g., for rice harvester machines).

Insurers with an interest in providing climate risk insurance, if such a product was developed and if reinsurance coverage was available, are aware that flooding would be a key risk. As such, they are interested in providing flood index insurance to flood-prone regions of Sierra Leone. However, they are also aware of some of the complexities of flood risk, such as flash floods, river flooding, and floods caused by water dams' water release.

Drought could potentially be relevant, but it is more related to the minor season (approximately September to November).<sup>18</sup> Late onset of rain has also become a relevant risk in Sierra Leone in recent years, as per the insurers' experiences.

Insurers also expressed an interest in potentially bundling excessive rainfall insurance or flash-flood insurance with fire insurance, which is currently provided to MSMEs in Sierra Leone, including in urban areas. Insurers perceive the scope for cross-selling or bundling excessive rainfall coverage on top of the fire insurance for MSMEs.<sup>19</sup>

Such an excessive rainfall indexed product could cover excessive rainfall over consecutive days, with a sum insured of 1,000 and a premium of 20-80 for Freetown i.e., 2%-8% of the Sum Insured. Currently, the premium rate for a health micro-insurance product in Freetown is 5%.

**Overall, there seems to be good access to reinsurance markets, including major reinsurers, such as Africa Re, Continental Re, Zep Re, WAICA Re, CICA Re, and Ghana Re.**

## 3.2 Government and Regulatory Perspectives

Ministry of Agriculture (MoA) and Ministry of Finance (MoF) stated that government support for agriculture insurance should be forthcoming. From a policy perspective, there is a strong focus on the Rice value-chain given the importance of Rice as a major food crop in Sierra Leone and the inadequate production of rice compared to the extent of Rice consumption. Oil-Palm is another significant focus crop from a revenue generation perspective.

The government of Sierra Leone is working on a disaster risk financing strategy with the World Bank team. The regulator has had some discussions with the Africa Risk Capacity (ARC) on macro-level risk transfer. The regulator is keen to create a policy paper related to disaster risk insurance and support any new products developed for climate risk and/or agricultural insurance in Sierra Leone.<sup>20</sup>

Regulators are also aiming to develop regulations for agriculture insurance, microinsurance, epidemic, natural catastrophe property insurance, and Takaful as Sierra Leone does not have any. The country also lacks specific regulations related to agricultural, index or climate risk insurance.<sup>21</sup> It is also noted that there are no specific restrictions in terms of bundling different insurance products together or with other services, such as credit and farming inputs.<sup>22</sup>

## 4. Data Availability



### Sierra Leone Meteorological Agency (SLMet)

The Sierra Leone Meteorological Agency (SLMet) provides meteorological and climatological services throughout Sierra Leone. They provide both real time weather data and forecasts. The forecasts are for different time series, ranging from daily to seasonal forecasts. SLMet also maintains a database of historic weather data.

SLMet has both automatic and manual weather stations. Currently, SLMet has no experience providing weather data for the purposes of insurance. However, SLMet has worked on many projects with different stakeholders in the past.

### Sierra Leone Agriculture Research Institute (SLARI)

The Sierra Leone Agriculture Research Institute was established in 2007. Its role is to conduct research and generate information and technologies to support sustainable agricultural development and poverty reduction in the country. SLARI plays a critical role in supporting the development of Sierra Leone's agriculture sector, which is the backbone of the country's economy and the livelihoods of its people.

SLARI welcomed the idea of climate risk insurance and thought insurance for seed multiplication or bundled with seed sales could be of interest for the major seed companies as well as farmers producing seeds in Sierra Leone.

# National Disaster Management Office

Data on past flood events and estimates of the severity and impact of floods as well as other natural disasters is available at the **National Disaster Management Office (NDMO)**<sup>23</sup>. The NDMO is about 2 years old and has some data on national hazard profiles. They are supposed to have data on flash flooding and river flooding as well as many other risks, such as lightning, storms, landslides, mudslides, and epidemics (such as Ebola, cholera, and Covid-19). The meteorological department plays a role in terms of claims verification for risks, such as windspeed-related damage.

