

Platform
for Agricultural
Risk Management
Managing risks
to improve farmers'
livelihoods

Tools Assessment



Information Systems for Agricultural Risk Management

Assessment
in 7 Africa Countries
**Cabo Verde, Cameroon, Ethiopia,
Mozambique, Niger, Senegal and Uganda**

**Executive Summary
Report**
October 2016






PARM
PLATFORM FOR
AGRICULTURAL RISK
MANAGEMENT

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Executive Summary Report
October 2016





Study Conducted by

- Research Centre for the Management of Agricultural and Environmental Risks (**CEIGRAM**), a research centre of the Universidad Politécnica de Madrid, Spain;
- **VISAVET** - Health Surveillance Centre, a research centre of the Universidad Complutense de Madrid, Spain.

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Foreword

The Platform for Agricultural Risk Management (PARM), a G8-G20 initiative hosted by the International Fund for Agricultural Development (IFAD), is a multi-donor partnership co-financed by the European Commission (EC), Agence Française de Développement (Afd), Italian Government and IFAD, to support Governments and stakeholders on Agricultural Risk Management (ARM). The Platform works in strategic partnership with NEPAD / CAADP in African countries to mainstream agricultural risk management into the national agricultural policy and investment plans (www.p4arm.org). The German cooperation support PARM through an agreement KfW-NEPAD. This study supports the PARM risk and feasibility assessment work in Cabo Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal, and Uganda. PARM is currently working also in Liberia and Zambia.

Information is the main input for risk assessment and the design of risk management tools and strategies. An efficient holistic approach to ARM requires information from a large diversity of sources covering all agricultural risks, with long enough time series and disaggregated enough information. Furthermore, accessibility of information is key for all users, including farmers, to ensure that it is used for ARM in symmetric equal conditions and to facilitate the development of efficient risk management and risk transfer tools. PARM experience in managing agricultural risk in African countries shows that information is one of the main constraints. This study assesses Information Systems for Agricultural Risk Management (IS-ARM) in seven African countries using a common methodology. The information in this study aims to contribute to define the priorities, strategies and investment plans for information systems in seven African countries, and to learn cross country lessons about the strength and weaknesses of Agricultural Risk Management Information Systems in Africa.

This publication includes the cross country comparison report, and the executive summaries and policy briefs on Cabo Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal, and Uganda. The full country reports are available in the PARM website www.p4arm.org.

The study was conducted for the Platform for Agricultural Risk Management by the Research Centre for the Management of Agricultural and Environmental Risks (CEIGRAM), a research centre of the Universidad Politécnica de Madrid, and VISAVET- Health Surveillance Centre, a research centre of the Universidad Complutense de Madrid, both in Spain. The team contact person is Alberto Garrido (alberto.garrido@upm.es). Team members from CEIGRAM-UPM are Alberto Garrido, José M. Sumpsi, Isabel Bardají, Marina Martínez, M. Inés Mínguez, Carlos Hernández, Lucía Rodríguez, Ana María Tarquis, Rosa M. Benito, Esperanza Luque. Team members from VISAVET-UCM are J.M. Sánchez-Vizcaíno, Joaquín Goyache, Marta Martínez, Ángel M. Ramos, José Luis Sierra, José María López, Eduardo Fernández, Beatriz Villa, Laura Rico, Almudena Morate, Raquel Vargas.



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List of acronyms

AfDB	African Development Bank Group
AISE	Agricultural Input Supply Enterprise (Ethiopia)
ARFA	Agência de Regulação e Supervisão de Produtos Farmacêuticos e Alimentares (Cabo Verde)
ARM	Agricultural Risk Management
CSA	Central Statistical Agency (Ethiopia)
DRMFSS	Disaster Risk Management and Food Security Sector (Ethiopia)
EAC	East African Community
ECX	Ethiopia Commodity Exchange (Ethiopia)
EFR	Emergency Food Reserve (Ethiopia)
EGTE	Ethiopian Grain Enterprise (Ethiopia)
ESDAC	European Soil Data Centre
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FEWS NET	Famine Early Warning Systems Network
GIEWS - FAO	Global Information and Early Warning System of the FAO
IAPC	Inter-African Phytosanitary Council of the African Union
ICT	Information and Communication Technologies
IS	Information System
ISRIC	World Soil Information
LINKS	Livestock information network knowledge system
MAFAP - FAO	Monitoring and Analyzing Food and Agricultural Policies Programme of the FAO
NDVI	Normalized Difference Vegetation Index
OECD	Organization for Economic Co-operation and Development
OIE	World Organization for Animal Health
RFBS	Regional Food Balance Sheet (Uganda)
SIMA	Sistema de Informação de Mercados Agrícolas de Moçambique (Mozambique)
SIMA	Système d'information sur les marchés agricoles (Niger)
UN Comtrade	United Nations Commodity Trade Statistics Database
USAID	United States Agency for International Development
WB	World Bank
WFP - VAM	World Food Programme - Vulnerability Analysis Mapping



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Assessment in 7 Africa Countries **Cabo Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda**

Comparative Report

1. Introduction

The objective of the project contracted with the Platform for Agricultural Risk Management (PARM) in IFAD was to assess the Information Systems for Agricultural Risk Management (IS-ARM) in the following African countries: Cape Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project was a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a comparison yardstick based on which a final report to compare the information systems for agricultural risk management in the seven countries was also drafted.

This report contains a synthesis and a discussion of the main results of the country reports. With a view to make it more self-contained, a few methodological comments will be useful.

The scores showed in the assessment matrix (Table 1), which summarizes the quantitative assessments of the seven countries of the information systems, are based on the benchmark indicators. These refer to characteristics of the information and the attributes of the information systems that were assessed in eight thematic blocks considered in each country. A complete description of the benchmark is included in Annex 1; the scoring criteria and the parameters employed to obtain the scores is included in Annex 2 to this report. All blocks are assessed on exactly the same methodological approach in the seven countries, thus enabling a comparison across countries.

The interpretation of the scores is as follows. The reported figures show the optimal, medium and minimal standards or requirements for performing agricultural risk assessments and enabling risk management policies. Low values of scores ($\leq 40/100$) indicate that the information available allows only for poor risk assessments; medium values of scores ($41-69/100$) indicate that the information available allows for preliminary risk assessments; and high values ($\geq 70/100$) would mean that the information available allows for a proper risk assessment and management. As indicated earlier, this scale of values should be interpreted and expressed in absolute terms, and thus will be applied in the same way to the seven countries (i.e. regardless of the level of socio-economic development and the institutional capacity and strength of the concerned country).

We applied this quantitative assessment method to the more relevant information systems found in our search, distinguishing national, regional or international, and public or private sources and systems.

- To proceed with the overall quantitative assessment for the thematic sub-blocks or blocks, the scores of the best information systems assessed in the corresponding sub-block or block were upgraded or downgraded as follows:
- higher score for the existence of national systems and lower for the predominance of international systems and lack of national systems;
- higher scores for the existence of private systems and lower for the lacking of private systems (specially in the thematic block 3 prices and markets);
- higher score for the existence of integrated information systems and lower score for the lacking of integrated information systems;
- higher score if there is complementarity among the different information systems and lower score if there is not; and,
- higher score for good coverage of the variables included in the sub-block or block and lower score for incomplete or deficient coverage.

Each country report includes detailed conclusions and recommendations that pertain to the specific circumstances gathered through reiterated checks of the Information Systems and data sources found along the investigation. In addition, authors have presented the country reports in Uganda, Ethiopia, Senegal, and Cameroon, gathering feedback, comments and observations from Ministries officers, stakeholders, donors and IFAD's specialists. The conclusions and recommendations reported for these four countries have been modified in response to this information gathered in the workshops held in the capitals.



These consultations involved a detailed list checks and confirmations including thorough and itemized questions that arose as a result of the impossibility of the authors to delve into some issues that the distant (online and document-based) inspection of the IS brought out.

The document is organized in three sections, in addition to the introductory one. First, the comparative assessment analysis by thematic sub-blocks/blocks and countries is reported. The second section ranks the countries based on the assessments of all blocks and sub-blocks. The last section contains a few general recommendations and thematic block-specific recommendations.

2. Comparative assessment analysis by thematic sub-blocks/blocks across countries

In this section we report the comparative analysis of the information systems assessment of the thematic blocks across countries. To avoid merging assessments of very different thematic areas within the blocks we will distinguish sub-blocks in all blocks except in blocks 6 (policies), 7 (socio-economic) and 8 (integrated systems). In these three blocks we will perform overall block assessments. To perform this comparative analysis of the sub-blocks or block information systems assessment across countries we built an assessment matrix with 14 sub-blocks/blocks (rows) and 7 countries (columns) shown in the Table 1.

Thematic sub-block 1.1: Meteorological and climate

Ethiopia reaches the maximum score (81/100) due to the existence of three complementary information systems providing jointly information of an acceptable quality for most of the key meteorological and climate variables. Uganda reaches a good score (70/100) because of the existence of international or regional systems. In Senegal (60/100) the best regional systems is accessible free of charge, and in Uganda the international system is based on models and synthetic data instead of observed data. The deficiencies in the meteorological infrastructure plan raise some doubts about the quality and representativeness of data.

Cameroon, Niger and Mozambique have intermediate scores between 50 and 60 due to the fact that international systems are based on simulation models and synthetic data and national systems are limited and deficient (data series are short and continuity and geographical scope of data series are rather poor).

Fundamental aspect of this sub-block is that series are long enough (>30 years), provide data of the basic variables (see Benchmark), rely on automatic stations and are representative of the main agro-ecology zones. These factors explain the range of scores among the countries.

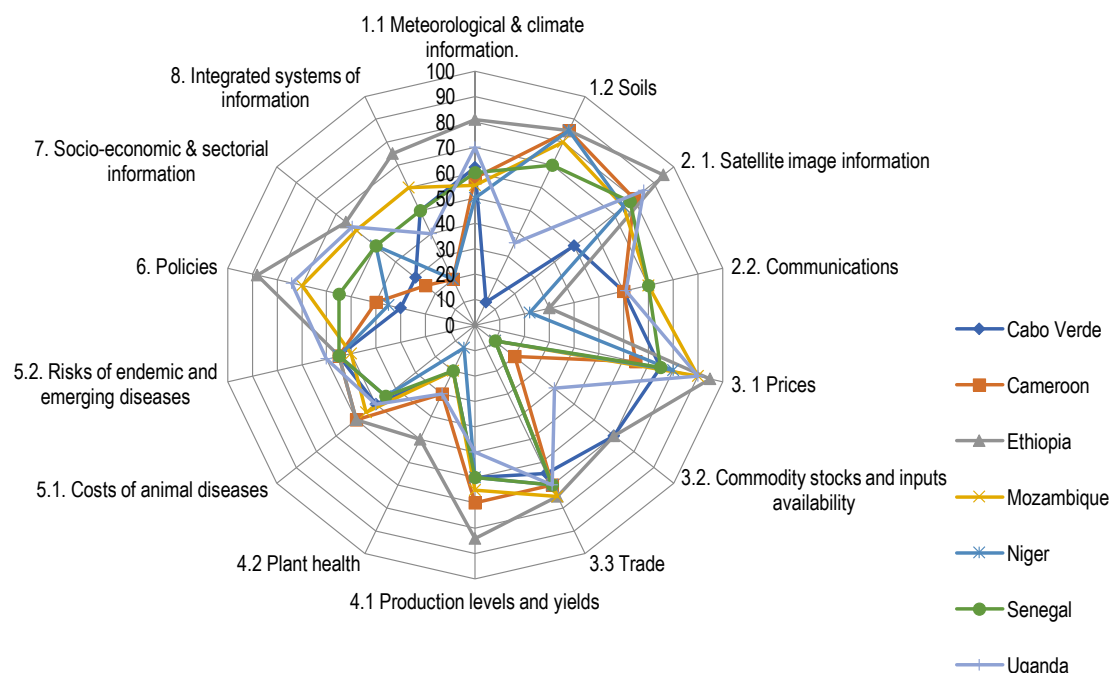
Thematic sub-block 1.2: Soils

In this thematic block we find high scores (70-85/100) in almost all countries, indicating the existence of good systems for soil information. However, the best and sometimes unique system found is internationally run, except the Ethiopian one, which is run nationally and includes a large number of locations throughout the country. The main example of international IS is the ISRIC-World Soil Information, which is an independent and science-based foundation that includes the Africa Soil Profiles Database. This database has the soil profile attributes and analytical data which are available for 15,564 profiles of which 14,197 are geo-referenced. The original attribute values are standardized according to e-SOTER conventions and validated according to routine rules. It is important to note that ISRIC experts state that, in general, there is a need to update soil information and use current technologies to improve data acquisition and organization.

Particularly, low scores were granted to Uganda (36/100) and Cabo Verde (10/100). In the case of Uganda the information on soils is sparse, limited and mostly referred to the national level. In the case of Cabo Verde the only information available is from the European Soil Data Centre (ESDAC). There are only ten land use maps dated 1930 and no information on soil types; this is considered insufficient for risk analysis although a small investment could compensate for the lack of information.

Table 1: Assessment of the thematic sub-blocks/blocks IS for ARM in the seven countries

Thematic Block	Quantitative assessment						
	Cabo Verde	Cameroon	Ethiopia	Mozambique	Niger	Senegal	Uganda
1.1 Meteorological & climate information.	62	58	81	55	50	60	70
1.2 Soils	10	85	85	80	85	70	36
2. 1. Satellite image information	50	80	95	75	75	78	85
2.2. Communications	60	60	30	70	22	70	61
3. 1 Prices	75	65	95	90	80	75	90
3.2. Commodity stocks and inputs availability	70	20	70	10	10	10	40
3.3 Trade	65	70	75	75	70	70	70
4.1 Production levels and yields	60	70	84	65	60	60	50
4.2 Plant health	20	30	50	20	10	20	30
5.1. Costs of animal diseases	50	60	60	55	45	45	50
5.2. Risks of endemic and emerging diseases	55	55	55	50	55	55	60
6. Policies	30	40	88	70	35	55	74
7. Socio-economic & sectorial information	30	25	65	60	50	50	62
8. Integrated systems of information	50	20	75	60	20	50	40

Figure 1: Graphical representation of the Assessment of the thematic sub-blocks/blocks IS for ARM in the seven countries

Thematic block 2.1: Remote sensing

We may distinguish three levels in the scores of this thematic sub-block. The highest scores correspond to Ethiopia (95/100) and Uganda (85/100) because both countries have a good international primary system (FAO), and national institutions and systems are doing a remarkable work to calculate some indexes which are offered to the potential users free of charge. In Senegal, Niger and Mozambique the scores are something lower (75-80/100) because the work of national institutions elaborating indexes based on the primary images (FAO) is not so good and complete. Finally Cabo Verde has the lowest score (50/100) because there is no national institution to elaborate satellite images, and those images are poor in this country.

Thematic sub-block 2.2: Communications

Senegal and Mozambique have the highest score on communications (70/100) followed by Cabo Verde, Cameroon and Uganda (60/100). In these countries the intermediate-high score is due to a good index of mobile penetration. Cameroon, Senegal and Uganda have also a good broadcasting media radio and Mozambique, Uganda and Senegal broadcasting Medias and TV. In addition Uganda, Senegal and Cabo Verde have a good index on internet penetration. Cabo Verde is the only country that has a high score on fixed phone penetration, most likely to the small size of country and population. The two countries with lowest scores are Ethiopia (30/100) and Niger (22/100) due to the low values in mobile, fixed phone and internet penetration indexes, due in the case of Ethiopia surely to the large size of the Ethiopian population.

All countries except Cabo Verde and Senegal have low values for secure internet servers which may explain why many national information systems web pages are working deficiently as we reported many times. This is an important limitation to improve the access and functionality of the national information systems for ARM.

It should be noted, though, that given that IS-ARM involves the producers and other private actors of the food chain, one of the most relevant criteria to the IS-ARM assessment is accessibility. In the course of seminars held in Dakar (Niger) and Addis Ababa (Ethiopia), most attendants expressed that in general farmers do not have access to internet. Furthermore, disseminating punctual information and data series on some variables (e.g., climate, prices) to the farmers is mostly valuable through mobile (SMS), via local newspapers and radio/TV stations or via the producers' organizations. A distinction should be made between providing early alerts, warnings or forecast services and providing data series of different variables. For the latter the traditional ways and direct transmission to the farmers from the local offices of the administrations, cooperatives and producers associations may be the best way. But, when information must be transmitted urgently and widely, SMS and producers' associations are the most effective means.

Accessibility to information and early warnings is essential and we could say that information and/or data that are not accessible to the farmers and to the public in general hardly exist. Following this judgment, we should grant a high weight to the accessibility criteria. Although data accessibility is a key criterion to assess IS-ARM, it is very easy and cheap to publish existing information, as in many cases it is just a question of legal change and/or political will. In other cases, it involves organizing and uploading all the existing information and improving the access and functionality of the websites. Therefore, we decided to give a low-medium weight to the accessibility criterion. This added a certain positive bias of our scoring system of most of the national IS, as the question of the lack or limited accessibility is a common problem of most of the national sources and information systems in all countries.

Thematic sub-block 3.1: Prices

In general we find high scores for price information systems in all countries except Cameroon (65/100). In all countries, we identified many information systems (between 7 and 11) among international, regional or national systems; some of them are old and others more recent. Such amount of price information systems can cause confusion, as not always it includes complementary sources on product coverage or length of data series. Probably the concerns on extreme price volatility since 2007-2008 (global food crisis) and the fact that commodity and food prices are relevant variables, not just for understanding market risks but also for food security concerns, explain the number of price information systems.

Ethiopia has very a high score in price information systems (95/100) due to the existence of very good national systems like ECX (cane and grain ex-change market) and CSA (vegetal products) complemented by LINKS for livestock price and markets. However, there were comments by national officers indicating that not all relevant prices for food security and humanitarian actions are sufficiently covered, reaching critical regions in the country and covering basic staples.

There also are some national sources providing prices for some inputs. Mozambique and Uganda reach also high scores (90/100). In the case of Mozambique this high score is due to the good national system (SIMA) well complemented in coverage and services by GIEWS-FAO and WFP-VAM, as well as the existence of INFOCOM that provides price information and market services. Uganda's high score is due to some good national systems, and in particular to the data price provided by private companies (Infotrade and Farmgain), although the access to part of information and services is not free of charge.

Niger, Senegal and Cabo Verde have also moderately high values (75-80/100), but scored slightly worse than Ethiopia and Mozambique because of the lower scores of national systems (lower coverage and updating), less complementarity among national and international systems and weak input price information in some of that countries. Niger has a good national system (SIMA), providing commodity and input prices information; and Senegal has an interesting private company (Manobi) which is offering different market information and services obviously not free of charge. Cabo Verde has a national system (ARFA) with a good degree of integration within the block 3 (price and markets)

The lowest score was given to Cameroon (65/100), due to the inexistence of updated data price. Since 2012 there is no any information on commodity and input prices in this country. In addition it was not possible to access to the historical time series of prices, for unknown reasons.

Thematic sub-block 3.2: Commodity stocks and inputs availability

The information systems of this thematic block were judged as very deficient in most of the countries. Only international systems (FAOSTAT) have some information on stocks but the information is neither updated nor actual (estimated), and unreliable. Hardly any information exists on inputs availability. Four countries have very low scores in this sub-block on stocks and input availability (less than 25/100): Cameroon, Mozambique, Niger and Senegal.

In Uganda with an intermediate score (40/100), the Regional Food Balance Sheet (RFBS) provides under free registration some updated information on cereals stocks (partnership between WFP, USAID and EAC). The only two countries in which this sub-block have a high score are Ethiopia and Cabo Verde (70/100); in the first country, the score can be explained by the existence of the Emergency Food Reserve (EFR) and the Ethiopian Grain Enterprise (EGTE) both managing public stocks; the first for food security purposes, and the second for price stabilization. ECX also provides some information on stocks. In addition Agricultural Input Supply Enterprise (AISE) provides some information on input supply and availability. All these national systems are public systems; in Cabo Verde is due to the existence of a national public system (ARFA) that provides good, updated and integrated information on prices and stocks.

Thematic sub-block 3.3: Export and imports trade

The assessment of this thematic sub-block is one of the most homogenous across countries. In fact, the scores for this sub-block vary between 65 and 75 in the seven countries. The explanation for such homogeneity is that the information comes primarily from national sources (customs control) and is rather good. But it is surprising that, coming from national sources, the information on trade elaborated and disseminated by international/regional sources (FAOSTAT, UN Comtrade and AfDB) are in most of the seven countries more complete than the trade information reported by national sources (on-line or through publications). The two countries with slightly higher scores, Ethiopia and Mozambique (75/100) have more complete trade information in national systems, the latter having a very detailed description of tariffs and trade regime.

Thematic sub-block 4.1: Plant production and yields

Five out of seven countries have very similar and medium scores in this thematic sub-block (between 60 and 70). Most of the long series on plant production and yields come from international sources, data are not updated, and the level of disaggregation is not sufficient. The lowest value is for Uganda (50/100). The highest value is Ethiopia (84/100), because the National Institute of Statistics (CSA) has good, updated and disaggregated information on all the variables of this sub-block. Countries did not reach the highest scores because the level of geographical disaggregation was considered insufficient, primarily because statistical branches or data collectors do not cover all the agro-ecological regions.

Thematic sub-block 4.2: Plant health

This thematic sub-block is jointly with the commodity stocks and input availability sub-block the worst assessed sub-block across the seven countries. Most of the countries are scored below 30/100. There is little variation from 10/100 the lowest score in Niger, 20/100 in Cabo Verde, Mozambique and Senegal, 30/100 in Cameroon and Uganda; the highest score in Ethiopia (50/100). The scores of this sub-block are very low because we did not find information systems at national level, except in Ethiopia whose Central Statistical Agency of Ethiopia (CSA) provides some data about damages affected crops in Ethiopia; and the *Portail de l'information phytosanitaire au Cameroun* delivering some information related to plant health for a limited number of crops. At international level, Plantwise offers information about pest and disease, but there are no historical data at country level, which is not necessarily relevant for risk analysis and assessments.

The systems for Plant Health in Africa are now under construction by the Inter-African Phytosanitary Council of the African Union (IAPC). The IAPC, based in Cameroon, has published the "For better Plant Health in Africa" as Strategic Plan for 2014 to 2020. The IAPC second programmatic area is "Plant Pest Risk Reduction". IAPC has the role of facilitating and supporting decision-support tools, pest risk analysis, testing and monitoring. Therefore, in the future important progress can be expected on plant health information in Africa.

A couple of specific international initiatives for locust and rust are worth mentioning: Desert Locust Control Organization for Eastern Africa (DLCO-EA) and the RustTracker.org. These international initiatives could be replicated by the countries, focusing on the specific national pests or diseases.

The lack of sufficiently long and published data series covering pests and diseases outbreaks reaching the main crops and regions is a common limitation across the countries. This explains the low to moderately low given scores.

Thematic sub-block 5.1: Cost of animal diseases

We did not find any information systems on cost of animal disease or specific information or data in any of the seven countries. The scores across countries for this sub-block are rather homogeneous at medium-low values ranging from 45/100 (Niger and Senegal) to 60/100 (Ethiopia and Cameroon). Cabo Verde and Uganda (50/100), and Mozambique (55/100) have intermediate values. This homogeneity is due to the fact that, although there are good international systems (OIE and FAO), these sources are not complete, and lack relevant information for animal health risk assessment. In particular, animal border trade and domestic movements, animal production and holdings, animal surveillance and control systems are not collected or reported. This information is lacking or is insufficiently covered by the national systems which have serious deficiencies and limitations. The scores of the countries are based on the differing status of information systems available in each country covering these critical variables.

Thematic sub-block 5.2: Animal endemic and emerging diseases

The homogeneity of scores for this sub-block across countries is remarkable at medium values varying from 50 to 60/100. Five out of seven countries scored 55/100 (Cabo Verde, Cameroon, Ethiopia, Niger and Senegal). Uganda reached 60/100 and Mozambique 50/100. The explanation is very similar to that one provided for sub-block 5.1. There is a reference international information system for animal health (OIE), but it is not complete, and the national systems do not fully complement the lacking information. Moreover, compliance with OIE's disease reporting commitments is influenced by the lack of enhancement in some topics in many national Veterinary Services, such as laboratory infrastructure and staff training. It is of utmost importance for both the national and the international community to improve the quality of Veterinary Services worldwide, as well as their laboratory diagnostic capabilities, without forgetting training and continuous support by the OIE. There are some barriers to implement an OIE's adequate information system, including the complexity of the standardized collaboration, a general lack of resources, the above-mentioned inadequate capacity within some national Veterinary Services, and a deficit of satisfactory legislation, policy and guidance, including some governmental reluctance to disease communication. Therefore, the OIE PVS Pathway (the global program for the sustainable improvement of a country's Veterinary Services' compliance with OIE standards on the quality of Veterinary Services) should be reinforced, and the results must be available in the public domain (at present this is based on a voluntary basis).

From this point of view, the disproportionate scientific, sanitary, and sociopolitical attention to some specific animal diseases with trade relevance can be deeply criticized because it prioritizes the interest of certain countries, placing free trade above other national, regional or global health needs. In this context, certain endemic diseases presents in some countries have historically suffered from a lack of attention in international health efforts, which have led to a chronic failure in surveillance, prevention and treatment options of these processes. Furthermore, the emphasis of the international information system on the communication of outbreaks and the declaration of disease-free areas is understandable to contain the spread of diseases in disease-free countries, but its implementation is not particularly helpful to improve the management of endemic diseases in some developing countries. Complementary information systems are required to be developed at national and international (OIE/FAO/WHO) level with a particular emphasis on neglected diseases (including zoonoses) in all sides of health (human, livestock, wildlife and environment), to improve surveillance, prevention and treatment in endemic countries.

Efforts should be made to develop an animal/human health integrated IS. The achievement of comprehensive and effective integrated information systems is compromised by organizational complexities and inefficiencies. ISs in animal and human health are highly variable and real interoperability and automatic data transfer between national, regional and international ISs is unviable. This hampers data sharing and analysis, and recognition and response to health threats. Integration of human and animal ISs into a global One Health IS (including the environmental interface) should be promoted.

Thematic Block 6: Policies

There are no proper information systems on policies, but specific, discontinued and incomplete information in national systems. Some countries publish policies information from international sources (USDA, OECD) or programs (MAFAP-FAO). The countries that have policies information (trade measures, farming support, infrastructures public investments, early warning, safety nets and crop insurances) from international sources have higher scores. It is the case of Ethiopia (88/100) with the highest score. This country has also a national system for early warning and some pilot projects on crop insurances, including very promising micro-insurance private initiatives. It is the case of Uganda and Mozambique which reached 74/100 and 70/100 respectively, due to MAFAP-FAO, early warning from international systems (GIEWS-FAO, WFP-VAM or FEWS-NET) and some information on policies and pilot projects from national sources and institutions.

The rest of countries got lower scores: Cameroon (40/100), Niger (35/100) and Cabo Verde (30/100), indicating that these countries only have some policy information and early warning from international sources (FAO-GIEWS, WFP-VAM and FEWS-NET), although they do not have MAFAP or other international sources (USDA) informing about national policies. We did not find any national information system or punctual information on policies in those countries. Senegal has an intermediate score (55/100) because we found some national information on trade measures as trade facilitation indicators and insurances.

Thematic Block 7: Socio-economic and sectorial

In this thematic block we have two levels of scores. In the first level we have medium values between 50 and 65/100, in Ethiopia (65/100), Uganda (62/100), Mozambique (60/100) and Niger and Senegal (50/100). In a second level we find very low scores: Cabo Verde (30/100) and Cameroon (25/100). The information on this sub-block comes from international/regional (WB, FAO, United Nations and AfDB) and national sources and institutions. The difference in the scores across countries can be explained by the existence or not of national systems with some information on socio-economic and sectorial variables although the information is not complete or fully updated.

Integrated systems

In this block the scores across countries show wide variations ranging from the lowest (20/100) in Cameroon and Niger to the highest value (75/100) in Ethiopia. In the middle stands Mozambique with 60/100, Cabo Verde and Senegal with 50/100. The high score in Ethiopia is due to the integrated information and services in ECX, CSA and LINKS and the DRMFSS platform. In Senegal and Mozambique the intermediate scores (50-60/100) can be explained by the existence of national private market information systems which have some degree of integration within the different sub-blocks of block 3 (price and markets) and offering diverse market services: Manobi in Senegal, Infocom and Aviso Previo in Mozambique and Infotrade and Farmgain in Uganda (40/100). In Cabo Verde (50/100) we found a public national system that integrates price and markets information (ARFA). In Cameroon and Niger we did not find any proper national integrated system.

3. Comparative analysis of country overall assessment (ranking)

The attention is turned to review the comparative analysis by country, weighting the different sub-blocks/blocks according to its relevance for ARM purposes (see the Table 2 for weights and calculations and Table 3 for ranking).

Table 2: Weighted assessment of the IS for ARM in seven countries

Thematic Block	Weight	Weighted quantitative assessment						
		Cabo Verde	Cameroon	Ethiopia	Mozambique	Niger	Senegal	Uganda
1.1 Meteorological & climate information.	13%	8.06	7.54	10.53	7.15	6.50	7.80	9.10
1.2 Soils	3%	0.30	2.55	2.55	2.40	2.55	2.10	1.08
2. 1. Satellite image information	5%	2.50	4.00	4.75	3.75	3.75	3.90	4.25
2.2. Communications	5%	3.00	3.00	1.50	3.50	1.10	3.50	3.05
3. 1 Prices	15%	11.25	9.75	14.25	13.50	12.00	11.25	13.50
3.2. Commodity stocks and inputs availability	5%	3.50	1.00	3.50	0.50	0.50	0.50	2.00
3.3 Trade	5%	3.25	3.50	3.75	3.75	3.50	3.50	3.50
4.1 Production levels and yields	12%	7.20	8.40	10.08	7.80	7.20	7.20	6.00
4.2 Plant health	5%	1.00	1.50	2.50	1.00	0.50	1.00	1.50
5.1. Costs of animal diseases	10%	5.00	6.00	6.00	5.50	4.50	4.50	5.00
5.2. Risks of endemic and emerging diseases	10%	5.50	5.50	5.50	5.00	5.50	5.50	6.00
6. Policies	5%	1.50	2.00	4.40	3.50	1.75	2.75	3.70
7. Socio-economic & sectorial information	2%	0.60	0.50	1.30	1.20	1.00	1.00	1.24
8. Integrated systems of information	5%	2.50	1.00	3.75	3.00	1.00	2.50	2.00
Total Score by country (%)	100%	55.16	56.24	74.36	61.55	51.35	57.00	61.92

Table 3: Ranking of the seven countries by total score of the weighted assessment

Country	Overall assessment scores
Ethiopia	74
Uganda	62
Mozambique	62
Senegal	57
Cameroon	56
Cabo Verde	55
Niger	51

As shown in Table 3 Ethiopia has the highest overall score (74/100) because this country performs rather well in almost all thematic sub-block and blocks. The scores on animal and human health in Ethiopia are intermediate (55/100).

Uganda and Mozambique, both (62/100) and Senegal (57/100) have intermediate level of scores due to low scores in stocks and plant health information and medium values in many sub-blocks (plant production and yields; cost of animal diseases; animal and human health; policies; socio-economic and integrated systems); in addition to soils and communications in Uganda.

In a low-intermediate position stands Cameroon (56/100) and Cabo Verde (55/100), because these countries perform rather poorly in many sub-blocks information systems. The only sub-blocks with scores above 70/100 are soils in Cameroon (85/100), Satellite images in Cameroon (80/100) and prices information systems (75/100) in Cabo Verde.

Niger have the lowest scores (51/100) due to the low scores in plant health and stocks; socio-economic; policies and integrated systems. This country has many sub-blocks with medium scores (40-60) and only few sub-blocks with high scores (more than 70/100).

4. Recommendations

The following list of recommendations draws from the countries reports' conclusions and recommendations. But is meant to offer general lessons that might be applicable to any country in a beginning or intermediate stage of implementing policy agricultural risk management efforts. We assume the risk of making generalizations in order to provide common guidelines that could be applied with different intensity and scope in the seven countries. To gather more detailed recommendations by country we suggest reviewing the country reports. We will start with general recommendation followed by block-specific recommendations

General recommendations

1. The risk assessment analysis in this report shows that across countries the three information areas that clearly require more investment are: stocks and input availability (3.2), Plant health (4.2) and, to a lower extent, information on animal diseases. The reasons underlying this common finding obey to different factors: stocks are difficult to control or else considered strategic information for governments' policy; inputs' use – seeds, products and fertilisers – has emerged as a promising area in peasants' and subsistence agriculture very recently, as opposed to commercial exporting agriculture in the countries that use it since decades; plant health status, risks and data are also new concerns which countries are now starting to pay attention, and international knowledge is also somewhat recent; and about the same reasons apply to animal diseases.
2. It is not uncommon to find duplicate efforts in addressing similar or equal IS or databases. It is thus recommended that IS should specialize in the areas closer to the core of its professional expertise and its legal mandate. We also recommend that some IS draw on other IS to disseminate information that may be relevant for its core of interest and on which the IS lacks the data and professional capacity. Examples are:
 - There should only be one national IS for meteorological data; plants' and animal disease; and socio-economic data.
 - There might be more than one IS for prices. In some countries, either because the importance of one crop stands out for its market value (e.g. cotton in Mozambique) or because an exchange or bourse system negotiates contracts for some commodities (e.g.. EXCME in Ethiopia), it would make sense having more than one IS on prices operational. This report does not recommend keeping many different IS on prices.
 - In the case of the most specialized IS (e.g. animal and human health and plants health), we recommend that only one national IS should take all the responsibility and work close to and interoperate with international sources.
3. Take more care of increasing the length of the time series and the continuity in reporting the different values, which is essential for risk assessment and analysis. In several countries and information blocks the series are discontinued or provided in a one shot basis which can be useful to inform and alert for an event or situation, but is not useful for ex ante risk analysis.
4. It is essential that databases be continued and reported entirely, adding if possible technical notes describing the most important methodological, quality check procedures and sampling aspects.
5. The private initiatives should be stimulated by adequate regulation and be legally protected. For-profit organizations seek to occupy market niches providing information through paying data services. In most instances, this requires that the private sector collect data that would not be otherwise collected. We, thus, do not see any risk of public-private collision or duplication. On the contrary, the country reports are abundant with very promising public-private partnerships that can provide valuable information for agricultural risk assessment and management.

6. Although parastatal agencies should be prioritized and lead some aspects of the development of IS, we recommend that purely public agencies be the main statistical and database gatherers and reporters. Government policy should be based on data sources that are available to the general public, university and research centers.
7. When choices have to be made as a result of very tight budgets, we recommend that IS should prioritize regional trends, markets, diseases, or prices. Most often, it is better to have fewer IS focusing on narrower topics or areas, albeit offering trustworthy and relevant data, than wider and more superficial IS addressing many topics, none of which has sufficient length, relevance or continuity. The list of priorities would be:
 - Climate data and early warning systems
 - Price and markets data, including inputs and stocks
 - Animal movements, trade and border exchanges
8. All IS should provide data at the right level of disaggregation, reaching all specific and relevant agro-ecological zones. The provincial level is the minimum required disaggregation level, but for the largest countries this may not be sufficient.

