

Platform  
for Agricultural  
Risk Management

Managing risks  
to improve farmers'  
livelihoods

Tools assessment



# Liberia

Study conducted by



In collaboration with



Feasibility study for investment:  
information systems  
for agricultural risk management

Full report  
April 2019







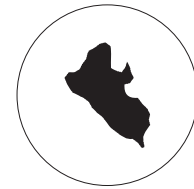
PARM  
PLATFORM FOR  
AGRICULTURAL RISK  
MANAGEMENT

Platform  
for Agricultural  
Risk Management

# Managing risks to improve farmers' livelihoods



# Liberia



## Feasibility study for investment: information systems for agricultural risk management

### Full Report

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# Foreword

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The **Platform for Agricultural Risk Management (PARM)** is an outcome initiative of the 2010-2013, G8-G20 discussions on food security and agricultural growth. It was established in December 2013 through a multi-donor partnership between the European Commission (EC), the French Development Agency (AFD), the Italian Development Cooperation (DGCS), the German Cooperation (BMZ/KfW) and the International Fund for Agricultural Development (IFAD). PARM works in strategic partnership with the New Partnership for Africa's Development (NEPAD) and other development partners to make risk management an integral part of policy planning and implementation.

This feasibility study report on "Improving access to agricultural risk information for meso level stakeholders in Liberia" responds to a major risk priority that was identified through the risk assessment conducted by CEIGRAM (PARM 2017) and discussed with the Ministry of Agriculture (MoA) and national stakeholders. The study was conducted by NITIDAE and includes an analysis on timely access to information for farmers on weather, pest and diseases and market price for an investment to establish an integrated Information and Early Warning System in Liberia.

The content of the report was discussed with the MoA and national stakeholders during the Agriculture Coordination Committee meeting (ACC) held in Monrovia in March 2019. The engagement and feedback from the Government and stakeholders during the ACC meeting contributed to improvement and validation of this report. We hope that it contributes to enhance and align with the efforts of the Government of Liberia and its development partners to improve the management of priority agricultural risk for Liberian agriculture sector development and growth.

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# Contents

<b>List of acronyms</b> .....	9
<b>List of figures and tables</b> .....	10
<b>Executive summary</b> .....	11
<b>1. Introduction</b> .....	16
<b>1.1. Study context</b> .....	14
1.1.1. The Platform for Agricultural Risk Management.....	14
1.1.2. PARM in Liberia.....	14
1.1.3. Agricultural risk context in Liberia.....	15
1.1.4. Proposals from PARM Liberia Risk Assessment Study (RAS).....	15
1.1.5. Objective of the study.....	16
<b>1.2. Country context</b> .....	16
1.2.1. General data.....	16
1.2.2. Geographical data.....	17
1.2.3. Agricultural sector data.....	19
<b>1.3. Methodology and approach</b> .....	22
<b>2. Analysis of demand, supply and environment for an efficient ARM information system</b> .....	24
<b>2.1. The demand for information on Agricultural Risk Management in Liberia</b> .....	24
2.1.1. Cultural and post-harvest practices.....	24
2.1.2. Market information.....	25
2.1.3. Weather forecasts.....	25
2.1.4. Analysis of Information demand by category of stakeholder.....	26
<b>2.2. The availability and supply of information for Agricultural Risk Management in Liberia</b> .....	26
2.2.1. Central Bank of Liberia.....	27
2.2.2. Ministry of Agriculture.....	27
2.2.3. Liberia Institute of Statistics and Geo-Information Services (LISGIS).....	27
2.2.4. Liberia Meteorological Service (Ministry of Transport).....	28
2.2.5. Liberia Agriculture Commodity Regulatory Agency (LACRA).....	28
2.2.6. GROW Liberia.....	28
2.2.7. Information availability at rural communities' level.....	29



<b>2.3. The environment opportunity and challenges for an efficient ARM information system</b> .....	30
2.3.1. Opportunities for ARM information system.....	30
2.3.2. Challenges for ARM information system.....	30
<b>2.4. Conclusion of the analysis of information demand, supply and environment for an efficient ARM Information System</b> .....	33
2.4. Available agricultural risk management (ARM) tools and gaps in Liberia .....	33

### **3 Technical Solutions and Investment** .....

<b>3.1. Technical proposal for an efficient ARM Information system in Liberia</b> .....	34
3.1.1. Faster and cheaper collection of the information is necessary.....	34
3.1.2. Information/data processing done by sectorial experts.....	35
3.1.3. Target a timely, broad and useful dissemination of the information.....	35
3.1.4. Examples of operational Information Systems to manage agricultural risks.....	36
3.1.5. Operational proposals.....	40
<b>3.2. Governance proposals for an efficient ARM Information system in Liberia</b> .....	43
<b>3.3. Investment Plan for an efficient ARM Information system in Liberia</b> .....	44
3.3.1. Proposal of Log Framework:.....	44
3.3.2. Proposal of Investment Budget.....	45
3.3.3. Impact and benefit expected .....	47
3.3.4. Exit strategies.....	48
3.3.5. Main challenge of the Information System: the selection of the 6 individuals for the task force.....	49

## **Annexes**

<b>Annex 1 – Field Mission Calendar</b> .....	52
<b>Annex 2: List of people met during the mission</b> .....	53



# List of acronyms

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AFD	French Development Agency
ARM	Agricultural Risk Management
ARM IS	Agricultural Risk Management Information System
BIP	Bong Interior Plateau
BMZ/KfW	German Cooperation
CAADP	Comprehensive Africa Agriculture Development Programme
CEIGRAM	Center for Studies and Research for Agricultural and Environmental Risk Management
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CIRAD	French Agricultural Research Centre for International Development
CP	Coastal Plains
DGCS	Italian Development Cooperation
DP	Degraded Forests
EC	European Commission
EWS	Early Warning System
FAO	Food and Agricultural Organisation of the United Nations
FSs	Feasibility Studies
GSM	Global System for Mobile Communications
IFAD	International Fund for Agricultural Development
IMF	International Monetary Funds
IP	Interior Plains
ITU	International Telecommunication Union
LAC	Liberia Agriculture Company (LAC)
LACRA	Liberia Agriculture Commodity Regulatory Agency
LASIP	Liberia Agriculture Sector Investment Program
LATA	Liberian Agricultural Transformation Agenda
LISGIS	Liberian Institute of Statistics and Geographic Information System
MFZ	Montane Forest Zone
MoA	Ministry of Agriculture
MoT	Ministry of Transport
NAIP	National Agriculture Investment Plan
NEPAD	New Partnership for Africa's Development
ODA	Offre & Demand Agricole
PARM	Platform for Agricultural Risk Management
RAS	Risk Assessment Study
RESIMAO	Network of Market Information Systems
RML	Reuters Market Light
TFZ	Tropical Forest Zone
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNICEF	United Nations International Children's Emergency Fund
WFP	World Food Programme
WPt	Woodlands Plateaus



# List of figures and tables

## List of figures

<b>Figure 1:</b> Liberia's ecoregions map (adapted from West Africa: Land Use and Land Cover Dynamics) .....	18
<b>Figure 2:</b> Population distribution and density in Liberia .....	19
<b>Figure 3:</b> Liberia's Gross Domestic Product and labour force distribution in 2017 .....	20
<b>Figure 4:</b> Liberia's agricultural product exports in value, 2017.....	20
<b>Figure 5:</b> Liberia's rice imports and production from 2007 to 2017, in MT .....	21
<b>Figure 6:</b> Agro clusters planned by the Liberian National Investment Commission.....	22
<b>Figure 7:</b> Picture of the interview with Mr. Madison GONKARNUE, Field officer for MoA in Karnplay .....	22
<b>Figure 8:</b> Warehouse of Mr John BARLEAH, Cocoa, Coffee and Kola nut trader in Karnplay, Nimba County .....	25
<b>Figure 9:</b> ICT Price basket for Liberia, neighbor countries and Least Developed countries average.....	31
<b>Figure 10:</b> Use of internet in Liberia and neighbouring countries .....	32
<b>Figure 11:</b> Diversity of the information provided by Reuters Market Light in India .....	36
<b>Figure 12:</b> Short presentation of Cropwin a IT solution to improve the use of water and inputs in agriculture.....	37
<b>Figure 13:</b> Advertising for Sandji a weather information service for farmers provided by Orange in Mali .....	38
<b>Figure 14:</b> Example of key text message sent by Service n'kalô in Côte d'Ivoire in 2013 (Source: Presentation of n'kalô service during FAO Investments Days, Dec. 2013).....	38
<b>Figure 15:</b> Extracts of N'kalô newsletters on cocoa and cashew market for cashew.....	39
<b>Figure 16:</b> Collection of information scheme.....	41
<b>Figure 17:</b> Dissemination of the information scheme .....	43
<b>Figure 18:</b> Proposal of governance scheme for ARM Information System.....	43

## List of tables

<b>Table 1:</b> Liberia Country Profile Data .....	16
<b>Table 2:</b> Information needs and demand by stakeholders .....	26
<b>Table 3:</b> Summary on agricultural information supply .....	29
<b>Table 4:</b> Percentage of Households that have either grown or sold specific crops .....	40
<b>Table 5:</b> Regional and international sources of information on ARM Information System that can be used in Liberia.....	42
<b>Table 6:</b> Proposed investment plan.....	46
<b>Table 7:</b> Example of Business Model for the Information System after the end of the program.....	48
<b>Table 8:</b> Example of trade levies that could finance the service after the end of the program .....	49

# Executive summary

## Study context and objective

In 2017, the Center for Studies and Research for Agricultural and Environmental Risk Management (CEIGRAM) conducted an agricultural risk assessment study in Liberia for PARM. The study divided agricultural risks in Liberia into 3 categories:

- Weather risks, especially floods and wind storms
- Production risks, especially postharvest losses that reduce food self-sufficiency and marketable surpluses
- Environmental risks, especially pests and diseases that decrease yields in main staple and cash crops.

From the CEIGRAM study, it was concluded that strengthening early warning and information systems as well as strengthening the Ministry of Agriculture (MoA)'s extension services capacities for assessing and managing agricultural risks are key for the agricultural sector productivity in Liberia. Therefore, this feasibility study is to develop recommendations and an investment plan for agricultural risk management (ARM) information system that would be useful for value chain stakeholders and meso-level operators to efficiently manage risks related to weather, pests, diseases and price volatility in Liberia. The study relies on the analysis of demand and supply of agricultural information in Liberia.

## Demand and supply of agricultural information in Liberia

### Demand

We analyze agricultural information demand according to stakeholders and risk categories. The table below summarizes the data collected.

Stakeholders	Needs on weather information	Needs on price and market information	Needs on pests and diseases information
<b>Producers</b>	<b>High priority</b> <ul style="list-style-type: none"> <li>- Weekly weather forecast during the rainy season (especially about the onset)</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>- Regularly updated information on farm-gate prices (county level)</li> <li>- Advises on potential marketing price</li> <li>- Contact with trustworthy spot buyers</li> </ul> <b>Lower priority</b> <ul style="list-style-type: none"> <li>- Market information at the national and international level</li> <li>- Wholesale prices in nearest cities</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>- Advises on cultural and post-harvest practices, especially on pest control</li> <li>- Contacts of agro dealers (improved seeds and seedling, inputs)</li> <li>- Updates on potential pest propagation</li> </ul>
<b>Farmers' Organisations</b>	<b>High-priority information</b> <ul style="list-style-type: none"> <li>- Weekly weather forecast during the rainy season (especially about the onset)</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>- Regularly updated information on farm-gate prices (price range at the national level) and nearest wholesale prices</li> <li>- Markets price trend for the coming weeks or coming months</li> <li>- Contact with trustworthy buyers, possibly with willingness to pre-fund their purchases</li> </ul> <b>Lower priority</b> <ul style="list-style-type: none"> <li>- Contacts of banks and financial institutions</li> <li>- Market information at the international level</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>- Updates on pest propagation</li> <li>- Contacts of agro dealers (improved seeds and seedling, inputs)</li> <li>- Advises on cultural and post-harvest practices, especially pest control and storage good practices</li> </ul>

(...)



(...) Producers	Needs on weather information	Needs on price and market information	Needs on pests and diseases information
<b>Local traders and wholesalers</b>	<b>High-priority information</b> <ul style="list-style-type: none"> <li>Weekly weather forecast during the rainy season (especially about the onset)</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>Farm-gate and wholesale prices at the national level (price range)</li> <li>International market prices variation and trends (weekly to monthly trend)</li> <li>Contacts of potential buyers with capacity to purchase in bulk (&gt;30 MT)</li> </ul>	<b>Lower priority</b> <ul style="list-style-type: none"> <li>Advises on storage practices and market quality requirements</li> <li>Contacts of agro dealer (inputs, bags)</li> <li>Forecasts on production at the national level</li> </ul>

## Supply

The table below sums up existing and past agricultural information supply in Liberia, as observed during the mission. Agricultural information supply is currently very limited for value chain stakeholders and meso-level operators. Most of the information available are now historical data and are available online. Most producers and farmers' organizations declared having no access to weather information, extension and advisory services. Market information are access through direct phone contact with Monrovia's wholesalers. The Liberia Agriculture Commodity Regulatory Agency (LACRA)'s minimum price radio statement for the 2018 cocoa campaign has been well perceived by stakeholders as information are otherwise not available.

Organizations	Weather information	Price and market information	Pests and diseases Information	Other
<b>Central Bank of Liberia</b>		<ul style="list-style-type: none"> <li>Historical and aggregate information on agricultural products exports and imports as well as consumer price index</li> <li>Last publication: Oct 2018</li> <li>Available online</li> </ul>		
<b>MoA</b>	<ul style="list-style-type: none"> <li>Direct information feedback (calls) from field officers in case of urgent matters (major flood or drought)</li> </ul>		<ul style="list-style-type: none"> <li>Direct information feedback (calls) from field officers in case of urgent matters (pest propagation)</li> </ul>	<ul style="list-style-type: none"> <li>Monthly information feedback from field officers on their field activities</li> <li>Annual crop assessments, in partnership with LISGIS. Last done in 2016. Available on line and by request</li> </ul>
<b>LISGIS</b>		<ul style="list-style-type: none"> <li>Local retail prices monitoring (rice, cassava, palm oil, pepper and bitterballs)</li> <li>Last publication in Sep. 2017, also disseminated through WFP's dataviz and FAO's GIEWS</li> </ul>		<ul style="list-style-type: none"> <li>Annual crop assessments, in partnership with MoA. Last done in 2016. Available on line and by request</li> </ul>
<b>Liberia Meteorological service</b>	<ul style="list-style-type: none"> <li>Current joint project with UNDP on climate information services</li> <li>Weather information dissemination stage not yet reached</li> </ul>			
<b>LACRA</b>		<ul style="list-style-type: none"> <li>First minimum price for the cocoa campaign done in 2018</li> <li>Dissemination through radio statements</li> </ul>		
<b>GROW Liberia</b>		<ul style="list-style-type: none"> <li>Tried to build market linkage and information system activities in the past year</li> <li>Activities stopped due to low results</li> </ul>		

## Opportunities and challenges for an efficient ARM information system

Regarding the **main opportunities** for an efficient ARM information system, we identify that:

- Liberia has good telecommunication infrastructure in the main agricultural areas: 56% of the population has a mobile phone subscription and 80 radio stations are active, mainly in rural areas.
- There is a good literacy rate in rural areas: 43% of the total population and 49% of those within the ages of 15-and 24-years old in 2007.
- More producers have now a more market-driven strategy for their farming systems, as observed with the resumption of cash and commercial food crops plantation dynamic (cocoa, rubber, palm oil, plantain, pepper).