## The Ministry of Agriculture

**The Ministry of Agriculture (MOA)** has some data availability for historical yield data, cost of production data, estimates of number of farmers and hectareage for different agro-ecological zones (AEZs), price (of crops) data (since 2015 to date) etc.<sup>24</sup> MoA made some of the following observations:

- a) Productivity for rice has increased significantly from around 1 MT/Hectare (5 years ago) to about 2-3 MT/Hectare currently, in terms of the typical yield. Yet, this yield is still significantly lower than the benchmark yield in other countries in the region.
- b) Key weather risks, in MoA's views, comprises of drought or late onset of rains in the early part of the season and excessive rainfall towards the end of the season.
- c) Pest and diseases are also very relevant, including the Fall Army Worms (FAW) is a major risk, particularly for upland Maize.

Interestingly, the MoA stated that lack of credit is a challenge for smallholder farmers and that even when the credit is available, the repayment structure is not suitable, in that regular repayments are required, whereas seasonal crop farmers make their income from end of season sales of the crop.<sup>25</sup> Hence, credit linked agriculture insurance could play a role in terms of making it easier for financial institutions to have single 'bullet repayment' loan products, which smallholder seasonal crop farmers may find easier to repay than the regular repayment loans.

## 5. Distribution Channel Factors



Insurers are currently not working with smallholder farmers, either individually or in groups.<sup>26</sup> In general, there is also a lack of well-organized farming cooperatives in Sierra Leone, which makes it difficult to leverage on farmer organizations as a form of distribution channel.<sup>27</sup> Some insurers are open to considering distribution channels, such as microfinance institutions (MFIs) as well as local chiefs, who may be able to identify farmers and to promote the products in their chiefdoms.<sup>28</sup>

Mobile Money Operators, such as Orange Money, have some partnerships in place with microfinance institutions and also one relating to microinsurance (for market women). Mobile money is being leveraged in the microinsurance partnership for premium payments. Mobile money is also being leveraged by major agribusinesses for paying farmers in bulk. There are no specific mobile money products for smallholder farmers currently.



**Africell** has the largest outreach in Sierra Leone. They also have their own radio station, which can be leveraged for awareness raising and marketing of microinsurance products.

Importantly, Africell has expressed interest in allocating their resources to develop the technology for a mobile-based climate risk insurance product without incurring any costs for this development. However, they requested that the digitization be done exclusively with Africell.



**Mosabi** is a financial technology (FinTech) company that provides financial literacy and inclusion services to underserved communities. The platform provides a range of services, including financial education courses and access to financial products. Mosabi connects users to financial services. In Sierra Leone, they partnered with Orange mobile network operator and currently Mosabi is working with 120,000 end users on their platform.

Mosabi has not yet partnered with an insurance company, but there is an opportunity to potentially use its platform for insurance education, awareness, and possibly onboard individual farmers if insurance is offered to them on a stand-alone basis



**Orange Money** is a mobile money service offered by Orange, a mobile network operator. It enables users to perform various financial transactions using their mobile phones, such as sending and receiving money, paying bills, purchasing airtime and data, and accessing additional financial services.

Currently, Orange Money is working in partnership with a Sierra Leone insurance company to collect premiums for one of its microinsurance products. Orange Money is interested in forming a partnership with an insurance company to distribute insurance products, similar to how they have partnered with a financial institution to offer a loan product on their platform.

# 6. Demand Side Factors

As part of the study, virtual and in-person interviews were conducted with several potential aggregators or distribution channels, who could play the role of group policyholders for both micro and/or meso-level climate risk insurance. The key findings from these meetings are summarized in this section.

**Lambano** is an agribusiness that supports farmers through out-grower schemes.<sup>29</sup> Typically, they provide an annual credit of approximately 10 million Leone (approximately USD 500) per hectare to each farmer. This credit covers the cost of fertilizer, seeds, and machinery but does not typically include pesticides. Maize farmers working with Lambano usually achieve a normal yield of 3-5 metric tons per hectare. Hence, the normal revenue (at L 8,000 per kilogram) amounts to 4,000 kilograms x L 8,000 = L 32 million per hectare. However, in the worst years, Lambano farmers may experience a yield as low as 1 metric ton per hectare, resulting in revenue of only L 8 million per hectare.