Thematic Block 1: Meteorological IS

1. We recommend that fewer stations, strategically located, provide complete datasets without interruptions and counting on appropriate data checks and quality control.
2. We reiterate that there should be only one IS centralizing all meteorological services. Climate observation and reporting. We recommend this to be public, although we do not find inappropriate that the more detailed data be offered on fee basis.
3. The IS should be connected and coordinated with international IS.
4. We recommend that the national meteorological agency should work with other IS to develop and calculate indicators that are relevant and input data for their risks assessment methods. This means that meteorological IS should work collaboratively with other government branches and ISs, instead of these engaging on tasks that should be performed better and more efficiently by the former.
5. In the absence of data direct collected from the stations, estimated and simulated data can be a solution. But this could lead to error and misleading recommendations if the models used are not properly calibrated.

Thematic Block 2: Satellite images and communications (ICT)

6. IS should include continuing repositories of cartographies containing specific variables (e.g. soil moisture. NDVI). If possible, the maps should indicate anomalies with respect to the expected values at each date to which the maps are referred.
7. Governments should invest in broadband access and internet penetration. Having wide coverage of IT services is a prerequisite not only for massive use of ISs' alerts and services, but also for facilitating the development of private services. On this block, countries scores differed widely, which means that there should not be major obstacles to popularize ITs, at least in the most densely populated rural areas.
8. We recommend that telephone (via SMS), local newspapers and radio/TV stations and cooperative producers associations maintain a prevalent communication means for rural areas, especially for disseminating alerts and early warning messages, in parallel with internet and other IT communications.



Thematic Block 3: Prices and markets

9. We recommend that international and national IS should be maintained in parallel and simultaneously operative. National IS should keep and report data regularly and continuously of the most relevant markets. For the commodities that are more critical for security, we recommend that prices be collected at various markets and looking at least at two value chain positions.
10. Input price and market information should be significantly strengthened, and be given more attention.
11. Specialized IS should take most if not all responsibility of gathering, processing and reporting market prices. For critical products, price information could also be contained in the integrated IS specialized in food security and disaster preparedness and management. Ideally, market exchanges should be created, Ethiopian Commodity Exchange (ECX) being the most successful example. Note that a simplified platform with sufficient liquidity and trustworthiness can be easily scaled up to include more products and contracts. With this, additional market services can be developed and offered, genuinely helping traders, farmers and cooperatives better manage their market risks.
12. The co-existence of various national IS reporting inconsistent prices for the same commodities and market position should be avoided by all means.
13. Keeping track and reporting of stocks of the most critical commodities and food products is a crucial factor to carry out market risk assessments. We recommend that, respecting the confidentiality of sensitive information, IS attempt to report estimates of stocks, following internationally accepted methodologies. Publically held stocks can also service other means, like helping farmers store their harvests and obtaining credit (Warehouse Receipt Systems. Local Food Reserves). But public-private partnerships perhaps provide the best platforms to engage in storing services, market management and reporting, and offering risks management services to the farmers.
14. Trade flows are best reported by international IS. National IS are responsible of collecting, information on imports and exports. The national systems should organize and disseminates all the trade flow information available.

Thematic Block 4: Plant productions, yields and health

15. We recommend that IS focusing on plants' health and pests should prioritize the most relevant pests, diseases and weeds. None of the seven countries included in the study scored above 40 (except in Ethiopia) in this block, indicating that none is even closer to offering sufficient information and data to support risk assessments that help farmers prepare and protect their crops.

Thematic Block 5: Animal and human health

16. All countries rely on the international IS for this block. We recommend that national IS should prioritize their efforts to their most critical species, threats and diseases. Right now, no country is prepared to rely exclusively on the national IS, but in the authors' view this should not be a source of serious concern if the systems already in place work well and narrow their focus. National IS should be closely coordinated and inter-operational with international IS.
17. It is essential that national governments perform evaluations of the economic costs of diseases, and use this information to focus on the most relevant threats. Admittedly, without proper risk assessments it might be difficult to set the right targets and focus. But countries could rely on the international IS to define its strategic plans and early warning systems.

18. Although substantial technical studies of endemic diseases have been performed worldwide, sanitary and economic analysis of the effects and the control of these type diseases in developing countries remains a relatively neglected field. Decision making about endemic diseases needs to be viewed from both the economical and health perspectives. Governments of developing countries face complex decisions about disease control efforts, including whether to invest or not in earning further information before making decisions. International efforts (OIE, FAO, WHO) are required to develop an animal/human/environment health integrated IS, with a particular emphasis on neglected diseases (including zoonoses).
19. National IS should be completely inter-operational with international IS.
20. The movement of animals within the countries and across borders should be monitored, especially for those species more vulnerable for contagious diseases.
21. Information about animal diseases surveillance, control systems and control programs should be also strengthened.
22. Information on human disease surveillance and notification should be strengthened in all countries.

Thematic Block 6: Policies

23. The ISs' deficits were identified in most of the cases in the trade regimes and policies information. Countries lacking trade measures IS should use FAO's MAFAP as a valid starting point, or some other international organizations. The information should always be reported on time and clearly explained.

Thematic Block 7: Socio-economic and sectorial information

24. In this block, we also recommend that a selected IS be responsible of collecting, gathering and reporting all relevant data. Some countries have too many IS collecting information which cannot be later on processed and reported using similar definitions, quality standards and criterions. We recommend that either the National Statistical Services or the Agricultural Statistical services take on this role, following internationally accepted methodologies and criterions. There are gains to be accrued from professional specialization and tasks concentration on a single service. This IS should be a data provider to other IS.

Integrated systems of information

25. Some private companies offer integrated market information and services like Manobi in Senegal or Infotrade and Farmgain Ltd in Uganda. Obviously, these IS are non-free access systems and to pay the access rates is a major problem for the small holders farmers. The sustainability of those private systems is a serious concern.
26. Some countries have created specific platforms for early warning and disaster management systems (Aviso Previo in Mozambique; DRMFSS in Ethiopia). We recommend all countries to develop such type of platforms. But we advise against platforms or Information systems integrating all thematic blocks. Instead, we recommend that IS specialize in their core topics and data, and other IS seeking to offer risk assessments should rely on the former IS specialized ones. To our knowledge no world country has a single IS that integrates information on all the blocks considered in the study; this evidence supports the recommendation that some IS become truly specialized (meteorological; prices and markets; satellite and ITs; plants' health; animal health). whereas some others be users' and processors of the specialized IS. We do not recommend that integrated IS address more than three or four blocks.

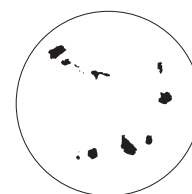






Country Reports

1. Cabo Verde



1.1. Objective

The objective of the project contracted with IFAD is to assess of the Agricultural Risk Management Information Systems (ARM-IS) in the following African countries: Cabo Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project is a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a comparison yardstick based on which a final report to compare the information systems for agricultural risk management in the seven countries was also drafted.

The purpose of this country report is to summarize the research results of the availability and quality of information for agricultural risk management purposes in Cabo Verde. Both the existence and quality of the information, and the timely and useful access by stakeholders for risk management purposes will be assessed. The gaps on information and access tools for the main stakeholders (smallholders, commercial farmers, microfinance institutions, value chain, private investors, donors and governments) will also be evaluated. A special emphasis will be place on two groups of users of ARM-IS: at micro level, the usefulness and timely access of smallholders to information for Agricultural Risk Management purposes; at macro level, the usefulness and access for the Government and policy makers, and for business developers of risk management services.

This executive summary contains the conclusions and recommendations drawn from an extensive Country Report for Cabo Verde. Although it was written to offer self-contained facts and judgments, it draws extensively from the main country report. Therefore, the interested reader seeking further detailed elaborations, facts and data should read the entire Country Report.

1.2. Methodology

The project will cover the main sources of risks in agriculture. In particular, risks stemming from areas included in the following thematic blocks for which information systems and sources will be assessed:

1. Meteorological, climate and soils
2. Satellite image & Communications
3. Prices of commodities, inputs and market components
4. Production levels and yields, Plant health
5. Animal and human health
6. Policy
7. Socio-economic and sectorial

The methodological approach is based on the following steps:

- Developing of a benchmark for **Agricultural Risks Management** Information Systems (**ARM-IS**), hereafter referred as **Benchmark-ARM-IS**. The Benchmark defines the standard requirements for the information systems in each thematic block to make a proper agricultural risk assessment and management (Appendix 1)
- A search of information from different sources, covering academic and grey literature, bibliographic sources, websites, national and international institutions, generating an assessment process
- Checking, contrasting and completing some inconsistencies/gaps of the information systems found in Senegal through local consultants.
- Identification of weaknesses and strengths of ARM-IS in Senegal.
- Quantitative assessment of the IS and the thematic sub-blocks or blocks following the methodology of quantitative assessment (Appendix 2) in all countries
- Feedback from the national governments and selected stakeholders, gathered in public workshops presented in Praia.



- Comparison of the revised quantitative/qualitative assessments across countries and discussion
- Recommendations for improving the information systems relevant for each thematic block and their interactions with one another, with a view to enhance Cabo Verde's preparedness to perform further analyses of agricultural and veterinary risks.

1.3. Assessment of Information systems for ARM in Cabo Verde

Following a general methodology applied to each thematic block (see Appendix 2) we assessed quantitatively the information systems for the different blocks as well as the whole block. Having useful information systems and sources (IS) for agricultural risk management (ARM) requires that policy makers, as well as private actors along the food chain, get involved in thinking out the best data and information sources, and making it widely available for the whole country. This includes users, individually or through professional organizations, businesses and traders, and consumers. The value of IS will be assessed primarily based on its accessibility, quality and reliability for enabling useful agricultural risk management in Cabo Verde.

Given that IS-ARM involves the producers and other private actors of the food chain, one of the most relevant criteria to the IS-ARM assessment is accessibility. To assess the accessibility of IS we assigned scores (0-100) to the accessibility indicator and decided the weight of accessibility compared to the weight of the rest of criteria. Concerning the first, the question is which values to assign (between 0 and 100) to the different levels of accessibility or different ways to access the data: internet, bulletins, radio, mobile (SMS) and others. Authors initially assigned low values to the traditional ways to disseminate and access information (bulletins, radio) medium values to the internet and high values to the internet plus mobile (SMS), but we reversed the assessment. Therefore, high scores were given to the traditional media (TV/Radio/Newspapers) and low to internet and SMS. Clearly, disseminating punctual information and data series on some variables (e.g., climate, prices) to the farmers is mostly valuable through mobile (SMS), TV/Radio or via the producers' organizations. A distinction should be made between providing early alerts, warnings or forecast services and providing data series of different variables. They serve different purposes and means.

Even more controversial is how to assign a weight to the accessibility criteria. This is a key criterion, which considers that information and/or data that are not accessible to the farmers and to the public should be considered as non-existing. Although data accessibility is a key criterion to assess IS-ARM, it is very easy and cheap to publish existing information, as in many cases it is just a question of legal change and/or political will. In other cases, it involves organizing and uploading all the existing information and improving the access and functionality of the websites. Therefore, we decided to give a low-medium weight to the accessibility criterion.

We assessed information sources/systems, instead of scattered and sporadic pieces of information. The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Cabo Verde.

As it is explained in detail below the IS, each containing a number of key variables, are evaluated using different attributes. The logic of the analysis is targeted to the main question of the study: are IS ready to and permit performing agricultural risk management?

Attributes differ for each IS based on the type of information that is relevant in each Block. While somewhat subjective, the attributes were weighted as follows: frequency (20%), aggregation level (20%), length (20%), accessibility (10%), continuity /update (10%), geographical (10%). The rationale for weighting, for example, frequency (20%) stronger than accessibility (10%) stems from the fact frequency is a prerequisite to perform useful agricultural risk assessments whereas accessibility is not. During the execution of the project, not only in Cabo Verde but also in the other seven countries, it was found that data sources were available though not accessible. Since available data can be easily be made accessible, and non-existing data cannot, it was decided to weigh both variables accordingly.

The total number of information systems for the seven sub-blocks is large (73) for a small country; especially in thematic blocks 5 (Animal and human health) and 3 (Prices and markets).

It should be clear that having more information systems does not necessarily mean that a higher overall score should be given to the whole block or sub-block. In fact, under certain conditions having too many IS for a specific block or sub-block might be negative if there is not complementarity among the different IS. In all blocks, except for block 7 Socio-economic systems international IS are predominant, although the assessment is focused mainly on national systems. All the identified information systems and sources have been described, and most of them have been assessed following the methodology for IS quantitative assessment (Annex 4). Some others were not assessed due to the lack of information on assessment criteria (features of information and attributes of IS) or the irrelevance of the concerned IS.

Table 1.1: Number of IS identified by thematic block in Cabo Verde *

Thematic Block	National	Regional	International	Total
1 - Meteorological	2	2	3	7
2 - Remote Sensing	1	1	11	13
3 - Prices/markets	4	5	6	15
4 - Plants	2	3	4	9
5 - Animal	3	2	13	18
6 - Policies	2	1	5	8
7 - Socio-economic	1	1	1	3
Total	15	15	43	73

* A number of IS provide information and data to more than one Thematic Block, therefore the numbers reflect IS that cover each thematic block, and do not refer the number of specific IS relevant for Cabo Verde, which may be less than 73 in total. The following national IS provide data and information for more than one thematic block (MDR (5 Blocks); INE (5 blocks); ARFA/ANSA (4 blocks))

Since it is not possible to summarize the description and assessment of so many IS within this executive summary, we will comment just the results of the overall assessment of the thematic sub-blocks or blocks (scores ranging 0-100). Readers interested in the detailed information should review the main document.

The interpretation of the overall scores (0-100) of the sub-blocks or blocks is as follows in Table 1.2. The reported figures (see Table 1.3) are based on the degree of fulfillment of the desirable, medium and minimal requirements for performing agricultural risk assessments and thus enabling risk management policies in the corresponding sub-block or block.

Table 1.2: How to interpret the overall scores

Overall score of the sub-blocks or blocks	The available information would permit
≤20	Only a very poor or irrelevant risk assessments in the corresponding thematic sub-block or block
21-40	Merely allow poor risk assessments
41-69	A preliminary risk assessment
≥70	Enables a proper risk assessment and management

As it can be seen in the Table iii, the result of the overall quantitative assessment i.e. overall scores (0-100) of the different thematic sub-blocks and blocks, shows that the information systems for ARM in Cabo Verde are uneven, although there are many thematic blocks or sub-blocks with a medium-high or high score.

**Table 1.3:** Assessment of the sub-blocks and blocks IS for agricultural risk management in Cabo Verde

Thematic Block	Quantitative assessment	Comments
1. 1 Meteorological & climate information	62	Weather information of a desirable level could be obtained of most variables in the national, but improvement on all features is needed, in particular: Representativeness, Accessibility (the site is inactive or inefficient), and Continuity/update which are deficient and require a long term investment and commitment, the data series are not updated and only averages on annual basis.
1.2 Soils	10	Only International IS that provides sparse and old information at country level, in different scales and not geo-referenced.
2.1 Satellite image information	50	The private companies have a good infrastructure and the accessibility to data to calculate several indexes with a good flexibility. However, this work has to be demanded and maintained so for everyday task the cost will be extraordinary high. Only in certain moments and cases can be required their work. In the national institution they haven't shown activity in this sub-block.
2.2 Communications	60	There is a very good mobile penetration indicator and good internet users and secure internet servers indicators. The broadcast news media for radio, TV and Newspapers have a low score due a small country.
3.1 Prices	75	A strong national Integrated IS (ARFA/ANSA) with good length of price data at different levels, wide coverage of markets. ARFA is the best rated IS for Cabo Verde although it has only medium products coverage. Quality control applied but not information about method followed. The international Information Systems are not so robust at national level.
3.2 Commodity stocks and input availability	70	Very limited and irregular information on inputs, transport and other market elements. The public market information system in Cabo Verde (ARFA) is the institution in charge of food security issues. It provides regular information on stocks evolution. There has not been identified any information system in Cabo Verde providing regular information about input availability. However, some sources offer some kinds of useful information.
3.3 Trade	65	UN Comtrade is a good and complete (broad coverage) system of ITS but the absence or unavailability of trade information in the websites of the national institutions/systems (INE, MDR and customs) is a negative element of the trade information systems.
4. 1 Production levels and yields	60	Only estimated annual data on production, at country level. FAOSTAT information system feeds on national statistical data when available; it does show a better performance. Cabo Verde is a small country and the country aggregation of the FAOSTAT will be enough for data analysis, although it is formed by ten islands, with diversity in their agricultural systems. The information provided by the Instituto Nacional de Estatística does not improve the geographical representativeness.
4.2 Plant health	20	There are no monitoring centers for pests and diseases, only virtual tracking is available.
5.1 Cost of animal diseases	50	The low number of real information systems is a negative aspect to an overall assessment of this Sub-block. Most of them are not complementary, and there is a lack of some specific and necessarily more detailed information about trade (flow of official trade, and an estimation of the unofficial and the illegal trade), livestock holdings and distribution, biosecurity, slaughterhouses, markets, etc. International information systems of reference provide data of diseases and infections allowing detection of emerging disease outbreaks. Webs are easy to use but some are not up to date.
5.2 Risk of endemic and emerging diseases	55	The IS analyzed are predominantly the same (Sub-Block 5.1), but some not real international IS where included. On the side of the risk on endemic and emerging diseases of human relevance, WHO's Health Statistics and Information Systems is the webpage of reference. In general, it would be desirable to increase resolution, deeper than region (i.e. geographical) in order to be able to perform risk assessment.
6. Policy	30	Information related to agriculture, food and trade policies, market interventions, producer or consumer safety nets, risk management (insurance policies) and food security and emergency policies. Not organized in a systematic, periodic updated way. There are global early warning systems, which can be considered a tool to face food market volatility and food crisis and emergencies. At national level, there is a project that will lead to a national early warning system with high potential (SIARA-CV). We did not find information on trade barriers in Cabo Verde as the country does not export agricultural products. There is not insurance market for agriculture and only projects to implement micro-insurances.
7. Socio-economic & sectorial information	30	Coverage of socio-economic information and indicators at macro level, lack of disaggregated socio-economic information and indicators. INE providing information with a useful research engine. The overall numerical evaluation of this block includes the existing national and international information systems. Regarding the first ones, the Institutions in charge of the national statistics provides socio-economic information but it presents deficiencies as lack of enough disaggregated data, indicators not updated and very few data provided.
8. Integrated systems of information	50	There are some National (INE, MDR) and Regional (AFDB) Integrated Systems with a great potential providing information with good frequency, accessibility and coverage.

Two sub-blocks reach high scores (≥ 70): 3.1 (prices) and 3.2 (commodity stocks and input availability). Eight sub-block or blocks reach medium scores in the range (41-69): 1.1 (climate and meteorological); 2.1 satellite images; 2.2 (communications); 3.3 (trade); 4.1 (plant production and yields); 5.1 (animal diseases cost); 5.2 (endemic and emerging animal diseases risk); and 8 (Integrated systems of information). Two sub-block or blocks reach low-medium scores in the range (21-40): 6 (policies), and 7 (socio-economic and sectorial). Finally two sub-blocks or block reach low or very low scores in the range of 0-21: 1.2 (soils) and 4.2 (plant health). The information

sub-blocks soil is important at the level of farmer and it has relative value for water and fertility respond of crops. On the other hand, plant health is an important risk to be assessment and thus it is a relevant limitation to make a complete and reliable cropland risk assessment. The comments from the last column of table ii, contributes to complement and/or justify the overall score of the concerned thematic sub-blocks or blocks.

1.4. General Recommendations

1. Very few statistics are collected at national level on annual basis and lack of relevant data exists due to the low capacity and few technical resources of the Institutions in charge of national statistics, including INE and MDR. The same can be said of INMG, whose limited infrastructure and coverage reduces its capacity of providing reliable weather and climate information. More financial resources are needed to strengthen the capacity of these national information systems to deliver timely and reliable information.
2. Animal movements should be surveyed and controlled, because this is a requirement to be able to generate risk assessment models of risks of transmission of communicable diseases. The information on the structure of livestock market and the marketing routes should be expanded. The animal census should be updated. The animal health block should better be integrated with meteo, prices and markets, and policies, because some of the animal health risks are related to certain climatic phenomena, and market forces.
3. It is essential that IS should provide more disaggregated data and variables covering regional (islands) and local dimensions, including the methods used to collect and process them. The adequate geographical scope of the data will permit fine-tuning and more detailed risk assessments and modelling efforts.
4. SIARA should coordinate its programmes with different Early Warning Systems, in order to increase their effectively.
5. Cabo Verde Government should identify the most valuable information pieces for farmers, food traders and processors and consumers and concentrate efforts in disseminating them effectively; following perhaps the well-developed models INFOPREÇO (MDR) of TV program "ARFA-PAPN bulletin"

1.5. Specific recommendations by blocks

Thematic Block 1: Meteorological, climate and soils information

1. The Instituto Nacional de Meteorologia e Geophísica is installing new meteorological stations so they are in a position to provide for desirable daily climate data for risk analysis; nevertheless the web needs to be operational, the data available or else specify the procedure to obtain them. Projects should aim at the establishment of automated weather stations in representative agro-ecological areas accompanied by a maintenance programme for the meteorological stations.
2. Establish and maintain a National Soil information system that could build on European Soil Data Centre (ESDAC) data and connect to ISRIC World Soil information.

Thematic Block 2: Satellite images and communications

3. Serviço Nacional de Protecção Civil (SNPC) must improve the website and its structure and functioning. SNPC should improve the accessibility to some data that can be relevant for users and farmers.

Thematic Block 3: Prices and market information

4. We recommend focusing the improvements of price IS in Cabo Verde on the ARFA system, improving especially the coverage of products with price information, and cooperating and exchanging information between ARFA, the MDR and FAOSTAT (high coverage). Input prices should also be part of this strategy.
5. The website of national customs should updated information on export and import (trade).



Thematic Block 4: Production levels and yields, Plant health

6. Counting on INE's better data (more frequently collected), risk analyses should be done specifically for each of the islands of the Cabo Verde archipelago, and data must be provided at that level from the Instituto Nacional de Estatística or from the Ministério do Desenvolvimento Rural.
7. The implementation of projects for IS focused on Plant Health by the Inter-African Phytosanitary Council of the African Union could help reach this target. The contribution of Cabo Verde to the International Plant Protection Convention information systems must be updated and the information about Description of the Plant Health & Regulatory Department, legislation on phytosanitary must be added.

Thematic Block 5: Animal and human health

8. Statistics on animal census are not satisfactory. A more detailed and up-to-date information should be provided for animal and animal-products trade (country of destination / country of origin, type of live-stock involved, etc.), kind of livestock holdings and distribution, slaughterhouses, etc. (National/Regional/International).
9. It seems to be necessary to improve interoperability and automatic data transfer between national IS and other international or regional IS (National/Regional/International).

Thematic Block 6: Policy

10. The maintenance and widening of the FAO's MAFAP programme to Cabo Verde is recommended as it is valuable tool to monitor agricultural and food policies, delivering information and indicators on policies. It constitutes the only agricultural information system existent on policies.

Thematic Block 7: Socio-economic and sectorial information

11. More statistics should be collected at national, regional and local levels on an annual basis.

1.6. Way forward

1. **Public-Private partnership and institutional arrangements:** Public-Private partnerships and institutional arrangements. In the future the IS for ARM should integrate the private sector through public-private partnerships translated into public-private institutional arrangements for financing and governing the IS.
2. **Integration:** Information system integration should be reinforced, taking advantage of the good work developed by ARSA/ANSA at national level and other IS at regional or international level. The integration of important variables to release the alerts on food crisis, as prices, markets or pests and diseases will improve its affectivity.
3. **Users' participation and networking:** Linked to the need of making IS more integrated, there must be mechanisms to ensure the users participation. This is a way to render the IS more useful to the costumers and to improve the reliability and control of quality of the information. In that sense, the IS must be improved offering not only information but different products and services too. IS should be supply- and demand-driven, and that involves testing and surveying the value among users.
4. Geographical information systems emerge as a promising means to gather process and convey information. They could be linked to mobile phones, so that relevant geo-referenced information can be relayed to users massively to avert and prevent climate hazards and accelerated episodes of price movements.

2. Cameroon



2.1. Objective

The objective of the project contracted with IFAD is to assess the Agricultural Risk Management Information Systems (IS-ARM) in the following African countries: Cap Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project is a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a ready comparison of information systems for agricultural risk management in the seven countries in a final that was also prepared.

The purpose of this country report is to summarize the research results of the availability and quality of information for agricultural risk management purposes in Cameroon. Both the existence and quality of the information, and the timely and useful access by stakeholders for risk management purposes will be assessed. It is important to stress that we assessed information sources/systems, rather than scattered and sporadic pieces of information.

The gaps on information and access tools for the main stakeholders (smallholders, commercial farmers, microfinance institutions, value chain, private investors, donors and governments) were also evaluated. A special emphasis is placed on two groups of users of IS-ARM: at micro level, the usefulness to and timely access by smallholders of information for Agricultural Risk Management purposes; at macro level, the usefulness and access for Government, policy makers, and business developers of risk management services.

2.2. Methodology

The project will cover the main sources of risks in agriculture according to the following thematic blocks for which information systems and sources will be assessed:

1. Meteorological, climate and soils
2. Satellite image & communications
3. Prices of commodities, inputs and market components
4. Production levels and yields, crop health
5. Animal and human health
6. Policy
7. Socio-economic and sectorial

The methodological approach is based on the following steps:

- Developing of a benchmark for **Agricultural Risks Management** Information Systems (**IS-ARM**) hereafter referred as **Benchmark-IS-ARM**. The Benchmark will define the standard requirements for the information systems in each thematic block that are required to make a proper agricultural risk assessment and management (Appendix 1)
- A search of information systems from different sources, covering academic and grey literature, bibliographic sources, websites, national and international institutions, generating an assessment process
- Checking and contrasting some inconsistencies/gaps of the information systems found in Cameroon through local consultants
- Identification of weaknesses and strengths of IS-ARM in each country (Cameroon)
- Quantitative assessment of the IS and the thematic sub-blocks or blocks following the methodology of quantitative assessment (Appendix 2)
- Feedback from the national governments and selected stakeholders, gathered in public workshops presented in each country's capital.
- Comparison of the revised quantitative/qualitative assessments across countries and discussion
- Recommendations for improving the information systems relevant for each thematic block and their interactions with one another, with a view to enhance each country's preparedness to perform further analyses of agricultural and veterinary risks.

2.3. Assessment of Information systems for ARM in Cameroon

The feedback from the 14th June 2016 workshop at Yaoundé allowed confirmation, improved specifications, or corrections/additions to parts of this report. Discussions were fruitful in particular those on differences between Information Sources and Information Systems have been taken into account, and the Cameroonian Representatives were aware of the issue. Feedback from participants is acknowledged here. As a consequence, various websites from important Research Centres were listed as Information Sources only (Annex 2).

The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Cameroon.

Table 2.1: Number of IS identified by thematic block and by IS in Cameroon

Thematic Block	National	Regional	International	Total
1 – Meteorological-climate-soil	2	0	1	3
2 – Remote Sensing	0	0	2	2
3 – Prices/markets-	3	1	4	8
4 – Crops	3	1	2	6
5 – Animal	1	0	3	4
6 – Policies	0	0	2	2
7 - Socio-economic	1	1	1	3
Total	10	3	15	28

The total number of information systems for the seven blocks is 28 (Table 2.1); Thematic Block 3 (Prices and markets) has the largest number of entries (8), followed by 6 in the Crop Production Block. It should be noted that there are no national IS sources for the Policies and Remote Sensing Blocks (although the latter may not be a priority).

All the identified information systems and sources have been described, and most of them have been assessed following the methodology for IS quantitative assessment (Appendix 2). Some others were not evaluated due to the lack of information on assessment criteria (features of information and attributes of IS) or lack of relevance of the concerned IS.

In this executive summary, we will comment on the results of the overall assessment of the thematic sub-blocks or blocks (scores ranging 0-100). Readers interested in the detailed information can review the main document. The interpretation of the overall scores (0-100) of the sub-blocks and blocks is as follows in Table ii. The reported figures (see Table iii) are based on the degree of fulfilment of the desirable, medium and minimal requirements for performing agricultural risk assessments and thus enabling risk management policies in the corresponding sub-block or block.

Table 2.2: How to interpret the overall scores

Overall score of the sub-blocks or blocks	The available information would permit
≤20	Only a very poor or irrelevant risk assessments in the corresponding thematic sub-bloc or block
21-40	Merely allow poor risk assessments
41-69	A preliminary risk assessment
≥70	Enables a proper risk assessment and management

A detailed description of the procedure performed to obtain the scores is provided in Appendix 2.

**Table 2.3:** Assessment of the IS for agricultural risk management in Cameroon

Thematic Block	Quantitative assessment	Comments
1.1 Meteorological & climate information.	58	<p>Weather forecasts are provided by National IS (e.g. DMN), weather alert systems seem in place</p> <p>Risk assessment: the National IS (DMN; MINADER; INSC) have to improve their information as it is not provided at the desirable level for risk assessment, mainly because their data is not accessible. Coordination between them, as currently done, could easily step up the IS quality.</p> <p>The coverage of information from international sources allows for a first step in risk assessment although limitations would be due to its low resolution. The websites are up to date and working in international and regional IS information is diversified. Nevertheless the weather/climate data is provided as annual averages by location; it should be provided on a daily base or at least weekly; data from weather stations are not open and data existence and quality would need to be checked.</p> <p>The use of weather generators or climate models to produce climatic data as do the international systems described, does not allow to always capturing the extreme weather events which are increasingly important under global warming/climate change.</p>
1.2 Soils	85	<p>Soil information from international IS (ISRIC) seems adequate and allows for a correct risk assessment because they include soil profiles. They nevertheless need updating.</p> <p>National IS could be built on ISRIC and soil data updated.</p>
2. 1. Satellite image information	80	<p>The national ISs do not provide full and updated map of vegetation and soil indices information. Information on NDVI maps exists in other International Institutions but they are not linked to any Governmental website, the rest of remote sensing indices are scarcer to find. Private companies can provide many of the data needed to establish a robust system but data are not open.</p> <p>The coverage of information from international sources allows for a first step in risk assessment although limitations would be due to the limited length of the data series.</p>
2.2. Communications	60	<p>There is an increasingly important mobile penetration (79 per 100 people) although internet users is still low (15 users per 100 people) as is the number of secure internet services (38). These are the strongest limitation for internet communication as it causes problems for information dissemination. Broadcast media TV, Radio have the best scores.</p>
3. 1 Prices	65	<p>The National ISs do present limitations: the MIS FEWS NET is not operating, MINEPAT, DRADER and "Douanes Camerounaises" do not show raw data within their websites (if any website available), there is no information on the data processing nor quality control in national MIF.</p> <p>The international ISs offer a wide coverage of commodities and reliable market information, a high frequency on market prices, including input prices that can offer information for market and food security risk assessments.</p> <p>The International and Regional ISs (FAO, WFP, AfDB) offer different kind of information, reports and tools (risk management and early warning tools) and quality control is applied in Global Price Information Systems (FAO, WFP).</p>
3.2. Commodity stocks and inputs availability	20	<p>The information on price and availability of inputs, commodity stocks and transportation (infrastructure and cost) is very scarce, irregular and non-reliable. It can be said that there is no any proper IS on these sub block of market information which are particularly important for market and food security risk assessment</p>
3.3 Trade	70	<p>The INS website publishes useful trade information within the statistical yearbooks, but is not been updated. AfDB is a good and complete (broad coverage) system of ITS and with the Ministry of Trade publish useful trade information.</p>
4.1 Production levels and yields	70	<p>International, regional, and national IS web pages are in general well maintained. The level of aggregation of information varies among IS; in general information on production and cultivated area, crop management is given either at administrative region or agro-ecological level. Nevertheless the updating of data seems to have stopped.</p>
4.2 Crop health	30	<p>Crop health warnings exist, and there is updated information on the phytosanitary status of crops. Nevertheless there is no data base (i.e. historical) on pests and diseases that could sustain risk assessment.</p>
5.1. Costs of animal diseases	60	<p>There is a large volume of information about animal and public health issues in Cameroon.</p> <p>Some of the National ISs offer a range of practical information on animal and public health, and various National ISs give bilingual information (French and English). Nevertheless and most important there is no information on cattle movement, and most of the ISs are not always updated.</p> <p>In relation to international ISs, some OIE's annual reports are missing.</p>
5.2. Risks of endemic and emerging diseases	55	<p>The IS analysed are predominantly the same as in 5.1 but somewhere included as IS even if not being ISs stricto sensu (CDC, EMPRES and ProMED-mail). Among them, EMPRES has a significantly worst assessment (39) due to its low weight in many parameters (frequency, availability, etc.). CDC and PubMed received the same assessment.</p>
6. Policies	40	<p>The data on some socio-economic and sectorial information from national ISs are scarce and not updated; there is a weak sectorial information and lack of disaggregated socio-economic information and indicators.</p> <p>The international and regional ISs have coverage of socio-economic information and indicators at macro level, with adequate length of macroeconomic data series, continuity and updating of the main macroeconomic information/indicators is maintained.</p>

(...)



(...) Thematic Block	Quantitative assessment	Comments
7. Socio-economic & sectorial information	25	The data on some socio-economic and sectorial information from <u>national IS</u> are scarce and do not seem to be updated (2007-2011). At macro level the coverage of socio-economic information and indicators, the length of macroeconomic data series, the continuity and an updating of the main macroeconomic information/indicators from <u>global and regional IS</u> , are main sources of information. Nevertheless there is weak sectorial information, and no disaggregated socio-economic information, and indicators.
8. Integrated systems of information	20	There are seven integrated ISs that cover at least three blocks with different level of interaction and integration among them. Nevertheless these IS are not integrated.

As it can be seen in Table iii, the result of the overall quantitative assessment i.e. overall scores (0-100) of the various thematic sub-blocks and blocks, shows that the information systems for ARM in Cameroon are uneven, although there are many thematic blocks or sub-blocks with a medium-high or high score:

- Three sub-blocks reach high scores (≥ 70): 1.2 (soils): 2.1 satellite images, and 3.3 (trade).
- Six sub-blocks reach medium values of the overall score (41-69): 1.1 (climate and meteorological); 2.2 (communications); 3.1 (prices); 4.1 (crop production and yields); 5.1 (animal diseases cost); and 5.2 (endemic and emerging animal diseases risk).
- Three blocks and one sub-block present low-medium values of the overall score (21-40): 4.2 (crop health); 6 (policies); and 7 (socio-economic and sectorial).
- Finally two sub-blocks and one block reach very low scores in the range of 0-20: 3.2 (commodity stocks and input availability); and 8 (integrated systems).

Nevertheless one thematic information block (7. Socio-economic and sectorial information) and two sub-blocks (3.2 commodity stocks and input availability, and 4.2 Crop health) - Block 8 excluded -, are essential to proceed to a proper agricultural risk assessment and thus it is a significant limitation to make a complete and reliable agricultural risk assessment in Cameroon. A summary of the overall assessments is presented in Table iii with justification for the scores allotted.