The **main challenges** observed are:

- MoA's field officers are poorly equipped and trained. They are also dependent on projects funds
- Liberia market is small and poor to attract private companies wanting to invest in services for agriculture, including agricultural information.
- There is a high turnover in public agencies in key positions (technical and managerial positions) which create losses in skills, knowledge and network in the administration.
- Mobile phone communications are costly. Average cost is 18.41 USD/month for 30 calls and 100 SMS according to the International Telecommunication Union (ITU).
- The mobile network is relatively good in the country, but internet use remains very limited, particularly in rural areas.
- Increasing industrialisation and medium/commercial plantations (rubber and palm oil mainly) in several rural areas decrease the availability and increase the cost of manpower for family farming. This situation pushes small household to orientate their own production towards a subsistence strategy (food crops only for self-consumption) and generate incomes by renting out labour.

## Technical and operational proposal

We suggest that an efficient ARM information system in Liberia should rely on:

- **Fast and cheap data collection:** data collection should be done by a limited number of staff, through phone calls to key informers previously met. This approach greatly reduces costs and allow a greater flexibility in the data collection than the usual network of field staff collecting local data. Moreover, it enables to include qualitative information in the data collection, which are useful for context analysis.
- **Data processing by sectorial experts:** data collection and analysis should be done a pool of experts (specialized in a crop or in a specific agrarian context). Experts can easily identify determining factors during routine data collection. They can also quickly synthesize the information to advice on risk management.
- **Timely, broad and useful information dissemination:** the information system must disseminate broad and unrestricted information. Information should be disseminated rapidly (max 48h between data collection and information dissemination). Dissemination should be regularly and timely so that users know they can rely on it to make decisions. In addition, it must provide advice on how to manage priority risks.

We also recommend to:

- **Start the ARM information system with a limited number of crops:** rice, cassava (the two main staple crops), palm oil, plantain (crops at the junction between food security and producers' commercial strategy), rubber and cocoa (the two main cash crops in the country). More challenging crops could be added later, such as pepper and bitter balls (highly perishable).

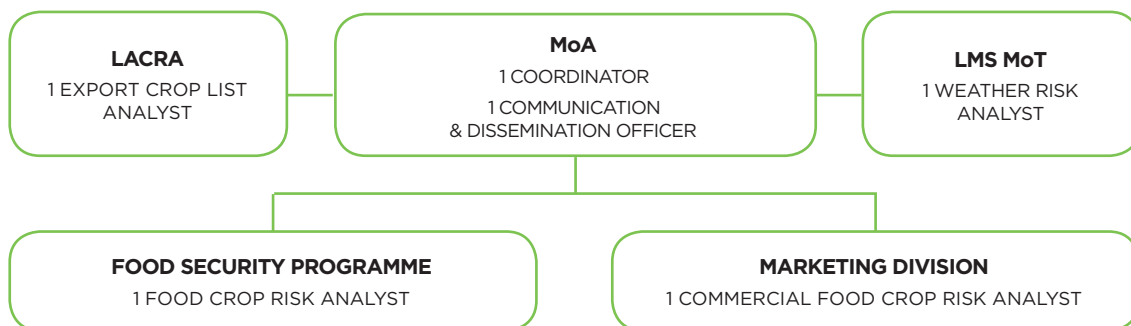


- **Focus on short term updates:** weekly weather forecasts (rainfall forecasts), market information (farm-gate trends and marketing advices), pest control information, cultivation & post-harvest tips for the first stages of the ARM information system as they appear the most strategic.
- **Collect data through phone calls** to private and public stakeholders on a weekly basis to start. Using this methodology, few individuals can manage data collection nationwide in a timely and efficient manner.
- **Disseminate information using several channels**, such as mail and WhatsApp groups, for public agencies, research units, international organizations and NGOs, text messages and radio broadcasts for local stakeholders.

To enhance the implementation of the recommendations outlined above, we suggest the creation of a six-member ARM Information System Team within the MoA. The team should compose of 4 Agricultural Risk Analysts, 1 ARM Coordinator and 1 Communication/Dissemination Officer. The ARM information system would be based and coordinated by the MoA. 1 Agricultural Risk Analyst would be based in the MoA's Food Security Division (supervising information on cassava and rice) and another Agricultural Risk Analyst would be based in the MoA's Marketing Division (supervising information on palm oil and plantain). The third Agricultural Risk Analyst would be based in LACRA (export crops: cocoa and rubber) and the last Agricultural Risk Analyst would be in the Liberia Meteorological Service (weather risk).

To monitor and coordinate the program, the following institutions should be represented in a steering committee additionally to the institutions implementing the Information System:

- Ministry of Agriculture: Department of Planning & Development, Division of Extension and Advisory and Division of Crop Protection
- Ministry of Commerce
- Liberian Institute of Statistics and Geographic Information System (LISGIS)



We propose an investment plan for 3 years with a total cost of 1,276,240 USD. The yearly cost to run the ARM Information System after the end of the project would be of 52,080 USD.

Amount in USD	Year 1	Year 2	Year 3	Total	Post-project
Project coordination, M&E and capitalization	44,000	44,000	44,000		0
Capacity building (Technical Assistance + Training sessions)	102,000	69,000	46,000		0
Collection and production of information	80,080	27,080	17,080		17,080
Dissemination of the information	333,000	417,000	53,000		35,000
<b>Total</b>	<b>559,080</b>	<b>557,080</b>	<b>160,080</b>	<b>1,276,240</b>	<b>52,080</b>

Several exist strategies are proposed in the conclusion part of the report, including opportunities for both private and public sources of financing for the Information System. But as an advantage, we specify clearly the need for the proposed Information System is to have a limited running cost.



# 1. Introduction

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## 1.1. Study context

### 1.1.1. The Platform for Agricultural Risk Management

The Platform for Agricultural Risk Management (PARM) is a multi-donor facility established in December 2013 by the European Commission (EC), the French Development Agency (AFD), the Italian Development Cooperation (DGCS), German Cooperation (BMZ/KfW) and IFAD in strategic partnership with the New Partnership for Africa's Development (NEPAD) Programme and other development partners to make risk management an integral part of policy planning and implementation in the agricultural sector of developing countries.

The PARM process follows a five-phase process in each country: setting up of activities, risk assessment, policy dialogue, follow-up and implementation. The core of the process begins with the risk assessment to define the problem before the identification of Agricultural Risk Management (ARM) tools that will subsequently emerge as potential solutions. During risk assessment study, discussions are held with stakeholders where main ARM priorities are identified, including capacity building support to improve local stakeholders' awareness and knowledge on ARM, as well as capacity to manage and conduct appropriate institutional reforms and mainstream ARM in countries.

### 1.1.2. PARM in Liberia

The goal of the overall PARM process in Liberia is to ensure the integration of ARM conceptual and operational tools (including the capacity development) into the National Agriculture Investment Plan (NAIP), designed under the auspices of the African Union and NEPAD's Comprehensive Africa Agriculture Development Programme (CAADP).

The Risk Assessment Study (RAS) for Liberia conducted by PARM in collaboration with the Research Centre for the Management of Agricultural and Environmental Risks (CEIGRAM), indicates that the major risks affecting the country's agriculture are: 1) high precipitation (floods); 2) post-harvest losses; 3) crop pest and diseases; 4) livestock pest and diseases; 5) price risk; and 6) political risk.

Against these risks, CEIGRAM has highlighted some vital solutions - with potential to inform initial key areas where PARM can support the Government of Liberia in undertaking their corresponding ARM Feasibility Studies (FSs). Given the results of the RAS, PARM in collaboration with the Ministry of Agriculture (MoA) prioritize two ARM tools for the Feasibility Studies to define a concrete investment proposal for solutions to manage some of the identified agricultural risks in Liberia. The two ARM tools are: (1) Agricultural Risk Information and Early Warning System, and (2) Strengthening capacities of the extension services of the Ministry of Agriculture for assessing and managing agricultural risks.

This study focuses on the first ARM tool "Agricultural Risk Early Warning System". In the context of the study, the agricultural risk early warning system is used to refer to a comprehensive information system that collects, stores, and disseminates data relevant to weather and climate risk; pests and diseases; and price risk. Information is expected to be relevant to crops and livestock, and the principle end-users are the meso-level stakeholders in the agricultural value chain such as farmers' organizations, extension services, processors, input suppliers, financial service providers (including insurers), Media and community-based actors who use it to improve services for smallholder producers.



### 1.1.3. Agricultural risk context in Liberia

Risk refers to the possibility that an adverse development will occur and negatively affects a system's performance. Understanding the risks faced by agricultural sector and effective strategies to manage those risks is vital to creating a diversified and resilient economy for sustained growth and economic transformation. The RAS conducted by PARM in collaboration with CEIGRAM provides a rigorous analysis of the production, marketing, and enabling environment risks faced by Liberia's agricultural sector, prioritizes the key risks and identifies solutions to manage them. Below are the possible categorization and examples of risk in the agricultural sector of Liberia;

#### Weather Risks

**Floods** are the most frequent weather disasters in Liberia (40% of the events) together with **wind storms** or Harmattan (13%). Flooding is the main problem in the lowland areas of the country. In these areas, rivers are threatening the livelihoods of the population, especially in the rainy season. In addition, **sea erosion** by the coastline is a risk and it also destroys houses and buildings.

Both floods and sea erosion are causing periodic displacement of people in the disaster-prone areas, and the consequences are often worsened by the fragility of infrastructural facilities. This explains the worrying rate of transport accidents (20% of the events) in the country.

#### Production

**Post-harvest losses** reduce the self-sufficiency of food and agricultural yields to be sold, thereby leading to reduced income. The deficit of storage facilities and roads provoke important postharvest losses and exacerbate the difficulties of access to market. It limits opportunities for farmers to keep their produce for future market and take advantage of the higher prices, usually after 3 or more months of harvest.

#### Biological & Environmental

**Pests and diseases** that affect rice (either in production or storage) are critical in Liberia. This risk is a major problem responsible for decrease rice yields. Pests such as grass cutters (ground-hogs) and birds threaten the quality and quantity of rice throughout the country. Attacks have intensified following the end of war and resumption of farming activities in rural areas. Exposure to the consequences of these and other risks can be effectively limited through risk management systems tailored to the prevailing conditions of Liberia's agricultural sector.

### 1.1.4. Proposals from PARM Liberia Risk Assessment Study (RAS)

The PARM/CEIGRAM 2017 risk assessment report for Liberia, proposed a list of ARM solutions based on stakeholder interviews, focus group discussions, and published literature on Liberia's agricultural sector. The proposed ARM strategies are a combination of risk-mitigation, risk-transfer, and risk-coping instruments. For risks that are frequent but with limited impacts, the best approach proposed by CEIGRAM is to try to mitigate them. Two proposed areas of risk management priority, with significant potential for synergies as identified in the RAS are:

1. Strengthening early warning and information systems to detect threats to food security.
2. Strengthening capacities of the extension services at Ministry of Agriculture for assessing and managing agricultural risks.

PARM aims to build on its experience and mandate in Sub-Sahara Africa and the intention to find complementarities with ongoing initiatives and the Governmental priorities, rather than duplicating existing actions. Therefore, the CEIGRAM/PARM risk assessment study serves as the basis for this feasibility study for investment to improve access to agricultural risk information for meso level stakeholders and smallholder producers in Liberia.

Timely access to information is a crucial ex-ante risk mitigation instrument identified by PARM to manage agricultural risk. Information systems are also an area considered a priority by national and international stakeholders – it was clearly emphasized during PARM's first country mission to Liberia in 2016. EWS and complementary agricultural information systems are important mechanisms to better manage agricultural risks. They are used to monitor and improve responses to foreseen and imminent production, weather and adverse market price risks. This is especially relevant for Liberia, and therefore, this study on information accessible for farmers through meso level stakeholders was launched.

### 1.1.5. Objective of the study

The objective of the study is to examine the different types of information relevant for mitigating meteorological/weather, pest and disease and market/financial information in Liberia. The study also outlines recommendations and a corresponding investment plan for early warning and information system(s) to help meso-level operators in agriculture and smallholder farmers better manage risks related to weather and climate variability, pests and diseases, and price volatility.

Specific focus of the study is to ensure that information is available and accessible in a timely manner for meso level actors in the agricultural value chain. The use of new technologies (mobile services, e-bulletins accessible by mobile phone) and traditional channels (community radios) are some possible information channels. The study analysis identifies possible solutions to improve these channels for information dissemination and concludes with an investment plan.

To avoid the risk of duplication, this study revisits existing studies on information systems, which are often too fragmented. It then proposes solutions to converge them into one ARM information system, easily accessible by meso level operators along agricultural value chains and smallholder producers. It also considers best practice and any relevant lessons from other countries.

## 1.2. Country context

### 1.2.1. General data

Liberia is a West African coastal country with a land area of 111,369 km<sup>2</sup>. Liberia shares 1,667 km of border with Guinea, Côte d'Ivoire and Sierra Leone. Its estimated population in 2018 was 4,810,000, with a median age of 17.8 years old and a population growth rate of 2.59%. Urban population is 51.2% and the annual rate of urbanization is 3.41% for the 2015-2020 period<sup>1</sup>.

In 2017, the GDP per capita was estimated at 1.300 USD. Agricultural activities contributed to 34% of the total GDP while services were responsible of 52% of it. Liberia's trade balance showed a deficit of 2.45B USD<sup>2</sup>. The general country data are summarized in the table below;

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1 All data presented in this section are from CIA's the world factbook  
<https://www.cia.gov/library/publications/the-world-factbook/geos/li.html> [consulted on 5/3/2019]  
2 Trade balance data from the Observatory of Economic Complexity  
<https://atlas.media.mit.edu/en/profile/country/lbr/> [consulted on 5/3/2019]

**Table 1:** Liberia Country Profile Data

Liberia – General Data	
Land area	111,369 km <sup>2</sup>
Total population (2018 est.)	4,810,000
Median age (2018 est.)	17.8
Population growth rate (2018 est.)	2.59%
Urban population ((2018 est.)	51.2%
Annual rate of urbanization (2015-2020)	3.41%
GDP per capita (2017 est.)	1,300 USD
GDP distribution: agriculture (2017 est.)	34%
Trade balance (2017 est.)	-2.45B USD

Source: Author's construct based on information from multiply statistical sources

## 1.2.2. Geographical data

### Ecoregions of Liberia

Liberia has very diverse ecological zones. It is mostly the low mountains in the northeast and north-central regions (respectively Guinea highlands and Nimba mountains). Going towards west and south, these highlands run into hills and finally plains, swamps and mangrove on the coast. The average annual rainfalls range from 2,000 mm in the central-north of the country (Nimba county) to 2,800 mm in the coastal plains (except Grand Kru and Maryland counties)<sup>3</sup>

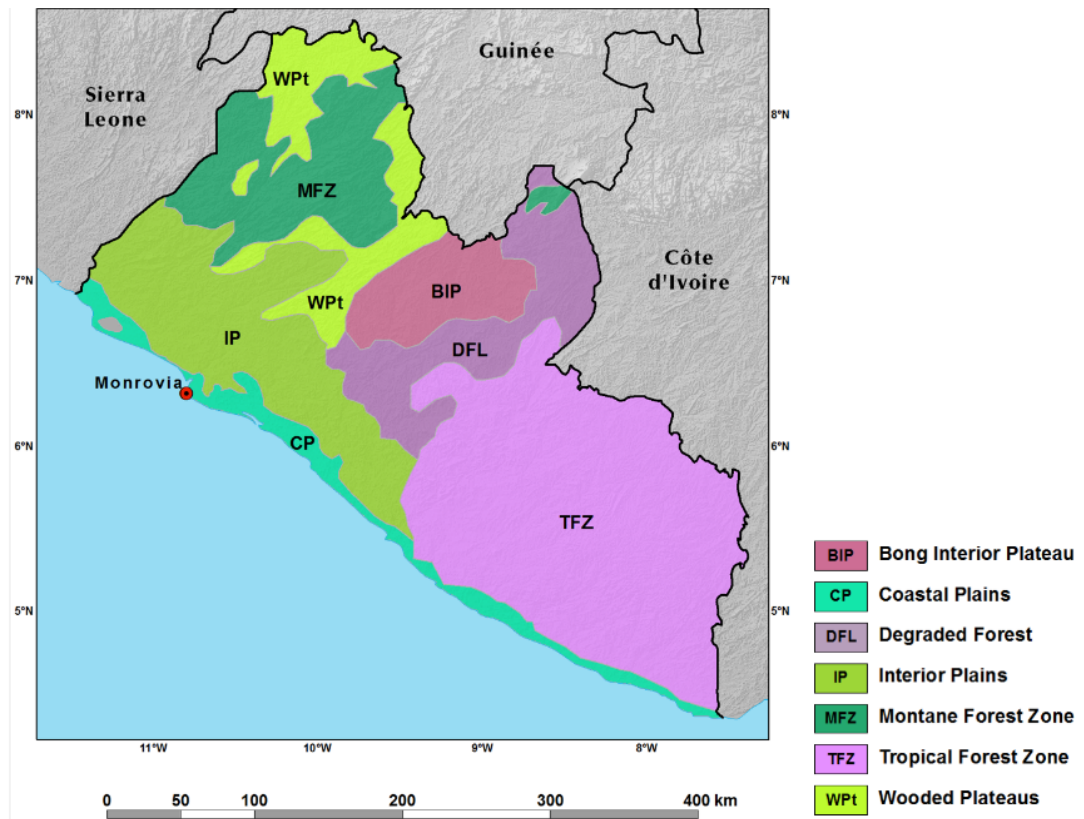
As shown in figure 1 below, the West Africa Land Use and Land cover dynamics<sup>4</sup> distinguishes 7 types of ecoregion for Liberia:

- Bong Interior Plateau (BIP), where most of the arable land of Liberia is located
- Coastal Plains (CP), with savannah degraded forest and agriculture
- Degraded Forests (DFL), with farmlands and patches of semi-deciduous and tropical rainforests
- Interior Plains (IP), in the east, mainly lowlands covered with tropical rainforests and farmlands
- Montane Forest Zone (MFZ), in the northeast of the country, hills with dense rain forests
- Tropical Forest Zone (TFZ), in the southern part, lower lands with dense rain forests and farmlands
- Woodlands Plateaus (WPT), less densely forested woodlands on the highlands of the country.