Lambano is highly interested in partnering on a potential pilot programme of a weather index insurance product. They are interested in insuring the cost of production or credit exposure (e.g., L 10 million per hectare) from their perspective as the agribusiness with a credit exposure.

**The National Federation of Farmers (NFF)** is the apex body for farmer organizations in Sierra Leone.<sup>30</sup> They have registered about 60,000 farmers on their system so far. They cited that banks not financing smallholder farming in general has been a key challenge for them. Even when they are financing farmers, the loan products are not suitable for seasonal crop farmers and there are very few single bullet repayment products available. Hence, they see insurance as a catalyst for banks and MFIs to provide suitable seasonal crop loans to farmers and reasonable interest rates. They also see a scope in insurance being used as an alternative to collateral for agriculture financing.

**LAPO** is a major microfinance institution (MFI) in Sierra Leone that also finances smallholder farmers. However, they limit their exposure to agricultural risks due to various farming challenges.<sup>31</sup> The primary production risk associated with agricultural lending is flooding. Pest and disease risks can also lead to credit risks for MFIs. Currently, drought is not a major concern for LAPO. Nonetheless, LAPO believes there may be demand for climate risk insurance products among farmers, particularly in locations like Makeni.

**The Sierra Leone Chamber for Agribusiness Development (SLeCAD)** is a forum of agribusiness business operators, companies and industries with interests in promoting agribusinesses.<sup>32</sup> The Chamber represents the voice of agribusinesses and acts as a bridge between them and government at various levels while also providing extensive business development support services to its members. Value-chains of their focus include Rice, Vegetables, Maize, Oil Palm, Coffee and Cocoa. They also have experiences with production risks, such as erratic rainfall and Fall Army Worms for Maize.

SLeCAD is interested in suitable insurance products as a way of unlocking more investment in agriculture and agribusinesses. They are also interested to market climate risk insurance products as they have a wider network through which they can raise awareness among smallholder farmers. They see the potential role of insurance being used as a form of 'certificate' or alternative to collateral in order for farmers and agribusinesses to get better access to agricultural loans.

**Solidaridad** is an international civil society organization with over 50 years of experience in developing solutions to enhance the resilience of small-scale and family farmers, workers in agriculture, mining, supply chains, and their respective communities.<sup>33</sup> In Sierra Leone, Solidaridad supports small-scale farmers engaged in cocoa, coffee, cashew, rice, groundnut, and cassava production. They also work with crop exporters, providing technical assistance and extension services through community facilitators. They train farmers through farmer field schools and have 27 staff members in the districts. While Solidaridad has some experience providing inputs to crops like cocoa, coffee, and cashew, they do not do so regularly. Some cocoa exporters offer input loans to trusted farmers, but this practice is limited.

Solidaridad has shown a keen interest in facilitating connections between insurance companies and their network of smallholder farmers. This interest stems from their collaboration with around 400 village Osusu groups, which are savings and loan schemes operating in 12 districts, including areas such as Kenema, Kaluhun, Bo, and Kono. Each of these savings groups consists of approximately 25-30 members, and they typically save an average of USD 50 per member (or around USD 1,400 per group) over a standard 12-month savings cycle

Solidaridad has a strong interest in potentially implementing a climate risk insurance pilot, including a dry run if necessary. They are particularly interested in providing coverage for excessive rainfall, especially during the months of July and August, and are open to the idea of annual coverage as well. Therefore, there is a significant opportunity for piloting with Solidaridad in late 2023 or early 2024.