2.4. General Recommendations

1. Additional human and financial resources need to be allocated to build or strengthen various Information systems in Cameroon. In particular for:
 - Meteorological and climate information (sub-block 1.1)
 - Commodity stocks and input availability (sub block 3.2)
 - Crop health (sub block 4.2)
 - Animal health (block 5)
 - Policies (block 6)
 - Socio-economic and sectorial information (block 7)
2. The international financing and cooperation agencies should prioritize the financing of investment on building, strengthening or improving, and maintaining information systems. In that sense, we recommend taking advantage of the Regional Food Reserves Project financed by EU-DEVCO that has an important budget to build, strengthen and improve the information systems for agriculture and food security (component 1). EU DG-DEVCO could provide funds for Cameroon if a regional approach is taken in Central Africa. A model to explore is the one based on AGRHYMET and executed by CILSS - who is executing Component 1 - to "Improve IS for agriculture" for Western Africa. EU-DEVCO considered that the regional approach taken by AGRHYMET-CILSS optimised resources, data acquisition, organization, and analyses, as well as improving collaboration among countries to improve risk management in agriculture.
3. Other IS needed continuity and increased time or geographical resolution; these do not represent difficult improvements and will overcome concerns. This is the case of climate and soil, production levels and yields, and policies. The IS identified in the study for these thematic blocks reach the minimum of the benchmark but some potential at different degree for improvement has been considered.

2.5. Specific recommendations

Thematic Block 1: Meteorological, climate and soils information

1. The Direction de la Météorologie Nationale (DMN) should focus on: consolidating automatic recording of weather variables, increasing the number of complete weather stations for coverage of strategic or main agro-ecological zones, as well as providing maintenance programmes; and consolidating web access as a means of retrieval of data (either free or paid for).
2. Improve farmers' access to weather forecast by mobile, radio, or newspapers. Mobile and radio are currently the easiest way of access for farmers in rural areas to weather alert systems. A significant increase of mobile penetration can enable this approach. Newspapers will also be useful for 3day-10day and seasonal forecasts.
3. Create a National Soil information system that could build on an update of the international IS: ISRIC World Soil Information: Africa Soil Profiles Data Base.

Thematic Block 2: Satellite image information & Communications

4. CIFOR should improve the accessibility to some data that can be relevant for users related to risk in forests (drought, fires). They can have a synergic activity with MINADER.

Thematic Block 3: Prices and market information

5. We recommend focusing the improvements of commodity price IS in Cameroon on the MINADER system, due to its good experience and integration of information (commodity and input prices, stocks and trade). Publication of trade information and the yearbooks should be reinstituted after the interruption of 2013.
6. We recommend to setting up input price information based on MINADER, and commodity stocks/food reserves based on MINADER balance sheets.

Thematic Block 4: Production levels and yields, Crop health

7. While the key crops rice, coffee, cocoa are paid special attention in terms of collected and offered data, the same should be extended to staple crops. The agriculture yearbooks are not updated (last published 2010), and there is little information on agricultural inputs (fertilizers, machinery, seeds) and there is no historical database on pests and diseases.
8. Articulate the surveillance and alert systems for crop protection and the geo-localised phytosanitary data base (www.infophyto.minader.cm) for updating and improving the information on crop health status.
9. Postharvest losses, due to mycotoxins or crops pests and diseases, have risk dimensions that should be integrated in any framework of Agricultural Risk Management. An information source should be organised to possibilities a future Information System.

Sub-block 4.1 Production levels and yields

10. *The Institut National de la Statistique du Cameroun* should provide at the level of Province or Locality. Information systems on Production levels and yields must be improved in relation to data continuity and update and offered on a permanent and stable URL.

Sub-block 4.2 Crop health

11. *The Portail de l'information Phytosanitaire au Cameroun* should be upgraded to help growers in the management of crop pests and diseases, and maintenance of crop health information systems on all relevant crops is advised.



Thematic Block 5: Animal and Human Health Risk Management IS

12. Statistics on animal census and national's public health structure would be satisfactory, but a more detailed information should be provided for animal and animal-products trade (country of destination / country of origin, type of livestock involved, etc.), kind of livestock holdings and distribution, slaughterhouses, other human health issues, etc. Efforts (National/Regional/International) should be made to develop an animal/human health integrated IS (International).
13. There is a weak level of information on animal and human diseases surveillance and notification, and there is no evidence of any procedure for data integration from both sides of health. Integration, surveillance and notification procedures should be reinforced (National).

Thematic Block 6: Policy

14. The maintenance and widening of the FAO's MAFAP programme to Cameroon is recommended as it is a valuable tool to monitor agricultural and food policies, delivering information and indicators on policies. It constitutes the only agricultural information system existent on policies.

Thematic Block 7: Socio-economic and sectorial information

15. Building capacity of local administration to collect data will contribute also to get reliable national statistics.

Integrated systems

16. It is recommended that the current systems be first improved, before moving in the direction of building integrated systems. Animal health block should better be integrated with meteorological and climate, prices and markets, and policies, because various animal health risks are related to some climatic phenomena, and market forces.

2.6. The way forward

- 1. Integration:** The lack of integration in the IS for ARM in Cameroon is one of the main weaknesses. The development of an Early Warning System could focus on providing timely information in order to minimise the negative effects of disaster: the integration of other important variables to release the alerts on food crisis, as prices, markets or pests and diseases will improve its affectivity.
- 2. Users' participation:** Linked to the need of making IS more integrated; there must be mechanisms to ensure the users participation. This is a way to render the IS more useful to the costumers and to improve the reliability and control of quality of the information. In this sense, the IS must be improved offering not only information but different products, further analyses, and services too. IS should be supply-and demand-driven, and that involves testing and surveying the value among users.
- 3. Enhanced access to information:** Current farmers' access to information seems to rely on mobile phone transmitted information is rather than internet-based information. Given the low rate of Internet penetration in Cameroon in rural areas, it may be more efficient in the short term to improve accessibility through mobile phone technology. This should not hinder improvement of internet access. Mobile phones in Cameroon have extensive use.
- 4. Regional Information Systems should be reinforced and strengthened** through financial support of the international community as they offer a joint treatment to problems with regional dimension as trade, pest and diseases, animal health or food reserves. National IS can build on them and increase their data resolution. There is an example for Western Africa (AGRHMET).
- 5. Incorporate information on post-harvest losses:** Postharvest losses, which affect the supply of food for households as well as marketable surpluses, should be incorporated to an information source that should allow then to build an information system in the near future.

3. Ethiopia



3.1. Objective

The objective of the project contracted with IFAD was to assess of the Agricultural Risk Management Information Systems (ARM-IS) in the following African countries: Cap Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project is a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a comparison yardstick based on which a final report to compare the information systems for agricultural risk management in the seven countries was also drafted.

The purpose of this country report is to summarize the research results of the availability and quality of information for agricultural risk management purposes in Ethiopia. Both the existence and quality of the information, and the timely and useful access by stakeholders for risk management purposes will be assessed. The gaps on information and access tools for the main stakeholders (smallholders, commercial farmers, microfinance institutions, value chain, private investors, donors and governments) will also be evaluated. A special emphasis will be placed on two groups of users of ARM-IS: at micro level, the usefulness and timely access of smallholders to information for Agricultural Risk Management purposes; at the macro level, the usefulness and access for the Government and policy makers, and for business developers of risk management services.

This executive summary contains the conclusions and recommendations drawn from an extensive Country Report for Ethiopia. It integrates feedback and comments gathered in two seminars held in Addis Ababa on Dec. 17-18th, 2015, and on May 31, 2016. Although it was written to offer self-contained facts and judgments, it draws extensively from the main country report. Therefore the interested reader seeking further detailed elaborations, facts and data should read the entire Country Report.

3.2. Methodology

The project has considered the main sources of risks in agriculture. In particular risks stemming from areas included in the following thematic blocks for which information systems and sources will be assessed:

1. Meteorological, climate and soils
2. Satellite image & Communications
3. Prices of commodities, inputs and market components
4. Production levels and yields, Plant health
5. Animal and human health
6. Policy
7. Socio-economic and sectorial

The methodological approach is based on the following steps:

- Developing of a benchmark for **Agricultural Risks Management** Information Systems (**ARM-IS**), hereafter referred as **Benchmark-ARM-IS**. The Benchmark defines the standard requirements for the information systems in each thematic block to make a proper agricultural risk assessment and management (Appendix 1)
- A search of information systems from different sources, covering academic and grey literature, bibliographic sources, websites, national and international institutions, generating an assessment process
- Checking and contrasting some inconsistencies/gaps of the information systems found in Ethiopia through local consultants.
- Identification of weaknesses and strengths of ARM-IS in each country.
- Quantitative assessment of the IS and the thematic sub-blocks or blocks following the methodology of quantitative assessment(Appendix 2)



- Feedback from the national governments and selected stakeholders, gathered in public workshops presented in each country's capital.
- Comparison of the revised quantitative/qualitative assessments across countries and discussion
- Recommendations for improving the information systems relevant for each thematic block and their interactions with one another, with a view to enhance each country's preparedness to perform further analyses of agricultural and veterinary risks.

3.3. Assessment of Information systems for ARM in Ethiopia

Following a general methodology applied to each thematic block (see Appendix 2) we assessed quantitatively the information systems for the different blocks as well as the whole block. Having useful information systems and sources (IS) for agricultural risk management (ARM) requires that policy makers, as well as private actors along the food chain, get involved in thinking out the best data and information sources, and making it widely available for the whole country. This includes users, individually or through professional organizations, businesses and traders, and consumers. The value of IS will be assessed primarily based on its accessibility, quality and reliability for enabling useful agricultural risk management in Ethiopia.

Given that IS-ARM involves the producers and other private actors of the food chain, one of the most relevant criterion to the IS-ARM assessment is accessibility. To assess the accessibility of IS we assigned scores (0-100) to the accessibility indicator and decided the weight of accessibility compared to the weight of the rest of criteria. Concerning the first, the question is which values to assign (between 0 and 100) to the different levels of accessibility or different ways to access the data: internet, bulletins, radio, mobile (SMS) and others. Authors initially assigned low values to the traditional ways to disseminate and access information (bulletins, radio) medium values to the internet and high values to the internet plus mobile (SMS), but upon feedback gathered in the course of the workshop held in Addis Ababa on May 31, 2016, we reversed the assessment. Therefore, high scores were given to the traditional media (TV/Radio/Newspapers) and low to internet and SMS. Clearly, disseminating punctual information and data series on some variables (e.g., climate, prices) to the farmers is mostly valuable through mobile (SMS), TV/Radio or via the producers' organizations. A distinction should be made between providing early alerts, warnings or forecast services and providing data series of different variables. They serve different purposes and means.

Even more controversial is how to assign a weight to the accessibility criteria. This is a key criterion, which considers that information and/or data that are not accessible to the farmers and to the public should be considered as non-existing. Although data accessibility is a key criterion to assess IS-ARM, it is very easy and cheap to publish existing information, as in many cases it is just a question of legal change and/or political will. In other cases, it involves organizing and uploading all the existing information and improving the access and functionality of the websites. Therefore, we decided to give a low-medium weight to the accessibility criterion.

We assessed information sources/systems, instead of scattered and sporadic pieces of information. The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Ethiopia.

As it is explained in detail below the IS, each containing a number of key variables, are evaluated using different attributes. The logic of the analysis is targeted to the main question of the study: are IS ready to and permit performing agricultural risk management?

Attributes differ for each IS based on the type of information that is relevant in each Block. While somewhat subjective, the attributes were weighted as follows: frequency (20%), aggregation level (20%), length (20%), accessibility (10%), continuity /update (10%), geographical (10%). The rationale for weighting, for example, frequency (20%) stronger than accessibility (10%) stems from the fact frequency is a prerequisite to perform useful agricultural risk assessments whereas accessibility is not. During the execution of the project, not only in Ethiopia but also in the other seven countries, it was found that data sources were available though not accessible. Since available data can be easily be made accessible, and non-existing data cannot, it was decided to weigh both variables accordingly.

The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Ethiopia

Table 3.1: Number of IS identified by thematic block in Ethiopia*

Thematic Block	National	Regional	International	Total
1 - Meteorological/ Soils information	4	1	5	10
2 - Remote Sensing	2	5	8	13
3 - Prices/markets	11	5	6	22
4 - Plants	5	2	6	13
5 - Animal	9	0	14	25
6 - Policies	7	0	9	16
7 - Socio-economic	1	2	1	4
Total	39	15	49	103

* A number of IS provide information and data to more than one Thematic Block, therefore the numbers reflect IS that cover each thematic block, and do not refer the number of specific IS relevant for Ethiopia, which may be less than 103 in total. The following national IS provide data and information for more than one thematic block (Central Statistical Agency of Ethiopia (CSA); The Ethiopian Agricultural Transformation Agency (ATA) Disaster Risk Management and Food Security Sector (DRMFSS)

The total number of information systems that have been assessed for the seven sub-blocks is large (103); especially in thematic blocks 3 (Prices and markets) and 5 (animal and human health). It should be clear that having more information systems does not necessarily mean that a higher overall score should be given to the whole block or sub-block. In fact, under certain conditions having too many IS for a specific block or sub-block might be negative if there is not complementarity (consistency and comparability) among the different IS.

In many blocks and sub-blocks the regional (with this we mean continental or sub-continental) or international IS are predominant, although the assessment will be focused mainly on national systems. All the identified information systems and sources have been described, and most of them have been assessed following the methodology for IS quantitative assessment (Appendix 2). Some others were not assessed due to the lack of information on assessment criteria (features of information and attributes of IS) or the irrelevance of the concerned IS. Since it is not possible to summarize the description and assessment of so many sources within this executive summary, we will comment only the results of the overall assessment of the thematic sub-blocks or blocks, with a special focus on national IS. Readers interested in the detailed information should review the main document.

The interpretation of the overall scores (0-100) of the sub-blocks or blocks is as follows in Table 3.2. The reported figures (see Table 3.3) are based on the degree of fulfillment of the desirable, medium and minimal requirements for performing agricultural risk assessments and thus enabling risk management policies in the corresponding sub-block or block.

Table 3.2: How to interpret the overall scores

Overall score of the sub-blocks or blocks	The available information would permit
≤20	Only a very poor or irrelevant risk assessments in the corresponding thematic sub-block or block
21-40	Merely allow poor risk assessments
41-69	A preliminary risk assessment
≥70	Enables a proper risk assessment and management

A detailed description of the procedure performed to obtain the scores is provided in Appendix 2.

Table 3.3: Assessment of the sub-blocks and blocks IS for agricultural risk management in Ethiopia

Thematic Block	Overall assessment	Comments
1.1. Meteorological & climate information	81	Three IS are complementary, jointly providing information of an acceptable quality for most key variables. Length of series cannot be improved in the short run, but geographical coverage could. Drought early warning systemS LEAP (WFD) and FEWS are dedicated to anticipate food security risks.
1.2. Soils	85	Adequate soil database includes soil profile information
2.1. Satellite image information	95	DRMFSS, a national platform, and FAO are complementary. They both get good scores in most attributes. Accessibility should be improved. Many National IS use satellite applications for drought, climate, hydrology, and even index insurance.
2.2. Communications	30	Internet penetration and social media use are low
3.1.Prices	95	Wide coverage of prices, with strong and growing two national ISs, and one weaker that scores very well in coverage. International IS are complementary with national IS Scoring low (58) input prices are a source of risk, not so much in terms of the price, but in terms of access and allocation. The value chain of seeds is long, unreliable and uncertain.
3.2. Stocks and inputs	70	All IS are international. Frequency of data is low and not all IS are updated. Several donors' initiatives are complementing the information stocks. Publically held stocks are issued annually
3.3. Trade	75	Trade policy information is dispersed and not adequately reported. The National IS is weak, but the international ISs complement it. National trade data could not be found or inspected
4.1. Production levels and yields	84	Data disaggregation is insufficient. National IS is strong, data are frequent, has a wide geographical coverage and is 100% accessible
4.2. Plant health	50	Some information about surfaces hit by pests & diseases, information is limited for risk analysis. Post-harvest losses, missing
5.1. Cost of animal diseases	60	Abundant information available/Good Government's official data. Poor integrated animal-human integrative systems. Many IS are available, not all of them scoring high, as a whole providing very complementary information. The best IS are international
5.2 Risk of endemic and emergingdiseases	55	Same comments as in 5.1
6. Policy	88	Trade policy measures are weakly covered in the IS. Platform DRMFSS should be expanded and updated.
7. Socio-economic & sectorial information	65	IS are little integrated and insufficiently disaggregated
8. Integrated systems of information	75	There are promising integrating platforms, but the largest number of blocks covered by a single national IS is 4 (CSA), while DRMFSS only covers 3 blocks. This may be enough, but depends on the strategy the Government will pursue. LEAP programme integrates drought risks with financial and food security needs.

3.4. General recommendations

1. Animal and plant health received the lowest scores. It is recommended that the weaknesses identified in these areas should be corrected, focusing on the specific points mentioned below.
2. Disaster Risk Management and Food Security Sector (DRMFSS) should focus not only on emergencies, preparedness and urgent needs, but also on monitoring the variables that give rise to, drive, and cause acute Food insecurity situations. This includes: meteo (Block 1), prices & markets (#3), plant (#4) and animal health (#5). Ethiopia has its relevant national IS fully operative and ready to offer timely assessments at the most disaggregated level.
3. For Ethiopia, hydrological data and alerts are as important, if not more, as meteorological information systems and sources. Despite this, the report did not include hydrological IS because the project's terms of reference did not include such area of analysis.
4. Data sources quality control is essential to build confidence in the value and usefulness of the information. More detailed and georeferenced information (GIS supported), especially with respect to animal, plant, and climate data could contribute to the development of more sophisticated risk management strategies, including the potential expansion of agro-insurance.

5. ATA (Agricultural Transformation Agency) should be strengthened and supported. Though not genuinely an IS, it is a leading agency in Ethiopia for pursuing very promising public-private partnerships. The learning outcomes of these initiatives should be disseminated. Data connectivity across IS should be a priority to make different IS more consistent and coherent across each other. This should be a priority for ATA.

3.5. Specific Recommendations

Thematic Block 1: Meteorological, climate and soils information

1. It is recommended that the National Meteorology Agency (NMA) web access be stabilised and consolidated, through automatic recording of weather variables, in particular temperature and rainfall. But other variables (drought, hailstorm, snow, floods, cyclones) are of course essential, and monitored by NMA and other IS.

Thematic Block 2: Satellite image information & Communications

2. While penetration of mobiles and internet has grown remarkably in the last years, it needs to increase penetration rates. The main goal, though, is to ensure that information is disseminated in a way that reaches smallholder farmers. This is best done via TV/radio/producers associations and hard copy reports; no so much via internet and SMS.

Thematic Block 3: Prices, stocks and trade

3. The weakest point of this very well-developed block is that the market position (farm level, wholesale and retail) is poorly covered. This may be relevant for some sensitive crops (teff, and wheat), and would enable a better understanding of critical value chains (transmission asymmetries and price formation processes). Data should also be collected at local level.
4. Access to inputs (especially certified and non-certified seeds) is uncertain. Being seeds' supply chain long, unreliable and unstable, provision of price information especially to farmers is critical to avert risk of production. Therefore, it is recommended that farmers have better information sources for inputs' prices, markets and access, creating an IS perhaps under ATA's web page.
5. CSA's data include a narrow set of commodities, missing some important ones, e.g. most root crops or horticulture crops or even coffee/tea and spices. Furthermore, it does not adequately align with other government responsibilities, which focus on pre-harvest assessments of relevant commodities for food security and vulnerable social groups.

Thematic Block 4: Plant production, yields and health

6. It would be desirable that data of main crops would be shown at the level of Province or Locality, and provided on a GIS platform.
7. Plants' health and information on pests and diseases could be improved: there should be some prioritising on the most relevant ones and deeper information about these. Early warning IS contains from local and regional institutions focuses only on few insect pests. The country lacks diseases' early warning system. FAO-Crop protection service in controlling migrating pests in Eastern African countries with DLCO-EA should be expanded to other pests and diseases other than locusts, and make use of their communication means.

Thematic Block 5: Animal and human health

8. There is a weak level of information about animal disease surveillance, animal control systems, and disease control programs. Animal movements should be surveyed and controlled, because this is needed to be able to develop general assessment models of risks of transmission of communicable diseases. There is also a

need to prioritize some diseases counting on clear indicators, rather than basing continuity just on diseases “usually” encountered: those prioritized by the international community (impact on trade) or those with a high morbidity or mortality.

9. Statistics on animal census and national's public health structure can be considered satisfactory, but more detailed information should be provided for animal and animal-products trade (country of destination / country of origin, type of livestock involved, etc.), kind of livestock holdings and distribution, slaughterhouses, other human health issues, etc. (National/Regional/International). This should be made available on a regular basis.
10. Efforts should be made to develop an animal/human health integrated IS (National/Regional/International), and there is a weak level of information on human disease surveillance and notification (National)

Thematic Block 6: Policy

11. Although trade measures are disseminated and updated in an IS (Ministry of Trade and Ethiopian Revenue and Customs Agency), there is lack of updated information about the sanitary measures required in the main importing countries especially tailored to the livestock sector but also to other key sectors.

Thematic Block 7: Socio-economic and sectorial information

12. National IS (CSA) should improve the scope and breadth of data related to livestock production. At the moment, the information on crops is stronger and broader than on animal production.

3.6. The way forward

1. **Public-Private partnerships and institutional arrangements:** In the future the IS for ARM should integrate the private sector through public-private partnerships translated into public-private institutional arrangements for financing and governing the IS. The private actors recommended are professional and producers organizations, cooperatives, universities and private foundations and programs (e.g. Alliance for Green Revolution in Africa).
2. **Pre-harvest assessment-**by MoANR/DRMFSS/FAO/WFP- would be a fundamental issue to prioritise after the IS is fully developed and weaknesses overcome.
3. **Integration:** The lack of integration in the IS for ARM in Ethiopia is one of the main weaknesses, although the DRMFSS is a noteworthy integrative initiative. Any hierarchy of IS might work if it is thought out strategically; at the moment, it is recommended that DRMFSS should be more encompassing and be given broader roles to provide not only valuable pre-crisis information but also more risk assessments.
4. **Users' participation:** Linked to the need of making IS more integrated, there must be mechanisms to ensure the users participation. This is a way to render the IS more useful to the customers and to improve the reliability and control of quality of the information.
5. Postharvest losses, which affect the supply of food for households as well as the marketable surplus they can sell, range for just grains (maize, wheat, sorghum and barley) between US\$ 233.6 million and over US\$ 650 million. While the project did not include this as thematic block, it is clear that it should be addressed more systematically.

4. Mozambique



4.1. Objective

The objective of the project contracted with IFAD was to assess of the Agricultural Risk Management Information Systems (IS-ARM) in the following African countries: Cap Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project is a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a comparison yardstick based on which a final report to compare the information systems for agricultural risk management in the seven countries was also drafted.

The purpose of this country report is to summarize the research results of the availability and quality of information for agricultural risk management purposes in Mozambique. Both the existence and quality of the information, and the timely and useful access by stakeholders for risk management purposes will be assessed. The gaps on information and access tools for the main stakeholders (smallholders, commercial farmers, microfinance institutions, value chain, private investors, donors and governments) will also be evaluated. A special emphasis will be placed on two groups of users of IS-ARM: at micro level, the usefulness and timely access of smallholders to information for Agricultural Risk Management purposes; at macro level, the usefulness and access for the Government and policy makers, and for business developers of risk management services.

This executive summary contains the conclusions and recommendations drawn from an extensive Country Report for Mozambique. Although it was written to offer self-contained facts and judgments, it draws extensively from the main country report. Therefore the interested reader seeking further detailed elaborations, facts and data should read the entire Country Report.

4.2. Methodology

The project has considered the main sources of risks in agriculture. In particular risks stemming from areas included in the following thematic blocks for which information systems and sources will be assessed:

1. Meteorological, climate and soils
2. Satellite image & Communications
3. Prices of commodities, inputs and market components
4. Production levels and yields, Plant health
5. Animal and human health
6. Policy
7. Socio-economic and sectorial

The methodological approach is based on the following steps:

- Developing of a benchmark for **Agricultural Risks Management** Information Systems (**IS-ARM**), hereafter referred as **Benchmark- IS- ARM**. The Benchmark defines the standard requirements for the information systems in each thematic block to make a proper agricultural risk assessment and management (Appendix 1)
- A search of information systems from different sources, covering academic and grey literature, bibliographic sources, websites, national and international institutions, generating an assessment process
- Checking and contrasting some inconsistencies/gaps of the information systems found in Senegal through local consultants.
- Identification of weaknesses and strengths of IS-ARM in each country.
- Quantitative assessment of the IS and the thematic sub-blocks or blocks following the methodology of quantitative assessment (Appendix 2)
- Feedback from the national governments and selected stakeholders, gathered in public workshops presented in each country's capital.



- Comparison of the revised quantitative/qualitative assessments across countries and discussion
- Recommendations for improving the information systems relevant for each thematic block and their interactions with one another, with a view to enhance each country's preparedness to perform further analyses of agricultural and veterinary risks.

4.3. Assessment of Information systems for ARM in Mozambique

Following a general methodology applied to each thematic block (see Appendix 2) we assessed quantitatively the information systems for the different blocks as well as the whole block. Having useful information systems and sources (IS) for agricultural risk management (ARM) requires that policy makers, as well as private actors along to the food chain, get involved in thinking out the best data and information sources, and making it widely available for the whole country. This includes users, individually or through professional organizations, businesses and traders, and consumers. The value of IS will be assessed primarily based on its accessibility, quality and reliability for enabling useful agricultural risk management in Mozambique.

Given that IS-ARM involves the producers and other private actors of the food chain, one of the most relevant criteria to the IS-ARM assessment is accessibility. To assess the accessibility of IS we assigned scores (0-100) to the accessibility indicator and decided the weight of accessibility compared to the weight of the rest of criteria. Concerning the first, the question is which values to assign (between 0 and 100) to the different levels of accessibility or different ways to access the data: internet, bulletins, radio, mobile (SMS) and others. Therefore, high scores were given to the traditional media (TV/Radio/Newspapers) and low to internet and SMS. Clearly, disseminating punctual information and data series on some variables (e.g., climate, prices) to the farmers is mostly valuable through mobile (SMS), TV/Radio or via the producers' organizations. A distinction should be made between providing early alerts, warnings or forecast services and providing data series of different variables. They serve different purposes and means.

Even more controversial is how to assign a weight to the accessibility criteria. This is a key criterion, which considers that information and/or data that are not accessible to the farmers and to the public should be considered as non-existing. Although data accessibility is a key criterion to assess IS-ARM, it is very easy and cheap to publish existing information, as in many cases it is just a question of legal change and/or political will. In other cases, it involves organizing and uploading all the existing information and improving the access and functionality of the websites. Therefore, we decided to give a low-medium weight to the accessibility criterion.

We assessed information sources/systems, instead of scattered and sporadic pieces of information. The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Mozambique.

As it is explained in detail below the IS, each containing a number of key variables, are evaluated using different attributes. The logic of the analysis is targeted to the main question of the study: are IS ready to and permit performing agricultural risk management?

Attributes differ for each IS based on the type of information that is relevant in each Block. While somewhat subjective, the attributes were weighted as follows: frequency (20%), aggregation level (20%), length (20%), accessibility (10%), and continuity/update (10%), geographical (10%). The rationale for weighting, for example, frequency (20%) stronger than accessibility (10%) stems from the fact frequency is a prerequisite to perform useful agricultural risk assessments whereas accessibility is not. During the execution of the project, not only in Mozambique but also in the other seven countries, it was found that data sources were available though not accessible. Since available data can be easily be made accessible, and non-existing data cannot, it was decided to weigh both variables accordingly.

The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Mozambique.

Table 4.1: Number of IS identified by thematic block in Mozambique*

Thematic Block	National	Regional	International	Total
1 - Meteorological / Soils information	2	3	4	9
2 - Remote Sensing	3	1	11	15
3 - Prices/markets	4	5	6	15
4 - Plants	3	3	3	9
5 - Animal	3	2	13	18
6 - Policies	3	1	6	10
7 - Socio-economic	1	1	1	3
Total	19	16	44	79

* A number of IS provide information and data to more than one Thematic Block, therefore the numbers reflect IS that cover each thematic block, and do not refer the number of specific IS relevant for Mozambique, which may be less than 79 in total. The following national IS provide data and information for more than one thematic block (Instituto Nacional de Estatística (INE), Ministério da Agricultura e Segurança Alimentar (MASA))

The total number of information systems that have been assessed for the seven sub-blocks is large (79); especially in thematic blocks 3 (Prices and markets) and 5 (animal and human health). It should be clear that having more information systems does not necessarily mean that a higher overall score should be given to the whole block or sub-block. In fact, under certain conditions having too many IS for a specific block or sub-block might be negative if there is not complementarity (consistency and comparability) among the different IS.

In many blocks and sub-blocks the regional (with this we mean continental or sub-continental) or international IS are predominant, although the assessment will be focused mainly on national systems. All the identified information systems and sources have been described, and most of them have been assessed following the methodology for IS quantitative assessment (Appendix 2). Some others were not assessed due to the lack of information on assessment criteria (features of information and attributes of IS) or the irrelevance of the concerned IS.

Since it is not possible to summarize the description and assessment of so many sources within this executive summary, we will comment just the results of the overall assessment of the thematic sub-blocks or blocks, with a special focus on national IS. Readers interested in the detailed information should review the main document.

The interpretation of the overall scores (0-100) of the sub-blocks or blocks is as follows. The reported figures (see Table ii) are based on the degree of fulfillment of the desirable, medium and minimal requirements for performing agricultural risk assessments and thus enabling risk management policies in the corresponding sub-block or block.

Table 4.2: How to interpret the overall scores

Overall score of the sub-blocks or blocks	The available information would permit
≤20	Only a very poor or irrelevant risk assessments in the corresponding thematic sub-block or block
21-40	Merely allow poor risk assessments
41-69	A preliminary risk assessment
≥70	Enables a proper risk assessment and management

A detailed description of the procedure performed to obtain the scores is provided in Appendix 2.

Table 4.3: Assessment of the sub-blocks and blocks IS for agricultural risk management in Mozambique

Thematic Block	Quantitative assessment	Comments
1.1 Meteorological & climate information.	55	There are notable deficiencies in both the National Meteorological Services and the Statistical Services (INAM and INE) length is short; continuity and geographical scope poor. Accessibility is fair. Only frequency, INAM scores higher than 75
1.2 Soils	80	Adequate soil database includes soil profile information in some cases. Data downloading is slow and not easy to use
2. 1. Satellite image information	75	FAO tops the ranking. National IS lag behind, with CENACARTA reaching 63.40. Private providers do not add significant value to other available IS. In general, Accessibility and Dissemination are the worst rated attributes
2.2. Communications	70	Internet penetration and social media use are very low, but the penetration of Mobile cellular is very high, and grew very quickly in just 5 years (2011-2015)
3. 1 Prices	90	SIMA tops the rank, followed by GIEWS-FAO. FAO and GIEWS-FAO complement SIMA in coverage and series, but SIMA scores better in position and dissemination channels. The excessive number of systems may cause some confusion to the users especially if the information on the prices of the same products is different according to different systems. SIMA and WFP-VAM partially complement each other, the former being stronger.
3.2. Commodity stocks and inputs availability	10	This Sub-block is very poorly developed. No direct report was found containing actual, as opposed to estimated stocks assessments. But INFOCOM has some production/use balances, not really available for risk management purposes.
3.3 Trade	75	National IS is poor and does not provide information that is registered in customs. INE scored poor in frequency, update and length. UN Comtrade complements INE, but also scores poor in frequency.
4.1 Production levels and yields	65	The major difficulties of INE are Aggregation level and Length. IAM is very complete and strong, but focuses on cotton. CountryStat-FAO scores better on Aggregation and Length, but data are discontinued.
4.2 Plant health	20	Only IAM provides enough information for cotton; for the remaining crops the information is poor and insufficient.
5.1. Costs of animal diseases	55	Abundant information available/Good Government's official data (INE and Ministério da Agricultura e Segurança Alimentar). Poor integrated animal-human integrative systems. Many IS are available, not all of them scoring high, as a whole providing very complementary information. The best IS are international, but they are far from complete with respect to the ideal content.
5.2. Risks of endemic and emerging diseases	50	The best IS are international (OIE and WHO); national IS (Ministério da Agricultura e Segurança Alimentar) scores poorly on account of low figures in Frequency, Availability and Length, and Ministério da Saúde does not provide anything. Some IS are good, and work well, but do not jointly provide the necessary content.
6. Policies	70	Only policies are integrated. Trade measures are not, and insurance policies do not exist
7. Socio-economic & sectorial information	60	IS are little integrated and insufficiently disaggregated
8. Integrated systems of information	60	There are promising integrating platforms, but the largest number of blocks covered by a single national IS, AVISO PREVIO only covers four blocks. This may be enough, but depends on the strategy the Government will pursue

4.4. General recommendations

1. AVISO PREVIO should focus not only on emergencies, and preparedness, but also on following up the variables that give rise to, drive, and cause acute Food insecurity situations. This includes: meteo (Block 1), stocks (#3), plant (#4) and animal health (#5). The platform is a promising base to grow in scope, depth and value; but to grow and become more useful it should have interfaces that permit data accessing work smoothly with production, plant and animal, and climate information. It should perhaps rely on international sources for some data collection and analyses, but ideally Mozambique should have its national IS fully operative and ready to offer timely assessments at the most disaggregated level. AVISO PREVIO should integrate the information of INFOCOM, and INAM.
2. Many data sources are discontinued, have gaps and do not seem consistent among different sources (see the details of these weaknesses above). Data sources quality control is essential to build confidence in the value and usefulness of the information. The expansion of agro-insurance could be significantly facilitated with more detailed and georeferenced information, especially with respect to animal, plant, and climate data.
3. It is important that the information on trade and stocks be provided from past years, as this would help the analysis of price movements, and production and market incentives. If this is still considered sensitive information, it should be a crucial variable for the executive committee of AVISO PREVIO.

4. Agricultural inputs data should be covered: including fertilisers, seeds, vaccines forage,...the most critical variables for agricultural and animal production. Transport costs, especially from ports, and logistics seem to be an acute problem. Information on inputs, transport and other market elements should be included in the IS and provided. Critical transportation networks and infrastructure should be included in AVISO PREVIO and INFOCOM.

4.5. Specific recommendations

Thematic Block 1: Meteorological, climate and soils information

Sub-Block 1.1 Meteorological and Climate

1. The Instituto Nacional de Meteorologia de Moçambique (INAM) is in a position to provide for desirable data for risk analyses; it is recommended to support INAM projects that increase the number of complete weather stations in order to cover agro-ecological zones to provide for at least daily weather data, provide a maintenance programme, and consolidate link to other providers of IS on climate such as Instituto Nacional de Estatística (INE).
2. Data are provided at low geographical resolution: providing daily and more disaggregated data is recommended to represent all relevant agricultural zones.

Sub-Block 1.2 Soils

3. It is recommended that the National Soil information system be reinforced, such as the one under construction at the Agricultural Research Institute of Mozambique (IIAM); it could increase the number of soil profile and build on the international IS: ISRIC World Soil Information: Africa Soil Profiles Data Base.

Thematic Block 2: Satellite image information & Communications

4. INGC should improve the updating of the data showed in public as we understand that probably is much more difficult to increase the length of the data. It should perhaps team up with CENACARTA, designing a strategic planning together.
5. MASA should improve the accessibility to some data that can be relevant for users and farmers as some VI.
6. There is a need to reinforce the integration of IS and sources. This could be done broadening the existing EWS called Aviso Previo. EWS in animal health should be reactivated; Aviso Previo may broaden its scope having interlinkages with EWS in animal health.