<sup>3</sup> <https://earlywarning.usgs.gov/fews/product/252>

<sup>4</sup> <https://eros.usgs.gov/westafrika/ecoregions-and-topography/ecoregions-and-topography-liberia>

**Figure 1:** Liberia's ecoregions map (adapted from West Africa: Land Use and Land Cover Dynamics)



## Population and infrastructures

The majority of Liberian lives now in the cities, mainly Monrovia and Robertsport creating an imbalance in population density between cities and the smaller towns and villages. Monrovia's population density exceeds 1,600 pop. /km<sup>2</sup><sup>5</sup>, while that of the rest of the country is 250 pop. /km<sup>2</sup>. Apart from Montserrado county, the most densely populated counties are Margibi, Maryland, Bomi and Nimba counties.

Transport infrastructure are scarce in Liberia. The current road density is low, with a total road length of around 10,000 km (10,3 km per 100 km<sup>2</sup>), which is slightly below Sub-Saharan countries average. Only 734 km (~7% of total road) are currently paved<sup>6</sup>. These paved roads, especially the routes of Monrovia to Bo, Monrovia to Buchanan and Monrovia to Ganta, are well-maintained. New road development projects are ongoing, such as on the Ganta-Zwedru axis<sup>7</sup>.

There are four main seaports in Liberia are Harper, Buchanan, Greenville and the Freeport of Monrovia. Freeport is the most active, and it is where most of the imported commodities arrive.

5 MapAction's Liberia Ebola Outbreak Population density by district, 2014  
<https://maps.mapaction.org/dataset/231-3531>

2008 NATIONAL POPULATION AND HOUSING CENSUS  
[https://www.emansion.gov.lr/doc/census\\_2008provisionalresults.pdf](https://www.emansion.gov.lr/doc/census_2008provisionalresults.pdf)

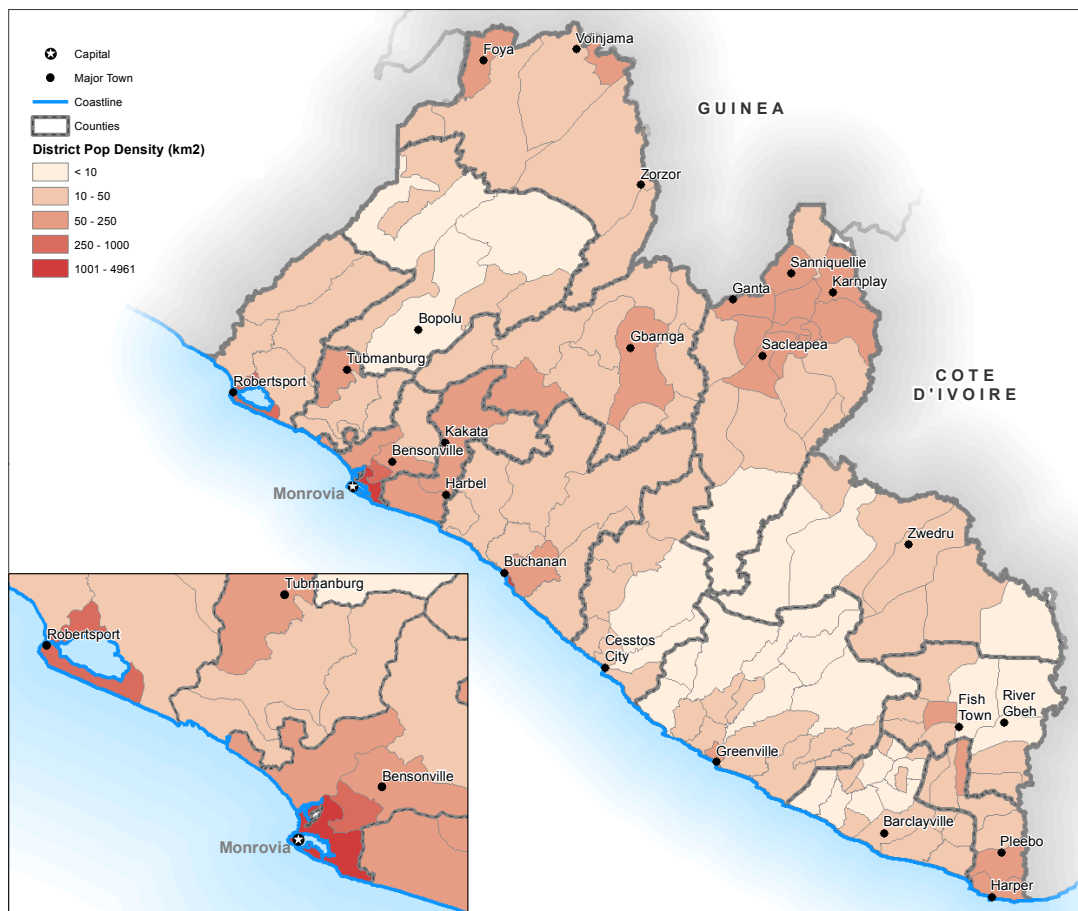
6 World Bank. Liberia: Emergency Road Maintenance Project (P164463). PID  
<http://documents.worldbank.org/curated/en/878611500315011191/pdf/IL-AISPID-CP-P164463-07-17-2017-1500314995364.pdf>

7 <http://www.worldbank.org/en/news/press-release/2018/12/18/liberia-new-southeastern-road-project-to-advance-economic-development-and-transformation>





**Figure 2:** Population distribution and density in Liberia



Source: Adapted from MapAction's Liberia Ebola Outbreak Population density by district, 2014

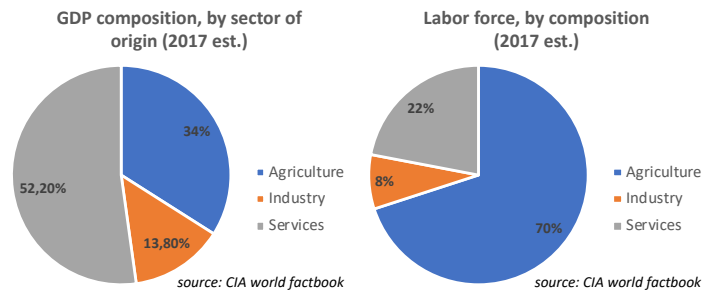
### 1.2.3. Agricultural sector data

Land use and land cover data indicate that there is a strong revival on agriculture (rain fed, irrigated and agro-forestry) in Liberia since 2003<sup>8</sup>. The agricultural sector in Liberia currently employs around 70% of the national labor force and is often referred as dualistic sector with a larger number of smallholders and few large-commercial farms (plantations). Outputs from the sector contributes to about 37% of the total country GDP<sup>9</sup> and 17% of the total export value in 2017 (near 171 million USD)<sup>10</sup>; Rubber exports are by far the highest contributing commodity (128.8 million USD or 75%), followed by cocoa (32.6 million USD or 19%) of the total agricultural products export value. The graphical presentation of Liberia's agricultural sector data is given below;

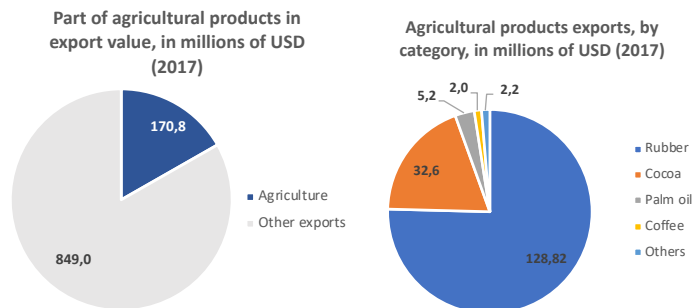
<sup>8</sup> <https://eros.usgs.gov/westafrica/land-cover/land-use-land-cover-and-trends-liberia>

<sup>9</sup> <https://www.cia.gov/library/publications/the-world-factbook/geos/li.html>

<sup>10</sup> <https://atlas.media.mit.edu/en/profile/country/lbr/>

**Figure 3:** Liberia's Gross Domestic Product and labour force distribution in 2017


Source: CIA world factbook

**Figure 4:** Liberia's agricultural product exports in value


### Small household farms

Most farmers are smallholders, with an estimated average farm size of 1.5 ha (LISGIS 2001 baseline survey). They primarily rely on family with low level of mechanization and limited inputs use (fertilizers, pesticides, loans). Farming systems rely on shifting cultivation (with long fallow period) and swamp management. Production systems are typically oriented towards subsistence, and farmers may also sell surpluses in the local market. Rice and cassava as the commonly cultivated crops. When producing crops for subsistence, farmers also integrate income-generating cash crop such as rubber, palm oil, cocoa and plantain.

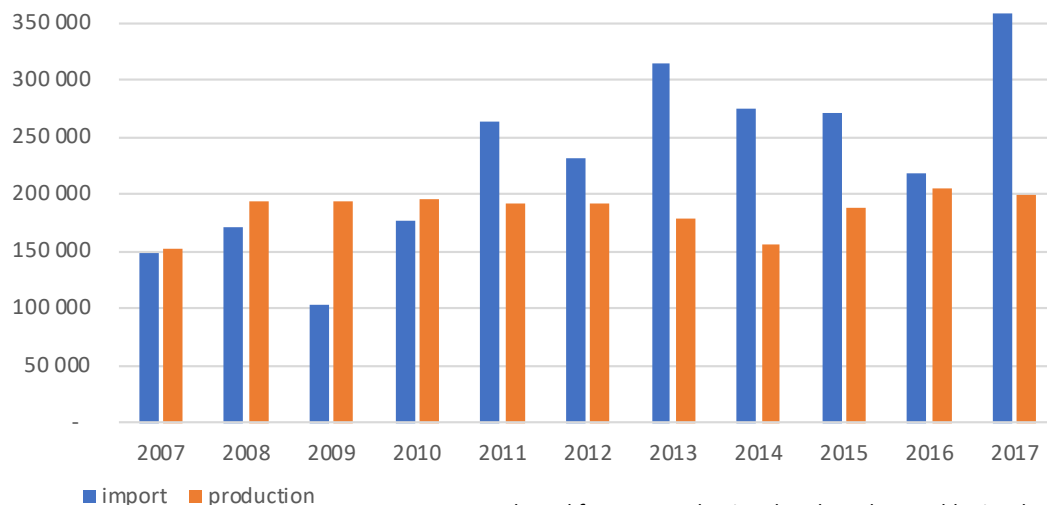
Rice, which is the first most important staple crop is cultivated in uplands and swamps. In 2017, Liberia's rice production was estimated at 200,000 MT <sup>11</sup>. The same year rice imports were about 364,000 MT (see figure 5). Cassava is as the second most important staple is heavily produced in the northern part of the country. Production is all year round and annual production is estimated at 250,000 MT in 2007 <sup>12</sup>. Other key food crops that are grown includes vegetables (pepper and bitter balls), oil palm, plantain and groundnuts.

<sup>11</sup> Based on FAOstat's paddy rice production in Liberia, 302.700 MT.

<sup>12</sup> FAO 2007 Comprehensive assessment of the agricultural sector / volume 1 - synthesis report <http://www.fao.org/3/a-ai562e.pdf>



**Figure 5:** Liberia's rice imports and production from 2007 to 2017, in MT



Source: comtrade and foostat, production data based on paddy rice data

Marketing strategy remain limited amongst these farmers. The 2006 comprehensive food security and nutrition survey indicate that 71% of rice, 55% of cassava were consumed by the farm household. But this study revealed that 57% of the vegetable production was sold<sup>13</sup>. Also, reports from the 2016 LISGIS survey indicated that 7.4% of household grew and upkeep cocoa trees and 10.3% rubber trees<sup>14</sup>. Small to medium-size commercial farms and family-owned farms primarily focus on cash crop farms. It is also worth to note that the poor road network, coupled with the limited availability of trucking services push transport costs high, especially during the rainy season. This situation impedes the development of potential commercial production in the agricultural sector.

### Large-scale plantations

On the other end of the spectrum, the agricultural sector in Liberia also includes major plantations managed by the private sector. Currently only two companies actively own rubber tree plantations in the country: Firestone and SOCFIN-Liberia Agriculture Company (LAC). The Firestone rubber plantation is near 417,000 ha, making it the world's largest plantation, and that of SOCFIN-LAC is about 14,000 ha. SOCFIN runs an out-grower scheme in Bong county to supply the Weala Rubber Company (rubber mill). The company buys rubber from local smallholders tapping a total of 14,000 ha of rubber trees<sup>15</sup>.

### National agricultural policies

Since 2003, national agricultural policies in Liberia have looked for balancing food security strategy with the development of commercial oriented farms in rural communities. In 2008, the Government of Liberia launched the Food and Agricultural Policy and Strategy. The objectives are: 1) to improve food security, and 2) to enhance competitiveness and market linkages. Specific sector and subsectors were identified, and strategies to engage with smallholders were made a priority.

In 2011, the government of Liberia finalized the Liberia Agriculture Sector Investment Program (LASIP), with the aim to coordinate investments in the sector while also considering the priority areas consistent with the poverty reduction strategy. LASIP specifies four domains of actions: 1) food and nutrition, 2) competitive value chains and market linkages, 3) institutional development, and 4) land and water management.