**Seed Tech** is a Sierra Leonean agro dealer company registered and based in Sierra Leone, established in 2001.<sup>34</sup> The company specializes in seeds, seedlings, fertilizers, agrochemicals, tools and materials. They supply seeds to farmers, government entities, and NGOs, and they are also involved in seed multiplication for crops like maize and groundnut. Seed Tech also has experience in insurance coverage for their assets and stock, protecting against fire and burglary. Because of this, they have potential interest in insuring losses during seed multiplication and recognize the value of using index insurance as a sales promotion tool for farmers who buy seeds and encounter floods or low germination percentage due to bad weather conditions.

**Ecobank** has a limited portfolio of agricultural loans due to the high credit risks in the agricultural sector.<sup>35</sup> They typically provide funding to value-chain stakeholders, such as processors, but generally do not finance actual production. Because they have some exposure to the poultry value-chain, they are interested in poultry insurance covering poultry disease risks. They are also interested in insuring perils such as flooding and bush fires, primarily related to sugarcane plantations. Excessive rainfall in the month of August particularly is a key risk factor, which could be covered by climate risk insurance products.

**BRAC Sierra Leone:** BRAC began working in Sierra Leone in 2008 with its main activities being being the provision of health services, education, agriculture, livestock, and youth empowerment programmes.<sup>36 37</sup> It is the largest microfinance institution of the country with 42 branches in 12 districts. BRAC offers inclusive, accessible, and convenient loan products tailored to the needs of the local community, including women, smallholder farmers, small business owners, and jobholders. These services are complemented with financial literacy training, enabling borrowers to make informed financial decisions. BRAC is currently focusing on developing a core banking system and have piloted loan repayments using mobile money to increase operational efficiency and offer greater convenience to clients.

BRAC's Agriculture, Food Support and Livelihoods (AFSL) programmes train farmers in climate-smart agriculture and raising poultry and livestock and equip them with inputs such as seeds, tools, poultry, livestock, and feed to jumpstart their businesses. BRAC also recruits and trains local leaders to act as community promoters, offering on-site support and advice to farmers, assisting them in resolving challenges, and selling goods such as animal feed, medication, seeds, and fertilizers.

**Munafa** is a social microfinance institution in Sierra Leone that offers individual loans, savings accounts, and personalized training. This comprehensive support enables entrepreneurs to grow their businesses, increase their income, and enhance their living conditions sustainably. The name 'Munafa' was derived in 2018, when Entrepreneurs du Monde decided to commence operations in the poorest neighborhoods of Freetown and later expanded to outlying areas.<sup>38</sup> They set up Munafa, which means 'prosper' in several local languages.

Through Munafa, entrepreneurs gather in groups of 15 to 35 individuals. After five initial training sessions participants can acquire their first loan which will be tailored to their financing needs and repayment capacity, with no guarantor or deport required.

Twice a month, groups meet with their facilitators. During these meetings, participants make loan repayments, contribute to their savings accounts, and engage in training sessions covering management, sales, or social topics like education, health, and rights. This multifaceted approach strengthens their businesses and contributes to the advancement of their families and communities on various levels.

## **Sierra Leone Small and Medium Enterprises Development Agency (SMEDA)**

is a government entity established under the SMEDA Act No.11 of 2016.<sup>39</sup> This Act was created through stakeholder consultations and a Memorandum of Understanding (MOU) signed between the Bank of Sierra Leone, the Ministry of Finance, the Ministry of Trade and Industry, and the International Labour Organization (ILO). The aim was to refine the SME policy and strategy that was initially developed in 2014.

SMEDA services include:



**SME Registrations**



**Loan and Grant**



**Access to Finance**



**SME Diagnostic Tool**



**Mentoring and Coaching**



**Business Development Services**

SMEDA plays a significant role for MSME's through its Credit/Loan Department. Through it, they provide access to financial services like loans through government, microfinance institutions, and banks. This department also specializes in non-financial services to MSMEs across all enterprise sectors while also facilitating the development of businesses by providing capacity building training on enterprise development skills, financial services, and access to finance, as well as mentoring and coaching.