Thematic Block 3: Prices and market information

7. The weakest points of this very well-developed block are coverage, position and frequency. Data quality checks and reliability should be a priority in running market information information systems.
8. SIMA is a very good price information system but its coverage should be improved. Some international systems (FAOSTAT and WFP-VAM), that get data price from SIMA, have broader coverage (products). We recommend that the coverage complementarity between these international systems and SIMA be checked to improve the coverage of SIMA.
9. The input price information provided by SIMA should be complemented based on the cooperation and exchange checks of information with AMITSA and AFO
10. We recommend that stocks information systems/food reserves should be based on INFOCOM (MIC) in collaboration with SETSAN and taking advantage of the PAPA program activities and information. There would be significant gains for the platform AVISO PREVIO from having a consolidated and reliable IS for stocks.

Thematic Block 4: Production levels and yields, Plant health

11. MASA and INE should work together to reinforce the potential of these ISs' efforts in putting together a reliable and consistent IS for plant yields, production and acreage. Data should be offered in GIS platforms-
12. Plants' health and information on pests and diseases could be improved: there should be some prioritising on the most relevant ones and deeper information about these. Government should develop databases of



pests and diseases, and attempt to make connections with climate data. It is essential that alerts systems be created so that farmers can receive SMS or any other communication means to be able to prepare against any potential vulnerability.

Thematic Block 5: Animal and human health

13. Statistics on animal census and national's public health structure are basically satisfactory, but a more detailed information should be provided for animal and animal-products trade (country of destination / country of origin, type of livestock involved, etc.), kind of livestock holdings and distribution, slaughterhouses, other human health issues, etc. (National/Regional/International)
14. Efforts should be made to develop an animal/human health integrated IS (International)

Thematic Block 6: Policy

15. Mozambique should provide timely and precise information on trade measures.
16. The country should maintain its status in MAFAP, because it is the only updated repository of agricultural policies in the country.

Thematic Block 7: Socio-economic and sectorial information

17. Very few statistics are collected at national level on annual basis and lack of relevant data exists due to the low capacity and lack of technical resources of the Institutions in charge of national statistics as INE. More financial resources are needed to strengthen the capacity of these national information systems to deliver timely and reliable information.
18. Data on pastoral activity and nomadic herding should be collected for both sanitary and agricultural policy purposes.

Thematic Block 8: Integration of Information Systems

19. It is recommended that Aviso Previo should be more encompassing and be given broader roles to provide not only valuable pre-crisis information but also more risk assessments.

4.6. The way forward

1. **Public-Private partnerships and institutional arrangements:** In the future the IS for ARM should integrate the private sector through public-private partnerships translated into public-private institutional arrangements for financing and governing the IS. The private actors recommended are professional and producers organizations, cooperatives, universities and private foundations and programs. Private companies creating IS are seen as a for-profit organisations, which encounter difficulties to cooperate with the public sector.
2. **Integration:** The lack of integration in the IS for ARM in Mozambique is one of the main weaknesses, although the Aviso Previo is a noteworthy integrative initiative. It is not clear what strategy should work best for the country in terms of seeking unique and comprehensive integrated IS or various sectoral ones. It is recommended though that those ISs that work best (see the scores of the tables presented in the previous sections) be strengthened and supported.
3. **Users' participation:** Linked to the need of making IS more integrated; there must be mechanisms to ensure the users participation. This is a way to render the IS more useful to the costumers and to improve the reliability and control of quality of the information. In that sense, the IS must be improved offering not only information but different products and services too. IS should be supply- and demand-driven, and that involves testing and surveying the value among users.
4. **Dissemination:** An effort should be made to disseminate information using TV, Radios, bulletins, and SMSs. Farmers throughout Africa are intense users and receivers of these information sources and emitters, less so of webpages and internet.

5. Niger



5.1. Objective

The objective of the project contracted with IFAD is to make an assessment of the Agricultural Risk Management Information Systems (IS-ARM) in the following African countries: Cap Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project should be a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a comparison yardstick based on which a final report to compare the information systems for agricultural risk management in the seven countries was drafted.

The purpose of this report is to summarize the research results of the availability and quality of information for agricultural risk management purposes in Niger. Both the existence and quality of the information, and the timely and useful access by stakeholders for risk management purposes will be assessed. The gaps on information and access tools for the main stakeholders (smallholders, commercial farmers, microfinance institutions, value chain, private investors, donors and governments) will be evaluated. A special emphasis will be place on two groups of users of IS-ARM: at micro level, the usefulness and timely access of smallholders to information for Agricultural Risk Management purposes; at macro level, the usefulness and access for the Government and policy makers, and for business developers of risk management services.

5.2. Methodology

The project will cover all sources of risks in agriculture; in particular risks, stemming from areas defined in the following thematic blocks for which information systems will be assessed:

1. Meteorological, climate and soils
2. Satellite image & Communications
3. Prices of commodities, inputs and market components
4. Production levels and yields, Plant health
5. Animal and human health
6. Policy
7. Socio-economic and sectorial

The methodological approach is based on the following steps:

- Developing of a benchmark for **Agricultural Risks Management** Information Systems (**IS-ARM**), hereafter referred as **Benchmark-IS-ARM**. The Benchmark will define the standard requirements for the information systems in each thematic block to make a proper agricultural risk assessment and management (Appendix 1)
- A search of information systems from different sources, covering academic and grey literature, bibliographic sources, websites, national and international institutions, generating an assessment process
- Checking and contrasting some inconsistencies/gaps of the information systems found in Niger through local consultants.
- Quantitative/qualitative assessment of the components (sub-blocks) of the thematic blocks according to the standards defined in the Benchmark (Appendix 1)
- Feedback from the national governments and selected stakeholders, gathered in public workshops presented in each country's capital.
- Comparison of the revised quantitative/qualitative assessments across countries and discussion
- Identification of weaknesses and strengths of IS-ARM in each country.
- Recommendations for improving the information systems relevant for each thematic block and their interactions with one another, with a view to enhance each country's preparedness to perform further analyses of agricultural and veterinary risks.

5.3. Assessment of Information systems for ARM in Niger

We assess information systems, not punctual, scattered and sporadic information. The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Niger.

Table 5.1: Information Systems identified on all the blocks in Niger

Thematic Block	National	Regional	International	Total
1 - Meteorology	3	2	6	11
2 - Remote Sensing	0	5	9	14
3 - Prices	3	7	6	16
4 - Plants	2	4	4	10
5 - Animal	3	1	14	18
6 - Policy	1	2	7	10
7 - Socio-economic	1	1	1	3
Total	13	22	47	82

The total number of information systems for the seven sub-blocks is very large (82) especially in thematic blocks #3 (Prices and markets) and #5 (animal and human health). Nevertheless, having more information systems does not necessarily mean that a higher overall score should be given to the whole block or sub-block. In fact, under certain conditions too many IS for a specific block or sub-block might be negative if there is not complementarity among the different IS. In all blocks the regional (with this, we mean continental or sub-continental) or international IS are predominant, although the assessment is focused on national systems. All the information systems have been described and most of them have been assessed following the proposed methodology. Some others were not assessed due to the lack of information about the features or attributes of the IS, their irrelevance or because we could not find any content from which an assessment could be made.

Since it is not possible to summarize so many IS within an executive summary, we will comment just the results of the overall assessment of the IS by thematic sub-blocks or blocks (scores ranging 0-100).

The interpretation of the overall scores (0-100) of the sub-blocks or blocks is as follows in Table ii. The reported figures (see Table 5.3) are based on the degree of fulfillment of the desirable, medium and minimal requirements for performing agricultural risk assessments and thus enabling risk management policies in the corresponding sub-block or block.

Table 5.2: How to interpret the overall scores

Overall score of the sub-blocks or blocks	The available information would permit
≤20	Only a very poor or irrelevant risk assessments in the corresponding thematic sub-block or block
21-40	Merely allow poor risk assessments
41-69	A preliminary risk assessment
≥70	Enables a proper risk assessment and management

In Table 5.3 we report the overall quantitative assessment (scores) by thematic sub-block or block.

The main conclusion is that the overall assessment of the Information Systems for Agricultural Risk Management in Niger is not positive. Only four IS out of fourteen sub-blocks/blocks reach scores above 70/100: Soils (85), Commodity and input prices (80), Satellite image (75) and Trade (70). Two thematic sub-blocks have middle scores (51-69): Plant production and yields, farm holdings and crop management (60) and Risk of endemic and

emerging diseases (55). Four sub-blocks or blocks have low scores (25-50): Meteorological and climate (50), cost of animal diseases (45), socio-economic and sectorial information (50) and Policies (35). Finally four blocks or sub-blocks scored very low (less than 25): Integrated information systems (20); Communications (20); Plant health (10); and commodity stocks and inputs availability (10). The comments in the right column of Table 5.3 are self-explanatory and justify/complement the score given to each thematic block or sub-block.

Table 5.3: Assessment of the Information Systems of the thematic blocks/sub-blocks in Niger

Thematic Block	Quantitative assessment	Comments
1.1 Meteorological & climate information.	50	a) Early warning and alert systems are not in place; weather forecasts are in the web of the Direction de la Meteorology Nationale (DMN-Ministère du Transport) but are posted with delay. b) National IS are still limited. The DMN has the infrastructure of weather stations for providing the more complete information systems, however poor maintenance of these stations is not allowing raising the standards and this IS does not seem to produce satisfactory information for risk assessment; furthermore data are not open. The Institut National de la Recherche Agronomique du Niger (INRAN) is currently active and improving the representativeness of climate data with meteorological stations in various agroecological zones. The INS receives data from these two IS. c) Regional IS AGRHYMET is a well-known regional centre but data are not open so that quality check cannot be done. The same applies for the Regional African Center of Meteorological Application for Development. The international IS from the University of Nebraska-Lincoln; Wageningen University and Research: The Global Yield Gap and Water Productivity Atlas is very good but it is based on models and synthetic data.
1.2 Soils	85	Soil information from international IS (ISRIC) allows for a correct risk assessment because it includes soil profiles and management recommendations. An update -up of these data and creation of a national IS based on ISRIC would improve information for risk assessment.
2.1. Satellite image information	75	FAO is a good remote sensing information system (92.5) and covers also several statistical indexes that can give a first approach to risk assessment: NDVI anomalies, Agricultural Stress Index, Vegetation Health Index among others. Private companies have good infrastructure and data to calculate indexes. However, there has to be a demand for offering this service and maintaining, and the cost will be very high. Among the national institutions the role of ICARDA is remarkable and can be improved calculating several indexes useful from risk assessment
2.2. Communications	22	There are strong limitations in communications: Mobile penetration (48/100); fixed telephone penetration (5/100); internet users (5/100). Having very few secure internet servers (3/100) is the strongest limitation for internet communication as cause problems for information dissemination. Broadcast media TV (10/100) and Radio (12/100)
3. 1 Prices	80	The best price information system is the national SIMA. The coverage of commodities and market is wide in international, regional and national systems as well as the length, frequency, spatial disaggregation and updating of series of data prices. The accessibility is good (open access). However the dissemination of food price information is only online and the websites of national systems do not work well. Concerns exist on the reliability of the price information.
3.2 Commodity Stocks and inputs availability	10	There is not any proper information system for commodity stocks or inputs availability. Information on commodity stocks or inputs availability is not available.
3.3. Trade	70	INS is a reasonably good and complete (broad coverage) trade information system. But the existence of several information systems without complementarities on the covered products. In addition, the fact that the trade information provided by INS is expressed only in monetary value, instead of in physical quantities, is a limitation.
4.1 Production levels and yields, farm holdings and crop management	60	The two information systems assessed for plant production and yield have a good accessibility and geographical representativeness. The data frequency, province aggregation level, and data series for ten years could be enough for a preliminary risk assessment but the information is not complete. The main weakness of the two systems is the irregular continuity. The lack of data about numbers of household and crop management forced to turn to other sources of information. The numbers of household can be obtained from agricultural census, which are logically offered with low frequency, and the data for crop management appear sometimes in bulletins or other type of publications.
4.2 Plant health	10	Plant health warnings exist but information is deficient. There are neither series nor trends on pests and disease impacts to allow for a basic risk assessment.
5. 1. Cost of Animal Diseases	45	The annual reports and PSV report from OIE and the FAO non-periodical surveys and statistics on animal production in FAOSTAT and CountrySTAT are good information systems but incomplete (they do not consider all the necessary information to evaluate cost of diseases). There is no regular, disaggregated and updated information on animal health, animal production and holdings. Weak animal surveillance and control IS. The dissemination of information is based only in websites, and websites are not always working appropriately. The information on animal trade and movements is not regular, reliable nor updated-. There is a lack of information on cost of the main endemic diseases.
5.2. Risk of endemic and emerging diseases	55	The OIE annual reports are the main strength in this sub-block. Lack of integration of animal and human health in national IS
6. Policies	35	There is only scarce and occasional information about policies related to agriculture and food. We did not find systematic, periodic, updated and well organized information on policies in Niger. The exceptions are the good early warning system that is a fundamental tool for triggering safety nets and other policies to face market volatility and food crisis and emergencies.

(...)

(...) Thematic Block	Quantitative assessment	Comments
7. Socio-economic & sectorial information	50	We found frequent and updated socio-economic and sectorial information from accessible International and regional IS (World Bank, FAO and AfDB) but the information is aggregated at national level which for sectorial information is a strong limitation. National information systems with more disaggregated information exists but provide less updated socio-economic and sectorial information
8. Integrated systems of information	20	The lack of integrated Information Systems (IS) is a negative aspect of the IS for ARM in Niger. Just a few international IS provides information on different thematic blocks with very limited interrelations among them

5.4. General Recommendations

NIS for inputs, stocks, animal and plant health and policies information do not reach the requirements established in the benchmark to proceed appropriately with agricultural risk assessment and management.

In the case of Niger we recommend to take advantage of the financing (EU-DEVCO) of the West Africa regional food reserves project that has an important component and funding for information systems executed by CILSS.

The national information systems should be totally functional without empty headers and/or broken links. We recommend to improve the national information systems with automatic updating

5.5. Specific recommendations

Thematic Block 1: Meteorological, climate and soils information

1. The Direction de la Meteorology National (DMN) seems to have had the infrastructure for providing the more complete information systems. However and as a consequence of poor maintenance of these stations and/or those being non-operational, the lack of data results in the following recommendations: increase the number of meteorological stations to improve representativeness of the data required, obtain a greater number of climate series with continuous recording and up-date of climate variables, and allow easier access to data, even if paid for. Or else DMN should coordinate with INRAN (see below). There are no early warning systems in place and weather forecasts should be posted in the web with no delay.
2. The Institut National de la Recherche Agronomique du Niger (INRAN) is currently aiming at improving the representativeness of climate data by installing meteorological stations in various agroecological zones: a follow up and support of these activities is recommended as well as a quality check of data as there are currently not accessible. Coordination with DMN is strongly recommended.
3. The Institut National de la Statistique (INS) should rely on INRAN to provide data for the agroecological zones.
4. In relation to soil data it is recommended that a national system be established that could be based on the data of the international programmes such as ISRIC_World Soil Information.

Thematic Block 2: Satellite images and communications

5. ICARDA should improve the updating of the data made publicly available. We understand that probably it is much more difficult to increase the length of the data series. The AGRHYMET Regional Center should improve the accessibility to some data that can be relevant for users and farmers.

Thematic Block 3: Prices, inputs and stocks

6. All the improvements of price information systems in Niger should be focused on SIMA (Système des informations sur le Marchés Agricoles). We recommend improving the price position information (providing not

just retailer prices, but also producer prices). The length of the commodity price series from SIMA should be reconstructed to the past, based on other commodity price information systems e.g. based on GIEWS-FAO that has long time series of prices for sorghum, maize and wheat, after the verification of the compatibility of the two data price (SIMA and GIEWS).

7. Thus, we recommend that resources should be focused on improving SIMA, and put in place a better cooperation and exchange of information among the international/regional CPIS and SIMA.
8. The coverage of SIMA of input prices should be improved, as SIMA currently provides prices for few inputs. This could be done based on FAOSTAT information that has better coverage for input prices in Niger.
9. We recommend setting up an information system or at least a reliable source of information for public commodity stocks based on the OPVN, the institution in charge of the food emergency reserves management.

Thematic Block 4: Plant production, yields and health

10. The Institut National de la Statistique provides the most complete information systems for Production, but having a stable URL that operates continuously will be desirable to guarantee accessibility, and should be improved in terms of data frequency and disaggregation level, including all historical data offered in digital form.
11. Implementation of projects systems for Plant Health by the Inter-African Phytosanitary Council of the African Union is necessary, but it must be completed with a historical review of other information sources related to pest and diseases to build a data base useful to risk analyses.

Thematic Block 5: Animal and human health

12. Dissemination through the web should be improved. Its usefulness would be probably higher for livestock owners if available in some local languages too (i.e. Hausa, Zarma and Songhai, etc.) (National).
13. Statistics on animal census and national's public health structure would be satisfactory, but a more detailed information should be provided for animal and animal-products trade (country of destination / country of origin, type of livestock involved, etc.), type of livestock holdings and distribution, slaughterhouses, other human health issues, etc. (National, Regional or International IS).
14. Efforts should be made to develop an animal/human health integrated IS (International).

Thematic Block 6: Policies

15. The maintenance and widening of the FAO's MAFAP program to Niger is recommended as it is valuable tool to monitor agricultural and food policies, delivering information and indicators on policies, permitting its monitoring. It constitutes the only agricultural information system existent on policies.

Thematic Block 7: Socio-economic and sectorial

16. Very few statistics are collected at national level on annual basis. Lack of relevant data exists due to the low capacity and lack of technical resources of the Institutions in charge of national statistics. More financial resources are needed to strengthen the capacity of these national information systems to deliver timely and reliable information

Integrated systems

17. We recommend that Niger should move towards building integrated systems based on the current systems. But before moving to create more ambitious integrated systems, it is necessary to proceed to improving the current systems and building new ones in some thematic blocks where none exists at the moment.

5.6. The way forward

1. **Public-Private partnership and institutional arrangements.** In the future the IS for ARM should integrate the private sector by means of a public-private partnership translated into public-private institutional arrangements for financing and governing the IS. The private actors recommended for leading this effort are professional and producers organizations, cooperatives, universities, foundations and programs (e.g. Alliance for Green Revolution in Africa).
2. **Integration.** The lack of integration in the IS for ARM in Niger is one of the main weaknesses we detected in this study. In the future a greater integration will be necessary; but not just for providing information on different thematic blocks, but also integrating that information in a holistic information system that takes advantage of the synergy. The private IS or mix private-public could do that more easily due to the pressure of the private customers and user. As a particular recommendation, we suggest to hold round tables among leaders of IS to promote the integration, cooperation and coordination among them.
3. **Users' participation.** Linked to the previous point, in the future ISs must establish mechanisms to ensure the users' participation. This is a way to render the IS more useful to the customers, and to improve the reliability and control of quality of the information. In this sense, IS must be improved by offering not only information, but also different products and services too.
4. **Towards regional information systems.** Related to the previous point the regional IS emerge as a good solution because of the geographical proximity and common problems (border trade, markets, animal health and plant pests regional control, regional food reserves etc). In the region, already exist some regional IS in different thematic blocks but they should be reinforced through the technical assistance and financial support of donor and international agencies. In this sense we identified two main regional IS that might be the reference point to progress on regional integrated information systems: Centre Regional AGRHYMET (thematic block 1 climate information and 4 plant yields, production and pests), CILSS hosting AGRHYMET has financing for the component 1 (information systems) of the regional food reserves project financed by EU-DEVCO; and RESIMAO (thematic block 3 commodity prices and markets). CIRAD is an important knowledge partner for this regional approach particularly for market information systems.

6. Senegal



6.1. Objective

The objective of the project contracted with IFAD is to assess of the Agricultural Risk Management Information Systems (ARM-IS) in the following African countries: Cap Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project is a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a comparison yardstick based on which a final report to compare the information systems for agricultural risk management in the seven countries was drafted.

The purpose of this country report is to summarize the research results of the availability and quality of information for agricultural risk management purposes in Senegal. Both the existence and quality of the information, and the timely and useful access by stakeholders for risk management purposes have been assessed. The gaps on information and access tools for the main stakeholders (smallholders, commercial farmers, microfinance institutions, value chain, private investors, donors and governments) have also been evaluated. A special emphasis has been placed on two groups of users of ARM-IS: at micro level, the usefulness and timely access of smallholders to information for Agricultural Risk Management purposes; at macro level, the usefulness and access for the Government and policy makers, and for business developers of risk management services.

This executive summary contains the conclusions and recommendations drawn from an extensive Country Report for Senegal. It integrates feedback and comments gathered in the seminar held in Dakar on March 30th, 2016. Although it was written to offer self-contained facts and judgments, it draws extensively from the main country report. Therefore, the interested reader seeking further detailed elaborations, facts and data should read the entire Country Report.

6.2. Methodology

The project has considered the main sources of risks in agriculture. In particular, risks stemming from areas included in the following thematic blocks for which information systems and sources will be assessed:

1. Meteorological, climate and soils
2. Satellite image & Communications
3. Prices of commodities, inputs and market components
4. Production levels and yields, Plant health
5. Animal and human health
6. Policy
7. Socio-economic and sectorial

The methodological approach is based on the following steps:

- Developing of a benchmark for **Agricultural Risks Management** Information Systems (**ARM-IS**), hereafter referred as **Benchmark-ARM-IS**. The Benchmark defines the standard requirements for the information systems in each thematic block to make a proper agricultural risk assessment and management (Appendix 1)
- A search of information systems from different sources, covering academic and grey literature, bibliographic sources, websites, national and international institutions, generating an assessment process
- Checking and contrasting some inconsistencies/gaps of the information systems found in Senegal through local consultants.
- Identification of weaknesses and strengths of ARM-IS in each country.
- Quantitative assessment of the IS and the thematic sub-blocks or blocks following the methodology of quantitative assessment (Appendix 2)

- Feedback from the national governments and selected stakeholders, gathered in public workshops presented in each country's capital.
- Comparison of the revised quantitative/qualitative assessments across countries and discussion
- Recommendations for improving the information systems relevant for each thematic block and their interactions with one another, with a view to enhance each country's preparedness to perform further analyses of agricultural and veterinary risks.

6.3. Assessment of Information systems for ARM in Senegal

Following a general methodology applied to each thematic block (see Appendix 2) we assessed quantitatively the information systems for the different blocks as well as the whole block.

Having useful information systems and sources (IS) for agricultural risk management (ARM) requires that public policy makers, as well as private actors along to the food chain, get involved in thinking out the best data and information sources, and making it widely available for the whole country. This includes users, individually or through professional organizations, businesses and traders, and consumers.

Given that IS-ARM involves the producers and other private actors of the food chain, one of the most relevant criteria to the IS-ARM assessment is accessibility. To assess the accessibility of IS we assigned scores (0-100) to the accessibility indicator and decided the weight of accessibility compared to the weight of the rest of criterions. Concerning the first, the question is which values to assign (between 0 and 100) to the different levels of accessibility or different ways to access the data: internet, bulletins, radio, mobile (SMS) and others. Initially we assigned low values to the traditional ways to disseminate and access information (bulletins, radio) medium values to the internet and high values to the internet plus mobile (SMS). In the course of the seminar held in Dakar (March 30), most attendants expressed that in general farmers do not have access to the internet. Furthermore, disseminating punctual information and data series on some variables (e.g., climate, prices) to the farmers is mostly valuable through mobile (SMS) or via the producers' organizations. A distinction should be made between providing early alerts, warnings or forecast services and providing data series of different variables. For the latter the traditional ways and direct transmission to the farmers from the local offices of the Senegalese administration may be the best way. But, when information must be transmitted urgently and widely, SMS and producers associations are the most effective means.

Even more controversial is how to assign a weight to the accessibility criteria. This is a key criterion and we could say that information and/or data that are not accessible to the farmers and to the public in general does not exist. Following this judgment, we should grant a high weight to the accessibility criteria. Although data accessibility is a key criterion to assess IS-ARM, it is very easy and cheap to publish existing information, as in many cases it is just a question of legal change and/or political will. In other cases, it involves organizing and uploading all the existing information and improving the access and functionality of the websites. Therefore, we decided to give a low-medium weight to the accessibility criterion. This added a certain positive bias of our scoring system of most of the national IS, as the question of the lack or limited accessibility is a common problem of most of the national sources and information systems in Senegal.

We assessed information sources/systems, instead of scattered and sporadic pieces of information. The following table summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Senegal.

Table 6.1: Number of IS identified by thematic block in Senegal

Thematic Block	National	Regional	International	Total
1 - Meteorological	3	2	6	11
2 – Remote Sensing	1	5	8	14
3 – Prices/markets	3	6	6	15
4 – Plants	7	4	3	13
5 – Animal	5	2	14	21
6 – Policies	1	3	6	10
7 - Socio-econ	2	2	1	5
Total	22	24	44	90

The interpretation of the overall scores (0-100) of sub-blocks or blocks is as explained in Table 6.2. The reported figures (see Table 6.3) are based on the degree of fulfillment considering a minimum standard and a high standard for performing agricultural risk assessments and thus enabling risk management policies in the corresponding sub-block or block. A detailed description of the procedure performed to obtain the scores is provided in Appendix 2.

Table 6.2: How to interpret the overall scores

Overall score of the sub-blocks or blocks	The available information would permit
≤20	Only a very poor or irrelevant risk assessments in the corresponding thematic sub-block or block
21-40	Merely allow poor risk assessments
41-69	A preliminary risk assessment is possible
≥70	Enables a proper risk assessment and management

A detailed description of the procedure performed to obtain the scores is provided in Appendix 2.

Table 6.3: Assessment of the sub-blocks and blocks IS for agricultural risk management in Senegal

Thematic Block	Quantitative assessment	Comments
1.1 Meteorological & climate information.	60	ANACIM does not offer complete on-line information on meteorological and climate data series, pursuant to legislation on information confidentiality in Senegal. Existing climate data can be obtained by request of research or academic institutions. It offers short length of some data series, poor updating and insufficient geographical coverage of the meteorological stations. Its geographical coverage is much better in the West than in the East of Senegal. However, as a provider of alerts and forecasts services, ANACIM is very useful since it has open access to such information.
1.2 Soils	70	The Africa Soil Profiles Database of ISRIC - World Soil Information includes soil profile layer attributes inventoried and compiled from a wide variety of data sources. This information is provided with sufficient number of soils and detailed profiles, except for information on erosion or soil quality. As a weaknesses: data downloading of ISRIC is slow and somewhat complicated because the application interface is not easy to use and that some variables are not covered by any other IS on soils (i.e. incomplete coverage and the lack of a real national system on soils information that should be hosted by the Institut National de Pédologie).
2. 1. Satellite image information	78	CSE (national system) offers biomass data in its bulletins, based in a strong fieldwork, publishing indexes related to crops and fires. As weaknesses its web does not provide all bulletins and data are not totally open to the public. Relating the IS of ICARDA, the main weaknesses are the short length and the lack of update of the data. Some technical problems were found in these IS: (a) Data and reports offered by some systems cannot be downloaded or printed; (b) Some of the data are based mainly in MODIS; (c) Radiometric and Spatial resolution sometimes is not specified; (d) Organization of some websites is too complicated; (e) Not clear the products of each sensor that some systems used; (f) Not clear the terms to use free data from some systems; (g) The resolution of the maps should be improved.
2.2. Communications	70	Compared with other African countries, Senegal has a rather good mobile penetration indicator and internet users and secures internet servers indicators. The broadcast news media for radio and TV have a rather wide coverage. In the other hand, newspapers have lower penetration indicators.

(...)



(...) Thematic Block	Quantitative assessment	Comments
3. 1. Prices	75	<p>Two main IS on commodity prices in Senegal are CSA and Manobi. The first one is a national public system and Manobi is a private one. CSA is the main source of price information in Senegal and provides price information to national (ANSD) regional (RESIMAO) and international (FAO, WB, WFP) systems. It provides rather complete information on commodity prices but not all is published on the web page resulting in a problem of accessibility and insufficient dissemination.</p> <p>Manobi is a private information system aimed to provide services to small producers. It serves as a common platform of information and commodity marketing for all the stakeholders. Information about agricultural prices and alerts can be obtained in real-time only by SMS, not on-line, but only very few farmers have access to the IS. However, the existence of a private information system should be considered as a positive element.</p>
3.2. Commodity stocks and inputs availability	10	<p>There has not been identified any proper information system providing regular, systematic and reliable information about national stocks and/or input availability. CSA is the national institution managing public reserves, but it does not provide any systematic and regular information about stocks. However, CSA does have information on stocks and food reserves in Senegal that is not accessible because it is legally classified as confidential.</p>
3.3 Trade	70	<p>The best trade information system in Senegal is UN Comtrade and its main limitation is the low frequency of data. The assessment of national systems for foreign trade is rather poor. The main national source for it is ANSD. ANSD's website publishes monthly bulletins on trade (import and exports) and trade indices, but the data offered on line are rather incomplete. The information available in the international source (UN Comtrade) is much more complete than the information published by the ANSD. This is a negative element, since ANSD is believed to be the provider of information to international sources. In this regard, ANSD should make an effort to disseminate it.</p>
4.1 Production levels and yields	60	<p>DAPSA is responsible for collection, centralization, processing and dissemination of agricultural information and statistics that cover all the Country. The Data Portal provides information about cropland, yields and production for the main crops. Yet this complete information of DAPSA is not available for the public, as the process to build and feed its Data Portal is still ongoing.</p> <p>FAO and ANSD systems feed on national statistical data from DAPSA and they show similar performance in some criteria but not in others. The main limitation of ANSD information about plant production and yields is the short length of the data series, being a severe constraint for agricultural risk assessment.</p> <p>Therefore, there is not currently enough accessible information on historical and disaggregated data on yields, crop production and cultivated land to carry out a proper risk assessment and management.</p>
4.2 Plant health	20	<p>DPV publishes a weekly bulletin as well as monthly and annual reports, but there are no structured systems to collect and disseminate historical data on plant health, the reduction of yields and costs caused by plant infection. DPV alerts farmers about pest and diseases through farmer organizations and local offices of MAER.</p> <p>The systems for Plant Health are still under construction by the Inter-African Phytosanitary Council of the African Union. Given that, is not possible to perform risk analysis and management.</p>
5.1. Costs of animal diseases	45	<p>There is a lack of updated information on this area in Senegal. At producer level, farmers lack timely access to the prices and demand for livestock, red and white meats and dairy products. The website of the "Ministère de l'Élevage et des Productions Animales" does not have relevant information about animal production.</p> <p>Most of the existing information provided by international sources is based in outdated reports. FAO-EMPRES and the International Bureau for Animal Resources (AU-IBAR) provide relevant but outdated information and occasional reports on Senegal. The information from OIE and FAOSTAT is complete and updated for some variables but is insufficient to make a proper risk analysis on animal production and cost of diseases. This is because they do not cover all the variables that influence the animal production and the cost of animal diseases.</p> <p>The absence or unavailability of serial livestock information in the national IS (ANSD and the Ministère de l'Élevage et des Productions Animales, mainly) is a severe constraint in order to estimate the cost of animal disease in Senegal.</p>
5.2. Risks of endemic and emerging diseases	55	<p>Substantial number of sources and some information systems on risk of endemic and emerging diseases. Two international IS stand out above the rest due to their websites with many and useful information: OIE and WHO's Health Statistics and Information Systems for animal and human diseases, respectively. The national sources ranked very poor due to their low performance, poor accessibility and lack of historical and updated information [Ministère de la Santé et de L'Action Sociale, Ministère de l'Élevage et des Productions Animales, and Agence Nationale de Statistique et de la Démographie].</p> <p>Currently, there is a deficit of national information sources about animal and human diseases to make a proper risk analysis and management. There is a lack of coordination between animal and human health information sources.</p>
6. Policies	55	<p>DAPSA is carrying out policy monitoring and evaluation activities and it publishes some reports. Scarce and occasional information about policies related to agriculture and food. Senegal is not yet included in the policy information Program FAO's MAFAP but the process to be included is now ongoing. The World Bank, the OECD and the USAID provide some information on trade measures and price support indicators.</p> <p>Concerning early warning systems for food security, Senegal disposes of a national early warning system since 2006 (SAP), launched by the Secrétariat Exécutif of Conseil National de Sécurité Alimentaire (CNSA). Nowadays SAP is in a difficult situation, but its managers are trying to reactivate it despite some problems of coordination and budget allocation. International early warning systems for food security (GIEWS-FAO, VAM-WFP, FEWS-NET and IPC) provide good early warning on food security for Senegal.</p> <p>Regarding agricultural insurance, the Government of Senegal has created the National Agricultural Insurance Company of Senegal (CNAAS) with public and private sector shareholding. This company has been carrying out agricultural insurance pilots in recent years, but there is no systematic information about it.</p>

(...)

(...) Thematic Block	Quantitative assessment	Comments
7. Socio-economic & sectorial information	50	DAPSA carries out agricultural surveys and censuses. There is a specific portal for the dissemination of the agro-survey results, but at moment only production, cultivated area and yield data are available. The institution in charge of the national statistics (ANSD) provides many socio-economic and sectorial elements of information through its annual yearbooks and censuses. However, this information has some deficiencies such as the lack of enough disaggregated information and indicators, or limited updating. In addition, the ANSD website does not always work properly. Concerning other international sources of information, AfDB, WB and FAO provide different datasets with annual socio-economic information and indicators. However, the sectorial information offered by that international institutions is very aggregated and not enough for agricultural risk assessments.
8. Integrated systems of information	50	Some national, regional and international IS provide information on several thematic blocks but not properly integrated. In some cases, the different information blocks are even collected and elaborated in an independent way by different departments of the same institution (World Bank, FAO, ANSD etc). The only proper integrated system is the private IS Manobi, which integrates information on price, markets and climate in an interrelated way and offering diverse market services to the farmers and other actors of the food chain through a common platform and mobile phones. Nevertheless very few farmers have access to this IS.

As shown in Table 6.3, the scores of the information systems for ARM in Senegal are uneven, although there are some thematic blocks or sub-blocks with a medium-high or high score. Five sub-blocks reach high scores (≥ 70): soils; satellite images; communications; prices; and trade. Six sub-block or blocks reach medium or medium-low scores within the range 35-65: (climate and meteorological); plant production and yields; 5.1 (animal production and cost of animal diseases); endemic and emerging animal diseases risk; policies; and socio-economic and sectorial. Finally, two sub-blocks or block reach low or very low scores within the range of 0-30: plant health and commodity stocks and input availability. Anyway these two last thematic information blocks are essential to proceed to a proper agricultural risk assessment and thus this limitation is a relevant limitation to make a complete and reliable agricultural risk assessment in Senegal.

6.4. General Recommendations

1. Harmonization and coordination among national Information systems for ARM. One of the problems identified in our assessment of IS-ARM is the existence of many information systems and the lack of harmonization and coordination among them. In fact the Système d'Alerte Précoce is not working well due to the difficulties to achieve the harmonization and coordination among the different IS involved and the lack of budget. We recommend setting up a Committee of Harmonization and Coordination of the Information Systems for ARM. This Committee may operate under the MAER, being responsible for the implementation of these recommendations.
Improvement of accessibility. Most of the national information systems are better providers of alert services to the farmers than providers of long, disaggregated and reliable time series of data required to perform agricultural risk assessments and management.
2. Concerning the provision of services, weather and harvest forecasts as well as alert systems related to meteorological and climate conditions, plant and animal health for direct use by stakeholders – farmers (crops, cattle), fishermen, agricultural organizations, etc. – seem to be already established or are currently being upgraded (use of protocols). However the national IS listed in Block 1 (e.g. ANACIM, meteorology) and/or in Block 2 (e.g. the Centre de Suivi Ecologique, remote sensing), Block 4 (e.g. DPV, plant health or DAPSA, harvest forecasts) and Block 5 (e.g. DSV, animal health) disseminate their information through bulletins, telephone and local offices of the Administration. The use of mobile phones to spread this information should be considered as the preferred access, since internet services are rather limited for farmers in the rural areas.
3. Strengthening the partnership between national and regional/international systems. We found in some cases that regional or international systems that get the information from national sources and information systems have better on-line information and better websites than the national institutions themselves that provide the information and data to the international information systems. This is, for instance, the case of foreign trade data provided on-line by UN Comtrade or FAO webpage compared to the foreign trade on-line information provided by ANSD.
This recommendation is applicable to ANACIM with AGRHYMET; ANSD with FAO and UN Comtrade; DAPSA with FAO; CSA with FAO; DSV with OIE; and SAP with GIEWS-FAO, WFP-PAM and FEWS-NET.