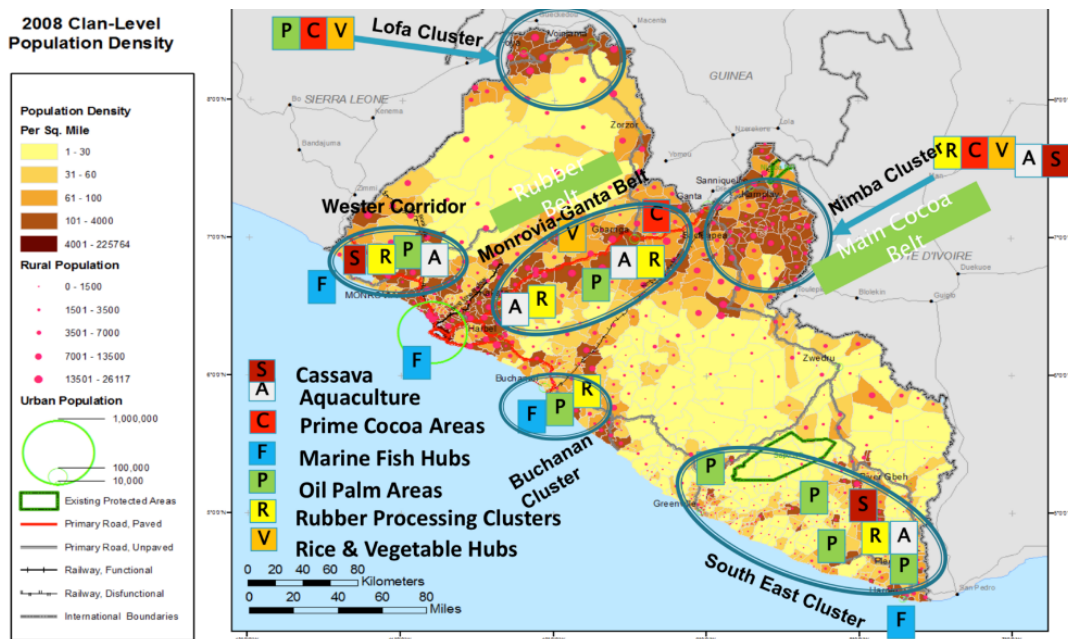
<sup>13</sup> <http://www.moa.gov.lr/doc/CFSNS-FINAL.pdf>

<sup>14</sup> [http://www.lisgis.net/pg\\_img/Final%20Agriculture%20Recall%20chapter%202016.pdf](http://www.lisgis.net/pg_img/Final%20Agriculture%20Recall%20chapter%202016.pdf)

<sup>15</sup> USAID, 2008 cited in Agricultural risk assessment

Fast forward to 2016, the Government initiated the Liberian Agricultural Transformation Agenda (LATA), a three-year policy framework for developing agriculture and agribusinesses through investments in strategic value chains. The main aim is to increase value-added and market opportunities for farmers. Several value chains have been identified (rubber, palm oil, cocoa, fisheries, cassava and rice) as well as specific production areas, some along strategic corridors (see figure 6).

**Figure 6:** Agro clusters planned by the Liberian National Investment Commission

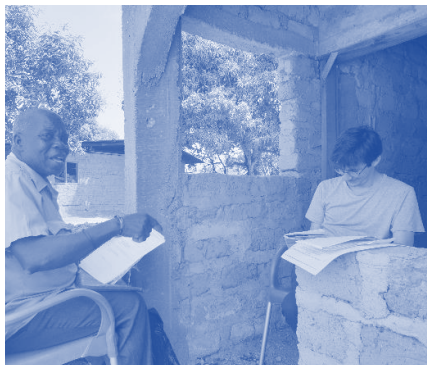


Source: Adapted from LATA presentation, primary data: LISGIS

### 1.3. Methodology and approach

Nitidae's approach is to promote low-cost, user-friendly and timely information services. Our experience leads us to defend that the information tool developed for farmers and stakeholders of agricultural value chain must be adapted to the context, the demand and the skills of the final users. We see technology as a tool (that is, the means to an end) but not as an end.

**Figure 7:** Picture of the interview with Mr. Madison GONKARNUE, Field officer for MoA in Karnplay





Therefore, from our experience, we identified the public and private stakeholders involved in the production and dissemination of useful information for managing agricultural risks of weather, pest/diseases and market.

During our mission, we met the public authorities (in charge of agriculture, trade and transport), international organizations, NGOs and many other organisations/agencies active in agriculture (see Annex 2).

To have a picture of the current availability of information, the priority demand of information, and the skills of meso-level stakeholders for using information and communication technologies, we did a 3-day field trip in Nimba and Bong counties (see Annex 1 for the Calendar of Field Mission). There, we met 2 Extension Services Officers, 7 Local Farmers' Organizations (representing 700 farmers), 10 individual farmers and 2 traders.

The final investment plan was written in two weeks following the field mission. During the mission, we took the opportunity of our interactions with donors and public agencies to discuss several ideas to incorporate their points of view in our final propositions/recommendations.



## 2. Analysis of demand, supply and environment for an efficient ARM information system

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### 2.1. The demand for information on Agricultural Risk Management in Liberia

The study interviewed stakeholders and key informers about the demand for information on ARM within three thematic areas:

1. cultural and post-harvest practices,
2. market information
3. weather forecasts.

#### 2.1.1. Cultural and post-harvest practices

Producers and farmers' organisations are first looking for informational contents on best practices regarding cultivation and post-harvest activities to increase yields, deter and manage potential pests and reduce post-harvest losses. Part of this demand is associated with the need for extension and advisory services, which mainly do not exist. This demand is also linked to the need for access pesticides, fertilizers and improved seeds and seedlings.

During interviews, cooperative leaders and producers often referred to their current cultivation practices as "traditional", meaning that they could be improvements through a better access to inputs and a rationalization. This fact was corroborated by the RAS, which indicates that shifting cultivation remains dominant and input use is very limited.<sup>16</sup> These producers are looking for information on a) best practices and advise on plot characteristics (soil, orientation...) and b) contacts of nearest agro-dealers that can provide the right inputs to their needs. This is especially the case for cash crops such as cocoa and rubber trees as well as improved seedlings.

The main concern for producers is crop pests and diseases protection. Their needs range from insects and caterpillar management on staple crops to fungal disease on tree crops (especially cocoa). Demand is focused on best crop protection to apply, and access to appropriate inputs to eliminate the pests and diseases. Producers are looking for access to extension services advise and contacts of agro dealers selling the right inputs.

The subject of post-harvest losses was less brought about by producers, as few have a strong marketing strategy. However, farmers' organizations pointed out the need to have better training on storage practices to avoid losses. The RAS shows that improvements of infrastructure in this domain are needed.<sup>17</sup>

Individual producers and farmers' and organizations' demand were more directly focused on maximizing the productivity than managing the product quality. We infer that, this is linked to the poor state of current market linkage. Buyers' requirements on quality and eventual premium prices for best quality is something still unfamiliar for producers. Wholesalers and local traders were more eagerly interested to adhere to national and international buyers' quality requirements to manage their commodities stocks the right way.

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<sup>16</sup> PARM. Liberia's Agriculture Risk Assessment Study. 2017, especially p21 and pp27-31.

<sup>17</sup> PARM. Liberia's Agriculture Risk Assessment Study. 2017, especially p17

### 2.1.2. Market information

Most of producers and trader currently access market information through their weekly visit of the local marketplace. Some of them call acquaintances in Monrovia or enquire from Red-Light wholesalers for information on daily price variations. This indicates that a better transparency on market prices and market variations would be an effective way to stimulate a potential marketing strategy of farmers. A third party, like the MoA, which does not have a direct impact in trade (i.e., not a buyer or a seller) is usually not of great assistance, even though disseminated market information from its channel is somewhat considered more trustworthy than those delivered by downstream value chain stakeholders.

**Figure 8:** Warehouse of Mr John BARLEAH, Cocoa, Coffee and Kola nut trader in Karnplay, Nimba County



Producers indicated an interest for local prices variation (farm-gate and local market prices) as well as forecasting of the local price trend to figure out the best marketing strategy to adopt. Community radios were cited as the best channel to convey this kind of information.

Among all the actors interviewed, traders have the best access to market information. Some of them indicated that they follow international market trend on the web. Nevertheless, they mentioned that a regular and trustworthy source of information on national and international market prices trends (price range in local markets and farm-gate level) is crucial for their agri-businesses risk management.

### 2.1.3. Weather forecasts

Weather information are scarce in Liberia. When mentioned during interviews, producers and traders alike referred to seasonal change as a cyclical phenomenon that can be anticipate but not precisely. All stakeholders indicated that having a better information (bi-weekly/weekly forecasts) on the onset of rains is useful for their activities. Producers and farmers organisations need this information to manage their agricultural calendars, especially to plan for activities of land preparation (ploughing and sowing), harvesting, drying, storing and marketing. They also need the information to plan for how to adapt their cultivation practices to the changing rainfall pattern.

Even traders are interested in weather forecast to anticipate the cost of transportation in times of rainfall - road networks become muddy and usually impossible to transport commodities from the remote farming communities to the urban centres.

## 2.1.4. Analysis of Information demand by category of stakeholder

From the field interaction with stakeholders and key informant, relevant information on agriculture risks information systems needs in the areas of weather, market price and pests and diseases were gathered. The stakeholders highlight their level of needs and demand for information in these three specified areas. The information is presented in the table below:

**Table 2:** Information needs and demand by stakeholders

Stakeholders	Needs on weather information	Needs on price and market information	Needs on pests and diseases information
<b>Producers</b>	<b>High priority</b> <ul style="list-style-type: none"> <li>Weekly weather forecast during the rainy season (especially about the onset)</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>Regularly updated information on farm-gate prices (county level)</li> <li>Advises on potential marketing price</li> <li>Contact with trustworthy spot buyers</li> </ul> <b>Lower priority</b> <ul style="list-style-type: none"> <li>Market information at the national and international level</li> <li>Wholesale prices in nearest cities</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>Advises on cultural and post-harvest practices, especially on pest control</li> <li>Contacts of agro dealers (improved seeds and seedling, inputs)</li> <li>Updates on potential pest propagation</li> </ul>
<b>Farmers' Organisations</b>	<b>High-priority information</b> <ul style="list-style-type: none"> <li>Weekly weather forecast during the rainy season (especially about the onset)</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>Regularly updated information on farm-gate prices (price range at the national level) and nearest wholesale prices</li> <li>Markets price trend for the coming weeks or coming months</li> <li>Contact with trustworthy buyers, possibly with willingness to pre-fund their purchases</li> </ul> <b>Lower priority</b> <ul style="list-style-type: none"> <li>Contacts of banks and financial institutions</li> <li>Market information at the international level</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>Updates on pest propagation</li> <li>Contacts of agro dealers (improved seeds and seedling, inputs)</li> <li>Advises on cultural and post-harvest practices, especially pest control and storage good practices</li> </ul>
<b>Local traders and wholesalers</b>	<b>High-priority information</b> <ul style="list-style-type: none"> <li>Weekly weather forecast during the rainy season (especially about the onset)</li> </ul>	<b>High priority</b> <ul style="list-style-type: none"> <li>Farm-gate and wholesale prices at the national level (price range)</li> <li>International market prices variation and trends (weekly to monthly trend)</li> <li>Contacts of potential buyers with capacity to purchase in bulk (&gt;30 MT)</li> </ul>	<b>Lower priority</b> <ul style="list-style-type: none"> <li>Advises on storage practices and market quality requirements</li> <li>Contacts of agro dealer (inputs, bags)</li> <li>Forecasts on production at the national level</li> </ul>

Source: Author's construct based on information collected from the fieldwork.

## 2.2. The availability and supply of information for Agricultural Risk Management in Liberia

We identified 6 agencies that deliver information on agricultural risk information in Liberia, of which one is from the private sector. The information supply activities of each agency are described below, and a summary is also given in the table 3:



### 2.2.1. Central Bank of Liberia

The Research, Policy and Planning Department of the Central bank of Liberia has disseminated bimonthly report on Liberia financial statistics in the past. These reports are available online and the last number (vol. 20 n°5) dates from Oct 2018<sup>18</sup>. The reports disseminate information on consumer price index, exports and imports value by commodity, offering valuable aggregate information on agricultural trade in the international market.

### 2.2.2. Ministry of Agriculture

The Ministry of Agriculture organizes internal information feedback. Field officers in counties send monthly reports to their parent departments to deliver information on field activities – especially on any needs or situations worth noticing for the central administration. Communications between field officers and the central administration sometimes occur through direct phone calls, especially in case of urgent matters, such as sudden pest propagation.

### 2.2.3. Liberia Institute of Statistics and Geo-Information Services (LISGIS)

In 2006, the UN agencies, including WFP and FAO, and the ministries of Liberia jointly signed a framework for food security. The objective was to provide technical and financial support to improve food security by designing an EWS and nutrition strategy for the country. The Ministry of Agriculture is the first concerned but limited field staffs and the absence of effective statistical unit drove WFP to ask LISGIS to participate in activities relative to data collection and analysis (LISGIS has 1 to 5 field officers per county).

Since 2006, the LISGIS has collaborated with the MoA to work on annual crop assessments, price monitoring and food security and nutrition surveys. It has undertaken annual crop assessments with support of the FAO, and comprehensive food security and nutrition surveys jointly with WFP, MoA and UNICEF through funding supports of the Danish Government. Several other surveys have been initiated in 2008, 2010, 2012 and 2016.

LISGIS also started monitoring market prices since 2008 after the world food crisis. It started as a joint with the MoA, WFP and FAO. The program had some issues on measurement units at the beginning, which pushed stakeholders to review its approach in 2009. The approach focused on wholesale prices as the unit for bulk sales across the country are more homogenous. Monitored commodities are imported rice (which is easier to follow than local rice that is not available all year round), palm oil, coffee, cocoa, beans and rubber. Gas, exchange rate and labour price are also being monitored as they serve as important input for agricultural supply chain activities.

The market price monitoring program was initially started in 9 counties and is now rolled-out to 15 counties, monitoring 22 markets. WFP trains the field staff to use mobile data to collect information for the program and provides expertise for the data analysis while LISGIS manages the data collection.

Information on price monitoring is disseminated through different channels, including the Liberia Market Price Monitor platform, where monthly bulletins are disseminated in collaboration with the Food Security and Nutrition Unit. Reports are also generated on imported and local wholesale price trends of food crops (rice, cassava, palm oil, pepper and bitterballs) but also charcoal and gas prices as well as transport costs between cities. The last issue was published in September 2017<sup>19</sup>.

18 [https://cbl.org.lr/doc/lfs\\_sept\\_oct\\_2018.pdf](https://cbl.org.lr/doc/lfs_sept_oct_2018.pdf)

19 [https://docs.wfp.org/api/documents/WFP-0000023580/download/?\\_ga=2.249123204.261119805.1552039074-542836969.1549967792](https://docs.wfp.org/api/documents/WFP-0000023580/download/?_ga=2.249123204.261119805.1552039074-542836969.1549967792)

The price data collected by the LISGIS are also disseminated through WFP's *dataviz*<sup>20</sup>. The FAO also inputs the data into its GIEWS Portal <sup>21, 22</sup>. Funding for the program is already terminated yet LISGIS still collects data from some retail markets in Monrovia. As such, finding a sustainable source of fund and attracting the Government support is crucial – even though the FAO and WFP recently made a proposal.

#### 2.2.4. Liberia Meteorological Service (Ministry of Transport)

The UNDP launched the “Strengthen climate information services to enhance resilient development” project. The project is coordinated collaboratively with the Liberia Meteorological Service (LMS) and several other partners (like the BRL Ingénierie and Earth network), who model and disseminate weather data and forecasts. The project is in its final stage, to be closed by the end of March 2019. The main objective of the project is to support the public meteorological agency, especially in investing in the necessary infrastructures to collect the local weather information (automatic weather stations), and to provide an early warning system to disseminate accurate and regular weather information and forecasts.

Weather information on Liberia is currently accessible through the *weatherbug* website and mobile applications. It is revealed from the UNDP and LMS key informants that the project activities focused on training MoA staff to use the *weatherbug* app. The project also planned on training the LMS staff on weather report writing and information broadcasting on radio and TV. This training is scheduled to take place in Nigeria by April 2019.

#### 2.2.5. Liberia Agriculture Commodity Regulatory Agency (LACRA)

LACRA is a new public agency set to design appropriate regulations for the main agricultural export crops of the country (rubber, cocoa and oil palm). They have already disseminated a minimum price for the previous cocoa trade campaign through radio statements. This information initiative is widely recognized by the farmers' organizations and farmers we met.