The Credit/Loan Department does not offer financial services directly to MSMEs. Instead, it partners with

financial institutions to provide low-interest guaranteed loans aimed at enhancing MSMEs' access to funding for startup and expansion, supported by government initiatives through the Ministry of Finance. Additionally, it ensures that lending institutions enhance their accuracy and efficiency in service delivery. The department conducts ongoing capacity-building training for MSMEs, reviews, and communicates lending institution concerns and standards. It also conducts various assessments and audits to verify that department procedures yield accurate and desired results. Overall, SMEDA serves as a regulatory institution within the MSME landscape.

## The Ministry of Agriculture, Forestry and Food Security (MAF)<sup>40</sup>

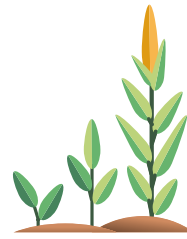
is responsible for agricultural development policies and advises the Government on such policies relating to its administration and the management of the agricultural sector of Sierra Leone's economy. Priority areas are:



Rice Self Sufficiency



Livestock Development



Crop Diversification



Forestry

**NGOs/Donor Agencies<sup>41</sup>** : The largest financiers in the agricultural sector of Sierra Leone are the following: The European Union, World Bank, African Development Bank, World Food Programme, International Fund for Agricultural Development, and the Islamic Development Bank. They are joined by many others including Japan International Cooperation Agency, Irish Aid, Italian Cooperation, governments of China, Germany, and Nigeria, as well as a range of NGOs including Action Contre la Faim, ACDI/VOCA, Africare, BRAC, Care, Concern, COOPI, Catholic Relief Services, Christian Aid, Heifer International, OFID, Oxfam, World Vision as well as the UN agencies including Food and Agriculture Organisation (FAO), ILO, United Nations Development Programme, United Nations International Children's Emergency Fund, World Health Organisation, United Nations Environment Programme, and the World Food Programme.

**Community Banks<sup>42 43</sup>** : Working to eradicate rural poverty and promote economic growth, the Government of Sierra Leone, with financial support from the International Fund for Agricultural Development, established 17 rural finance institutions across the country. With the widest financial network in the country, community banks are providing access to savings and loan facilities for increasing numbers of rural people.

## Agriculture service companies include WARC and Lizard Earth.

**WARC<sup>44</sup>** : This is an aggregator and agricultural services company, offering Sierra Leone's smallholder farmers previously inaccessible equipment, inputs, and training. WARC's Service Delivery Unit (SDU) brings its modern machinery and inputs to use on smallholder farmers' plots—significantly reducing farmers' taxing manual labour and increasing their yields. In exchange for WARC's services, these farmers pay in crops, selling their surplus for additional income. WARC's second business line hires subsistence farmers to work on its 1,500-hectare Training Farm, where they learn environmentally conscious farming methodologies and equipment operation. WARC then aggregates and sells the crops from its Training Farm and SDU farmers in Sierra Leone, gradually helping the country replace imported staple foods with locally grown rice and maize.

**Lizard Earth<sup>45</sup>**: An agricultural services company working to improve the livelihoods of smallholder cocoa producers in Sierra Leone. Lizard Earth provides essential, year-round farm-level services to smallholder producers, often in collaboration with donor partners. The business has developed a plantation management model that fosters talented smallholders to grow into successful agri-entrepreneurs who will have the capacity to independently manage sectors of the company's plantation.

**FAO** has been operating in Sierra Leone since 1978. Its interventions have greatly helped in improving food security and agricultural practices in the country. FAO provides technical support in collaboration with other UN agencies, NGOs, civil society, and rural communities. Current cooperation efforts focus on eliminating hunger, improving food security and nutrition, and achieving sustainable agriculture through improved farming methods and environmental protection.

FAO's priority areas in Sierra Leone are aimed at promoting sustainable agriculture and rural development, improving food and nutrition security, reducing the impact of disasters, conserving natural resources, adapting to climate change, and promoting sustainable fisheries and aquaculture.

FAO supports some key value chains through capacity building and providing inputs in the form of seeds. The value chains include vegetables, rice, and maize. They also help with training of government agriculture extension workers and are collaborating with the World Bank on developing access by farmers to digital agriculture extension services.