6.5. Specific recommendations

Thematic Block 1: Meteorological, climate and soils information

1. It is recommended making further improvements such as: (a) Making access to ANACIM's web stable; (b) Consolidating automatic recording of weather variables (automatic weather stations, moving from manual weather stations that only provide temperature and rainfall data); (c) Increasing the number of complete weather stations that will provide daily data in each agro-ecological zone.
2. The decision about the number and location of those stations should be made by ministerial departments involved in agriculture, or else by the Agricultural University. A maintenance program for this network of stations should be planned and financed. ANACIM is the provider of meteorological and climate information of Senegal to AGRYHMET, and both organizations should work closely coordinated.

Thematic Block 2: Satellite image information & Communications

3. CSE's services could be improved calculating several indexes useful from the risk assessment point of view and trying to increase the dissemination of the indexes and the accessibility of the data.

Thematic Block 3: Prices, stocks and trade

4. It is recommended focusing the improvements of information systems and sources in Senegal on the CSA system, increasing the commodity coverage (e.g. livestock prices are not covered currently) and extending the sample of markets to certain zones where no market is monitored.

Thematic Block 4: Plant production, yields and health

5. The digitalized database on crop production and yields from the DAPSA and the ANSD are recent. Thus, these information systems provide a preliminary database, but improvements on the length of the data series would be needed.
6. DAPSA has good information on cultivated land, yields and crop production at province level or lower, but this information is not in the DAPSA web site. We recommend accelerating the construction of DAPSA Portal and bringing together all the DAPSA available information on this Portal.
7. ANACIM coordinates the Groupe de Travail Pluridisciplinaire (GTP) that collects data on meteorology, agricultural hydrology, pastoralism, phytosanitary and markets to produce weekly a multidisciplinary bulletin.
8. Although the DPV provides some bulletins with good information, the DPV should improve the information on plant health uploaded on its web site.

Thematic Block 5: Animal and human health

9. The webpage of the Ministère de l'Élevage et des Productions Animales should include the necessary serial information about animal production: detailed and systematic information on livestock production, animal-products trade (country of destination and country of origin, type of livestock involved), domestic and border movements of animals, structure of livestock holdings, slaughterhouses and other updated information.
10. The DSV should provide and integrate the different information elements needed to develop an information system on animal health that should be available on a open access web site (Animal Health Portal). This could help overcome the weak level of information about animal disease surveillance and notification, animal control systems and disease control programs. DSV should exchange information and coordinate with the Ministère de la Santé et de L'Action Sociale to integrate the information on animal and human health.

Thematic Block 6: Policy

11. DAPSA already started the process to include Senegal in the MAFPA-FAO program. We recommend accelerating the implementation of MAFAP Program in Senegal.
12. Concerning early warning systems for food security, Senegal disposes of a national early warning system since 2006 (SAP). Nowadays it is in a difficult situation because of coordination and budget allocation problems that should be solved.

Thematic Block 7: Socio-economic and sectorial information

13. Improving the on-line availability of the sectorial statistics elaborated by DAPSA and the socio-economic and sectorial data from ANSD (including foreign trade) is necessary. Making ANSD's operational should be a priority.

6.6. The way forward

1. **Public-Private partnership and institutional arrangements:** In the future the IS for ARM should integrate the private sector by means of a public-private partnership translated into public-private institutional arrangements for financing and governing the IS. The private actors recommended are professional and producers organizations, cooperatives, universities, foundations and programs (e.g. Alliance for Green Revolution in Africa).
2. **Integration:** The lack of integration in the IS for ARM in Senegal is one of the main weaknesses identified in this study. In the future, greater integration will be necessary, but not just providing information on different thematic blocks but also integrating that information in a holistic information system that takes advantage of the synergy. The private IS or mix private-public could do that more easily due to the pressure of the private customers and user to get in an easy and integrated way the maximum information. We recommend as a first step to organize round tables or working groups with the different IS to promote cooperation and coordination among them.
3. **Users' participation:** Linked to the previous point in the future the IS must establish mechanisms to ensure the users participation. This is a way to render the IS more useful to the costumers and to improve the reliability and control of quality of the information. In that sense, the IS must be improved offering not only information but different products and services too.
4. **Towards regional information systems:** Linked to the mentioned above, the regional IS emerge as a good solution because of the geographical proximity and common problems (border trade, markets, animal health and plant pests regional control, regional food reserves etc). In the region already exist some regional IS in different thematic blocks but they should be reinforced through the technical assistance and financial support of donor and international agencies. In that sense, we identified two main regional IS that might be the departure point to progress on regional integrated information systems for ARM: 1) The Centre Regional AGRHYMET (thematic block 1 climate information and 4 plant yields, production and pests) hosted by CILSS; and RESIMAO (thematic block 3 commodity prices and markets). CIRAD is an important knowledge partner for this regional approach in West Africa particularly for market information systems.



7. Uganda



7.1. Objective

This report summarizes the conclusions and recommendations drawn from an extensive Country Report for Uganda. It integrates feedback and comments gathered in one seminar held in Kampala on May 26th, 2016. Although it was written to offer self-contained facts and judgments, it draws extensively from the main country report. Therefore the interested reader seeking further detailed elaborations, facts and data should read the Country Report.

The objective of the project contracted with IFAD is to assess of the Agricultural Risk Management Information Systems (IS-ARM) in the following African countries: Cap Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda. One of the outcomes of the project is a self-contained national report for each country. Common methodologies and indicators have been developed and applied to all countries, thus affording a comparison yardstick based on which a final report to compare the information systems for agricultural risk management in the seven countries was also drafted.

The purpose of this country report is to summarize the research results of the availability and quality of information for agricultural risk management purposes in Uganda. Both the existence and quality of the information, and the timely and useful access by stakeholders for risk management purposes will be assessed. The gaps on information and access tools for the main stakeholders (smallholders, commercial farmers, microfinance institutions, value chain, private investors, donors and governments) will also be evaluated. A special emphasis will be place on two groups of users of IS-ARM: at micro level, the usefulness and timely access of smallholders to information for Agricultural Risk Management purposes; at macro level, the usefulness and access for the Government and policy makers, and for business developers of risk management services.

7.2. Methodology

The project will cover the main sources of risks in agriculture. In particular risks stemming from areas included in the following thematic blocks for which information systems and sources will be assessed:

1. Meteorological, climate and soils
2. Satellite image & Communications
3. Prices of commodities, inputs and market components
4. Production levels and yields, Plant health
5. Animal and human health
6. Policy
7. Socio-economic and sectorial

The methodological approach is based on the following steps:

- Developing of a benchmark for **Agricultural Risks Management** Information Systems (**IS-ARM**) hereafter referred as **Benchmark-IS-ARM**. The Benchmark will define the standard requirements for the information systems in each thematic block to make a proper agricultural risk assessment and management (Annex 1).
- A search of information systems from different sources, covering academic and grey literature, bibliographic sources, websites, national and international institutions, generating an assessment process.
- Checking and contrasting some inconsistencies/gaps of the information systems found in Uganda through local consultants.
- Identification of weaknesses and strengths of IS-ARM.
- Quantitative assessment of the IS and the thematic sub-blocks or blocks following the methodology of quantitative assessment (Annex 4).

- Feedback from the national governments and selected stakeholders, gathered in public workshop presented in Kampala on May 26th, 2016.
- Comparison of the revised quantitative/qualitative assessments across countries and discussion.
- Recommendations for improving the information systems relevant for each thematic block and their interactions with one another, with a view to enhance each country's preparedness to perform further analyses of agricultural and veterinary risks.

7.3. Assessment of Information systems for Agricultural Risk Management in Uganda

Following a general methodology applied to each thematic block (see Appendix 2) we assessed quantitatively the information systems for the different blocks as well as the whole block. Having useful information systems and sources (IS) for agricultural risk management (ARM) requires that policy makers, as well as private actors along to the food chain, get involved in thinking out the best data and information sources, and making it widely available for the whole country. This includes users, individually or through professional organizations, businesses and traders, and consumers. The value of IS will be assessed primarily based on its accessibility, quality and reliability for enabling useful agricultural risk management in Uganda.

One of the most relevant criteria to the IS-ARM assessment is accessibility. To assess the accessibility of IS we assigned values (0-100) to the accessibility indicator and decide the weight of accessibility compared to the weight of the other criterions. Concerning the first, the question is which values to assign (between 0 and 100) to the different levels of accessibility or different ways to access to the data: internet, bulletins, radio, mobile (SMS) and others. Initially we assign low values to the traditional ways to disseminate and access information (bulletins, radio) medium values to the internet and high values to the internet plus mobile (sms). In the course of the seminars most attendants expressed that in general farmers do not have access to internet. Furthermore, disseminating punctual information and data series on some variables (climate, prices etc) to the farmers is mostly valuable through mobile (SMS) or transmission through the producers' organizations. A distinction should be made between providing early alerts, warnings or forecast services and providing data series of different variables. For the latter the traditional ways and direct transmission to the farmers from the local offices of administration may be the best way.

Even more controversial is how to assign a weight to the accessibility criteria. This is a key criterion and we could say that information and/or data that it is not accessible to the farmers and public in general does not exist. Following this judgment we should grant a high weight to the accessibility criteria. Although data accessibility is a key criterion to assess IS-ARM, it is very easy and cheap to publish existing information, as in many cases it is just a question of legal change and/or political will. In other cases it involves organizing and uploading all the information on the web and improving the access and webs' functionality. Therefore we decided to give a low-medium weight to the accessibility criterion. This added a certain positive bias of our scoring system of most of the national IS, as the question of lacking or limiting accessibility is a common problem of most of the national sources and information systems in Uganda.

We assessed information sources/systems, instead of scattered and sporadic pieces of information. The following tables summarize the number of national, regional and international information systems that have been thoroughly analysed for the seven thematic blocks found in Uganda.

Table 7.1: Number of IS identified for Uganda by thematic block

Thematic Block	National	Regional	International	Total
1 - Meteorological	2	3	6	11
2 - Remote Sensing	1	3	8	12
3 - Prices/markets	13	6	7	26

(...)

(...) Thematic Block	National	Regional	International	Total
4 – Plants	3	4	4	11
5 – Animal	3	2	13	18
6 – Policies	3	0	7	10
7 - Socio-economic	1	1	1	3
Total	26	19	46	91

The total number of information systems for the seven sub-blocks is large (91) especially in thematic blocks 3 (Prices and markets) and 5 (animal and human health). It should be clear that having more information systems does not necessarily mean that a higher overall score should be given to the whole block or sub-block. In fact, under certain conditions having too many IS for a specific block or sub-block might be negative if there is not complementarity among the different IS.

In all blocks the regional (with this, we mean continental or sub-continental) or international IS are predominant, although the assessment is focused mainly on national systems. All the identified information systems and sources have been described, and most of them have been assessed following the methodology for IS quantitative assessment (Annex 4). Some others were not assessed due to the lack of information on assessment criteria (features of information and attributes of IS) or the irrelevance of the concerned IS. The IS were evaluated using different attributes and these differ based on the type of information that is relevant in each block.

The interpretation of the overall scores (0-100) of sub-blocks or blocks is as explained in Table ii. The reported figures (see Table iii) are based on the degree of fulfillment considering a minimum standard and a high standard for performing agricultural risk assessments and thus enabling risk management policies in the corresponding sub-block or block. A detailed description of the procedure performed to obtain the scores is provided in Appendix 2.

Table 7.2: How to interpret the overall scores

Overall score of the sub-blocks or blocks	The available information would permit
≤20	Only a very poor or irrelevant risk assessments in the corresponding thematic sub-block or block
21-40	Merely allow poor risk assessments
41-69	A preliminary risk assessment is possible
≥70	Enables a proper risk assessment and management

A detailed description of the procedure performed to obtain the scores is provided in Appendix 2.

As it can be seen in the Table iii, the result of the overall quantitative assessment i.e. overall scores (0-100) of the different thematic sub-blocks and blocks, shows that the information systems for ARM in Uganda are uneven, although there are many thematic blocks or sub-blocks with a medium-high or high score. Five sub-blocks reach high scores (≥70): 1.2 (soils); 2.1 satellite images; 2.2 (communications); 3.1 (prices); and 3.3 (trade). Six sub-block or blocks reach medium or medium-low scores in the range 35-65: 1.1 (climate and meteorological); 4.1 (plant production and yields); 5.1 (animal diseases cost); 5.2 (endemic and emerging animal diseases risk); 6 (policies); and 7 (socio-economic and sectorial). Finally three sub-blocks or block reach low or very low scores in the range of 0-30: 8 (integrated systems); 4.2 (plant health); and 3.2 (commodity stocks and input availability). Anyway these two last thematic information blocks are essential to proceed to a proper agricultural risk assessment and thus it is a relevant limitation to make a complete and reliable agricultural risk assessment in Uganda. The comments from the last column of Table ii, contributes to complement and/or justify the overall score of the concerned thematic sub-blocks or blocks.

**Table 7.3:** Assessment of the IS for agricultural risk management (ARM) of Uganda

Thematic Block	Quantitative assessment	Comments
1. 1. Meteorology & climate	70	<p>Weather forecasts are provided by the national IS, Uganda National Meteorological Authority (UNMA), weather alert systems (incl. for fishermen) seem in place. Ex-post disaster events are communicated from Village, Sub county and District Disaster Management committees to the National Emergency Coordination and Operation Centre (NECOC). Weather data are available on National IS but the deficiencies in the meteorological infrastructure shed doubts about the quality and representativeness of data. The low accessibility (online availability) in regional and national information systems (not open or only under request) hinders data quality evaluation; data may exist not at the desirable level for risk assessment.</p> <p>There is a very good international system but is based on models and synthetic data. The use of weather generators or climate models to produce climatic data as do the international systems described, does not allow to always capture the extreme weather events which are increasingly important under global warming/climate change.</p>
1.2. Soils	36	Information on soils is sparse and mostly referred to country level. Soil information systems have the desirable data; an update of some variables may be needed to evaluate the risks on erosion, quality loss, nutrient availability
2. 1 Satellite image	85	<p>FAO is a good remote sensing IS (92.5) and covers also several statistical indexes that can give a first approach to risk assessment: NDVI anomalies, Agricultural Stress Index, Vegetation Health Index among others.</p> <p>The private companies have a good infrastructure and the accessibility to data to calculate several indexes with a good flexibility. However, this work has to be demanded and maintained so for everyday task the cost will be extraordinary high. Only in certain moments and cases can be required their work.</p> <p>In the national institutions the role of UNMA is remarkable and can be improved calculating several indexes useful from the risk assessment point of view and trying to improve the availability of the vegetative indices (VI)</p>
2.2. Communication	61	There are some limitations in communications: Mobile penetration (56/100), Fixed telephone penetration (55/100), Internet users (48/100), Secure internet servers (31/100) it is the strongest limitation for internet communication as it causes problems for information dissemination. Broadcast media TV (80/100) and Radio (100/100) have the best scores.
3.1. Prices	90	The combination of national private (INFOTRADE and FARMIS), national public (Coffee UCDA) and regional donor driven systems (RATIN) should be considered as a positive element for the overall assessment of this Sub-block. Coffee UCDA (70/85) and FARMIS (72/85) are good and complementary systems to INFOTRADE concerning to the covered products.
3.2. Commodity Stocks & inputs availability	40	There is a regional platform for commodity stocks information providing regular information but the quality and updating of information and accessibility of the platform should be improved. In addition there is not information on inputs availability.
3.3. Trade	70	The unique national system (UBOS) has an intermediate assessment value due to some limitations in coverage, frequency and updating. Estimation of informal trade should be considered.
4. 1. Production levels and yields	50	<p>National systems show a medium standard and quality, for production levels and yields information systems; have a good geographical coverage at census level, but need to improve in geographical representativeness, frequency and continuity, and mainly in length of the data series.</p> <p>There are long term international information systems updated and reliable but data are at country level.</p>
4.2. Plant health	30	There is no database of pests and diseases but initiatives exist (as Plantwise) aim to collect and share information among stakeholders
5. 1. Cost of Animal Diseases	50	<p>There is no regular, disaggregated and updated information on animal health, animal production and holdings. Weak animal surveillance and control IS.</p> <p>The dissemination of information is based only in websites, and websites are not always working appropriately. Information on animal trade and movements is not regular, reliable or updated- Lack of information on cost of the main endemic diseases.</p>
5.2. Risk of endemic and emerging diseases	60	The OIE annual reports are the main strength in this sub-block. Lack of integration of animal and human health in national IS
6. Policies	74	We did not find properly information systems on policies in Uganda. We found occasional and scarce information about policies related to agriculture and food as trade policies, market interventions, producer or consumer safety nets, risk management (insurance policies) and food security and emergency policies but we did not find systematic, periodic updated and well organized information on that policies.
7. Socio-economic & sectorial information	62	<p>Data base exist at national level in international sources (World Bank, FAO and AfDB) but the information is aggregated at national level which for sectorial information is a strong limitation.</p> <p>National information systems with more disaggregated information exists but provide less updated socio-economic and sectorial information</p>
8. Integrated systems of information	40	<p>Private companies offer integrated and valuable information to stakeholders Low integration of livestock data with relevant information</p> <p>Deficiencies in national information systems</p>

7.4. General recommendations

1. New human and financial resources need to be allocated to building or strengthening some Information systems in Uganda, particularly for inputs, stocks, animal and plant health and policies information.
2. It is essential to improve the accessibility to the information and disseminate accurate, timely and practical information to farmers through multiple channels including radio, extension and community services. With this objective the expansion of the information networks, internet penetration and other information dissemination sources is needed. The re-establishment of the extension services is paramount not only to disseminate information to farmers but also to improve the data collection.
3. Given the existence of some good private IS in Uganda it is recommended pursuing and strengthening public-private partnerships in order to improve the access to information to farmers. It is important also to translate these public-private partnerships into functional arrangements for financing and governing the information systems.
4. New initiatives (Africa Food prices Collection of EU, User-owned ICT4Ag Enabled Information Service (MUIIS) of CTA or Climate Information and Early Warning System) are being developed with the objective of improve the access to the information and the data collection using modern technologies. Their implementation in coming years can constitute an advance in the data collection, monitoring, access and quality control of the information. Reach their sustainability should be one of their main objectives.

7.5. Specific recommendations

Thematic Block 1: Meteorological, climate and soils information

1. The Uganda National Meteorological Authority (UNMA). It is strongly recommended that spatial coverage (representativeness) and accessibility to a IS that in the past provided the desirable data for risk assessment be improved.
2. Reinforce a National Soil information system; it could build on the international IS: ISRIC World Soil Information: Africa Soil Profiles Data Base.

Thematic Block 2: Satellite images and communications

3. More resources are needed to maintain infrastructure and technical capacity to calculate the required indices.
4. Most of the Information Systems dissemination rely only on-line websites, and many times, especially with the national information systems, the webs do not work properly. The main source of access to the information in rural areas is the Radio, as there is no access to internet. Wider coverage will improve the dissemination of information through ICT and the accessibility to reach farmers.

Thematic Block 3: Prices and market information

Sub-Block 3.1 – Commodity and Input Prices

5. INFOTRADE is a very good system and the best IS in Uganda. This system presents only minor limitations in price position and accessibility and thus the main recommendation will be to improve mainly the price position and particularly accessibility as the web is not always working properly.
6. None of the two regional input price systems is good enough and there is not any national input price information system. Therefore we recommend building a national system for input price information based on some of the good national commodity price information systems

Sub-Block 3.2 – Markets (stocks and inputs)

7. We recommend building a national system of commodity stock information based on the Regional Food balance Sheet currently operated in Uganda by the ministry of agriculture. Improvements on accessibility (currently is just on request), the information disseminated and the updating of information are needed.

Sub-Block 3.3 – Trade

8. We recommend improving the updating, frequency and length of the trade information provided by the national system UBOS based on the ex-change of information and cooperation with AFDB. The integration with data of informal trade is also recommended.

Thematic Block 4: Plant production, yields and health

Sub-Block 4.1 – Plant production and yields

9. The National Bureau of Statistics meets the standards except for the geographical representativeness, frequency of data.
10. The IS provided by the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) should be improved in relation to length of data series; it is also recommended that MAAIF or NAADS coordinate with the Uganda Bureau of Statistics (UBOS) to collect and to show data at local level.

Sub-Block 4.2 – Plant health

11. Implementation of projects systems for Plant Health by the Inter-African Phytosanitary Council of the African Union is necessary, but it should be completed with a historical review of other information sources related to pest and diseases to build a data base useful to risk analyses.

Thematic Block 5: Animal and human health

12. Statistics on animal census and national's public health structure would be satisfactory, but a more detailed information should be provided for animal and animal-products trade (country of destination / country of origin, type of livestock involved, etc.), kind of livestock holdings and distribution, slaughterhouses, other human health issues, etc. (National/Regional/International)
13. Efforts should be made to develop an animal/human health integrated IS. The achievement of comprehensive and effective integrated information systems is compromised by organizational complexities and inefficiencies. ISs in animal and human health are highly variable, and real interoperability and automatic data transfer between national, regional and international ISs is unviable.
14. There is a weak level of information on animal and human diseases surveillance and notification, and there is no evidence of any procedure for integrating data that is generated through sample research studies in Public Health. Integration, surveillance and notification procedures should be reinforced (National).

Thematic Block 6: Policy

15. Maintenance of the FAO's MAFAP programme is recommended as it is a valuable tool to monitor agricultural and food policies, delivering information and indicators on policies.
16. Coordination among different Early Warning Systems is needed in order to increase their effectively. The development of a national EWS is currently underway under a plan of the Office of Prime Minister (OPM) and it should integrate all existent international EWS.



Thematic Block 7: Socio-economic and sectorial

17. Very few statistics are collected at national level on annual basis and lack of relevant data exists due to the low capacity and lack of technical resources of the Institutions in charge of national statistics as UBO. Building capacity of local administration to collect and analyze data will contribute also to get reliable national statistics.

7.6. The way forward

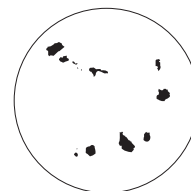
1. **Public-Private partnerships and institutional arrangements:** In the future the IS for ARM should integrate the private sector through public-private partnerships translated into public-private institutional arrangements for financing and governing the IS. The existence in Uganda of private actors as Infotrade or Farmgain has to be supported and their sustainability pursued. Providing more human and financial resources in Districts will facilitate this coordination.
2. **Dissemination of information:** More efforts are needed to reach farmers, providing needed information. The re-establishment of the extension services is essential not only to improve the dissemination of practical information to farmers but also to strengthen the data collection and the channels of communication between farmers and government.
3. **Integration:** The lack of integration in the IS for ARM in Uganda is one of the main weaknesses. The development of the Early Warning System Project by the Uganda government, currently under way, will focus on providing timely weather and climate information in order to minimise the negative effects of disaster. The integration and linking with other important variables to release the alerts on food crisis, as prices, markets or pests and diseases will improve its effectivity.
4. **Users' participation:** Linked to the need of making IS more integrated, there must be mechanisms to ensure the users participation. This is a way to render the IS more useful to the costumers and to improve the reliability and control of quality of the information. In that sense, the IS must be improved offering not only information but different products and services too. IS should be supply- and demand-driven, and that involves testing and surveying the value among users.
5. **Link Geographical information systems (GIS) to mobile phones:** GIS-based systems emerged as a promising means to gather, process and convey information. They could be linked to mobile phones, so that relevant georeferenced information can be relayed to users massively to avert and prevent climate hazards and accelerated episodes of price movements.
6. **Strengthen Regional Information Systems (RIS):** RIS should be reinforced and strengthened through financial support of the international community as they offer a joint treatment to problems with regional dimension as trade, pest and diseases, animal health or food reserves.





Policy Briefs

1. Cabo Verde



Key messages

- Agricultural production risks in Cabo Verde linked to epidemics, drought and floods appears to be greater in terms of frequency of occurrence and severity of impact than output price risks.
- Data from some of the national systems like ARFA¹ provide complete and integrative information on price and commodity risks management. Cabo Verde has a well-laid environment for agricultural risk information dissemination.
- Relevant information on soil, plant health and climate is missing in great depth, while socio-economic and policy related information are not systematically organised. Access to information is also associated with cost.
- The weaknesses could be improved by enhancing public-private partnerships, building capacity for data collection in areas of plant health, soil and climate, and ensuring data disaggregation for thorough risk assessment at micro-levels.

Context

Effective management of agricultural risks requires increased availability, accessibility and reliability of information on diverse thematic areas of risks (see table 1.1). In this policy brief, the strengths and weaknesses of the information systems identified for agricultural risk management in Cabo Verde are presented, followed by a sets of recommendations.

According to the **2016 PARM country risk profile for Cabo Verde**, agricultural production risks linked to drought and floods, outbreak of pests and diseases and fires are greater in terms of frequency and severity than output/commodity price risks. In particular, droughts occur three times more than floods, from 1990 to 2015 but not as compared to the PARM countries average. There are records of volcanic activity and insects infestations in some parts of the country. Newcastle disease and African swine fever are endemic in Cabo Verde from 2005 to 2015. Production losses for twelve major crops from 1990 to 2013 are estimated at about 8%, with losses amounting to about 18% in maize and 15% in pulses. These impacts affect not only poor rural farmers but also the government disaster/risk preparedness and management initiatives.

Existing information sources and information systems

Several information systems are available for agricultural risk management in Cabo Verde. Some of the information systems identified deliver information on a single thematic area of agricultural risk management: the INMG² for meteorology and climate information, the SNPC³ for satellite image information, and ARFA commodity stock/input price information. Only two of the national information systems – the INE⁴ and MDR⁵ – offer integrative information on two or more thematic areas. The INE for instance is the main national statistical agency in Cabo Verde responsible for developing sustainable systems to support private and national institutions. It provides different datasets on agriculture, foreign trade, national accounting, livelihood, energy, environment, justice, health and communications. The MDR is Cabo Verde's ministry for rural development. It basically monitors, validates and maintains data from different sources and publishes bulletin for use across the country.

1 Agência de Regulação e Supervisão de Produtos Farmacêuticos e Alimentares (ARFA).

2 Instituto Nacional de Meteorologia e Geofísica (INMG).

3 Serviço Nacional de Protecção Civil (SNPC).

4 Instituto Nacional de Estatística (INE).

5 Ministério do Desenvolvimento Rural (MDR).

**Table 1.1:** Information systems for thematic areas of agricultural risk management in Cabo Verde

Type of information systems	Thematic areas of agricultural risk management						
	Meteorology, climate & soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National	INMG MDR	SNPC	MDR INE ARFA/ANSA DNRE (Customs)	INE MDR	INE MDR Ministério da Saúde	SIARA-CV BCV	INE
Regional	ACMAD AGRHYMET	AARSE	AfDB & JRC-AfDB RESIMAO UNECA AMITSA	AGRHYMET AfDB eRAILS	AU-IBAR WHO-Regional Office for Africa	ARC	AfDB
International	CRED – IDD FAO-Aquastat, ESDAC	NASA ESA USGS CGIAR – CSI SOS Sahel Terra Remote Sensing ICARDA	GIEWS-FAO WFP-VAM FEWS NET FAOSTAT USDA CountryStat-FAO	CountryStat-FAO FAO-crop calendar Plantwise	Factfish FAOSTAT OIE WHO-HSIS EMPRES IAEA WB & CDC	GIEWS-FAO HDX WFP WB IPC	WB

Source: PARM IS-ARM Report, Cabo Verde (2016).

These information systems were identified during the Information Systems for Agricultural Risk Management Study in Cabo Verde finalised by PARM in October 2016. The classification of information systems are based on geographical scope or scale of information (national, regional and international).

Strengths

The thematic areas of soil, price, commodity stock and input, trade and meteorology and climate, and communications record the strongest score in Table 2, indicating that available information in these areas is sufficient for agricultural risk management in Cabo Verde.

Strong national integrated information on price of commodity and inputs availability: ARFA is one of the best rated information systems in Cabo Verde. Although it has only medium products coverage, most of its information is complemented by the MDR. Together, these two national systems provide information that are connected and allows for analysis of length of price data and information at different levels from many markets.

Complete information on price: There are specific sections of ARFA's website aimed to collect and provide the latest price datasets from consumers and producers. Price section provides average, maximum and minimum price of commodities for the last 6 months, compared domestic retail prices, and international price for certain commodities from January 2009 to September 2015. There are reports on stocks, availability and imports for cereals and sugar as well.

Well-laid dissemination systems/environment: There is a very good mobile penetration indicator and good internet users and secure internet servers indicators. The broadcast news media for radio, TV and Newspapers are also widespread across the country. This makes it possible to disseminate information via all forms of medium for risk assessment purposes.

Weaknesses

At the moment, information on some thematic and sub-thematic areas may not allow for sufficient analysis for agricultural risk management. For instance, the scores for information on soil, plant health, socio-economic and sectorial, and policy had weakest records during the IS-ARM assessment in Cabo Verde.

Relevant information on weather, soil and plant health is lacking. Very little weather information is available at MDR website. The continuity/update of data series requires a long term investment and commitment: they only depict easily available averages on annual basis. Besides, the score for soil information is 10/100 because is hardly any national systems reporting on the soil typologies and properties in Cabo Verde. While monitoring centers for pests and diseases is important for plant health risks, only virtual tracking is available. Also some specific and necessary details on trade (flow of official trade, and an estimation of the unofficial and the illegal trade), live-stock holdings and distribution, biosecurity, slaughterhouses, markets are lacking.

Information not organized in a systematic, periodic and updated way. There are global and national early warning systems – important tools for food market volatility and food crisis emergency management. But not much information on them exists to aid agriculture commodity risk management.

Cost to access information: High resolution satellite image is only available from private companies and can only be access at a cost of a fee. The websites of national public systems like INMG and MDR with free access to information respectively on meteorology/climate and commodity price do not work properly.

Information lacks proper representation: The data for production levels and socio-economic information are collected and analysed by the INE at macro level without any disaggregation at sub-national/micro levels.

The way forward

Reinforce national systems to build relevant data on soil, plant health and meteorology/climate. The capacity of local administration should be enhanced to collect data for reliable national statistics on soil, plant health and socio-economic and sectorial indexes. Well-informed professional and experienced individuals should be identified and approached for information gathering.

More financial resources are needed to strengthen the capacity information systems to deliver timely and reliable information. Very few statistics are collected at national level on annual basis and lack of relevant data exists due to the low capacity and lack of technical resources of the Institutions in charge of national statistics.

Seek for public-private partnerships to enhance investments in data management and information dissemination to smallholder farmers.

Data disaggregation is required to enhance regional (islands) and local information to be achieved at great depth. The adequate geographical scope of the data will permit fine-tuning and more detailed risk assessments and modelling efforts.

**Table 1.2:** Scores for information on thematic & sub thematic areas of ARM in Cabo Verde.

Strongest information areas (%)		Weakest information areas (%)	
Prices	75	Soils	10
Commodity stock & input	70	Plant health	20
Trade	65	Socio-economic and sectorial	30
Meteorology and climate	62	Policy	30
Production levels & yields	60	Cost of animal diseases	50
Communications	60	Satellite image	50
Risk of endemic and emerging diseases	55		

Source: PARM IS-ARM Report, Cabo Verde (2016).

2. Cameroon



Key messages

- Frequent occurrence of endemic diseases, price fluctuations, flooding and drought in Cameroon affects the production and marketing of major crops like banana, tomatoes, cassava and cocoa.
- Data from national systems – the national statistical institute INSC¹ and the MINADER² provide detail information for risk analysis across different thematic areas and commodities. MINEPIA³ and ONCC⁴ focus on market and production of livestock, cocoa and coffee. Information dissemination environment is well-laid in the country.
- The shorter length of some risk information such as in crop/animal health and the ineffectiveness of delivery channels limit the use of the information for proper risk management.
- For effective and reliable information systems in Cameroon there is a need to strengthen capacities for data collection and enhancing public-private partnerships for ITC information delivery mechanisms. The network of automatic weather stations should also be expanded and consolidated, while market information should be extended to other staple food crops and inputs.

Context

Increasing the availability, accessibility and reliability of information on diverse thematic areas of risks (see table 2.1) would be the utmost solution to manage agricultural risks. In this policy brief, the strengths and weaknesses of the information systems identified for agricultural risk management in Cameroon are presented, followed by a sets of recommendations.

Managing risks in agriculture involves seeking avenues and information to identify the opportunities and threats affecting farmers, both on-farm and off-farm. In Cameroon, the commonly noted risk affecting agricultural sector occurs at the production level. They include endemics of crop/animal pests and diseases like Newcastle disease, lumpy skin disease and Africa swine fever. Other frequent risks also noted are commodity pricing/marketing fluctuations, drought and floods. The 2016 PARM country risk profile for Cameroon estimates that annual value of production losses for 12 crops is averaged 6.5% from 1990 to 2013. Staple crops such as banana, tomatoes and cassava are the most affected. Together, these three crops make up 10% to 16% of annual production losses. While these risks could be managed properly, the availability of reliable and adequate information on crop/plant health, agricultural market and trade as well as weather systems in Cameroon have been one of the main challenges.

Existing information sources and information systems

The information systems identified for the seven thematic areas of agricultural risk management in Cameroon are indicated in Table 2.1. Some of them provides data and/or deliver information on a single thematic area of agricultural risk management. They include DMN⁵ for meteorology/climate information and ONCC for commodity price/market information on cocoa and coffee. Others including INSC and MINADER offer integrated information on two or more thematic areas of agricultural risks. INSC for example is Cameroon's public institution that coordinates activities of the national statistical information systems and processes data for economic

1 Institut National de la Statistique du Cameroun (INSC).

2 Ministry of Agriculture and Rural Development (MINADER).

3 Ministry of Livestock, Fisheries and Animal Industries (MINEPIA).

4 Office National du Cacao et du Café (ONCC).

5 Direction de la Météorologie Nationale.



and social management. By performing its main function, INSC makes information available for agricultural risk management relating to meteorology and climate, price and market, production levels and yields, animal and human health, and socio-economic aspects farmers' livelihoods. MINADER is the Cameroon ministry in charge of agricultural and rural development. It manages agricultural statistics and publishes biannual market bulletin, food balance sheets, and agricultural statistics yearbooks on a wide range of commodities. Sometimes, it brings out yearbook on monthly precipitation and temperature. Information from both INSC and MINADER can be accessed at their websites, only through internet access.