#### 2.2.6. GROW Liberia

GROW is a business and investment advisory agency in Liberia. Their current main project (funded by the Swedish International Development Agency) aims at fostering the agricultural services environment in Liberia, especially regarding inputs supply for farmers. In a partnership with the National Agro-Dealer Association of Liberia, GROW trains agro dealers to consolidate their business through support on financial and inventory management, extension on input uses and good cultivation practices and promotion of their business on community radio. The project is currently implemented in 5 counties, with the perspective that trained agro-dealers will extend their businesses to other counties in the coming years.

In the past year, GROW also launched a market information service for value chain stakeholders. The objective was to create a phone application to link vegetable producers to potential buyers. The market information service was developed in partnership with MTN and was based on a USSD interface. Unfortunately, after some time, the software provider could not propose a sustainable Business Plan for the System. It relied heavily on GROW support and had to terminate its activities right at the end of the project. It is mentioned that the software provider still exists its objective has deviated from the original idea to offer linkage between Monrovia's restaurants to local customers through a food ordering/delivering system.

20 [http://dataviz.vam.wfp.org/economic\\_explorer/prices](http://dataviz.vam.wfp.org/economic_explorer/prices)

21 <http://www.fao.org/giews/country-analysis/country-briefs/country.jsp?code=LBR>

22 <http://www.fao.org/giews/food-prices/tool/public/#/dataset/domestic-archived>,  
Liberia's market data are in the discontinued series, as last updates are from March 2018



## 2.2.7. Information availability at rural communities' level

Interviews with key informers, value chain stakeholders and rural communities' members indicated that agricultural information availability in rural areas is scarce. Most producers and farmers' organizations declared having no access to weather information, extension and advisory services. Only a few of them have access to market information through phone call to families and acquaintances in Monrovia or to wholesalers in the Red-Light market (Monrovia's wholesale market).

**Table 3:** Summary on agricultural information supply

Organizations	Weather information	Price and market information	Pests and diseases information	Other
Central Bank of Liberia		<ul style="list-style-type: none"> <li>Historical and aggregate information on agricultural products exports and imports as well as consumer price index</li> <li>Last publication: Oct 2018</li> <li>Available online</li> </ul>		
MoA	<ul style="list-style-type: none"> <li>Direct information feedback (calls) from field officers in case of urgent matters (major flood or drought)</li> </ul>		<ul style="list-style-type: none"> <li>Direct information feedback (calls) from field officers in case of urgent matters (pest propagation)</li> </ul>	<ul style="list-style-type: none"> <li>Monthly information feedback from field officers on their field activities</li> <li>Annual crop assessments, in partnership with LISGIS. Last done in 2016. Available on line and by request</li> </ul>
LISGIS		<ul style="list-style-type: none"> <li>Local retail prices monitoring (rice, cassava, palm oil, pepper and bitterballs)</li> <li>Last publication in Sep. 2017, also disseminated through WFP's dataviz and FAO's GIEWS</li> </ul>		<ul style="list-style-type: none"> <li>Annual crop assessments, in partnership with MoA. Last done in 2016. Available on line and by request</li> </ul>
Liberia Meteorological service	<ul style="list-style-type: none"> <li>Current joint project with UNDP on climate information services</li> <li>Weather information dissemination stage not yet reached</li> </ul>			
LACRA		<ul style="list-style-type: none"> <li>First minimum price for the cocoa campaign done in 2018</li> <li>Dissemination through radio statements</li> </ul>		
GROW Liberia		<ul style="list-style-type: none"> <li>Tried to build market linkage and information system activities in the past year</li> <li>Activities stopped due to low results</li> </ul>		



## 2.3. The opportunity and challenges for an efficient ARM information system.

### 2.3.1. Opportunities for ARM information systems

#### **Good telecommunication infrastructure in the main agricultural areas:**

Due to the important investments in Global System for Mobile Communications (GSM) network during the last 10 years, most of the households in rural areas have access to mobile phone networks. The number of mobile phone subscriptions is estimated at 2,66 million, that is, 56% of the population by the International Telecommunication Union (ITU)<sup>23</sup>.

All the stakeholders met explained that mobile phone is the main communication channel and that device and network availability is good in the main agricultural areas of the country. The same situation happens with radio stations. The number of community and local radio stations is very important in the country with close to 80 radio stations covering all the main agricultural areas in the country<sup>24</sup>. This number is huge in comparison with other West African countries.

#### **Good literacy in English in rural areas**

According to UNESCO survey in 2007, the literacy rate in English in Liberia is 43%. It was even 49% for population aged 15-24 years. In comparison with other West African countries like Guinea (32%) or Sierra Leone (32%), this level is high and would allow a good understanding and use of Information for Agricultural Risk Management.

#### **Strong agricultural dynamics**

At the producer level, the interviews indicated that there is a parallel resumption dynamic in the cash and commercial food crop plantation (cocoa, rubber, palm oil, plantain, pepper). This underlines that more producers are willing to have more market-driven farming systems. Although few, there are also medium-size farm with a commercial focus. In such context, the demand for information to adapt to market price risks is strong. Thus, there is guarantee for quick adhesion and keen interest for the Agricultural Risk Management Information System.

### 2.3.2. Challenges for ARM information systems

#### **Low equipment and training level of Ministry of Agriculture (MoA) field officers**

MoA's field officers are underequipped and undertrained. They are very dependants on project funded by external partners to be able to procure real services (training, advices, linkage, etc.) to the farmers. Most of them do not have computers or smartphones to communicate easily with local stakeholders and their central administration. To collect or disseminate information with the different categories of stakeholders, MoA staff often they use paper and pen and travel directly to and from each village. This generates high costs and waste of time in transports.

<sup>23</sup> <https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx>

<sup>24</sup> <https://www.internews.org/updates/mapping-expanding-radio-landscape-liberia>

## Small market for private investors in agricultural services

As Liberia is a small country, with low incomes, very small proportion of the population work in the agriculture sector compared to other West African countries. Thus, opportunities for private companies to invest in agriculture-related information is very limited. This explains the lack of private investment in agricultural services in general and the absence of information companies in the sector in particular. Even investment in agriculture information is very limited from the two GSM companies, MTN Liberia and Orange Liberia.

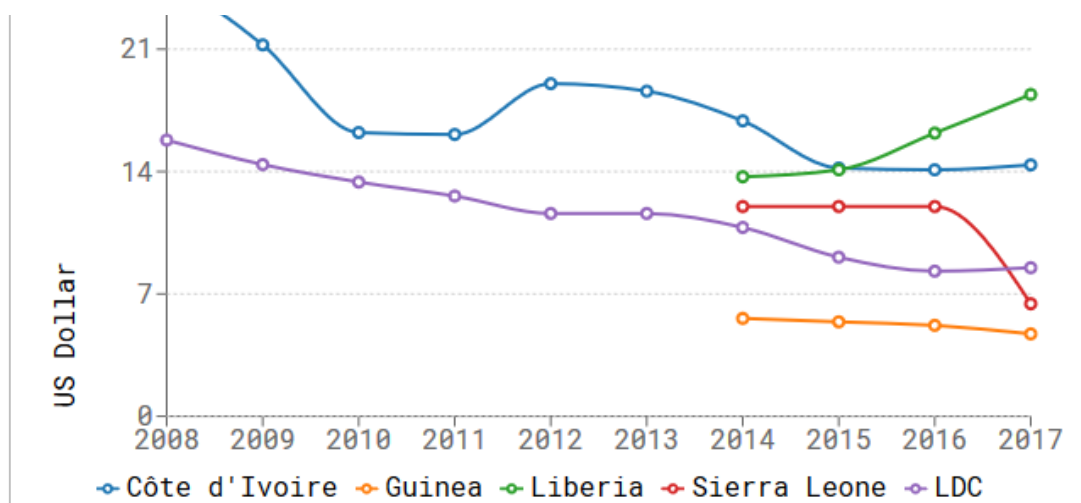
## High turnover in public agencies

Public services suffer of a high turnover in key positions (technical and managerial positions) which create losses in skills, knowledge and network in the administration. International Organizations indicated that capacity building supports have no effect as the individual trained and supported changed position few months after. This is a high risk in a context of building an information system as skills, knowledge and network are key element for the success of the Information System. It is important that the team which will be involved in the system do not suffer turnover.

## High cost of mobile communication

In comparison with other West African countries, the cost of mobile is relatively high. With an average cost of 18.41 USD/month for 30 calls and 100 SMS according to the ITU.

**Figure 9:** ICT Price basket for Liberia, neighbor countries and Least Developed countries average



Source: ITU

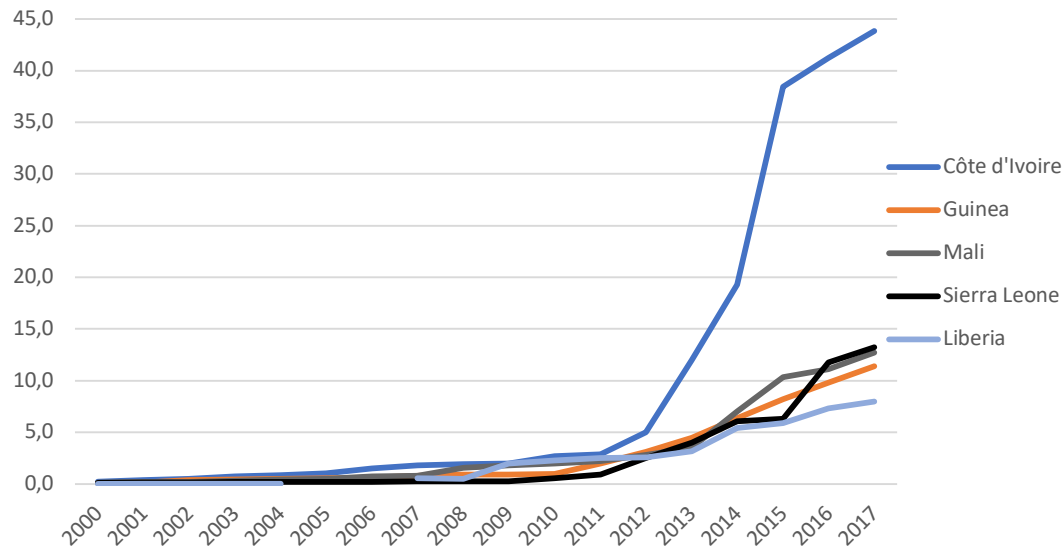
## Low use of internet

Even though mobile network is relatively good in the country, the internet use remains very limited, particularly in rural areas. In 2017, ITU estimates that only 7.98% of the Liberian population used the internet, this is lower than the rate in Guinea (11.4%) or Sierra Leone (13.24%) and far from that of Côte d'Ivoire (43.84%) - see the figure 10 below.

While the cost of internet data seems relatively low (an average of 1 USD/1 Go) compared to countries like Côte d'Ivoire (3 USD/Go) only a few can afford it in the rural farming communities. Most people felt they are already bearing with the cost of phone calls and are not ready for extra charges for internet. This means that an agricultural information system focusing on dissemination via internet-based tools would not be efficient in Liberia.

**Figure 10:** Use of internet in Liberia and neighbouring countries

(in % - Source: ITU)



### Competition between industrial and family farming

Neighbouring industrial and medium plantations (rubber and palm oil mainly) in several rural areas decrease the availability of labour – thus increasing the cost of hiring manpower for family farming. This situation pushes small household to orientate their own production towards a subsistence strategy (food crops only for self-consumption) while incomes are generated by the household rented labour.

### Low competitiveness of Liberian agriculture in comparison with the neighboring countries

High costs of transport (low quality of the road network) and labour, low availability of inputs and services (banking and advisory) in Liberia makes the local agriculture less competitive than the one neighbouring countries, especially regarding vegetables.

Production, collection and transport of vegetable from Côte d'Ivoire, Guinea or even Mali (for potatoes and onions) are more competitive than the Liberian production on the Liberian market. It may happen the same with imports of vegetables and animal products (meat, eggs) imported from Europe or even in rice from Asia to supply Monrovia market.

In such situation, in several sectors information will be insufficient to improve the competitiveness of local farming and support local farmers. Infrastructural investments and protective trade policies are priorities to support such sectors.



## 2.4. Conclusion of the analysis of demand, supply and environment for an efficient ARM Information System

The demand for ARM information is strong in Liberia from meso-level stakeholders to farmers. Information demand covers a) short to middle term weather forecasts (rains expectations in the coming days and weeks), b) market prices, situation and trends on main cash, food and commercial crops, c) pest, diseases and crop management information and tips for all the crops cultivated in the country.

But today, this demand is almost not matched by any supply of information. The lack of agricultural risk-related information services is in a big part, a consequence of the fragile history marked by politic instability, long civil war (1989-2003) and more recently the dramatic epidemic of Ebola (2013-2015).

Another key issue faced by the state to offer such services to the agricultural sector actors is the limited financial capacity. The Gross Domestic Product of Liberia is one of the lowest in the World, ranked 163rd out of the 193 countries (International Monetary Fund (IMF), 2017) and the public revenues are only 553 million USD or 17% of the GDP (CIA, 2017).

To the financial constraint, the technical constraint must be added, as skills of many officers of the MoA are limited in terms of ability to use database software like Excel which is crucial for data compilation and processing<sup>25</sup>.

With these challenges, it is important for any investment in ARM information systems to be adapted to the specific context of Liberia. It must be built on a low cost and simple solution as proposed in the Investment plan outlined in the next chapter.

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<sup>25</sup> For instance, FAO through its project "Support to Statistics and Information Management Systems of the Ministry of Agriculture (MOA) in Liberia" has supported the Ministry of Agriculture to improve its ability to produce production statistics for several years without success. Project reference: TCP/LIR/3602.

## 3. Technical Solutions and Investment

### 3.1. Technical proposal for an efficient ARM Information system in Liberia

#### 3.1.1. Faster and cost-effective collection of the information is necessary

Many information systems projects implemented in West Africa still rely on data collection methodologies that have existed before the arrival of the mobile phone. This is the case of information systems using smartphone applications for collection of the information such as those used by Esoko<sup>26</sup>, SIMagri<sup>27</sup>, Manobi<sup>28</sup> or RESIMAO<sup>29</sup>.

Mobile telephony and the internet are identified as channels of "transmission" of the information collected, replacing paper but not as channels for collecting information. According to this methodology, the collection of information on crop development, market situation, pest, diseases or food insecurity issues must necessarily be based on field visits that require a network of local interviewers, equipped with measurement tools and needing fuel and communication allowance to be able to work properly.

The main limits of this methodology are:

1. **Very costly:** (wages + allowances + equipment + training + training update + monitoring tours) x Number of investigators;
2. **Very laborious:** 1 person per district would mean 90 local interviewers to cover all the Liberian territory and 90 datasets to be checked and processed every week or every month;
3. **Limiting:** to control the quality of data collection and to make the processing simpler, data forms with precise and limited information must be used. However, several factors affect agricultural activities, including agricultural market and more generally a farmer's living conditions. Thereby making it totally impossible to design precise data forms.

As practiced today by most of the information professionals (journalists, pollsters, economic analysts), the collection of information no longer requires movement in the field at each collection interval. It is always necessary to travel for specific operations: identification of reliable sources of information, determination of the average conversion rates of traditional measurement units into standardized measurement units, measurement of cultivated areas, etc. But once the contacts and data are obtained, the collection can be done by simple phone calls at regular intervals.

Thanks to mobile telephony, we can significantly reduce the number of people involved in the collection of information as well as the collection costs per person. The intensity of work is also reduced because the interviewer can themselves synthesize the information collected from several sources which reduces the transmission and synthesis steps.

Oral communication during a phone call makes it possible to collect information that is broader and less restricted than the filling of standardized forms. Well-directed oral exchanges can capture crucial information that are not anticipated in the design of information forms but can play a key role in the evolution of agricultural risk in a specific area. By avoiding closed-ended questions, collection can be much richer in information and interpretation of information than it is with frozen forms. Finally, if staff in charge for collecting information is responsible for all or part of the processing of information (synthesis, analysis, production of advice, etc.), then the collection work will be much less tiring and laborious. Thus, staff may pay more attention to the quality of the information collected and be able to rectify or confirm information of questionable reliability.