Currently, FAO is not involved in any agriculture insurance project in Sierra Leone but they are aware that there have been some discussions with the government to promote access to agriculture production finance and insurance by farmers.

## 7. Weather Data Analysis



Five satellite-based rainfall datasets (Tropical Application of Meteorology Using Satellite and ground-based observation (TAMSAT), Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS), Integrated Multi-satellitE Retrievals for GPM (IMERG), PERSIANN and CMORPH) were assessed and temperature estimates from the ERA5 reanalysis dataset. All products provide long-term and near-real time updates, prerequisites for index insurance. The primary objective was to determine the skill of each of these datasets and their suitability for developing agriculture insurance products to insure against crop losses from drought/excess rainfall and heatwaves – perils which adversely impact crops. The main findings are as follows:

1

All satellite rainfall products demonstrated relatively poor performance, with lower correlations values found compared to other similar studies in West Africa. It is difficult to determine the reasons for this, but it is possible that the rain gauge station used in the study is located in an area with a rainfall climate that makes it challenging for satellite rainfall estimation methods to accurately estimate rainfall. Despite the low correlation values, IMERG performed marginally better than the other products, indicating that it may be the most accurate out of the datasets considered. All products exhibited different biases that varied throughout the year, although IMERG had the lowest bias overall during the rainy season (except during the end of the rainy season where IMERG overestimated rainfall).

# 2

Very few satellite-based temperature datasets exist. However, the ERA5 reanalysis gives hourly temperature data and provides a valuable resource for index insurance. ERA5 2-m temperature (daily mean and maximum) demonstrated moderate agreement with the station observations. Potential issues with the location of the weather station may have introduced errors into the temperature record (i.e., it is at Freetown airport which may expose the station to enhanced temperatures from tarmac/concrete and it is next to the ocean so may be exposed to localised sea breezes – both of which will affect thermometer readings). Moreover, ERA5 may struggle at land-sea boundaries (a common issue for models) which may introduce inconsistencies into the ERA5 data.

In summary, among the satellite rainfall products considered, IMERG is recommended for the development of rainfall-based index insurance products, although additional support from other satellite rainfall products may be helpful in identifying adverse rainfall conditions. While the 2-meter temperature data from ERA5 demonstrates only moderate agreement with the station observations, the proven excellent accuracy of ERA5 temperature in other parts of Africa suggests that it is still likely to be valuable for the development of temperature-based index insurance products in Sierra Leone, particularly in areas away from the coastal regions.

## 8. Pilot Proposal

### Partners

It would be very important for insurance companies to partner with efficient distribution channels in order to reach a large number of smallholder farmers with suitable Climate Risk Insurance (CRI) products. Bundling credit-linked CRI with agricultural loans could lead to farmers gaining better access to more suitable loan products, such as single repayment loan products, which are more suitable for smallholders in seasonal crop farming.



**High Potential** distribution channels or aggregators (identified through this feasibility study), with whom a CRI pilot could be successfully trialed includes the following:

1. **Africell** - largest MNO in Sierra Leone and with strong interest in developing a mobile-based CRI product in the near future;
2. **Lambano** - agribusiness with an out-grower scheme;
3. **National Federation of Farmers** - apex body of farmer organizations in Sierra Leone with 60,000 registered farmers as of July 2023;
4. **Solidaridad** - international civil society organization, which expressed an interest in partnering for a CRI live or dry run pilot.

**Other Potential Distribution Channels** identified, which could potentially be leveraged with in the medium term (e.g., after the initial piloting of the CRI product) are the following:

1. **BRAC Sierra Leone** - major MFI, financing smallholder farmers;
2. **LAPO** - MFI, financing smallholder farmers;
3. **Mosabi** - Fin Tech, which could be leveraged for consumer education on CRI products;
4. **Munafa** - social microfinance program working primarily with MSMEs
5. **Orange Money** - MNO, which could be partnered with for mobile payment of premiums and claims;
6. **SLeCAD** - forum of agribusiness operators and companies, which could potentially play a role on consumer education on CRI products.

# End Notes and References

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