Table 2.1: Information systems for thematic areas of agricultural risk management in Cameroon

type of information systems	thematic areas of agricultural risk management						
	Meteorology, climate & soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National	DMN MINADER INSC	MINADER	INSC MINADER MINEPIA MINICOMMERCE AMIS ONCC	INSC MINADER ONCC Portail de l'information phytosanitaire au Cameroun	INSC MINEPIA Ministère de la Santé Publique	Direction de la protection civile	INSC
Regional	ACMAD	AARSE	AfDB UNECA	AfDB eRAIL AfricaRice	AU-IBAR WHO-Africa	BCEAO ARC	AfDB
International	CRED – IDD FAO-Aquastat WB – CCKP ESDAC ISRIC	NASA ESA USGS CGIAR – CSI UN (Spider) Terra Remote Sensing	GIEWS-FAO WFP-VAM FAOSTAT UN Comtrade	CountryStat-FAO FAO-crop calendar ICCO Plantwise	FAOSTAT OIE WHO-HSIS EMPRES IAEA USAID	GIEWS-FAO IPC WFP WB	WB

Source: PARM IS-ARM Report, Cameroon (2016).

These sources and information systems were identified during the Information Systems for Agricultural Risk Management Study in Cameroon finalised by PARM in October 2016. The classification of information systems are based on geographical scope or scale of information (national, regional and international).

Strengths

Cameroon boasts of national systems such as INSC, ONCC MINADER, and MINEPIA, which provide information that allows for proper agricultural risk management on thematic and sub-thematic areas of communication, satellite image, trade, production level and yields (see Table 2.2 for the score).

Well-laid environment for information dissemination: Cameroon has doubled mobile penetration and tripled internet access over the last three years. Rural use of mobile phones has made text-based SMS to be one of the promising communication medium. Thus farmers can be easily alerted on related weather and animal health risks through mobile phones, usually engineered by private operators.

Detailed information on market and price: National information sources such as INSC and MINADER have adequate data and reports for comprehensive analysis of agricultural market and trade. The information provided captures wide range of commodities and input across markets in Cameroon, which allows for better production and food security risk analysis. The MINADER, in particular has a transparent systems for monitor all the target market from time to time.

Weaknesses

As can be referred to in table 2, assessment scores for information relating to thematic and sub-thematic areas of commodity stock and input price, socio-economic and sectorial, crop health and policies appeared to be weak and inadequate for proper analysis.

Length of information not sufficient for risk analysis: The PIPC⁶ is an important initiative of MINADER designed to provide pests and disease information on tomatoes, banana, cassava and maize but is no historical data. Besides, long-term series archives on thematic areas such as price from AMIS⁷ and MINADER, and crop health from Plantwise are not easy to access because the websites are not working properly. Update of some information is also weak in Cameroon. The most recent livestock census data gathered by Ministère de l'Élevage, des Pêches et des Industries Animales was in 2013, and the INSC last published its agriculture year book in 2010.

Ineffective information delivery: Satellite data from some sources cannot be downloaded or printed. Besides, the websites of ministry of agriculture and the PIPC initiative, both of whom are the key sources of crop health information are not functioning. For national systems with operative websites, insufficient internet services are limiting the access to use available information. At present, information dissemination to rural farming households is also mainly through text messages initiated by private firms whom in most cases charge for delivery.

Missing relevant information: Very limited and unclear information on stocks as there is no perfect distinction between public and private stock for emergency and market stabilization purposes. Important areas such as live-stock movement, transports, exports and imports, national level soil information also appear not to be available. In particular, the private sector handles most of the marketed cereals and storage, and they do not publish this information due to the confidentiality issues.

The way forward

Reinforce and strengthen information systems: DMN should expand and consolidate the network of automatic weather stations to provide desirable agricultural risk data in strategic agro-ecological zones. The national system for soil information should be updated and where necessary new ones initiated through references from the Africa Soil Profiles Data Base of the ISRIC World Soil Information. In the same way, relevant information on live-stock movement should be created while input price and commodity stocks/food reserves should also be set up from the MINADER balance sheets to allow for comprehensive agricultural market risk analysis. Over the years, the INSC agriculture year book has focused on crops like rice, coffee and cocoa. There should be efforts to extend works to include other staple crops and agricultural inputs (fertilizers, machinery, seeds).

Building resources for information generation: The local administration and field-based/extension officers should be capacitated with adequate skills to collect data and build information that have immense contribution to the adequacy and reliability of national information systems statistics. Particularly in crop health areas, officers should be trained to undertake surveillance for improving information on crop health status and updating geo-localised phytosanitary data. The availability of adequate skilled field officers would enhance effective articulation of information and alert systems for crop and animal related risks. Cooperation between ministries, national directorates and institutes is also required.

Improve farmers' access to information: Cameroon is among the few African countries with high penetration of mobile phones, especially within rural areas. This should be complemented with quicker and cheaper internet service provision. Relevant risk management application should also be built to allow farmers to access cheaper information than those delivered by private based initiatives that might cost high amount for SMS. This would require committed public-private partnerships with potential investors.

6 Portail de l'information phytosanitaire au Cameroun (PIPC).

7 Agricultural Marketing Information Services (AMIS).

**Table 2.2:** Scores for information on thematic & sub thematic areas of ARM in Cameroon

Strongest information areas (%)		Weakest information areas (%)	
Soil	85	Commodity stock & inputs	20
Satellite images	80	Socio-economic & sectorial	25
Communication	60	Crop health	30
Trade	70	Policies	40
Production levels & yields	70	Risk of endemics and emerging disease	55
Prices	65	Meteorology & climate	58
Cost of animal diseases	60		

Source: PARM IS-ARM Report, Cameroon (2016).

3. Ethiopia



Key messages

- Many risks including livestock/plant diseases and pests, drought and food/crop price fluctuations are affecting the agricultural sector in Ethiopia. Efforts to reduce/mitigate them are constraint by limited risk management information.
- The available national information systems include CSA¹, NMA², EIAR³, EGTE⁴, LINKS⁵, ECX⁶ and EVA⁷. Some of them provide comprehensive and elaborative information for ARM on market, satellite, meteorology and production levels.
- However, there are weaknesses on the level of data aggregation, inadequate up-to-date information to allow for better analysis of plant/livestock pests and disease related risks, and limited communication and access for smallholder farmers.
- There is the need for effective communication packages for remote access, improvement in animal and plant health information and development of public-private partnership arrangement for IS-ARM in Ethiopia.

Context

Effective management of agricultural risks requires increased availability, accessibility and reliability of information on diverse thematic areas of risks (see table 3.1). In this policy brief, the strengths and weaknesses of the information systems identified for agricultural risk management in Ethiopia are presented, followed by a sets of recommendations.

Like many African countries, agriculture forms the mainstay of the Ethiopia's economy. It accounts for nearly 85% of exports and employs over 80% of the active labour force. Major risk facing the agricultural sector as identified in the **PARM Risk Assessment Study (RAS) for Ethiopia** include drought, livestock/plant diseases and pests, and food crop price fluctuations. According to the study, drought incidences in Ethiopia are very frequent with total estimated annual losses of about US\$ 78.35 million. In addition, pests and diseases such as busseola fusca, chilo partellus and rift valley fever cause US\$ 570 million losses in plant and US\$ 210 million losses in livestock based on the occurrence at epidemic level reported in EM-DAT. These rampant consequences to smallholder farmers' income and national food security are the result of several constraints including limited information on plants health and weak communication systems for climate-related risks.

Existing information sources and information systems

The information systems identified for the seven thematic areas of agricultural risk management in Ethiopia are listed in Table 3.1. Some national information systems deliver information on a single thematic area of agricultural risk management. Examples include the NMA for meteorology and climate information, ECX for commodity price information, and ESA for input price information. Others, including CSA, NBE, ATA, EVA and EIAR offer

1 Central Statistical Agency of Ethiopia (CSA).

2 National Meteorological Agency (NMA).

3 Ethiopian Institute of Agricultural Research (EIAR).

4 Ethiopian Grain Enterprise (EGTE).

5 Livestock Information Network Knowledge System (LINKS).

6 Ethiopia Commodity Exchange (ECX).

7 Ethiopian Veterinary Association (EVA).



integrated information on two or more thematic areas. The CSA for instance is one of Ethiopia's federal agencies that reports directly to the Ministry of Finance and Economic Development. It carries out annual socio-economic and demographic surveys, and provides countrywide information on precipitation and temperature, trade and prices of commodities, production and yields for economic management. Another important national information system is the EIAR, which comprise of many research centres located across various agro-ecological zones of the country. The affiliate centers of EIAR establish and maintain information that are useful for different aspects of agricultural risks management including, climate variability, prices and market, production and yield, policy and socio-economic.

Table 3.1: Information systems for thematic areas of agricultural risk management in Ethiopia

Type of information systems	Thematic areas of agricultural risk management						
	Meteorology, climate & soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National	NMA CSA EIAR ATA DRMFSS	DRMFSS ATA	ECX EGTE CSA ENADA EIAR LINKS NBE NAIA ESA	CSA EIAR ESA APHRD EPHI EVA MoA MoH NAHDIC	CSA MoA APHRD EVA MoH EPHI NAHDIC NVI	NBE FAO MAFAP Ethiopia EIAR	CSA EIAR
Regional	ACMAD IGAD – ICPAC	AARSE RCMRD	AfDB UNECA COMESA AMITSA AFO	ASARECA AfDB AU – IBAR WHO – Africa	AU-IBAR WHO-Regional Office for Africa DLCO-EA RustTracker	FEWS NET HDE	AfDB
International	CRED – IDD FAO-Aquastat, WB – CCKP ESDAC ISRIC GYGA	NASA ESA USGS CGIAR – CSI RSAC UN (Spider) Terra Remote Sensing	GIEWS-FAO WFP-VAM FEWS NET FAOSTAT USDA	CountryStat-FAO FAO-STATS GYGA EMPRES IAEA OIE USAID	Factfish FAOSTAT OIE WHO-HSIS EMPRES IAEA USAID WB	GIEWS-FAO FEWSNET WFP WB IPC	WB

Source: PARM IS-ARM Report, Ethiopia (2016).

These information systems were identified during the Information Systems for Agricultural Risk Management Study in Ethiopia finalised by PARM in October 2016. The classification of information systems are based on geographical scope or scale of information (national, regional and international).

Strengths

In Ethiopia, the national systems that provide relevant information for agricultural risk management are NMA, EGTE, LINKS and ECX. These systems maintain and deliver information services that allow for sufficient analysis of agricultural risk management on thematic areas such as prices of commodities and inputs, policy, production and yields, and meteorology and climate. They are noted for providing;

Comprehensive information: In terms of commodity and input price information for risk management, the EGTE, LINKS and ECX jointly provides data on all important crops, which permit a deep understanding and monitoring of pricing situations in the market. Particularly, their data have a wider coverage of agricultural commodities throughout major markets in Ethiopia. Data also captures prices for different levels in the food chain, import-export commodities for an appreciable length of series. In addition, weather information from the NMA also appears to be very extensive. The agency has more than 1000 observatory stations and over 140 AWS, which permits a better analysis of climatic trends such as El Niño oscillations and Pacific Decadal Oscillations in Ethiopia.

Well-elaborated information: The websites of some information systems including LINKS and EGTE are well-organised to provide detailed recent information on animals and animal products. The information is categorized according to many characteristics and organized under different criteria including market/price situation for different commodities. There is continuity in the time series accompanied by a clearly explained data sources and gathering methods. Besides, datasets are easy to find using the search engine and search filters on the websites.

Alert systems for specific pests and diseases: Some regional systems provide updated information about risks of infestation and spread (Desert Locust Control Organization for Eastern Africa, DLCO-EA and RustTracker.org)

Weaknesses

Information on thematic and sub-thematic areas of communication, plant health, risk of animal diseases is recorded not to be sufficient (see Table 3.2 for the scores) for agricultural risk management purposes in Ethiopia.

Limited up-to-date information: There is hardly any recent information on soil and livestock endemics in Ethiopia, although the ATA's EthioSIS project was launched in 2012 to develop depository for soil related information across the country. CSA collects data on production/yield of livestock, and publishes an annual Report on Livestock and Livestock Characteristics. The most recent report was published 2010/2011 with a series since 1995/96.

Difficult access to information: The means of communication of ARM information is only through reports and bulletins published on websites but internet penetration and social media use is low in Ethiopia. In addition, satellite data on agricultural systems can only be downloaded or printed from websites of private institutions but come with a cost of a fee, which might exclude poor farmers.

Data is aggregated at national and regional level: the information on plant health, crop management, production, acreage and yield available at CSA website is aggregated at regional level, which is made up of about 100-150 households within an enumeration coverage. Besides, information on some of commodities relevant for poor households' food security is not included. This does not permit an in-depth analysis of individual/farmer level situations.

Weak animal health information system: None of the national information systems had evidence on pests and disease prioritization programmes that are based on clear indicators. Rather, there is a continuity of report based on disease prioritized by the international community (particularly on impact on trade) or those with a high morbidity/mortality rates. Besides, animal diseases and endemic control information system appeared to be inadequate. There are little convincing evidences on disease control programmes. For the few ones that existed, there is hardly any progress or evaluation report on the detail description of the control programmes, as well as the costs, compensation or rewarding schemes and contingency plans.

The way forward

Build communication systems suitable for remote access. Mobile penetration in Ethiopia has grown remarkably in the last years. It should be complemented with cheaper and efficient internet services to allow information to be disseminated to smallholder farmers through SMS and social media platforms like twitter and Facebook that are increasingly becoming popular in Africa. Delivery and access mechanisms through TV/radio/producers associations and hard copy distributions should also not be undermined.

Improve plant and animal health-related information systems. There should be adequate surveys on animal movement dynamics to develop general assessment models for risk of further transmission of pests and diseases. Endemics within local areas should be prioritised rather than those of international recognition. There should be priorities to expand insect pests and diseases' early warning information systems from local and regional institutions.

Initiate public-private partnerships and institutional arrangements. In the future the information systems management should integrate the private sector through public-private partnerships translated into enhanced institutional arrangements in financing and governing all forms of ARM information. Private actors should include professional and producer organizations, cooperatives, universities and private foundations and programs (e.g. Alliance for Green Revolution in Africa).

Table 3.2: Scores for information on thematic & sub thematic areas of ARM in Ethiopia

Strongest score (%)		Weakest score (%)	
Prices	95	Communications	30
Satellite image information	95	Plant health	50
Policy	88	Risk of endemic and emerging diseases	55
Soils	85		
Production levels and yields	84		
Meteorological & climate information	81		
Trade	75		
Stocks and inputs	70		
Socio-economic & sectorial information	65		
Cost of animal diseases	60		

Source: PARM IS-ARM Report, Ethiopia (2016).

4. Mozambique



Key messages

- Output price and production related risks such as constant currency depreciation, commodity market volatility, drought, epidemics and floods affect Mozambique agricultural sector in great frequency and severity.
- Information from national systems including INGC¹, INE², MASA³, SIMA⁴, INFOCOM and INAM⁵ allow for comprehensive market/price risk analysis. There are prospects for enhanced access to information and better dissemination environment.
- However, some of the risk information are short-length and do not present enough geographically disaggregated information.
- Efforts to enhance the national information system should focus on building capacities for long-term data collect, data disaggregation at the most basic level, public-private partnership, and diversification of information across thematic areas.

Context

Increasing the availability, accessibility and reliability of information on diverse thematic areas of risks (see table 4.1) would be the utmost solution to manage agricultural risks. In this policy brief, the strengths and weaknesses of the information systems identified for agricultural risk management in Mozambique are presented, followed by a sets of recommendations.

According to the **2015 World Bank Risk Assessment and PARM 2016 country risk profile for Mozambique**, output price and production related risks such as constantly depreciating currency, commodity market volatility, drought, epidemics and floods occur in frequency and with severity of impacts. The average annual output price losses to agricultural producers are about 12% from 2000 to 2004. Agricultural products most affected by the output price risks are cassava, meat and cashew. Price risks increase expenditures of consumers and cause losses to about 10% per year, and as high as 24% in 2006. Epidemics and floods occur on average once every year. The occurrence of these events affects the production of paddy rice, maize, sweet potatoes and sesame seeds with average yield losses recorded at 15% per annum from 1990 to 2013. These impacts affect not only poor rural farmers, but also the government at the national due to lack of information to aid disaster preparedness and management initiatives.

Existing information sources and information systems

Several information systems are available for agricultural risk management in Mozambique. As shown in Table 4.1, some of the identified national information systems deliver information on a single thematic area of agricultural risk management; INGC and CENACARTA for satellite image information, SIMA and INFOCOM for market/price information and IAM for production related information. Only few national systems – INE and MASA – provide

1 Instituto Nacional de Gestão das Calamidades (INGC).

2 Instituto Nacional de Estatística/National Institute of Statistics (INE).

3 Ministério da Agricultura e Segurança Alimentar (MASA).

4 Sistema De Informação De Mercados Agrícolas De Moçambique (SIMA).

5 Instituto Nacional de Meteorologia de Moçambique (INAM).

integrative information on two or more thematic areas. INE is a governmental body responsible for developing censuses, surveys and other statistical reports in Mozambique. Over the years the INE has focused on gathering data on production and yield, price/market, animal health and socio-economic. In recent years, it has extended its statistical activity into climate change and hazards (floods, drought epidemics) impact analysis. MASA on the other hand serves more as a central state organisation tasked to direct, organize and ensure the implementation of legislations and policies in the field of agriculture, livestock, agricultural hydraulic, agro-forestry plantations and food security. It therefore maintains information on satellite image, production levels, price/market and animal health that are useful for agricultural risk management.

Table 4.1: Information systems for thematic areas of agricultural risk management in Mozambique

Type of information systems	Thematic areas of agricultural risk management						
	Meteorology, climate & soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National	INAM INE	INGC MASA CENACARTA	INFOCOM INE SIMA MASA	INE MASA IAM	INE MASA Ministério da Saúde	BM National Early Warning System (Aviso Previo) PAPA	INE
Regional	ACMAD SADC	AARSE AGRYMET	AfDB UNECA AMITSA AFO	AfDB eRAILS SADC	AU-IBAR WHO-Regional Office for Africa	ARC	AfDB
International	CRED – IDD FAO-Aquastat, WB – CCKP ESDAC ISRIC	NASA ESA USGS CGIAR – CSI SOS Sahel UN (Spider) Terra Remote Sensing ICARDA	GIEWS-FAO WFP-VAM FEWS NET FAOSTAT USDA	CountryStat-FAO FAO-crop calendar Plantwise	Factfish FAOSTAT OIE WHO-HSIS EMPRES IAEA USAID WB CDC	GIEWS-FAO FEWS NET WFP WB IPC HDE	WB

Source: PARM IS-ARM Report, Niger (2016).

These information systems were identified during the Information Systems for Agricultural Risk Management Study in Mozambique finalised by PARM in October 2016. The classification of information systems are based on geographical scope or scale of information (national, regional and international).

Strengths

Table 4.2 shows the scores for information on the thematic and sub-thematic blocks of agricultural risks management in Mozambique. Information on prices, soils, satellite image, trade and communication are within the highest scores. This indicates that the available information on these themes is sufficient for proper agricultural risk analysis in Mozambique due to the;

Prospects for ease access to information: Mozambique has a very good mobile penetration, and internet servers and users have been increasing rapidly over the past five years. Farmers and stakeholder are likely to get access to information with ease, either through internet services or by SMS.

Diverse information dissemination channels: SIMA is one of the national systems with wider information coverage and services delivery. It provides weekly, monthly, annual updates and historical bulletin online. It is also initiating an SMS delivery system to extend information to farmers without access to internet, such as those in remote settlements.

Comprehensive information on price/market: INE presents information on trading activities for about 195 agricultural commodities ranging from horticultural products, grains, and cereals to staple crops. Data for the information is collected from 32 sampled markets across Mozambique. SIMA also has a transparent system that monitors a number of commodities in the market and display recent price.

Weaknesses

Information for thematic and sub-thematic areas of commodity stock and input price, plant health, cost of animal diseases, and risk of endemic and emerging diseases, on the other hand appear to be weak (Table 2) for agricultural risk management purposes in Mozambique.

Some of the available information is short-length. There are notable deficiencies in terms of the length of information on climate/ meteorology and trade available from both the National Meteorological Services and the Statistical Services (INAM and INE). Information on commodity stock and input price is very poorly developed: very limited and irregular. No direct report was found containing actual, as opposed to estimated stocks assessments. Even though INFOCOM has some production/use balances, it is not sufficient for risk management purposes.

The aggregation level is not well-suited for thorough risk analysis. IAM has complete plant health information but only on one commodity – cotton. Information on socio-economic issues and production levels from INE are insufficiently disaggregated to portray micro level or individual farmer situations. The aggregation level for the information from IAM and INE is by province and national level.

Available information does not allow for holistic risk analysis. While SIMA is a notable trade information system, it does not provide any information on commodity stock/inputs markets. The INGC and MASA satellite information focus on only flooding situations. Ministério da Saúde does not provide any database on animal diseases, which makes it difficult to ascertain the risks and costs associated with endemic and emerging diseases. Policy and socio-economic information from the INE also lacks the necessary content. They hardly capture some of the important initiative in Mozambique such as Agricultural and Livestock Census (CAP) or the Trabalho do Inquérito Agrícola (TIA).

The way forward

Information/data sources/providers should seek to disaggregated data and variables for not only national, regional and provincial but also sub-provincial and individual farmer level dimensions. Mozambique should invest in geographically disaggregated information.

Strive for holistic data systems: Deeper information on all the various risks thematic areas should be a priority. In particular, government should develop complete satellite databases for all major disasters, and plant and animal pests/diseases. Data should be connected to other thematic areas like climate/meteorology data, policy and socio-economic information to enhance a holistic risk management approach.

Strengthen the capacity of national information systems to manage reliable data and deliver timely information. The technical personnel require a great deal of improvement in their expertise to allow for comprehensive collection of relevant long-term and up-to-date statistics at national level and on frequent basis.

Seek public-private partnership to increase information dissemination: It is essential that alerts systems be created so that farmers can receive information through SMS or other means of communications, and prepare themselves against potential vulnerability. Government should partner with potential private investors to enhance effectiveness and efficiency in delivering information.

**Table 4.2:** Scores for information on thematic & sub thematic areas of ARM in Mozambique

Strongest information areas		Weakest information areas	
Prices	90	Commodity stock & input	10
Soil	80	Plant health	20
Satellite image	75	Risk of endemic and emerging diseases	50
Trade	75	Cost of animal diseases	55
Communications	70	Meteorology and climate	55
Policies	70		
Production levels and yield	65		
Socio-economic and sectorial	60		

Source: PARM IS-ARM Report, Mozambique (2016).

5. Niger



Key messages

- Production related damages caused by floods, drought, epidemics and storms are the most frequent and severe risks that affect the agricultural sector of Niger – a country with very dry weather conditions.
- At the moment, agricultural risk related information can be sourced from INS¹, DMN², SIMA³, INRAN⁴ and RECA-Niger⁵. Information from some of these systems are geographical representative and sufficient for risk analysis.
- However, there is restricted access and inadequate information on thematic areas of plant health, commodity stock and policies. Early warning systems are very weak, and communication channels are poorly developed.
- An enhanced information system in Niger would require coordination between national systems (typically INS, DMN and INRAN), improve communication and early warning systems, and public-private partnerships to improve access.

Context

Increasing the availability, accessibility and reliability of information on diverse thematic areas of risks (see table 5.1) would be the utmost solution to manage agricultural risks. In this policy brief, the strengths and weaknesses of the information systems identified for agricultural risk management in Niger are presented, followed by a sets of recommendations.

According to the 2016 PARM country risk profile for Niger, production risks linked to epidemics, drought and floods are greater in terms of frequency and severity than market/price risks. Epidemics are the most recorded disaster from 1990 to 2015, and major flood events occur almost annually, about four times more than drought. The frequency of drought is recorded as once every 2 to 3 years. There are also recorded but infrequent cases of storms and insects infestations. The average production losses for twelve major crops cultivated in Niger from 1990 to 2013 amounted to about 6%, with losses as high as 21% in some peak years. Four most affected crops include; sesame seed, tomatoes, rice paddy and potatoes. These impacts affect not only poor rural farmers but also the government at the national due to lack of information to aid disaster preparedness and management initiatives.

Existing information sources and information systems

Several information systems are available for agricultural risk management in Niger (table 5.1). Some of the information systems deliver information on a single thematic area of agricultural risk management; the DMN for meteorology and climate information, RECA-Niger for commodity price and market, and the Ministère de L'Élevage for animal and human health information. Only two systems (INS and INRAN) provide information that integrates two or more thematic areas of agricultural risks in Niger. The INS is the main statistical body of Niger. It has information on meteorology and climate, animal and human health, prices of commodities and market, and socio-economic related issues for agricultural risk management. Among the functions performed by the INS include coordination of Niger's national statistical systems and a centralisation of data from relevant departments. The INRAN is typically an agricultural research institute with centres across Niger. It develops scientific and technical information for knowledge building and inventories that contribute to agricultural policy. INRAN

1 Institut National de la Statistique (INS).

2 Direction de la Météorologie Nationale (DMN).

3 Système d'information sur les marchés agricoles (SIMA).

4 Institut National de la Recherche Agronomique du Niger (INRAN).

5 Réseau National des Chambres d'Agriculture du Niger (RECA).



has relevant data and information on meteorology and agricultural production levels and yields but its website is rarely updated to provide most recent information.

Table 5.1: Information systems for thematic areas of agricultural risk management in Niger

Type of information systems	Thematic areas of agricultural risk management						
	Meteorology, climate & soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National	DMN INRAN INS		INS SIMA RECA-Niger	INRAN INS	INS Ministère de L'Elevage Ministère de la Santé Publique	Dispositif National de Prévention et de Gestion des Catastrophes et des Crises Alimentaires	INS
Regional	ACMAD AGRHYMET	AARSE AGRHYMET	AfDB RESIMAO UNECA AMITSA AFO CILSS	AGRHYMET AfDB eRAILS AfricaRice	AU-IBAR WHO-Regional Office for Africa World Bank	BCEAO ARC	SIPSA AfDB
International	CRED – IDD FAO-Aquastat, WB – CCKP ESDAC ISRIC GYGA	NASA ESA USGS CGIAR – CSI SOS Sahel UN (Spider) Terra Remote Sensing ICARDA	GIEWS-FAO WFP-VAM FEWS NET FAOSTAT USDA	CountryStat-FAO FAO-crop calendar Plantwise GYGA	Factfish FAOSTAT OIE WHO-HSIS EMPRES IAEA USAID CDC	GIEWS-FAO FEWS NET WFP WB IPC	WB

Source: PARM IS-ARM Report, Niger (2016).

These information systems were identified during the Information Systems for Agricultural Risk Management Study in Niger finalised by PARM in October 2016. The classification of information systems are based on geographical scope or scale of information (national, regional and international).

Strengths

The thematic areas of soil, price satellite image, trade and production levels and yield have the strongest score (table 5.2). In these areas information is sufficient for agricultural risk management in Niger.

Good accessibility and geographical representativeness for plant production and yield information. The available data shows adequate frequency, aggregation level, and ten years data series, which is enough for a preliminary risk assessment. The INS disaggregates information for both national and sub-national levels. In particular, the Institut National de la Recherche Agronomique du Niger (INRAN) is currently active and improving the representativeness of climate data with meteorological stations in various agro-ecological zones.

There is sufficient information on prices and trade: SIMA and RECA-Niger provide data on prices of wide range of agricultural commodities produced in Niger. Data is given in accordance to the major market in the country. The prices are also available at different level of the food chain as well as for exports and imports for longer series.

Most of the national information systems including SIMA, RECA-Niger and INS have diversified information dissemination services. SIMA in particular, disseminates information on commodity and input prices in different markets, evolution of commodity prices, commodity offer and supply characteristics, perspectives, charts and graphics using weekly, monthly, quarterly and annual bulletin. The INS develops an annual year book containing information on climate, prices, socio-economic and plant health.

Weaknesses

Some thematic and sub-thematic areas may not allow for sufficient analysis for agricultural risk management. For instance, the scores for information on plant health, commodity stock and input, communication and policy had weakest records during the IS-ARM assessment in Niger (table 2). Information on costs of diseases and meteorology/climate have weak scores, which could be explained by a number of reasons:

Delay in weather forecasting at the websites of the Direction de la Meteorology Nationale (DMN), and inadequate early warning and alert systems. The meteorological and climate information from the DMN's are not reliable and satisfactory enough to aid risk assessment due to poorly maintained infrastructures of the weather stations. INS climate information has missing data on important variables like solar radiation, humidity and wind speed, while its trade information is expressed only in monetary value, instead of in physical quantities. Also, its plant health information neither has a series nor trends on pests and disease impacts.

Restrictions in access to information: There is not any proper national information system for commodity stocks or inputs availability and satellite image information. The satellite image information can only be demanded from regional and international private systems offering this service, and the cost will be very high. With thematic areas having information from national system, the information is freely available online but the websites hardly work properly and information is rarely up-to-date. Typical examples are the climate information from INRAN and production and yields data from INS websites.

Strong limitations in communications: There are low estimates for mobile penetration is (48/100), fixed telephone penetration is (5/100), internet users record at (5/100) and secured internet servers at (3/100). Broadcast media – the main channel for dissemination in Africa – also appears to be weak with TV estimates at (10/100) and Radio (12/100). This is strong limitation for agricultural risk management information dissemination.

Scarce and occasional information about policies related to agriculture and food. There is no systematic, periodic, updated and well-organized information on policies to facilitate risk analysis for emergency alerts and safety nets programming. In addition, the information on animal trade and movements is not regular, reliable nor updated: there is hardly any information on cost of endemic diseases.

The way forward

Build a system of coordination between INRAN, INS and DMN. The Institut National de la Recherche Agronomique du Niger (INRAN) is currently aiming at installing meteorological stations in various agro-ecological zones. Both INS and DMN should connect with the INRAN and secure access to relevant data for comprehensive information.

Improve communication systems for enhanced access to information. Media outlets like radio and TV should be extended to have wide coverages across Niger. Regulations and education should be enforced to increase phone penetration. This will enable smallholder farmers to access relevant agricultural risk management information from the media and through text messages. For this purpose, seeking public-private partnership becomes a key requirement.

Systematization of policy information is required to provide agricultural risk evidences on the ground to aid policy action. Past, present and future initiative in the areas of the seven agricultural risks thematic areas should be documented. Critical descriptive information should be provided, and supported with evidences of successes and failures. This would allow for adequate risk assessments.

**Table 5.2:** Scores for information on thematic & sub thematic areas of ARM in Niger

Strongest information areas (%)		Weakest information areas (%)	
Soil	85	Plant health	10
Prices	80	Commodity stock & inputs	10
Satellite image	75	Communications	22
Trade	70	Policies	35
Production levels & yields	60	Cost of animal diseases	45
		Meteorology & climate	50
		Socio-economic and sectorial	50
		Risk of endemic & emerging diseases	55

Source: PARM IS-ARM Report, Niger (2016).

6. Senegal



Key messages

- Production risks linked to climatic stress – erratic rainfall, early cessation and/or delay onset of rain and extended drought – affects the agricultural sector of Senegal. Locust outbreak, bushfires and price volatility are also common.
- National information systems like ANSD¹, ANACIM², DAPSA³, ISRA⁴, MSAS⁵ and CSE⁶ provide comprehensive information for risk analysis. Senegal also has well-laid information dissemination channels with great potential.
- Legal rules on confidentiality reduce access to relevant information. Some of the national systems lack historical data while others hardly update their information. ANACIM offers climate data but its meteorological stations are very few with limited geographical coverages, especially across the eastern part of Senegal.
- Enhancing the information systems requires enacting more friendly regulation on data confidentiality, increasing reliability of internet services, enhancing public-private partnerships for information delivery, initiating a system to manage long-term data and up-dating information.

Context

Increasing the availability, accessibility and reliability of information on diverse thematic areas of risks (see table 6.1) would be the utmost solution to manage agricultural risks. In this policy brief, the strengths and weaknesses of the information systems identified for agricultural risk management in Senegal are presented, followed by a sets of recommendations.

According to the **2016 PARM Country Risk Profile for Senegal**, agricultural production risks are greater in terms of frequency and severity than market/trade related risks. In particular, the production risks are linked to climate-related causes such as drought and floods, in addition to outbreak of pests and diseases (including locust, Newcastle and lumpy skin disease), and bushfires. On average, floods occur twice every year, while lumpy skin has been endemic, recorded to be occurring virtually every year over the past 10 years. A major drought occurred in 2002 causing losses amounting to 50% of total agricultural production in Senegal. The estimates show that average annual production losses from 1990 to 2013 amounted to about 25% of yield losses in cowpeas and 16% in tomatoes. These impacts are not only felt by the poor rural farmers but also the government at the national due to lack of information to aid disaster preparedness and management initiatives.

Existing information sources and information systems

Several information systems are available for agricultural risk management in Senegal. As shown in Table 1, some of the identified national information systems deliver information on a single thematic area of agricultural risk management. Examples include the INP for soil information, Manobi Senegal (a private national system) and CSA

1 Agence Nationale de la Statistique et de la Démographie (ANSD).
2 L'Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM).
3 Direction de L'analyse, de la Prévision et des Statistiques Agricoles (DAPSA).
4 L'Institut Sénégalais de Recherches Agricoles (ISRA).
5 Ministère de la Santé et de L'Action Sociale (MSAS).
6 Centre de Suivi Ecologique (CSE).

for price/market, and MSAS for animal health related information. Several of the national information systems including ANSD, ANACIM, DAPSA, ISRA and CSE offer integrative information on two or more thematic areas. The ANSD for instance is the main agency in Senegal responsible for centralising and dissemination data summaries on agriculture, trade, energy, environment, health etc. generated by the national statistical systems. By performing its functions, the agency ensures that economic outlooks are made available for economic situation forecasting and management purposes. ISRA is another important national system with well-established connections to national, regional and international research institutions. It also provides research training and capacity building activities for information generation and dissemination purposes.

Table 6.1: Information systems for thematic areas of agricultural risk management in Senegal

Type of information systems	Thematic areas of agricultural risk management						
	Meteorology, climate & soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National	ANACIM ANSD INP	CSE	ANSD Manobi Senegal CSA	ANSD DAPSA CSE PPEA ANACIM ISRA DPV	ANSD ISRA MSAS MEFP MEPA	SAP	ANSD DAPSA
Regional	ACMAD AGRHYMET	AARSE AGRHYMET	AfDB RESIMAO UNECA AMITSA	AGRHYMET AfDB eRAILS AfricaRice	AU-IBAR WHO-Regional Office for Africa	SPAIF BCEAO ARC	SIPSA AfDB
International	CRED – IDD FAO-Aquastat, WB – CCKP ESDAC ISRIC	NASA ESA USGS CGIAR – CSI ANACIM UN (Spider) Terra Remote Sensing	GIEWS-FAO WFP-VAM FEWS NET FAOSTAT USDA	CountryStat-FAO FAO-crop calendar Plantwise	Factfish FAOSTAT OIE WHO-HSIS EMPRES IAEA WB	GIEWS-FAO FEWS NET WFP WB IPC	WB

Source: PARM IS-ARM Report, Senegal (2016).

These information systems were identified during the Information Systems for Agricultural Risk Management Study in Senegal finalised by PARM in October 2016. The classification of information systems are based on geographical scope or scale of information (national, regional and international).

Strengths

As shown in table 6.1, a number of national systems gather and deliver information for agricultural risk management on different themes. The information available on thematic areas of satellite image, prices, soil, communication and trade are recorded as the strongest (see table 6.2).