26 <https://esoko.com>

27 <http://www.simagri.net>

28 <https://www.manobi.com>

29 <http://www.resimao.net>



Through the qualitative collection, information system agencies can collect a diversity of information on incomes, pest, disease and crop developments or food availability to alert the state and concerned partners about major threats. Thus, playing the role of an Early Warning System (EWS). Agencies can also collect information on production and market trends to provide regular information oriented to decision making for the agricultural value chain stakeholders.

### 3.1.2. Information/data processing done by sectorial experts

In most information systems available in West Africa, the collection of standardized information is followed by information processing usually consisting of simple descriptive statistical synthesis (average, median, growth rate, comparisons etc.). These statistical treatments are generally destructive of information. For example, by calculating an average one loses information on the distribution of the studied data and, in particular, the occurrences of each value. Also, this type of analysis produces statistical indicators that are often difficult to interpret by most private players in the market. For example, if a cooperative leader is told that the average price in an area is 101.3 LRD / kg, he/she may not quite understand what that means. In case, a buyer offers the coop's production at 100 LRD / kg. Should he try to negotiate 1.3 LRD/kg more?

If statistical processing of the collected quantitative information can be used, it should not be systematic. For example, one can choose to generate an average price indicator for some analyzes but also a geographical representation of the prices that have the highest occurrence, or else price ranges by market type, etc. In general, it is therefore important to have a treatment of quantitative data that is adapted to the explanation that one wishes to make rather than a systematized treatment from which individual must deduce an explanation.

Finally, this type of process leaves little room for qualitative parameters, which are however numerous: state of the crops, growing interest for a new crop, concern about a new disease, stocks level, state of mind of the operators, level of competition on a market, arrival of new operators in a sector, impact of a new regulation/policy, etc.

To analyze agricultural risks which are particularly numerous and multifactorial, it is therefore preferable to have an analysis grid as open as possible and as qualitative as possible. To achieve this, no currently available computer software is effective, but a well-trained, specialized and experienced person in a specific sector (for example, on one crop, or on a specific agrarian system) can easily identify the most important factors. A trained expert can also prioritize risks and draw a synthesis or even advice to adapt or manage the risk.

It is therefore interesting to use a smaller number of experts rely for processing information on agricultural risks specific to a area rather than on automated processing using computer software. Well-trained analysts must be better able than any software for processing data and analyzing a variety of information to facilitate risk management decision-making by targeted stakeholders.

### 3.1.3. Target a timely, broad and useful dissemination of the information

Most of the publish information in Liberia are often in raw form, like lists of pest and diseases observed, prices mercurial, or simple graphical representations that are most often incomplete – thus making it difficult to interpret for the actors (farmers, traders, processors, extension officers, etc.). It is therefore essential to adapt the representation of information, the level of detail and the level of interpretation to the target populations. For this, it may be interesting to carry out field test phases by representing and explaining the same analysis in different forms to target population groups to see what form of information transmission allows them to have the best interpretation of the data.



Most often, the information broadcaster will have to go a very advanced level of interpretation to guide a cooperative leader or an extension officer who can himself advise small farmers. It will be able even if it feels the capacity and the legitimacy to go until a precise advice by explaining as much as possible the arguments which lead to this advice.

The goal is that the information provided can be useful to the recipient and not just to send him the information available hoping that he can do something about it. The Information System must disseminate broad and unrestricted information by the system architecture, with a fast collection / dissemination rate (maximum 48 hours between collection and dissemination) as well as a great regularity and punctuality, so that users can wait for the information to make their decision. In addition, it must provide advice on how to manage the most serious current risks.

### 3.1.4. Examples of operational information systems to manage agricultural risks

#### Reuters Market Light (RML), India

Reuters Market Light (RML) information services is a mobile-based provider of technical and financial advice to farmers in India. The service was built by the world leader of economic information Thomson-Reuters in 2007. It reaches 1.7 million farmers in India. RML works with content partners to provide personalized information on farming techniques, crop recommendations, weather forecasts, and various other pieces of agricultural information in 9 different languages. It is delivers expert information daily to the farmer's mobile phone covering every stage of the crop cycle, from pre-sowing to harvest and selling of crops enabling them to make informed decisions about their farming and marketing practices.

The business model of the service is based on low cost subscriptions (1.5 USD/month) for farmers but also include other sources of revenues: grants, advertisement, big data. After starting mainly with market information, the services were extended to weather and crop information and it now include other kind of information like health and education or financial contents.

**Figure 11:** Diversity of the information provided by Reuters Market Light in India<sup>30</sup>



<sup>30</sup> <https://rmlagtech.com>

## Offre & Demand Agricole (ODA), Europe :

Established in 1997, ODA is a French independent consulting firm. It supports professionals in the agricultural and agri-food sectors in risk management of agricultural commodity prices. Anticipating the opening of agricultural markets by the European Union and the inevitable increase in the volatility of raw material prices, Renaud de Kerpoisson, a farmer known for his expertise in the markets, decided to found ODA. Since its inception, the organisation has been helping actors throughout the agricultural sector to discover markets and to protect themselves against volatilities.

The company provide several of services to farmers in Europe:

- Understanding markets: trainings on local and world commodity markets, on management on price risk, on marketing strategies, etc.
- Decision-making tools: several personalized content available on mobile app and on the website to build marketing strategy based on independent information and advices.
- Brokerage: the company developed a brokerage branch to help farmers to find buyers and transporters.
- Investment advice: the company also provide advice for farmers, coops, traders and processors to optimize their investments and marketing strategies.

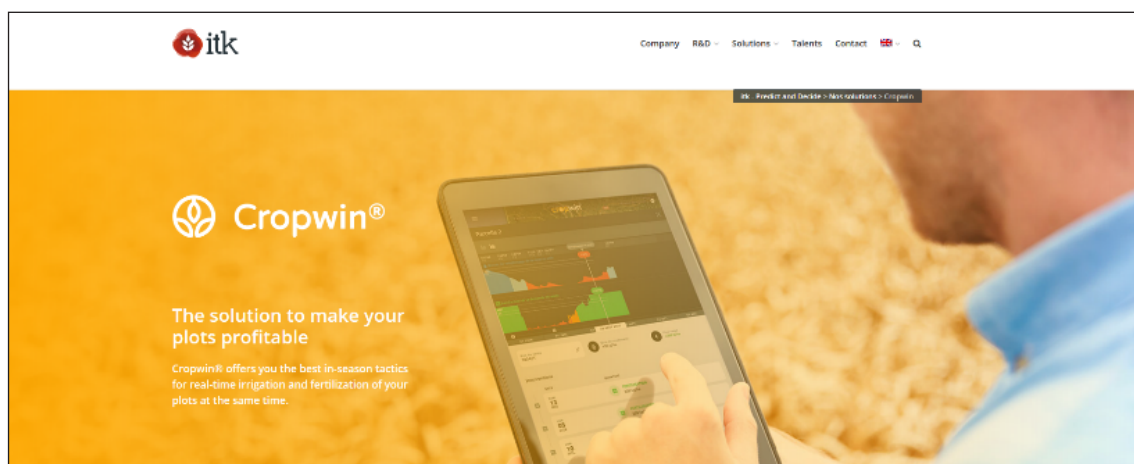
The business model of the company is based on subscription fees with different cost depending of the stakeholder and its needs.

## Intelligence Technology Knowledge (ITK), France and USA:

Intelligence Technology Knowledge was created in 2003 in Montpellier, to develop decision support tools for agriculture. Its mission is to enable farmers to optimize yields and enhance quality of their crops to reduce risks on their farm, while preserving the environment through better management of inputs (irrigation, fertilizer, phyto-sanitary products). ITK has always been closely linked to research. Its founder, Eric Jallas, was CIRAD Research Director, and the company is closely linked to the ecosystem of Montpellier's agronomic research center, one of the world's largest for crop production.

ITK tools are based on satellites imageries, small field sensors, drone survey and crop modelling. So far, the company develop content mainly for big cooperatives or sectorial associations adapting for their specific needs (milk sector, cotton sector, almond sector, etc.). The business model of the company is based on private project responding to specific needs of already organized sectors.

**Figure 12:** Short presentation of Cropwin a IT solution to improve the use of water and inputs in agriculture<sup>31</sup>



<sup>31</sup> <https://www.itk.fr/en/solutions/cropwin>

## Sènèkèla-Sandji (Mali)

Sènèkèla and Sandji are two services developed by Orange in Mali to provide market and weather information to farmers. The market and weather information are provided by several content providers to Orange. Orange disseminates the information on mobile phones through USSD (short code) and a call center with 4 agro-advisors replying to farmers in local languages on good practices, pest control and market strategies.

The Business Model of the service is based on request fees per short code or per call to the Call Center. Sènèkèla and Sandji gets several thousand request per year.

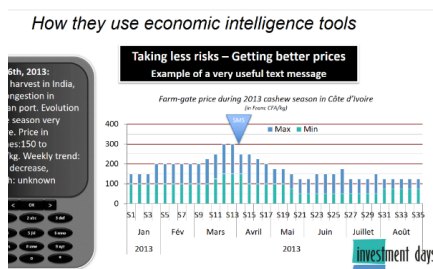
**Figure 13:** Advertising for Sandji a weather information service for farmers provided by Orange in Mali



## N'kalô Service & M-Agri (Côte d'Ivoire):

N'kalô information and advisory service collect and disseminate market information by SMS and email to more than 70,000 farmers and small traders and 500 coops and private companies in 14 countries (Côte d'Ivoire, Burkina Faso, Mali, Senegal, Mozambique, Gambia, Guinea-Bissau, Guinea, Ghana, Togo, Benin, Nigeria, Niger, Chad). It was created in 2010 for the cashew nut sector but it is currently extended to 10 additional agricultural commodities: cashew nut, sesame, shea, gum Arabic, cocoa, rubber, rice, maize, millet, sorghum.

**Figure 14:** Example of key text message sent by Service n'kalô in Côte d'Ivoire in 2013 (Source: Presentation of n'kalô service during FAO Investments Days, Dec. 2013)



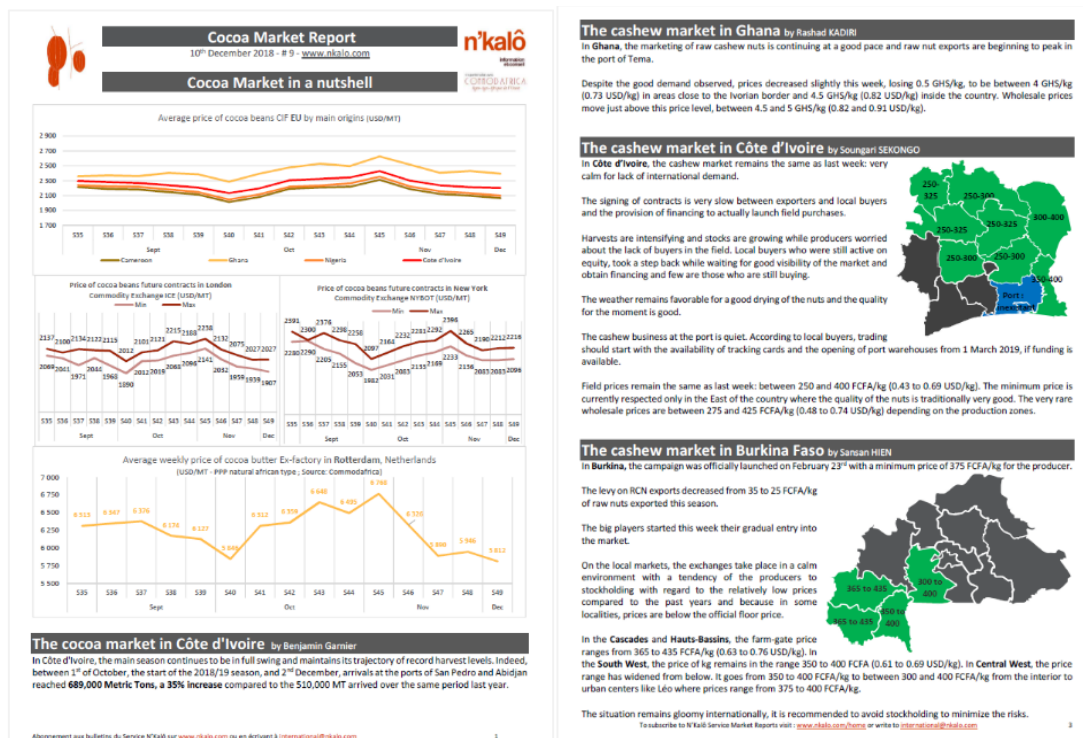
Source: Presentation of n'kalô service during FAO Investments Days, Dec. 2013

N'kalô service provides weekly information on prices (farm-gate and wholesale), market situation and market trends, and advises farmers, traders and processors on their marketing/procurement strategies. Clients subscribers to receive the information through a paid subscription, 0.15 to 0.30 USD/month for SMS, and 120 USD/year for market reports sent by emails. In Côte d'Ivoire, thanks to a partnership with the Orange telephone operator, the N'Kalô Service is available through a subscription to daily information SMS called M-Agri which covers all agricultural sectors in the country and disseminates: market information, weather forecasts, advice agricultural tips, post-harvest good practices and agricultural news. This service had more than 25,000 subscribers on average in 2018.



It works with only one (1) National Analyst per country and one (1) ICT Officer based in Côte d'Ivoire and two (2) International Analysts based in France who coordinate the production and dissemination of information or 17 people for 14 countries. The National Analysts collect and analyze information at each step of the value chain at the national level, International Analyst complete the analysis with sub-regional and global information.

Figure 15: Extracts of n'kalô newsletters on cocoa and cashew market for cashew



### 3.1.5. Operational proposals

#### Strategic crop to start with

For efficient and useful ARM information system, it would be easier to start collecting and disseminating information on a limited number of crops. The main crops in terms of food security and nutrition in Liberia are rice and cassava, so these are the strategically relevant crops to start with. Palm oil and plantain are additional strategic crops in terms of food security and farmer's incomes because they are the main commercial food crops in the country. Finally, rubber and cocoa, which are the two main cash/export crops, are also very important since they provide monetary incomes for small and medium farmers in the country.

Starting with 6 crops – 2 food crops, 2 commercial food crops and 2 cash crops – seems enough for the first phase of implementation of the ARM information system. Other relevant crops could be added after building the system, and confirming the sustainability and robustness in publishing timely, regular and qualitative information on those 6 crops. The potential crops to be added could be vegetables like pepper, bitter balls, okra, and fruits like pineapple sweet banana, orange, lemon, mangoes. However, the publication of information on these crops can be even more challenging as they are very perishable, and their marketing/profitability is more linked to processing and logistic issues – mainly challenging to tackle in developing countries like Liberia.

**Table 4:** Percentage of Households that have either grown or sold specific crops

Crops	Perishability	% of Household that have grown	Sold
Cassava	Low (in ground and after rural processing: gari)	38.9 %	19.4 %
Rice	Low	32.0 %	5.6 %
Pepper	Medium	32.1 %	18.5 %
Bitterballs	Hight	26.3 %	14.6 %
Corn	Low	27.0 %	14.3 %
Plantain	Medium	26.5 %	16.5 %
Palm Oil	Low	21.2 %	15.7 %
Cocoa	Low	7.4 %	5.1 %
Rubber	Low	10.3 %	4.7 %

Source: LISGIS, 2016 and consultants

#### Contents to start with

Following our meetings with farmers, local traders and extensions officers (see in paragraph 2.1.), it appears that the most strategic contents are mainly **weather forecast** (weekly) focused on rainfall, **market information** (current prices at farm-gate and wholesale level, market trends, marketing advices), **pest control information** (identification and management advices) and **post-harvest tips**. The information content should be developed and disseminated based on the crop calendar: weather forecast mainly during the rainy season, market information during the marketing season, pest control and tips a few weeks before the best time to be practiced.

A small team of experts should be trained and linked with all the main meso-stakeholders (cooperatives, traders, processors, researchers, NGO, international organizations, input providers) of the sector, so they can write/design many kinds of contents based on the current situation, field/region context and on all the expertise available in the sector in Liberia.



### Collection methodology

To make the system sustainable, very timely and efficient, it is advised to use the methodology of phone call to private and public stakeholders to collect the information on crops development, markets, pest and disease. Weather information could be collected through different sources/weather models available on the internet.

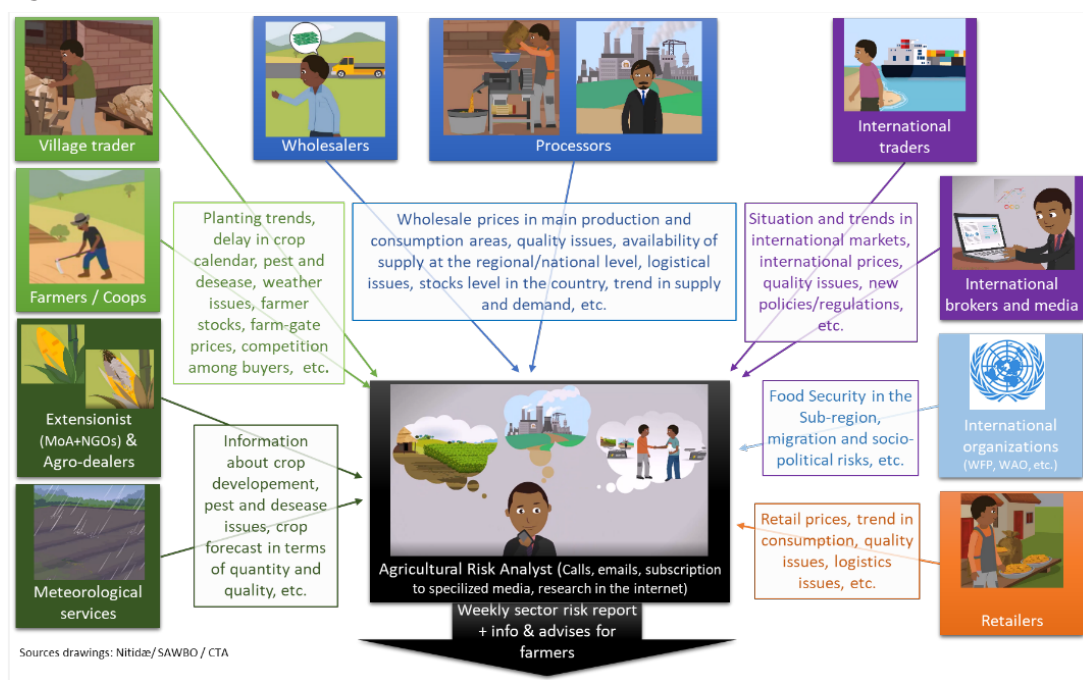
To start, the information collection could be done on a weekly basis. If a more regular collection is needed in some sectors, the collection timing can be increased. The data should be collected from the most relevant stakeholders depending on the period of the year. During the sowing season, information should be collected mainly from farmers, Coops leaders and extensionists about the sowing trends (more rice, more maize, less cassava, etc.), progress (sowing started earlier, later) and issues or new facts (regarding lack of improved seeds, availability of a new seed variety, change in the cost/availability of manpower to help sowing, etc.). During the growing season information should be collected from the same stakeholders about weather and crop development as well as food security as it is also the lean season. At the harvest period, information should be collected from traders and international markets to anticipate both the regional/national supply (quantity, quality, timing) and the international market situation, like for example, prices, supply and demand trends in the international cocoa market. During the marketing season, information should be collected from all the stakeholders, to gather prices, stocks, supply and demand situation from the local to the national, sub-regional or international level depending on the sector.

Figure 16 is presented a scheme of all the different kind of information to be collected with the different category of stakeholders. The collection process could last from 1 to 3 days depending of the period of the year and the crop. Stakeholders contacted for data collection should not be financially incentivized for providing information to the Agricultural Risk Analyst.

The quality control of the information is done by the Agricultural Risk Analyst crisscrossing information from different sources (several farmers, several traders, etc.). But another control posteriori will be done by the stakeholders of the value chain themselves, as they will provide feedbacks about the accuracy and pertinence of the information received. Directly linking the Analyst to several categories of stakeholders will ensure validity and reliability of the information.

In addition to the local and national sources of information, the Analysts must be trained to use regional and international sources like those listed in table 5 below. They and could also be linked to sub-regional information networks like n'kalô's services.

**Figure 16:** Collection of information scheme





**Table 5:** Regional and international sources of information on ARM Information System that can be used in Liberia

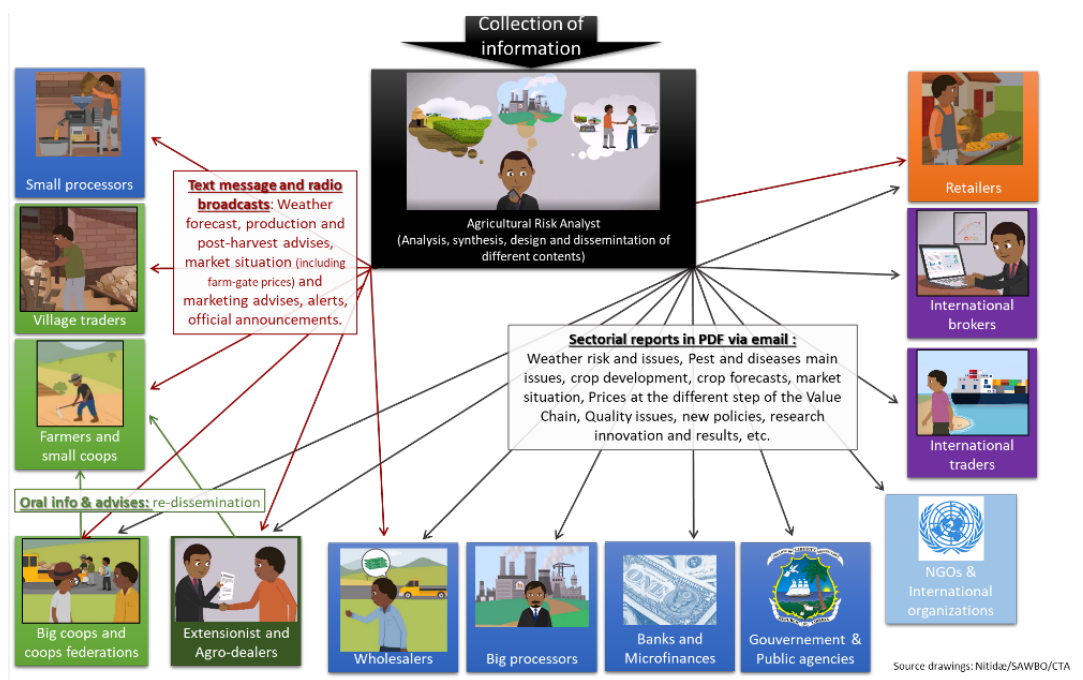
Source	Useful information on	Strategic information
<a href="http://www.cpc.ncep.noaa.gov">www.cpc.ncep.noaa.gov</a>	Weather balance in Liberia and West Africa	Weather
<a href="http://agrhymet.ciiss.int">http://agrhymet.ciiss.int</a>	Seasonal weather forecast in West Africa and production forecasts	Weather Crop development
<a href="https://www.weatherbug.com">https://www.weatherbug.com</a>	Worldwide and local weather forecasts. Source already used by UNDP/MoT Early Warning System.	Weather
<a href="http://www.accuweather.com">www.accuweather.com</a>	Worldwide and local weather forecasts	Weather
<a href="http://www.bbc.com/weather">www.bbc.com/weather</a>	Worldwide and local weather forecasts	Weather
<a href="http://www.fao.org/emergencies">www.fao.org/emergencies</a>	Food security analysis in West Africa	Food security
<a href="http://fiews.net">http://fiews.net</a>	Food security analysis in West Africa	Food security
<a href="https://www1.wfp.org">https://www1.wfp.org</a>	Food security analysis in West Africa	Food security
<a href="http://www.amis-outlook.org">www.amis-outlook.org</a>	Monitoring of international prices of Rice, Wheat, Maize and Soy	Rice
<a href="http://www.infoarroz.org/portal/en">www.infoarroz.org/portal/en</a>	Monitoring of international prices of Rice	Rice
<a href="http://www.fao.org/giews/food-prices/tool/public/#/home">www.fao.org/giews/food-prices/tool/public/#/home</a>	Monitoring of prices of many agricultural commodities	Rice, Cassava, Maize, Palm Oil
<a href="http://roac-wagn.blogspot.com">http://roac-wagn.blogspot.com</a>	Monitoring of grains markets in West Africa	Rice, Maize
<a href="https://globalrubbermarkets.com">https://globalrubbermarkets.com</a>	International market news on rubber	Rubber
<a href="http://www.anrpc.org">www.anrpc.org</a>	International market news on rubber	Rubber
<a href="http://www.icco.org">www.icco.org</a>	International cocoa prices	Cocoa
<a href="http://www.nkalo.com">www.nkalo.com</a>	Analysis of international cocoa and rubber markets	Cocoa Rubber
<a href="http://www.mpoc.org.my">http://www.mpoc.org.my</a>	Palm Oil Market news	Palm Oil
<a href="https://www.oilworld.biz">https://www.oilworld.biz</a>	Analysis of international palm oil markets	Palm Oil
<a href="https://www.investing.com">https://www.investing.com</a>	International prices of Rubber, Cocoa, Palm Oil and Rice	Rubber, Cocoa, Palm Oil, Rice
<a href="https://www.ecofinagency.com">https://www.ecofinagency.com</a>	Economic information on agricultural sector in West Africa	Rubber, Cocoa, Palm Oil, Rice

## Dissemination

The dissemination of information should rely on several channels, to reach a larger number of stakeholders in Liberia. The main channels to reach meso-level stakeholders (public institutions, international organization, NGOs, research centers and big companies) may be reports sent via emails and sectorial WhatsApp group (for technicians, extension officers and researchers). A training must be organized about report writing and WhatsApp group management to have very professional, useful and clear content and discussions.

The contents of information disseminated should be adapt at the crop calendar: i) focusing on good practices and weather during sowing, ii) on pest control and weather during growing, iii) on post-harvest & storage risk/ issues as well as weather and market trends during harvest, and iv) on market and weather during the marketing period. The main channels to reach farmers and other local stakeholders (traders, processors, input providers, etc.) must be rural radio and text messages (SMS) on mobile phone.

**Figure 17:** Dissemination of the information scheme

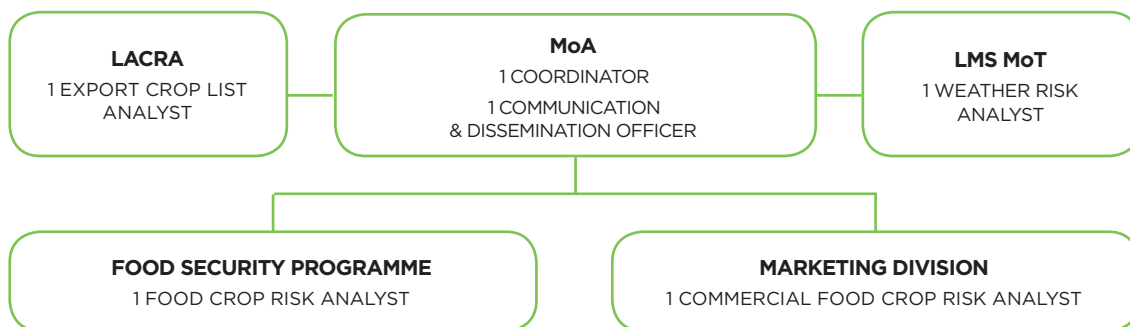


Source drawing: Nitidae/SAWBO/CTA

### 3.2. Governance proposals for an efficient ARM Information system in Liberia

To cover efficiently the 6 crop and weather risk at the national level, it seems important to join competencies and prerogatives of several public institutions sectors. Therefore, we propose the ARM information system to be administered and coordinated by the MoA. Its should be staffed with one Agricultural Risk Analyst from the Liberian Agriculture Commodity Regulation Authority (LACRA) in charge of regulation of export crops, another from the LMS of the Ministry of Transport (MoT) to cover the weather risk at the national level. The overall governance scheme proposed with 4 Agricultural Risk Analysts, 1 Coordinator and 1 Communication/Dissemination officer is shown below;

**Figure 18:** Proposal of governance scheme for ARM Information System



In terms of crops monitored, the proposal is that the Agricultural Risk Analysts specialized on the following crops depending on each institution:

- Food Security Division (MoA): cassava & rice
- Marketing division (MoA): plantain & palm oil
- LACRA: cocoa & rubber
- Liberian Meteorological Services (LMS-MoT): weather forecasts and risk analysis

The coordinator based in the MoA will oversee the organization of trainings, the dissemination calendar, the dissemination contracts (with radio and mobile operators), weekly meeting among the 4 analysts to share information, to control the quality and progressive improvement of the reports & information contents, the collaboration and partnerships with other organizations and public bodies and the monitoring and evaluation of the system.

The Communication and Dissemination Officer, based in the MoA will supervise all the four Analysts in designing their reports and managing WhatsApp groups, sending the PDF reports, the radio broadcast and the text messages, monitoring the receipt, understanding and feedbacks from the different categories of recipients of the information (institutions, coops, farmers, etc.).

In the last chapter, the importance of the selection process for those 6 individuals is highlighted.

### Steering committee

To monitor and coordinate the program, the following institutions could be represented in a steering committee additionally to the institutions implementing the information system:

- Ministry of Agriculture: Department of Planning & Development, Division of Extension and Advisory and Division of Crop Protection
- Ministry of Commerce
- Liberian Institute of Statistics and Geographic Information System (LISGIS)

## 3.3. Investment Plan for an efficient ARM Information system in Liberia

### 3.3.1. Proposal of Logical Framework:

The Logical Framework presented below is a proposal to be discussed and improved by MoA with the institutions involved as well as the Technical and Financial Partners (TFP).

**Global objective:** Improve food security and agricultural risk management in Liberia by setting up an Agricultural Risk Management Information System (ARM IS) to produce and disseminate timely and qualitative information on six strategic crops and weather.

**Specific objective 1 (SO 1):** Set up and build capacity of a task force of 6 persons to collect weekly information and produce qualitative reports on agricultural risks for six strategic crop and weather at the national level.

**Activity 1:** Identify, build capacity and network of a task force of 6 persons (4 Agricultural Risk Analysts, 1 Coordinator and 1 Communication and Dissemination Officer)

*Expected result:* 6 highly-skilled civil servants working at MoA, LACRA and MoT are identified, trained on agricultural risk analysis, agricultural risk management, market analysis and forecasting, weather risk analysis, agricultural risk report writing and publishing and linked with Extension Officers and stakeholders of the 6 target crops' value chains.



**Activity 2:** Collect Agricultural Risk Information and produce qualitative sectorial reports on a weekly basis.

*Expected result:* Weekly crop reports on agricultural risk are produced 3 months after the starting of the program and during the whole program implementation

**Specific objective 2 (SO2):** Set up a dissemination system able to inform both national and international institution and local meso and micro-stakeholders on agricultural risk and risk management strategies in Liberia.

**Activity 3:** Disseminate the crop reports to institutions and meso-level stakeholders via emails and social networks.

*Expected result:* The Liberian government and public technical services, international organizations, main farmer organizations, NGO's, main trading, transport and processing companies are aware of the sector risk situation (production, marketing, storage, etc.) and able to anticipate major risk for food security, farmers' living conditions and agricultural businesses.