Comprehensive data: DAPSA carries out agricultural surveys and censuses. It has a dedicated portal for the dissemination of agro-survey results on production, cultivated area and yields. National statistics from ANSD are configured into annual yearbooks that provide wide range of socio-economic and sectorial information on agricultural households and their livelihoods. Data from national systems like the CSE are based on extensive fieldwork, with some robust data analysis and interpretive results published to reveal indexes related to crops and agricultural fires.

Well-laid information dissemination environment in Senegal: Compared to other African countries, Senegal has good mobile penetration and secured internet service providers. Systems are also in place to disseminate alerts and information to smallholder farmers in rural areas. A typical example is the Manobi, which is a private platform aimed at providing real-time commodity market/price information to farmers through SMS.

National information systems feed into regional and international systems: Some regional and international agricultural risk management information systems rely on the national systems as reference for their data compilation and analysis. As a main source of price information in Senegal, the CSA provides complete information that feeds the ANSD (also a national system), RESIMAO (a regional system) and FAO, WB, WFP (international systems) databases. DAPSA is the main provider of data to ANSD and FAO systems, and the ANSD further feeds to the UN Comtrade with trades indices, imports and exports across Senegal.

Weaknesses

Information on thematic and sub-thematic areas of commodity stock and input price, plant health, cost of animal diseases, and socio-economic and sectorial risk of endemic and emerging diseases are the weakest (see the scores in Table 6.2) for agricultural risk management purposes in Senegal. This indicates that the information systems in Senegal are not without flaws.

Restricted access information: Pursuant to legislation on information confidentiality in Senegal, some national systems are reluctant to give access to relevant information. For instance, ANACIM does not offer complete on-line information on meteorological and climate data series, even though some climate data can be obtained under strict request from research/academic institutions. Data on commodity stock and prices of food reserves from CSA and CSE are also considered as legally confidential, denying public access to the data and associated bulletins/reports. Alternative sources like ANSD have hardly had their websites to work properly, continually making it difficult to access market/trade and climate related risk information.

Historical data and up-to-date information: DPV which is a well-established plant health information system does not have any structured systems to collect and disseminate historical data on plant pests and diseases, yields losses and costs of infection. Data series for plant production and yields information on ANSD website covers a very few number of years without much historical insights. Even, the available data are not disaggregated to allow proper risk assessment and management. While ANACIM offers climate data, its meteorological stations are very few with limited geographical coverages, especially across the eastern part of Senegal.

Missing information: The Government of Senegal has piloted different socio-economic risk reduction initiatives including the National Agricultural Insurance Company of Senegal (CNAAS) and national agricultural warning systems but no systematic information about some of these projects exists on the websites of both ANSD and DAPSA who are noted for socio-economic data and information services. The assessment of national systems for foreign trade is rather poor while that for animal health – livestock, production, prices, demand and diseases – is also deficient from some national information sources like the ANSD and Ministry of Livestock (Ministère de l'Élevage et des Productions Animales (MEPA) in French). This constrains risk analysis on cost of animal health reduction and diseases.

The way forward

Build complete form of data for risk analysis: Historical and well-up-dated data are crucial for long-term risk analysis. The national information systems lacking long-term data series should initiate systems to build on data that span from over 30 to the most current year. They should make regional information systems as their main sources of reference. For instance, like AGRHYMET for historical climate data and RESIMAO for complete market/trade related information. Professionals and institutions with long-term experiences should also be included as the main point source of information on related thematic areas.

Provide friendly regulations on data confidentiality to allow for both private and public information dissemination agencies to access and render relevant information for agricultural risk management. Enforcements should be purely public-private partnership oriented and be guided by terms and conditions to prevent partners from

utilizing the information in ways that may threaten the source agencies.

Improve data and information dissemination systems: While internet and mobile phone services in Senegal are noted for better penetration, the websites of some national systems do not work properly and not every small-holder farmer gets access to SMS services of private systems like the Manobi. There should be a strengthening framework to enable the communication technology providers to render internet services to specific standards. Private investors like Manobi should also be given more enticements to allow them to extend services to all areas and every farmer in Senegal.

Table 6.2: Scores for information on thematic & sub thematic areas of ARM in Senegal

Strongest information areas (%)		Weakest information areas (%)	
Satellite image	78	Commodity stock & inputs	10
Prices	75	Plant health	25
Soil	70	Cost of animal diseases	45
Trade	70	Socio-economic & sectorial	50
Communications	70	Risk of endemics and emerging disease	55
Meteorology & climate	60	Policies	55
Production levels & yields	60		

Source: PARM IS-ARM Report, Senegal (2016).

7. Uganda



Key messages

- Many risks including crop pests and disease and post-harvest losses affect the agricultural livelihoods in Uganda. Efforts to manage them are constrained by limited access to agricultural risk management information.
- National information systems like UBOS¹, UNMA², MAAIF³, Infotrade Uganda and FARMIS⁴ provide comprehensive and disaggregated information for proper agricultural risk management in areas of commodity prices and trade.
- However, there are cases of poor representation, insufficient access and lack of historical data on plant health (crop pests and diseases), soils, commodity stock level and inputs availability, and animal disease and endemics.
- Building human and financial resources for data collection, public-private partnership for investment in access to information, and a review of historical information/data is required to improve information for agricultural risk management

Context

Effective management of agricultural risks requires increased availability, accessibility and reliability of information on diverse thematic areas of risks (see table 7.1). In this policy brief, the strengths and weaknesses of the information systems identified for agricultural risk management in Uganda are presented, followed by a sets of recommendations.

Managing risks in agriculture involves seeking avenues and information to identify the opportunities and threats affecting farmers, both on-farm and off-farm. **The PARM Risk Assessment Study (RAS) for Uganda** conducted in 2015 identified crop pest and diseases such as coffee wilt disease (CWD) and banana xanthomonas wilt (BXW), and livestock pest and disease like Newcastle disease and helminth infections as the major risk for farmers. Other risks noted among the top four include crop price volatility and post-harvest loss. Pest and disease attacks are causing frequent crop failures and livestock death. The average estimated crop loss due to pest and diseases is about 10-20% during pre-harvest and 20-30% at post-harvest. Losses are as high as 90% for perishable horticultural crops. In addition, price fluctuations and post-harvest losses due to poor storage reduce earnings from farm investments. These rampant consequences are as a result of limited risk information services in Uganda.

Existing information sources and information systems

The information systems identified for the seven thematic areas of agricultural risk management in Uganda are indicated in Table 7.1. Some information systems deliver information on a single thematic area of agricultural risk management. They include Infotrade Uganda for commodity price and market information, Ministry of Health (MoH) for animal and human health information, and Bank of Uganda (BOU) for policy information on finance and income. Others such as UBOS, MAAIF, UCDA⁵ and UNMA offer integrated information on two or more thematic areas.

1 Uganda Bureau of Statistics (UBOS).

2 Uganda National Meteorological Agency (UNMA).

3 Ministry of Agriculture, Animal Industry and Fisheries (MAAIF).

4 Farm Record Management System (FARMIS).

5 Uganda Coffee Development Authority (UCDA).



The UBOS for instance is a semi-autonomous public body, which supervises and coordinates national statistical systems in Uganda. It has ample information on thematic areas such as trade, production levels, animal and human health and some socio-economic indicators like households' income, poverty trends and access to social services within the context of Uganda. Another important national information system in Uganda is the UNMA, a semi-autonomous department under the Ministry of Water and Environment. It establishes and maintains information on the conditions of climate in Uganda, which is useful for managing risk relating to meteorology and satellite image thematic areas. Both UBOS and UNMA have related risk information published on their websites, which requires farmers and stakeholders to have internet service for access. More to this, some weather data from the UNMA can only be accessed upon request, and FARMIS also requires payment of a fee.

Table 7.1: Information systems for thematic areas of agricultural risk management in Uganda

Type of information systems	Thematic areas of agricultural risk management						
	Meteorology, climate & soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National	UNMA UBOS	UNMA	UBOS Infotrade Uganda FARMIS AgriNet Uganda UCDA UNADA	MAAIF UBOS UCDA	MAAIF UBOS MoH	MAAIF DEWS BOU	UBOS
Regional	ACMAD IGAD – ICPAC MESA-IGAD	AARSE RCMRD	RATIN AfDB Farmgain Africa AFO AMITSA UNECA	AU-IAPSC IPPC AfDB ASARECA COMESTAT AfricaRice	AU-IBAR WHO-Regional Office for Africa	FEWS NET HDE	AfDB
International	CRED – IDD FAO-Aquastat WB – CCKP ESDAC ISRIC GYGA	NASA ESA USGS CGIAR – CSI RSAC Terra Remote Sensing	GIEWS-FAO WFP-VAM FEWS NET FAOSTAT	CountryStat-FAO FAO-crop calendar GYGA Plantwise	FAOSTAT OIE WHO-HSIS EMPRES IAEA USAID	GIEWS-FAO FEWSNET WFP WB	WB

Source: PARM IS-ARM Report, Uganda (2016).

These information systems were identified during the Information Systems for Agricultural Risk Management Study in Uganda finalised by PARM in October 2016. The classification of information systems are based on geographical scope or scale of information (national, regional and international).

Strengths

The most important national information systems in Uganda include both public and private initiatives such as FARMIS, UCDA, RATIN⁶, Infotrade, UNMA, UNADA⁷, UBOS and MAAIF. They provide significant information that allows for proper agricultural risk management on thematic and sub-thematic areas of commodity price, satellite image, policy, meteorology and climate, and trade in Uganda (see Table 7.2 for the score). The information gathered and delivered are:

Regular and comprehensive information: A wide range of agrometeorological and weather bulletins are available at the UNMA's website on daily to monthly basis. Seasonal forecasts are also provided at the beginning of every rainy season. In relation to trade information, the UBOS has a complete survey data and report on monthly informal cross border trading activities in Uganda. Farmgain and Infotrade also provide recent information on prices of about 46 major agricultural commodities and inputs in 23 central markets.

⁶ Regional Agricultural Trade Intelligence Network (RATIN).

⁷ Uganda National Agro-Input Dealers Association (UNADA).

Disaggregated data at local-level: The MAAIF collaborates with Plantwise in efforts to diagnose, generate and disseminate district as well as community level data on plant pest and diseases. Information on socio-economic themes gathered through the UBOS surveys are reported at household level, making it possible to get a clear picture of individual farmer-level situations.

First-hand source of data for regional and international information systems: Information from the national information systems such as UBOS and InfoTrade are the main inputs into the systems of credible regional and international information sources like RATIN, GEWS-FAO, FEWS-NET and WFP-VAM. This help to prevent duplication of information on various agricultural risk themes.

Table 7.2: Scores for information on thematic & sub thematic areas of ARM in Uganda

Strongest information areas (%)		Weakest information areas (%)	
Prices	90	Plant health	30
Satellite images	85	Soils	36
Policies	74	Stocks and inputs availability	40
Trade	70	Costs of Animal diseases	50
Meteorological and Climate	70	Production and yields	50
Socio-economic & sectorial	62		
Communications	61		
Risks of endemics & emerging diseases	60		

Source: PARM IS-ARM Report, Uganda (2016).

Weaknesses

In some cases, information on thematic and sub-thematic areas such as plant health (crop pests and diseases), soils, commodity stock level and inputs availability, production levels and yield, and animal disease and endemics are recorded not to be sufficient (see Table 7.2 for the scores) for agricultural risk management purposes in Uganda due to:

Insufficient access to information for stakeholders: Remote sensing data available at UNMA's website and commodity price information generated by the FARMIS are only available on-line. Limited internet connection in Uganda restrains access to these services. In some cases (like detailed information on prices by FARMIS and Farmgain) there is not free/open access to the information: access comes with a cost of a fee. Smallholder farmers may not be able or willing to pay for information.

Poor representation of information: ESDAC and ISRIC are the only available soil information system in Uganda. But their databases of soil profiles show insufficient information on Uganda. The ISRIC database presents only 13 soil profiles for Uganda, which are not enough for soil erosion and soil water management risk monitoring. In addition, very few of the weather and climate observation stations of UNMA are in service. This limits the spatial coverages for extensive climate risk analysis in Uganda.

Limited up-to-date information: Some of the most relevant national information systems such as UBOS and MAAIF provide good information services on various risk management themes, through census and surveys reports but the data are usually outdated. The latest MAAIF pest data was generated three years ago, in 2013/2014. Also, the UBOS data on socio-economic aspects of farmers' livelihoods are not updated on time. None of the information systems provide data on market of commodity stock and input.



Insufficient historical information: Not all the national information sources have relevant historical data that allow for robust risk analysis on agricultural systems. Historical data on production and yields of important commodities like coffee is not available on the UCDA's website. There is an initiative under the Plantwise programme to collect and share plant health information but no historical data exists on pests and diseases that affect crops. This hinders crop health trend and variability analysis for effective risk monitoring and management.

The way forward

Build human and financial resources for regular data collection and extensive coverage of useful risk related information. The government of Uganda and its private partners should invest adequate resources to hire and train more extension officers that are capable of identifying, gathering and analyzing different range of information useful for agricultural risk management. Highest priority should be placed on thematic areas with the weakest information systems such as plant health (crop pests and diseases), soils, commodity stock and input market, production levels and animal diseases information.

Negotiate for public-private partnerships for improved access to information, especially in remote rural areas. The Ministry of Agriculture, Animal Industry and Fisheries should undertake persuasive discussions with multinationals and local communication firms on the need for investment in ICT packages and internet services in rural areas. Negotiations should be incentivized to induce the investors to render quicker and cheaper communication services that will enable smallholder farmers to access all forms of risk-related information.

Initiate a national system to review historical data to provide long time series and geographically disaggregated information on production and yields, commodity stock, and pest and disease risks. Regional and international food balance sheets should be an important starting point.

Develop a system of coordination among all the national information systems. The focus of the coordination should be directed to increasing credibility, reducing duplication and cost associated with disseminating agricultural risk information.



8. Comparative IS-ARM

8.1. Key Messages from a study on Cabo Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda

- Information remains the key agricultural risk management (ARM) decision making tool for farmers, governments and investors. The detail of information and accessibility needs for ARM are particularly demanding.
- Three levels of information systems (National, Regional and International) and seven thematic blocks have been analysed in this study.
- Information systems in the seven countries present weak information for agricultural risk management on all the thematic/sub-thematic areas except Price, Satellite image and Trade. Information on animal and plant health is the weakest across all countries.
- Ethiopia is the only country with good information on almost all the thematic areas but it has very weak communication and poor information accessibility scores.
- Improved IS-ARM in most countries requires; specialisation of expertise, increase focus on length/continuity, stimulation of private sector services and public-private partnerships, and enhanced data/information disaggregation.

8.2. Context

Information is the key input for risk management in any area of activity. In the agricultural sector, appropriate information is required to facilitate farmers' production and marketing decisions, and to manage the corresponding risks. For instance, access to time series data/information on production and input/commodity markets helps a farmer decide where and when to buy inputs or sell produce to make the optimum benefit. It also provides a tool for assessing how prices, production and yields are performing or affected by hazards. Reliable information is crucial for governments and the private investors: It enables them to design pro-active policies and strategies, and invest in low-cost solutions to respond to the needs of smallholder farmers. Guaranteeing same access to information by all stakeholders facilitates risk transfer and ARM coordination of responsibilities.

Having recognised the importance of information for risk management, the Platform for Agricultural Risk Management (PARM) in October 2016 finalised a study that assessed Information Systems for Agricultural Risk Management (IS-ARM) in seven Sub-Saharan African countries conducted by the CEIGRAM/VISAVET, two research centres from Madrid Universities. The assessment focused on information for seven ARM thematic areas (Table 1): meteorology, climate and soils; satellite image and communications; price of commodities, inputs and market; production level, yield and plant health; animal and human health; policy; and socio-economic and sectorial.

The quality of information systems for each ARM thematic area in the seven PARM countries was assessed on a range of scores from 0 to 100. Low values (≤ 40) mean that the information system is weak and allows only **poor assessment of risks**, medium values (41-69) indicate potential for basic preliminary risk assessments, and high values (≥ 70) portray information systems allowing for good **risk assessments**. This policy brief relies on the PARM IS-ARM comparative report to present the types of information available for agricultural risk management in PARM countries and outlines the profile of each country. In addition, it puts forward policy lessons to improve information systems for proper agricultural sector risk management.

Table 8.1: Average scores for information on thematic and sub-areas of ARM in PARM Countries

Good/Proper risk management areas ($\geq 70\%$)		Average/Preliminary risk management areas (69-41%)		Poor risk management areas ($\leq 40\%$)	
Prices	81	Production levels and yields	64	Plant health	26
Satellite image	77	Soils	64	Commodity stocks & inputs	33
Trade	71	Meteorological & climate	62		
		Policies	56		
		Risks of endemic & emerging diseases	55		
		Costs of animal diseases	52		
		Communications	53		
		Socio-economic & sectorial	49		

Source: (PARM IS-ARM Comparative Report, 2016).

The table depicts scores for each of the thematic and sub-thematic blocks of agricultural risk management across the PARM countries. It was based on the assessment from a study finalised by PARM in October 2016. The score were assessed on a range from 0 to 100% and the indications for the values are given in the table.

8.3. Information systems in PARM countries

Information systems are systematic and continued forms of information managed and delivered by public, mixed or privately based institutions. We can distinguish between three types of information systems; national, regional and international systems (Table 2). National information systems are maintained by government established statistical/research institutions such as EIAR¹ in Ethiopia, UBOS² in Uganda, and DMN³ in Cameroon and Niger. Privately-based agencies such as Manobi in Senegal, INFOTRADE and FARMIS⁴ in Uganda also manage and deliver relevant information for rural agricultural households. Regional and international information systems on the other hand are led by multilateral agencies. For instance, the FAOSTAT⁵ and GIEWS⁶ services, the WFP-VAM⁷ portal and the World Bank and AfDB⁸ knowledge hubs maintain key information on agricultural risks in Africa.

Some of the information systems focus on a single thematic area of agricultural risk management. For example, the Manobi and FARMIS information systems provide commodity/input market information services, and the DMN manages meteorology/climate information. Many Information systems like EIAR, UBOS, FAOSTAT, WFP-VAM and AfDB provide information on two or more thematic areas of risk management. For example, the EIAR conducts researches across major agro-ecological zones of Ethiopia and it maintains information on climate, prices/market, production/yield, policy and socio-economic thematic areas. The AfDB has a regional information system on both commodity stock/input and production levels/yields. FAOSTAT and WFP-VAM maintain international information on all the seven thematic areas of agricultural risk management in the PARM countries.

1 Ethiopia Institute of Agricultural Research (EIAR).

2 Uganda Bureau of Statistics (UBOS).

3 Direction de la Météorologie Nationale (DMN), Cameroun.

4 Farm Record Management System (FARMIS), Uganda.

5 Food and Agriculture Organization of the United Nations (FAO) Statistics.

6 Global Information and Early Warning System (GIEWS) of FAO.

7 World Food Programme-Vulnerability Analysis and Mapping (WFP-VAM).

8 African Development Bank (AfDB).

Table 8.2: Information systems for the thematic and sub-thematic areas of ARM in the seven Countries

Type of information system	Thematic and sub-thematic areas of agricultural risk management						
	Meteorology, Climate & Soils	Satellite image & communications	Prices of commodity, input & market	Production levels, yields & plant health	Animal & human health	Policy	Socio-economic & sectorial
National Systems	UNMA, UBOS, EIAR & DMN	UNMA, MINADER, CSE, SNPC, MASA	UBOS, Infotrade, FARMIS, EIAR, Manobi, MINADER,	UBOS, EIAR, MINADER, MASA	UBOS	BOU, EIAR, SAP, BCV,	UBOS, EIAR
Regional systems	ACMAD, IGAD – ICPAC, MESA-IGAD, AGRHYMET & SADC	AARSE, RCMRD & AGRHYMET	RATIN, AfDB, Farmgain Africa, AFO, AMITSA, UNECA, RESOMAO, CILSS	AU-IAPSC, IPPC, AfDB, ASARECA, COMESTAT, AfricaRice, WHO–Africa, eRAIL, AGRHYMET & SADC	AU-IBAR, WHO-Africa, WB, DLCO-EA & RustTracker	FEWS-NET, HDE, BCEAO, ARC, SPAIF	AfDB, SIPSA
International systems	CRED-IDD, FAO-Aquastat, WB – CCKP, ESDAC, ISRIC, GYGA & WB-CCKP	NASA, ESA, USGS, CGIAR-COI, SOS Sahel, UN (Spider), Terra Remote Sensing, ICARDA & RSAC	GIEWS-FAO, WFP-VAM, FEWS NET, FAOSTAT, USDA, FAOSTAT, USDA & UN Comtrade	CountryStat-FAO, FAO-crop calendar, Plantwise, GYGA & ICCO	Factfish, FAOSTAT, OIE, WHO-HSIS, EMPRESS, IAEA, USAID, WB & CDC	GIEWS-FAO, FEWS NET, WFP, WB, IPC, HDE, HDX & FAO	WB

Source: (PARM Construct, 2016).

The above table is constructed based on IS-ARM 2016 report for each PARM Country. It presents samples of the national, regional and international information systems across the seven PARM countries.

8.4. Information for agricultural risk analysis

The identified information systems in PARM countries offer diversity of information, but it is essential to know the extent to which the availability and accessibility of information can support effective agricultural risk analysis. Table 1 shows results from the IS-ARM comparative assessment report for PARM countries.

The information on Price, Satellite image and Trade is good for agricultural risk analysis. The databases and websites of national information systems like EIAR in Ethiopia, SIMA and Infotrade, both in Uganda, and Manobi in Senegal provide real time series information on the price of many commodities/inputs across major local markets. In some PARM countries like Ethiopia, Cameroon and Cabo Verde, the national systems are connected and provide well-monitored trade information for a long-time frame. With regard to satellite image information, there exists a good combination of private, public, national as well as many regional and international systems with images and calculated indexes for climate variables and vegetation in all the PARM countries.

While the information on the three thematic areas has potential for good risk analysis, access to satellite information is not offered free of charge, and not all satellite images can be printed or downloaded. In addition, price and trade data in Senegal and Cameroon are considered strictly confidential, and there is hardly any reliable input price and animal trade information in Uganda and Niger.

There is only basic or preliminary information for agricultural risk management analysis on the following risk thematic areas: Production levels and yields, Soils, Meteorological & climate, Policies, Risks of endemic & emerging diseases, Costs of animal diseases, Communications, Socio-economic & sectorial. All PARM countries have national statistical information sources that conduct extensive surveys and collect wide range of data for production levels/yields, socio-economic and policy related information. But the output and yield information is usually not well-disaggregated, unorganised and rarely up-dated. In most cases, the output information also lacks adequate historical length for a rigorous risk analysis. Regional/international systems are noted for census/data on soils, animal diseases and endemics but they produce information from narrow sets of local indicators with shallow monitoring and control activities.

In the areas of meteorology/climate information systems the UNMA in Uganda and NMA in Ethiopia provide daily to monthly weather forecasts recorded from many observatory stations across the country. However, in the case

of ANACIM in Senegal, limited coverages are recorded throughout the eastern part of the country, while DMN in Niger has many missing data on humidity, wind speed and solar radiation.

Across the PARM countries there is a prospect for increased access to agricultural risk information due to the doubling effects of mobile phone penetration and internet services over the past few years. Notwithstanding, there are bottlenecks to access information either online or through private-initiated SMSs due to the high cost of service and weak internet systems. In some cases, like in Niger, radio and TV dissemination channels are very poor.

There is poor information for agricultural risk management analysis on two thematic/sub areas – Plant health and Commodity stock/inputs availability. Even though Cabo Verde and Ethiopia have national institutions to manage commodity stocks for food security and price stabilisation purposes, none of the PARM countries has comprehensive information on commodity stock/input availability. Information is poorly developed without any disaggregation for farmer-level risk analysis. In terms of plant health, some information exists for a limited number of crops in Ethiopia and Cameroon. Other countries rely on regional and international systems like the Plantwise initiative, WHO and AU-IBAR but these sources lack historical series and country-specific insights even though efforts are underway to implement country-specific plant pest information systems. In most cases, monitoring and surveillance are conducted through virtual tracking.

8.5. Available information across PARM countries

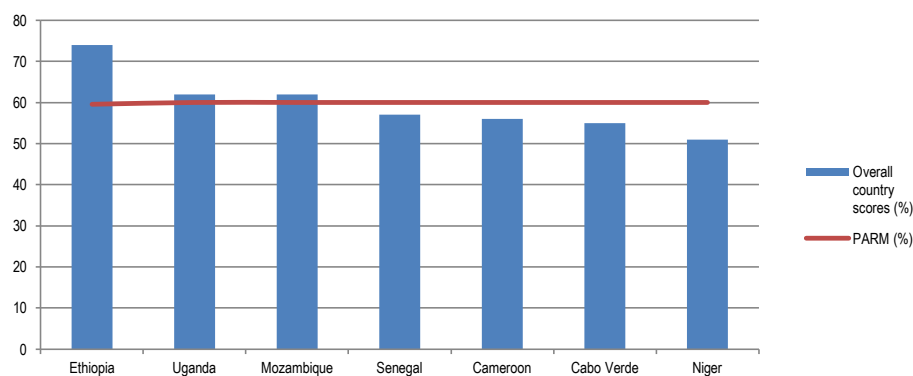
Figure 8.1 depicts the average country scores on information systems for agricultural risk management. The overall PARM average is 60% which denotes potential for **preliminary/average but not good agricultural risk analysis**. Ethiopia ranks the highest with a score (74%) **above PARM average**. Uganda and Mozambique score within average (both 62%), whilst Senegal (57%), Cameroon (56%), Cabo Verde (55%) and Niger (51%) are below average.

Ethiopia has **very good** information systems for all the thematic areas of agricultural risk except on communication and plant health. Even though information is sometimes not disaggregated at the household level, the national systems in Ethiopia have a mushrooming of affiliated centres such as the EIAR researching on critical risk areas such as meteorological/climate, price/market and commodity stock. They are also connected to one another (for instance ECX, LINKS and EGTE), which allows for complete monitoring of related risk information.

Uganda and Mozambique have **good** overall information for agricultural risk management. Both countries have good information systems on satellite images, prices, trade and policy. However, there are limited historical, up-to-date and comprehensive information on commodity stock and plant health thematic areas, due to the insufficiency of technical personnel and financial resource in both countries.

Senegal, Cameroon, Cabo Verde and Niger are the countries with overall **weakest information systems** for agricultural risk management. These countries have poor records of information on most of the thematic areas including, plant health, cost of emerging diseases, risks of endemics policies and socio-economic.

Figure 8.1: Average IS-ARM score for the seven PARM countries (100=max. score)

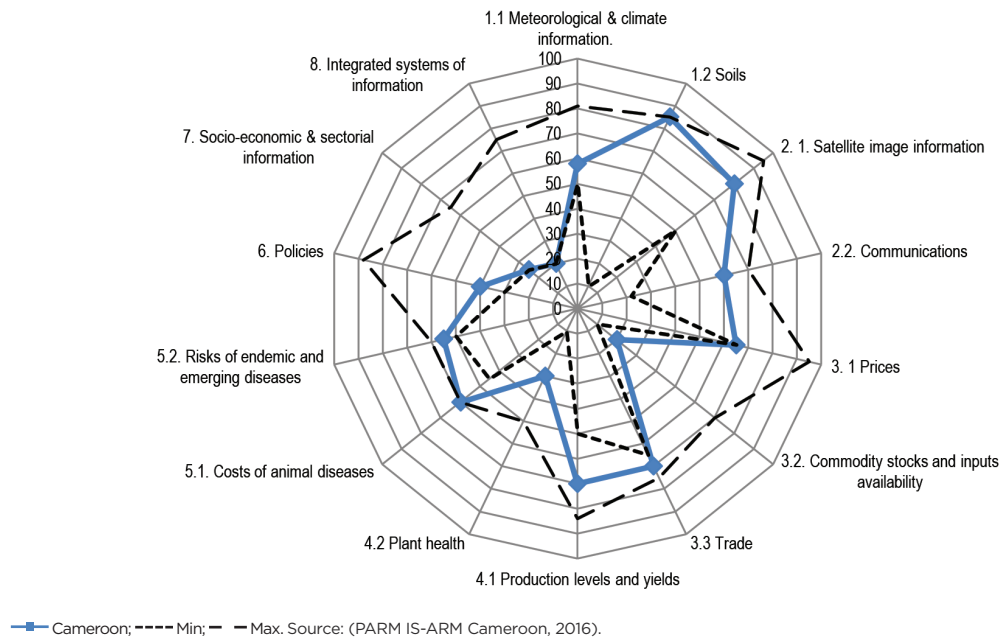


Source: (PARM IS-ARM Comparative Report, 2016).

8.6. Highlights from each PARM country

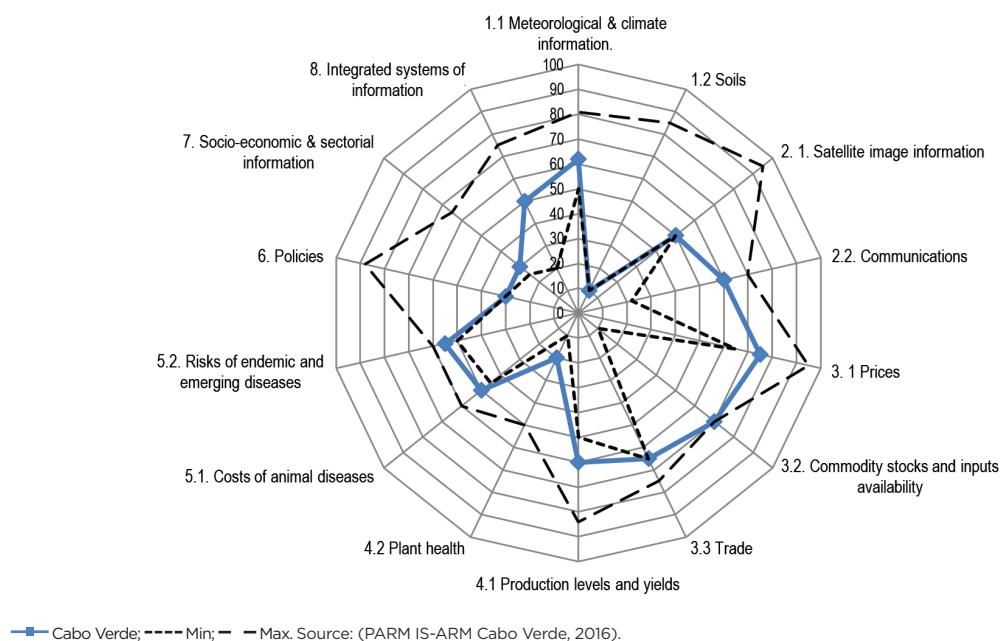
Cameroon has good information systems across some thematic areas but not on commodity stock/input, socio-economic and plant health (Figure 8.2). Mobile phone penetration is higher than in the other countries, thus a potential for increasing access to information for rural farmers.

Figure 8.2: IS scores for the thematic and sub-thematic blocks of ARM in Cameroon.



Cabo Verde is a country with fairly good environment for information communication. However, there is no national information on soils. Not much and well-disaggregated information on plant health, policy and socio-economic aspects of farmers livelihoods exists either (Figure 8.3).

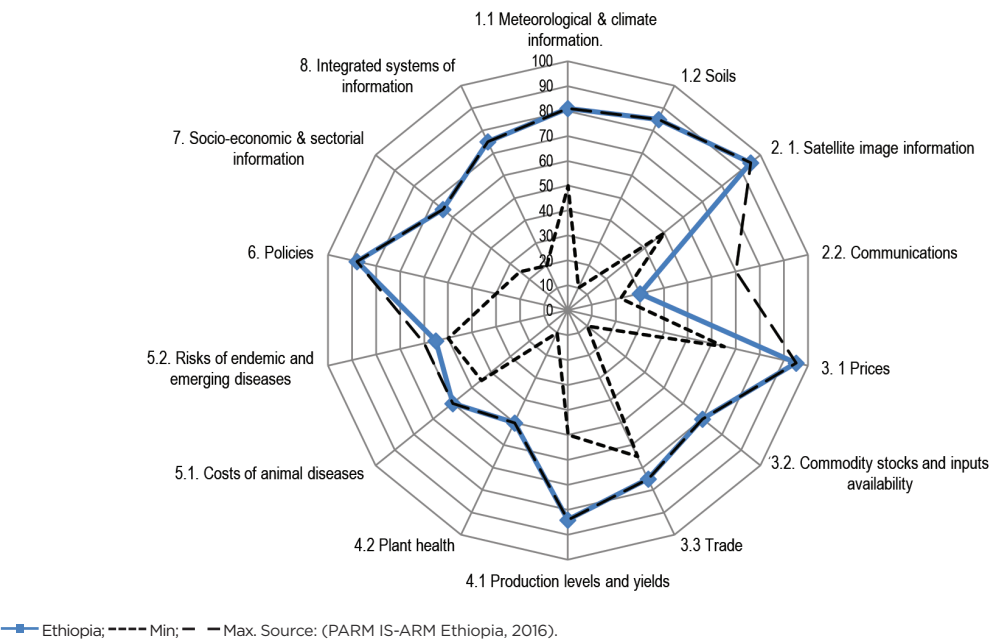
Figure 8.3: IS scores for the thematic and sub-thematic blocks of ARM in Cabo Verde.





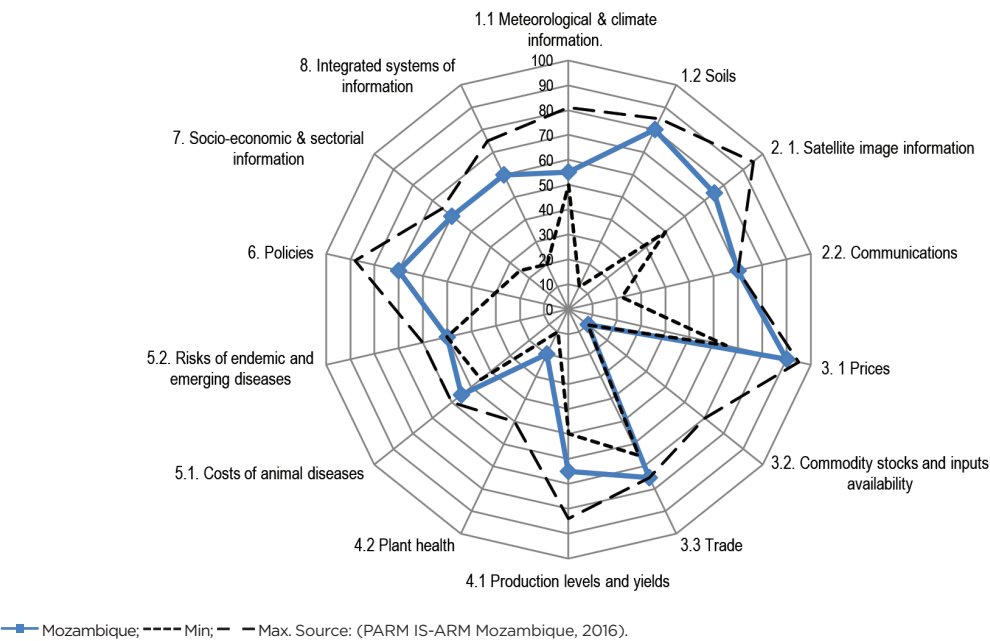
Ethiopia has numerous national information systems delivering very good information across the thematic areas (Figure 8.4). But the available information on plant and animal health control is weak due to unclear indicators used in defining context. Limited mobile penetration and lack of efficient internet services are also limiting the accessibility of information to smallholder farmers.