**Activity 4:** Contents targeted to micro-level stakeholders (farmers, small traders and small processors) are disseminated weekly through Radio broadcast, SMS on mobile phones and oral re-dissemination by extension officers and cooperatives in the main agricultural areas.

*Expected result:* At least 50,000 individual farmers, 500 small traders and agro-dealers and 500 small processors in Liberia to receive weekly information on current agricultural risk and to get some form of advice to manage those risks.

### 3.3.2. Proposal of Investment Budget

The proposed investment is designed for 3 years. These number of years should be enough to build an efficient and sustainable system. It would encourage the project team and the members of the steering committee to quickly explore the exit strategy without being dependent on donors' support. The total amount needed would be 1,276,240 USD over the three years spread as presented in the table 6 below:

The yearly cost of the Information System after the end of the initial investment is estimated to be around 52,080 USD/year. Several strategies to fund the system sustainably are propose in the next chapter.

**Table 6: Proposed investment plan**

Activity and budget lines	Year 1			Year 2			Year 3			Cost post program per year		
	Number of Unit	Unit details	Unit cost (USD)	Total (USD)	Number of Unit	Unit details	Unit cost (USD)	Total (USD)	Number of Unit	Unit details	Unit cost (USD)	Total (USD)
<b>Specific objective 1 (SO 1): Set up and build capacity of a task force of 6 persons to collect weekly information and produce qualitative reports on agricultural risks on six strategic crop and weather at the national level.</b>												
1 Project coordinator (High level Agro-economist)	12	Months	2 000	24 000	12	Months	2 000	24 000	12	Months	2 000	24 000
1 Communication and Dissemination Officer (High level Journalist or Communication strategist)	12	Months	1 500	18 000	12	Months	1 500	18 000	12	Months	1 500	18 000
1 International Technical Assistant	80	Days	650	52 000	60	Days	650	39 000	40	Days	650	26 000
Training sessions (Agricultural Risk Analysis & Management, Market Analysis & Forecasting, Weather Risk, Report Writing and Publishing)	5	Session	10 000	50 000	3	Session	10 000	30 000	2	Session	10 000	20 000
Network building field trips for the analysts	12	Field trips	2 500	30 000	8	Field trips	2 500	20 000	4	Field trips	2 500	10 000
Subscription to Paying Technical Medias (Oil World, Public Ledgers, etc.)	2	Subscriptions	3 000	6 000	2	Subscriptions	3 000	6 000	2	Subscriptions	3 000	6 000
<b>Specific objective 2 (SO2): Set up a dissemination system able to inform both national and international institution and local meso and micro-stakeholders on Agricultural Risk and risk management strategies in Liberia.</b>												
Computers	6	Computers	1 000	6 000								
Communication allowance (15 USD/member of the task force)	12	Months	90	1 080	12	Months	90	1 080	12	Months	90	1 080
Simple and resistant smartphones (member of the task force + per field officer of the MoA)	74	Devices + SIM card	500	37 000								
Workshops (Launch, Agricultural Risk Situation, Capitalization)	2	Workshops	10 000	20 000	2	Workshops	10 000	20 000	2	Workshops	10 000	20 000
Weekly Radio broadcasts (in average: 1 per crop +1 on weather/week*20 radio)	7 000	Broadcasts	5	35 000	7 000	Broadcasts	5	35 000	7 000	Broadcasts	5	35 000
Text Messages (SMS): In average 7 SMS per week * 20,000 Recipients	5 600 000	SMS	0	280 000	7 280 000	SMS	0	364 000	Covered by an agreement with a mobile operator.			
<b>Total</b>				<b>559,080</b>				<b>557,080</b>				<b>52,080</b>



### 3.3.3. Impact and benefit expected

#### For the Ministry of Agriculture (MoA)

- Having more regular and qualitative information collection on agriculture trends and risks in the main production areas and for 6 crops.
- Having analysts, experts of specific crop/sector, with deep knowledge of the sector in Liberia as worldwide and a capacity to easily collect any kind of information in the sector thanks to their large network of private stakeholders
- Having analysts being focal points to use their network to answer questions of Extension Officers about crop management, marketing, pest control, and to improve links between research and field advisors.
- Having more visibility, impact and links with the private sector as sending information to all kind of stakeholders every week.

#### For the Liberian Agriculture Commodity Regulation Authority (LACRA)

- Having more regular and qualitative information collection on export crops trends and risks at national and international level.
- Be able to improve and adapt regulations to the national and international market trends
- Having more visibility, impact and links with the private sector as sending information to all kind of stakeholders every week.

#### For the Liberian Meteorological Service (LMS) of the Ministry of Transport (MoT)

- Having more visibility, impact and links with the private sector and the public as sending weather information every week.
- Complete the meteorological skills with agro-meteorological, agricultural and economic analysis.

#### For the Government of Liberia:

- Having more regular and qualitative information collection on agriculture trends and risks to improve policy and regulation design, economic analysis and anticipate economic and social risks linked with agriculture.
- Create a more secure, resilient and transparent environment to attract foreign investment and improve financing in agricultural sector.
- Having an Early Warning System (EWS) to anticipate major risks for agricultural sector but not to warn/alert the government and other stakeholder about any major risk for the country. Rather, to provide information to support the design of interventions for areas where risks are major.

#### For Meso-level Private stakeholders (Farmers Associations, Traders, processors, NGOs):

- Having more regular and qualitative information collection on agriculture trends and risks to improve their services to farmers, their business and investment strategies.
- Increase their profitably and avoid losses.



### For Individual farmers:

- Reduce their risks as a result of the better risk projections
- Improve their farming strategies
- Improve their marketing strategies

### 3.3.4. Exit strategies

After the end of the investment program, the cost of the information system would be reduced to an estimated 52,080 USD/year. To cover this cost and possible additional investments to increase and improve the coverage of the information system, four main exit strategies are proposed:

#### A paid information service on mobile phone

This exit strategy is highly dependent on the negotiation for a profitable partnership with a mobile operator. The partnership arrangement will depend on the operators' agreement for a revenue sharing with the information system administration. The operators – like Orange and/or MTN – could provide a paid service plan with subscribers to receive information on agricultural risks. Revenue from the subscription services could be used to support the cost of information collection.

N'kalô Service in Côte d'Ivoire for instance, is currently operating on this investment model. Its subscription cost is 0.15 USD/month or 1.8 USD/year. N'kalô bears 25% of the cost and Orange 75%. So far, the average number of subscribers over the year is 25,000. As shown in the table 7 below, the services generate profit, which could cover the communication allowance and field trips of the analysts. If the number of subscribers increases the service also expands.

**Table 7:** Example of Business Model for the Information System after the end of the program

Example of Business Model with an agreement with a mobile operator (N'kalô, CI)		
Number of subscribers	25,000	Farmers and small stakeholders
Subscription cost	1.8	USD/year
Turnover total	45,000	USD
Taxes	4,500	USD
Profit total	41,500	USD
Profit for the content provider (n'kalô)	10,375	USD

#### Support from the government budget

The services to be delivered by the information system would be very useful for the public institutions as well as for the private sector. Therefore, part of the cost (0.6%) should be covered with the MoA's budget (8.3 million USD in 2018/2019<sup>32</sup>).

#### Support with a small levy on agricultural imports or exports

A very small levy on rice and wheat imports or rubber and cocoa exports could easily fund the information system work and development, as shown below:

32 <https://newspublictrust.com/2018/06/13/minister-flomo-urges-increase-in-liberias-agriculture-budget>

**Table 8:** Example of trade levies which could finance the service after the end of the program

Main agricultural imports and exports of Liberia	Flow in Metric Tons (Mirror data)	Needed levy in USD / Metric Ton imported or exported to finance the Information System
Rice imports (2017)	363 106	0,15
Wheat imports (2017)	108,475	0,51
Palm Oil imports (2017)	29,912	1,84
Rubber exports (2017)	63,318	0,87
Cocoa exports (2017)	14,943	3,68

### Sponsorship from private sector

The last possibility is to propose to a private company (trading or processing company, input supplier, bank, or mobile operator) to sponsor the service in exchange of advertisement/visibility in the information dissemination reports and radio broadcasting. The cost (52,080 USD/year) would be very affordable in comparison with the large and continuous visibility offered by a name associated to such qualitative and well disseminated information.

All the above outlined exit strategies can ensure the sustainable administration of the information systems for ARM. The best strategy or combination of strategies should be decided and chosen by the last year of the investment program. It should be noted that whichever strategy is chosen, the sustainability of the system would not be very difficult to build, only if the quality of the service is appreciated and the dissemination extensive.

### 3.3.5. Main challenge of the Information System: the selection of the 6 individuals for the task force

As the information system would be mainly built on human skills and managed by a small task force, the selection of the 4 Agricultural Risk Analyst, the Coordinator and the Communication and Dissemination Officer will be very strategic for the success of this investment program. The selection process must be very meritocratic and neutral. Some key criteria for the selection of the team are:

- **Human skills:** the sociability and ability to build good and strong relationship with different of stakeholders (individual small farmers, farmer leaders, small traders, big businessmen, extension officers, senior officials, field officers of NGOs and representative of international organization) is a key selection criterion. This is because the sociability will strengthen the network of partners who are the basis for a reliable information system.
- **Very good computer skills:** mastery of Word, Excel and Internet research is required to process the data collected and analyze information.
- **Interest, experience and/or training in both Agronomics and Economics:** the analysis of agricultural risks and trends demands that one has both agronomic knowledge to understand production and storage risk and economic knowledge to apprehend the impact of local, national and international events on agriculture profitability and trends.
- **Young individual wanting to be involved on the long term:** the efficiency and quality of an ARM information system is something that needs to be built on a long learning and network building process. Skill and knowledge transfer from an analyst to another is a long process. Therefore, it is important to selected young people wanting to work as analyst for more than the project period and to avoid changes in personnel during the implementation of the investment program.

As told previously, the selection process for the team will be one of the main challenges for the success and sustainability of the ARM information system. Therefore, it is advisable to use both writing and speaking tests in the recruitment process to select the best individuals.



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# Liberia



# Annexes



# A1. Field mission calendar

Date	Location	Activities
12 Feb	Monrovia	- Arrival
13 Feb	Monrovia	- Meeting with the LACRA direction - Meeting with the FAO representation
14 Feb	Monrovia	- Meeting with Meaway BARLEA, farmer in Nimba county, based in Monrovia - Meeting with Ms Musu FLOMO, Department of Planning and Development at the Ministry of Agriculture - Meeting with M. Jallah KENNEDY
15 Feb	Kamplay	- Trip to Kamplay (Nimba county) - Meeting with several cooperatives: Zoyeah farmer cooperative, Gbehlay-Geh farmer cooperative, Sroh Kwadoe farmer cooperative, Dordelah multipurpose cooperative, Zodoe multipurpose farmer cooperative
16 Feb	Kamplay, Ganta	- Meeting with the Gbehlay-Geh women multipurpose cooperative - Meeting with local traders - Meeting with MoA field officers (Kamplay and Ganta)
17 Feb	Gbalata, Kakata	- Meeting with traders and entrepreneurs in Gbalata and Kakata
18 Feb	Monrovia	- Office work
19 Feb	Monrovia	- Meeting with the ACDI/VOCA direction - Meeting with the USAID representation
20 Feb	Monrovia	- Meeting with WFP (VAM officer)
21 Feb	Monrovia	- Meeting with the Ministry of Agriculture (food security and nutrition, agricultural extension and marketing services) - Meeting with the Liberia Meteorological Service direction - Meeting with UNDP's climate information service project - Meeting with the LISGIS direction
22 Feb	Monrovia	- Meeting with GROW's senior intervention manager - Departure



## A2. List of people met during the mission

City	Organization	Division/Departement	Position	Name
Monrovia	Liberia Agricultural Commodities Regulatory Authority (LACRA)		Director General	Dr. John FLOMO
Monrovia	Liberia Agricultural Commodities Regulatory Authority (LACRA)		Deputy Director General for Administration & Finance	Hon. Ronald K. MENDS-COLE
Monrovia	Ministry of Agriculture (MOA)	Department of Planning & Development	Director for Planning & Policy	D. Musu B. Flomo Bendah
Monrovia	Ministry of Agriculture (MOA)	Program for Food Security and Nutrition	Program Officer	Tarnue D. KOIWOU
Monrovia	Ministry of Agriculture (MOA)	Department of Agricultural Extension	Director	Alaric N. MIENWIPIA
Monrovia	Ministry of Agriculture (MOA)	Department of Agricultural Extension	Assistant	Gertie K. SULUNTEH
Monrovia	Ministry of Agriculture (MOA)	Department of Agricultural Extension	Agro-Business Specialist	Helena K. JOYFE
Monrovia	Ministry of Agriculture (MOA)	Department of Marketing	Director	James T. MOORE
Monrovia	Ministry of Transport (MOT)	Liberia Meteorological Service	Director	Arthur GAR-GLAHN
Monrovia	Ministry of Transport (MOT)	Early Warning System Project	Project Manager	Amos J. Borbor
Monrovia	Ministry of Transport (MOT)	Liberia Meteorological Service	Assistant Director	Albert M. SHERMAN
Monrovia	Liberia Institute of Statistics & Geo-Info Services (LISGIS)		Assistant Director for Industrial Statistics & SDGs Focal Point	Andrew Akoi TELLEWOYAN
Monrovia	Liberia Institute of Statistics & Geo-Info Services (LISGIS)	Household Income and Expenditure Survey (HIES) coordinator	Assistant Director & Senior Economist	Boima HM SONII
Monrovia	GROW		Senior Intervention Manager	Kelvin DOESIEH
Monrovia	GROW		Team Leader	Yoquai V. LAVALA
Monrovia	USAID		Agricultural Development Officer - Climate & Environment Advisor	Moffatt K. NGUGI
Monrovia	USAID		Food for Peace (FFP) Specialist and Alternate Mission Disaster Relief Officer (AMDRO)	Joe Hoover GBADYU
Monrovia	USAID	Office of Economic Growth (EG)	Deputy Director	Maurice O. OGUTU
Monrovia	ACDI/VOCA		Country Representative & Chief of Party	Glenn A. LINES
Monrovia	World Food Program (WFP)	Vulnerability Analysis and Mapping (VAM) Unit	Programme Associate/ Head of VAM	Emmanuel ANDERSON

(...)



(...) City	Organization	Division/Departement	Position	Name
Monrovia	World Food Program (WFP)	Programme Unit	National Programme Policy Officer	Lonnie A. HERRING
Monrovia	FAO Representation in Liberia		Policy Officer	Al Hassan CISSE
Monrovia	FAO Representation in Liberia		FAO Representative	Mariatou NJIE
Kakata	Entrepreneur in Kakata (Bong County)		Hevea nursery manager	Kuku BOIMAH
Kakata	Farmer in Kakata (Bong County)		Rubber farmer	Slitus SIMPSON
Kamplay	Ministry of Agriculture (MOA)		District Officer Kamplay	Madisson GONKARNUE
Gbatala	Trader in Gbatala (Bong County)		Cocoa, Kola and Coffee Trader	Kadafi ASSIC
Kamplay	Gbehlay-Geh Rural Women Multipurpose Cooperative (Nimba County)		President	Oritha FANGALO
Kamplay	Trader in Kamplay (Nimba County)		Cocoa, Kola and Coffee Trader	John BARLEAH
Kamplay	Zoyeah Farmer Cooperative (Nimba County)		President	Peter MENDIN
Kamplay	Gbehlay-Geh Farmer Cooperative (Nimba County)		President	Erastus BORKUAH
Kamplay	Sroh KWADOE cooperative (Nimba County)		Member	Cyrus C. Lyon Sroh KWADO
Kamplay	Dordelah Multipurpose Cooperative (Nimba County)		Member	Rew S. Leamah FLEHN-BOR
Kamplay	Zodoe Farmers Multipurpose Cooperative (Nimba County)		President	Johnson WEEKYEE
Monrovia	Big Farmer in Nimba county, based in Monrovia		Rubber and Cocoa farmer	Meaway BARLEA







## NOTES

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