Figure 8.4: IS scores for the thematic and sub-thematic blocks of ARM in Ethiopia



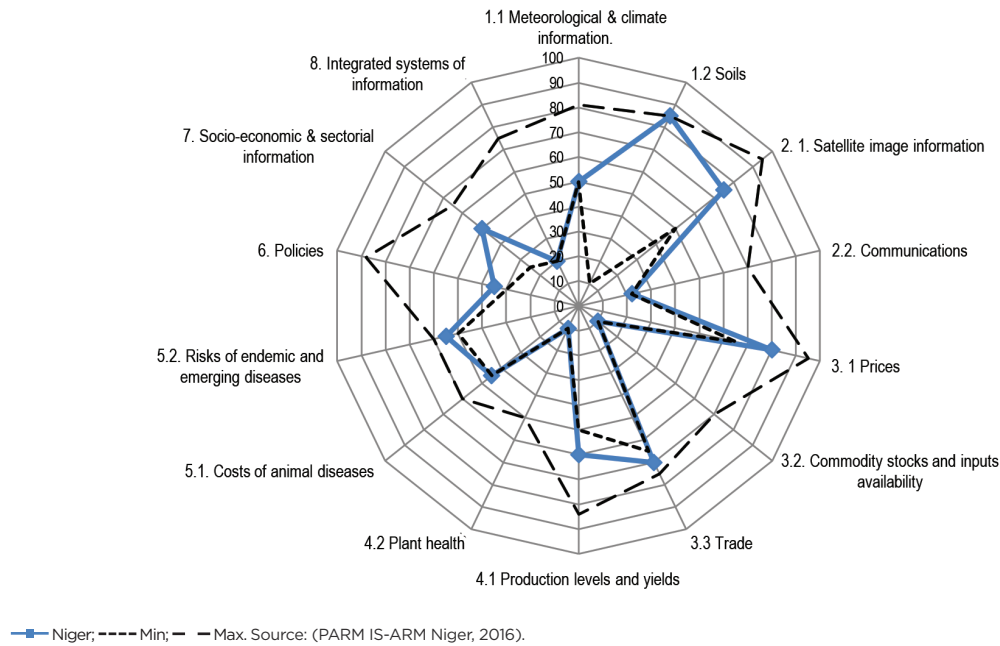
Mozambique is characterized with diversified information systems from national, regional and international sources and fairly good information across most of the thematic areas of risk (Figure 8.5). However, data on plant health is not disaggregated for farmer-level analysis, and information on commodity stock/inputs is only available for cotton.

Figure 8.5: IS scores for the thematic and sub-thematic blocks of ARM in Mozambique.



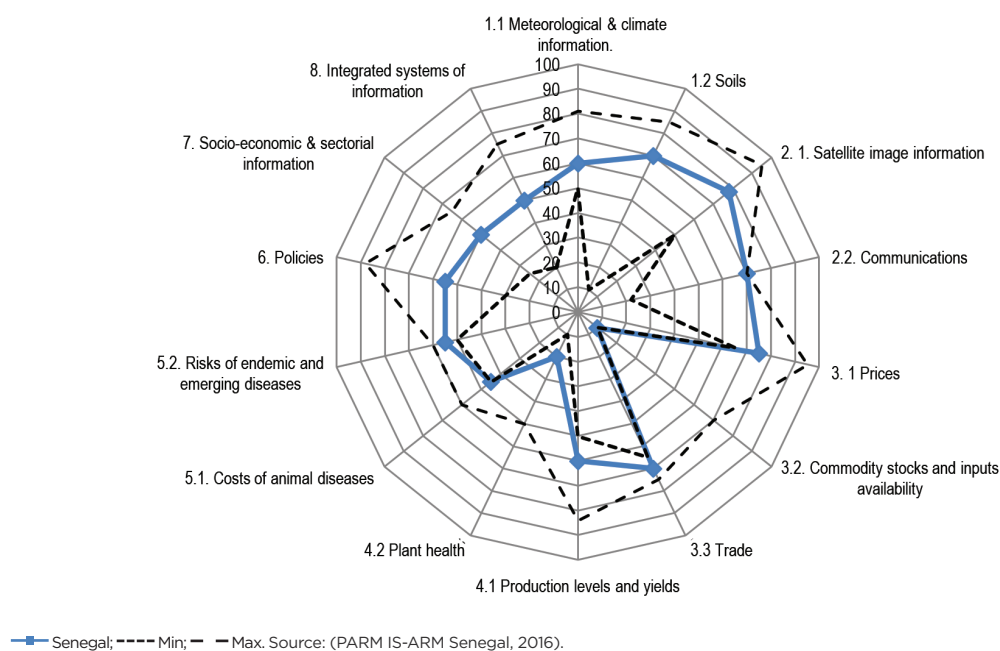
Niger has the weakest information dissemination rate among the PARM countries. No national system on satellite image information exist and communication through broadcast (TV & Radio) and social (phone & text-based) media are also very weak. Access to existing information on thematic areas of commodity stock/input, plant health, animal diseases and policy is very poor (Figure 8.6).

Figure 8.6: IS scores for the thematic and sub-thematic blocks of ARM in Niger.



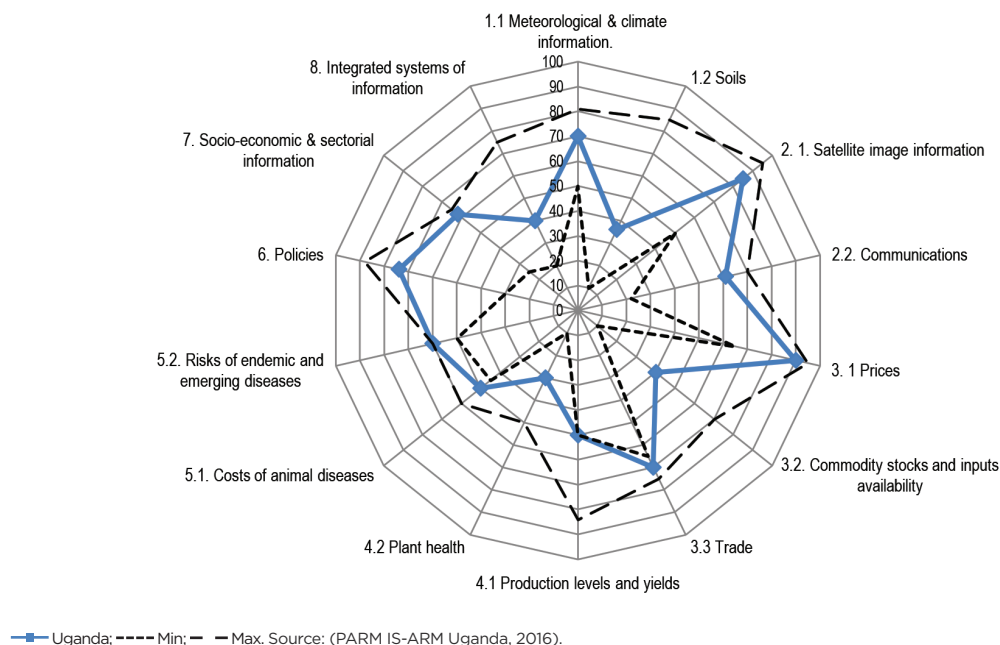
Senegal has well-developed private national information systems such as the Manobi who are making information accessible poor farmers. But legal issues of data confidentiality makes it difficult to securing information on commodity stock, plant health and animal diseases from relevant national sources.

Figure 8.7: IS scores for the thematic and sub-thematic blocks of ARM in Senegal.



Uganda has very good information on prices of commodities and satellite image but not on plant health and soils (Figure 8.8). Farmgain and Infotrade are among the most important systems providing information on prices of over 46 commodities in about 23 major markets. Plantwise is launching an initiative to map relevant plant pests and diseases information for future risk analysis.

Figure 8.8: IS scores for the thematic and sub-thematic blocks of ARM in Uganda.



8.7. Policy recommendations

Overall information systems in the seven PARM countries have poor information on commodity stock/input, plant health and animal diseases. Investments are required for an improvement in these areas for agricultural risk management.

Specialise in core professional areas of expertise within the legal mandate of information systems: Most often, it is better to have fewer information systems focusing on narrower topics or areas with trustworthy and relevant data than wider and more superficial ones addressing many topics without sufficient length, relevance or continuity. Detailed information is critical for rigorous risk analysis.

Increase focus on the length of time series and the continuity in reporting values that are essential for risk assessment and analysis. Where possible, information should be accompanied by technical notes describing the most important methodological, quality check procedures and sampling aspects. In several countries and information blocks, the series are discontinued or provided for a limited period of time, only useful to inform and alert for an event or situation, but not for ex-ante risk analysis. Historical and long-term series information should be prioritized to enhance management strategies for projected risks.

Stimulate private-based initiatives on information systems and provide adequate regulative protection. There is potential to promote private organizations providing risk information to smallholder farmers. In most countries mainly public organisations collect data from public statistical agencies. Where possible, there should be public-private partnerships to improve access to valuable on-demand information to private individuals who are seeking to invest in agricultural and demand risk management information.

Enhance the level of information disaggregation. Data should be disaggregated at the most basic level of analysis, for instance at household production level and agro-ecological zones. This would allow for better analysis of risks situation to improve smallholder farmers' livelihoods.





Appendices

AP.1. The full benchmark

Thematic Block 1: Meteorological and climate information

Climate and weather, and soil information play a crucial role in national development planning and, for that reason, there is a demand to develop and apply improved climate information data, predictions -including weather forecasts-, and outlooks for decision making for sustainable development. Where possible climate predictions and projections are transformed into support tools for adaptation and mitigation within weather-related risk management.

Indicators on agro-climatic risks are mainly related to historical trends in temperature and rainfall. In some of the countries included in this project, greater frequency and intensity of intra-seasonal rainfall distribution may be occurring and causing more frequent false starts and early cessation of rainy seasons. Furthermore, decreasing diurnal temperature range has been noted in some countries.

Climate-smart crop management practices need to be embedded in within-season and inter-annual monitoring for development of early warning systems. Soil management is at the base of system sustainability in Africa and must be improved, hence the need for detailed descriptions and associated chemical and physical analyses of soil profiles. High-quality local climate data and crop/soil management information are necessary for studies linked to best practices in regional early warning systems for resilience; in addition this data base is necessary for building a Yield Gap Atlas (already on-going in parts of Africa) to establish productivity benchmarks.

Yield Gap Atlas or GYGA (<http://www.yieldgap.org/>) is an international initiative that aims at global coverage of yield gaps for all major food crops and countries that produce them. Various countries of Sub-Saharan Africa are currently participating - Burkina Faso, Ghana, Mali, Niger, Nigeria, Ethiopia, Kenya, Tanzania, Uganda, and Zambia.

Estimation of individual and combined near-future effects of changes in temperature and rainfall regimes on crop water demand, biomass, crop phenology, yields and crop failure, as well as interactions with crop and animal health, should be evaluated qualitatively and quantitatively. These are linked to most Blocks below.

The primary data required are shown as “desirable or optimum” and also as “minimum” data sets. Missing data, relative to these requirements identify limitations that may invalidate attempts at risk assessment.

Table AP1.1: Benchmark for meteorological and climate information (Block 1)

Sub-blocks	Reference Threshold *	Desirable threshold *	Potential Sources
1.1 Climate	Weather forecast (standard web) 3 days	Weather forecast (standard web) 3 to 7 days forecasts	INSTITUTIONS (INTERNATIONAL, REGIONAL AND NATIONAL)
	Temperature (Tmax, Tmin)	Temperature (diurnal, Tmax, Tmin)	- World Meteorological Organization –WMO - Scidev.net
	Precipitation (daily mm)	Precipitation (daily mm)	- Agrhymet Regional Centre - National Meteorological Agency.
	The missing daily solar radiation, wind speed and relative humidity can be partly estimated from cloud cover or NASA's Prediction of Worldwide Energy Resource (POWER) data (http:// power. larc.nasa. gov/). Furthermore radar generated data.	Solar radiation (daily MJ/m ² day)	- Ministry of Agriculture and/or Environment. - Ministry of Transport
	RH average	Relative humidity or vapour pressure Deficit (RHmax, RHmin, %; VPD: kPa or mbar)	PRIVATE COMPANIES Agricultural Service Co Ex: <i>Infotrade</i>
	Wind speed qualitative	Wind speed daily (km/day) Wind direction	UNIVERSITIES AND RESEARCH CENTRES - Incl. Centre for Research on the Epidemiology of Disaster-CRED - Schools of agriculture
	Rainfall daily (mm)	Rainfall intensity (mm/h) or peak rainfall (hours)	SCIENTIFIC JOURNALS, PROCEEDINGS, PhD THESES
	Tmax; Tmin	Tmax; Tmin	
	Wind (km/day)	Wind gusts (velocity and direction)	
	Specific extreme events (**)	Specific extreme events (**)	(...)



(...) Sub-blocks	Reference Threshold *	Desirable threshold *	Potential Sources
1.2 Soil	Soil types	Soil types	INSTITUTIONS - ISRIC-World Soil information - FAO - Institutes of cartography - Extension services
	Representative soil profiles: depth, texture, slope	Soil profiles: depth by layers; pH, texture, organic matter or Carbon content; chemical data; slope	
	Erosion maps	Erosion (t/ha year) maps	PRIVATE COMPANIES - e.g. large production companies – mainly linked to exports
	Linked to specific soil types or soil management	Salinity (dS/m or other) Specific areas	UNIVERSITIES AND RESEARCH CENTRES Schools of agriculture RESEARCH AND DEVELOPMENT Foundations e.g.: AGRA, Bill and Melinda Gates Foundation SCIENTIFIC JOURNALS, PROCEEDINGS, PhD THESES

(*) Meteorological stations should be set in representative and uniform areas (desirable) at province or, for example at county level; the reference data set can rely on lower resolution data, and should be specified for each agroecological region within a country.

(**) Reported storms, floods, droughts, volcanic events, dust storms.

Thematic Block 2: Satellite image information

2.1. Sub-block Satellite image information

Sun-synchronous satellites (e.g. NOAA, Landsat, MODIS, SPOT, IKONOS, Quickbird) have several sensors recording radiation in different wavelengths that allow combination of spectral signals. Satellite remote sensing (RS) provides a unique source of data that can be exploited to characterize climate and land surface variables at different spatial resolutions. It permits the calculation of vegetation indices, land surface temperatures, atmospheric and soil moisture (Dalezios et al., 2014), rainfall indices, etc. More recently, a few have found some applications in epidemiology, the most important being the Landsat and the NOAA series. For this reason the variables selected coming from RS are several indexes related also to Production and Yield and Plant-Animal Human Health.

Table AP1.2: Benchmark for satellite image information (Block 2)

Sub-blocks	Primary data	Variables	Potential Sources
2.1. Satellite-based Earth observations information	Radiation in different wavelengths	Vegetation indices	INSTITUTIONS United Nations (UN Spider) National Aeronautics and Space Administration (NASA) European Space Agency (ESA) China National Space Administration Indian Society of Geomatics U.S. Geological Survey
	Spatial resolution and coverage		African Association of Remote Sensing of the Environment Google Earth CGIAR Consortium for Spatial Information (CGIAR – CSI)
	Radiometric resolution	Land surface temperatures	
	Spectral resolution	Atmospheric indices	PRIVATE COMPANIES Providers of satellite information and applications (e.g. Terra Remote Sensing Inc., Remote Sensing Applications Consultants Ltd., Vito nv)
	Spectral range	Soil moisture indices	RESEARCH Proceedings of International and National Congresses PhD Thesis
	Temporal coverage	Rainfall indices	
	Spatial resolution and coverage	Soil erosion indices	ACADEMIC JOURNALS International Journals (Remote Sensing, Journal of African Earth Science, Remote Sensing of Environment, Applied Earth Observation and GeoInformation, etc) National Journals (Berliner Geographische Studien, etc)

(*) The value of this information will be based on the access, use, or support to farmers, policy makers and private companies

2.2. Sub-block communication

The accessibility to all information systems also depends on the resources available on communication. These can be summarized as follows:

Table AP1.3: Benchmark for communication information (Sub-Block 2.2)

Sub-blocks	Indicator	Potential Sources
Voice & Data communication	% Mobile penetration	INSTITUTIONS FAO ICT STATISTICS World DataBank Internet World Stats RadioStationWorld ABYZ News Links
	% Fixed penetration	
	% Fixed broadband penetration	
Internet & Social Networks	% Internet Penetration	
	% Facebook Penetration	
	Number of secure Internet servers (per million)	
Broadcast news media	Number of broadcast media TV channels	
	Number of broadcast media radio channels	
	Number of broadcast media internet channels	
Other news media	Number of magazine news media	PRIVATE COMPANIES PROFESSIONAL ORGANIZATIONS
	Number of press agency news media	
	Number of local newspapers and news media	
	Number of national newspapers and news media	

Thematic Block 3: Prices of commodities, inputs, and timely access to information about markets, transportation and input availability

The traditional Market Information System (MIS) was a powerful tool to improve public policies by helping policy makers to take better account the market situation and dynamic and render markets more transparent and efficient. The modern MIS incorporates a new objective: preventing (early warning systems), managing (market risk management) and coping with extreme price volatility and price spikes of food markets (safety nets). This new objective needs the involvement of public policy makers as well as private market actors as users of MIS arising the need of public-private partnership. In that sense, the new institutional arrangements of MIS appears to be a crucial element of MIS benchmark as it shapes the priority objective of a MIS (information for policy makers or for market players) and the technical and organizational methods. The MIS Benchmark will include the following variables about the price and market information as well as some attributes of the MIS. In the next step we will translate the variables and attributes of the MIS benchmark into qualitative and quantitative indicators to define in a more concrete way the MIS benchmark.

**Table AP1.4:** Benchmark for commodity and input prices, stocks, markets and commodity trade information (Block 3)

Sub-blocks	Primary data	Variables	Reference threshold	Desirable threshold	Potential Sources
3.1 Price	Domestic Commodity Prices	1) Variables on data price available			INSTITUTIONS Ministries of Agriculture & Trade National Statistical agencies African Development Bank FAO (Faostat, countrystat, GIEWS, FPMA, AMIS) World Bank (databank) United Nations (UNECA) USAID West African Market Information System Network (RESIMAO) CIRAD IFPRI
		Coverage (prices of x% of the agricultural production value)	50% agricultural production	80% agricultural production	
		Decentralization (prices at national, regional or local level)	national	regional	
		Position (prices at different steps of the food chain)	producer	producer & consumer	
		Frequency of price collection and dissemination	monthly	weekly	
		Continuity (% of gaps within the price time series)	<10%	0%	PRIVATE ORGANIZATIONS e.g. FARMIS (infotrade)
		Length (years of price time series)	> 5 years	> 10 years	PROFESSIONAL AGRICULTURAL ORGANIZATIONS Association of African Agricultural Professionals in the Diaspora (AAPD)
		Accessibility (Open data, by request, not free...)	any	open data	PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE e.g. Ethiopia commodity exchange (ECX)
		2) Attributes of MIS			
		Institutional arrangements (institutions responsible for the MIS) *	public	public - private	RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
		Source and method for data price collection (information on how prices are collected: existing physical markets, electronic markets, informant people, etc.) **	-	-	
		Channel and method for data price dissemination ***	bulletins & radio	bulletins, radio, cell ph., other ICT	
		Diversification of services (dissemination of additional information along with price info.)	No	Yes	
Input prices		1) Variables on data price available			INSTITUTIONS Ministries of Agriculture & Trade National Statistical agencies African Development Bank FAO (Faostat, countrystat) World Bank (databank) United Nations (UNECA)
		Coverage (prices of relevant inputs)	Fertilizers	Fertilizers, seeds, energy, pesticides	
		Frequency of price collection and dissemination	every 4 months	monthly	
		Continuity (% of gaps within the price time series)	<15%	<5%	PRIVATE ORGANIZATIONS e.g. FARMIS (infotrade)
		Length (years of price time series)	> 2 years	> 5 years	PROFESSIONAL AGRICULTURAL ORGANIZATIONS e.g. Association of African Agricultural Professionals in the Diaspora (AAPD)
		Accessibility (Open data, by request, not free...)	any	open data	PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE e.g. Ethiopian coffee exchange (ECX)
		2) Attributes of MIS			
		Institutional arrangements (institutions responsible for the MIS) *	public	public - private	RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
		Source and method for data price collection (information on how prices are collected: existing physical markets, electronic markets, informant people, etc.) **	-	-	
		Channel and method for data price dissemination ***	bulletins & radio	bulletins, radio, cell ph., other ICT	

(...)



(...) Sub-blocks	Primary data	Variables	Reference threshold	Desirable threshold	Potential Sources
3.2 Market	National Commodity Stocks	1) Variables on data stocks available			INSTITUTIONS Ministries of Agriculture & Trade National Statistical agencies FAO (Faostat, countrystat, AMIS) World Bank (databank) United Nations (UNECA) West African Market Information System Network (RESIMAO)
		Coverage (stocks of the staple foods)	staple foods	staple foods	
		Frequency of stock data collection	every 4 months	monthly	
		Continuity (% of gaps within the stock time series)	<10%	0%	PRIVATE COMPANIES e.g. FARMIS (infotrade)
		Length (years of stock time series)	> 5 years	> 10 years	PROFESSIONAL AGRICULTURAL ORGANIZATIONS e.g. Association of African Agricultural Professionals in the Diaspora (AAPD)
		Accessibility (Open data, by request, not free...)	any	open data	PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE e.g. Ethiopian coffee exchange (ECX)
		2) Attributes of MIS			RESEARCH AND LITERATURE REVIEW
		Institutional arrangements (institutions responsible for the MIS) *	public	public	FAO reports World Bank reports Scientific journals
		Source and method for data stocks collection (information on how stock data are collected: informant people, warehouse, etc.) ****	-	-	
		Channel and method for data stocks dissemination ***	bulletins & radio	bulletins, radio, cell ph., other ICT	
	National Input availability	1) Variables on data stocks available			INSTITUTIONS Ministries of Agriculture & Trade National Statistical agencies FAO (Faostat, countrystat) World Bank (databank) United Nations (UNECA)
		Coverage (number and relevance of inputs coverage)	-	any	
		Frequency of stock collection and dissemination (weekly, monthly ...)	-	any	PRIVATE COMPANIES e.g. FARMIS (infotrade)
		Continuity (% of gaps within the input availability time series)	-	any	PROFESSIONAL AGRICULTURAL ORGANIZATIONS e.g. Association of African Agricultural Professionals in the Diaspora (AAPD)
		Length (years of input availability time series)	-	any	
		Accessibility (Open data, by request, not free...)	any	open data	RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
		2) Attributes of MIS			
		Institutional arrangements (institutions responsible for the MIS) *	-	any	
		Source and method for data on input availability collection **	-	any	
		Channel and method for data on input availability dissemination ***	-	any	

(...)



(...) Sub-blocks	Primary data	Variables	Reference threshold	Desirable threshold	Potential Sources
3.3 Trade	Commodity exports	1) Variables on data export available			INSTITUTIONS Ministries of Agriculture & Trade National Statistical agencies African Development Bank FAO (Faostat, countrystat) World Bank (databank) United Nations (UNECA) Agricultural Trade intelligence for Africa (JADAFa) U. Minnesota – IFPRI (Harvestchoice) World trade organization (WTO) International Trade Center Economic Community Of West African States (ECOWAS) East African Community
		Coverage (international prices of main agricultural exports)	top 5	> top 5	
		Coverage (international prices of agricultural productions mostly exported)	top 5	> top 5	
		Frequency of export data collection and dissemination	quarterly	monthly	
		Continuity (% of gaps within the export time series)	<10%	0%	
		Length (years of export time series)	> 5 years	> 10 years	PRIVATE COMPANIES e.g. FARMIS (infotrade)
		Accessibility (Open data, by request, not free...)	any	open data	PROFESSIONAL AGRICULTURAL ORGANIZATIONS Association of African Agricultural Professionals in the Diaspora (AAAPD) Système d'information sur les marchés agricoles (simaniger)
		2) Attributes of MIS			
		Public Institution and export statistics	public	public	PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE Ethiopia commodity exchange (ECX)
		Channel and method for data export dissemination ***	foreign trade yearbook	foreign trade yearbook & others	RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
	Commodity imports	1) Variables on data import available			INSTITUTIONS Ministries of Agriculture & Trade National Statistical agencies African Development Bank FAO (Faostat, countrystat) World Bank (databank) United Nations (UNECA) Agricultural Trade intelligence for Africa (JADAFa) U. Minnesota – IFPRI (Harvestchoice) World trade organization (WTO) International Trade Center Economic Community Of West African States (ECOWAS) East African Community
		Coverage (international prices of main agricultural imports)	top 5	> top 5	
		Coverage (international prices of agricultural productions mostly imported)	top 5	> top 5	
		Frequency of import collection and dissemination	quarterly	monthly	
		Continuity (% of gaps within the import time series)	<10%	0%	
		Length (years of import time series)	> 5 years	> 10 years	PRIVATE COMPANIES e.g. FARMIS (infotrade)
		Accessibility (Open data, by request, not free...)	any	open data	PROFESSIONAL AGRICULTURAL ORGANIZATIONS Association of African Agricultural Professionals in the Diaspora (AAAPD) Système d'information sur les marchés agricoles (simaniger)
		2) Attributes of MIS			
		Public Institution and import statistics	public	public	PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE Ethiopia commodity exchange (ECX)
		Channel and method for data import dissemination ***	foreign trade yearbook	foreign trade yearbook & others	RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals

* Institutional arrangements mean the public, private or mixed nature of the institution that hosts and is responsible for the MIS (we will distinguish four types of MIS based on the institutional position: 1) Public MIS; 2) MIS supported by professional organizations and NGOs; 3) MIS linked to a commodity exchange or marketing board; and 4) Private MIS).

** The price are observed through existing physical or electronic markets or are provided by a network of informant people. Price Collection is made using ICT (cell phone)?

*** Which are the channels and methods for dissemination (Radio, Bulletins, TV, News Letter, News papers, cell phones other)?

**** The national stocks are observed (public), asked through questionnaires (private) or estimated through balance sheets.

Thematic Block 4: Production levels and yields, Plant health

Agricultural risk can be assessed at different organizational levels, the field level being the smallest operational unit. Agricultural census informs on land use at the farm level, regional level by aggregation. Crop yields are indicators of efficiency of management and environmental impact –weather and soil. Agricultural statistics gather information from the various crops, their acreage and cropping season. On the other hand crop failures or low yields affect stock levels in the Public Food Stocks –Emergency Stocks – and governmental programmes of social safety nets.

Information on crop management and pest and disease control is dispersed and not collected systematically (also in developed countries), however this information is crucial for risk impact analysis and an important input for ARM-IS. Furthermore, and in connection with Block 1, data will sustain studies on yield gap analyses currently undertaken at world level.

Table AP1.5: Benchmark for production levels, yields and plant health information (Block 4)

Sub-blocks	Reference Threshold *	Desirable Threshold **	Potential Sources
4.1 Production levels and yields	Yield (direct data; kg/ha of specific in representative farming areas)	Yield (direct data; kg/ha at farm level included in GIS data bases) (Specific, localized data from farmers at plot and farm level, year/cropping season)	INSTITUTIONS (INTERNATIONAL, REGIONAL AND NATIONAL) - FAO stats and other specific applications (e.g.: FAO country, FAO kids) - USDA: e.g. Crop Explorer - Scidev.net - National statistical agency - Ministry of agriculture or related - Extension services - Post-harvest losses information systems
	Seasonal predictions of area and yield predictions of field, horticultural, and tree crops	Monthly area and yield predictions of field, horticultural, and tree crops linked to GIS	
	Production for each crop (t/year or cropping season) for top 5-10 crops (depends on agroecological regions)	Production for each crop (t/year or cropping season) Under rainfed and irrigated conditions	PRIVATE COMPANIES -Agricultural Service Co Ex: Infotrade - IFA: International Fertilizer Association - Seed and Chemical Companies - Agricultural machinery and equipment companies - Large production companies – mainly linked to exports
	Acreage for each crop for top 5-10 crops (depends on agroecological regions)	Acreage for each crop Under rainfed and irrigated conditions	
	Households no.	Households no.	
Crop management (per crop in farms or farming systems within agroecological regions)	Average sowing dates in an agroecological region	Sowing date	UNIVERSITIES AND RESEARCH CENTRES - Research centres - Schools of agriculture
	Crop duration	Harvest date	RESEARCH AND DEVELOPMENT -Research journals, Proceedings - International projects e.g.: USAID CIRAD, GLZ, European Commission: FP7, H2020, PhD Theses
	Seed amount sold	Seeds (sowing rates, per ha)	
	Fertilizer sold	Fertilizers rates	
	Pesticides sold	Pesticides	NGOs
	Herbicides sold	Herbicides	
	Inputs quality (general information)	Inputs quality (specific information on seeds, fertilizer, pesticides)	
	Irrigation, irrigation systems	Irrigation, irrigation systems	
	Labour in agriculture	Labour (nb) per farm	
	Machinery	Tractors (nb) per farm	

(...)



(...) Sub-blocks	Reference Threshold *	Desirable Threshold **	Potential Sources
4.2. Plant Health	Publicized information	Number of notified pest or disease	
	Publicized information	Area affected by pest or disease	
	Publicized information	Pesticides used or other control methods (IPM)	
	Publicized information	Damage (yield related: direct or derived estimations)	
	Atypical outbreaks	Atypical outbreaks	
	Quarantine regulations	Quarantine regulations	
	Agricultural Faculties, Agricultural Centres	Crop protection Labs	
Post-harvest chain	Grain or other storage equipments, silos	Grain or other storage equipments, silos: location and capacity. Conservation treatments	

* Aggregation to be specified for each agroecological region

** Aggregation level (farm, county/province)

Thematic Block 5: Animal and human health

The information on animal and human health is primarily determined by the information available on diseases. We focus on infectious diseases, particularly zoonotic or of a transboundary nature, for which the risk is generally evaluated for prevention and control purposes. There is a list of diseases notifiable to the international community through the World Organization of Animal Health (OIE) and the World Health Organization (WHO). Some of these are endemic in the countries, and the impact can be known. In such cases, we expect to find information that could allow evaluating the economic costs that these diseases may have. There are other diseases which can cause an emergency situation for which information on costs may be more difficult to find directly. In that case, the assessment of the information on available resources, livestock and holdings, an on surveillance and control plans will help for future risk assessments.

Disease diagnosis should be confirmed at the laboratory level. However this is not always possible due to lack of available tests or expertise. Surveillance and contingency plans should exist for endemic and emerging diseases. It is good practice to evaluate such plans regularly to check performance, effectiveness, or impact of control or prevention measures, but this information is usually hard to access to. When a notifiable disease is endemic for many years it could be an evidence of lack of control or of lack of interest in trade improvement.

5.1. Sub-block information to estimate the cost of diseases (human and animal)

- Census (livestock and human population).
- Livestock holdings, number and distribution.
- Socio-cultural issues (religion, festivities, political stability, importance per livestock species).
- Information on trade (animal health): number and trend of imports/exports; main exporting countries; demands from import countries; ability to respond to export market opportunities; animal movement records and national trade.
- Veterinary and medical staff available per livestock or population: information on number, location and distribution; type (vets vs. paravets; medics vs. paramedics); ratio of hospitals per population; public or private funding.
- Vulnerabilities (including climate).
- Veterinary and medical reference diagnosis laboratories: information on number, location and distribution; on number of diseases they can diagnose and on number of different tests available per disease.
- General surveillance and control plans.

- i. Collected information on the frequency, severity and costs of the diseases for governments and or for the stakeholders in the sector.
- j. Impact studies already carried out on the frequency, severity and costs of the diseases for governments and or for the stakeholders in the sector.

5.2. Sub-block information on the risk of endemic diseases (human and animal)

- a. List of diseases which are present, classified by notifiability and zoonotic nature.
- b. Laboratory confirmation or suspicion.
- c. Associated quantitative information on disease prevalence (number of cases and deaths per species and region; number of cases and deaths per species and country; number of cases and deaths per region for a single species; number of cases and deaths per country; only information on whether the disease is present or absent).
- d. Number of years with the disease.
- e. Disease-specific or multipurpose control and surveillance plans.

5.3. Sub-block information on the risk of emerging diseases (human and animal)

- a. List of notifiable diseases which are absent, classified by zoonotic nature and species.
- b. Date last detected, never reported or no information available.
- c. Disease-specific or multipurpose surveillance and contingency plans available.

Table AP1.6: Benchmark for Animal and Human Health (Block 5)

Sub-Blocks	Reference data	Desirable	Potential sources
5.1.1 Census (animal and human)	Country level by species	Province level by species	INSTITUTIONS Ministry of agriculture, health or related OIE FAO WHO
5.1.2 Animal premises	Number of farms (country level)	Location or number of farms at province level	
	-	Ratio of slaughterhouses/livestock census	
		Ratio of markets/livestock census	PRIVATE ORGANIZATIONS ACADEMIC JOURNALS
		Classification of farms by production type, farm size, biosecurity	
5.1.3 Socio-cultural issues	-	Livestock relevance (abundance, trend, region, revenue for population); Preference for species, spatial variation	RESEARCH
5.1.4. Information on trade	Importing or exporting countries; main partners	number and trend of imports/exports; main exporting countries; demands from import countries; ability to respond to export market opportunities; animal movement records and national trade	
5.1.5 Veterinary and medical staff available per population	Number, type	Information on number, location and distribution; type (vets vs. paravets; medics vs. paramedics); ratio of hospitals per population; public or private funding	
5.1.6 General surveillance and control plans	Existence	Details	
5.1.7. Cost of diseases Frequency, severity and cost for governments and stakeholders	Frequency of diseases; impact indicator (morbidity, mortality, production losses, vaccination or treatment costs, or DALYs*)	Cost estimation	
(...)			



(...) Sub-Blocks	Reference data	Desirable	Potential sources
5.2.1 Annual diseases present	Constant notifiability	Notifiable and non-notifiable disease information	INSTITUTIONS World Organization for Animal Health (OIE) World Health Organization (WHO) FAO Centers for disease control and prevention Health Map International Society for Infectious diseases (ISID) African Development Bank Group (AFDB)
	Number confirmed in the lab and number suspect		
	Number of zoonosis (potential and detected)	Quantitative information	
5.2.2 Type of annual information recorded for infectious diseases which are present	Number of diseases with quantitative information (number of cases, deaths, etc at administrative units or only at country level) and number with qualitative information only (present/absent), per species	Monthly information included	PRIVATE ORGANIZATIONS ACADEMIC JOURNALS RESEARCH CENTRES International Livestock Research Institute (ILRI) Australian Centre for International Agricultural Research (ACIAR) French Research Centre for Agricultural Development (CIRAD) International Food Policy Research Institute Research programmes in Africa: VGTROPICS
	All species specified for multispecies diseases	Only some species specified	
	Number of years with the disease		
5.2.3.Disease-specific or multipurpose control and surveillance plans	Existence	Details	
5.3.1. List of emerging diseases absent	Constant notifiability		
	Status (date last detected, never reported, no information)		
	Neighbouring or partner countries status		
5.3.2. Disease-specific or multipurpose surveillance and contingency plans	Existing	Details	

*DALY: Disability Adjusted Life Year (WHO)

For all sub-blocks, the information will be collected for at least 5 years. Both the variability of the information (frequency, representativeness, continuity, accuracy, level of update) as well as the attributes of the information system (public/private management, accessibility, how the information is gathered and aggregated, sustainability, and diffusion) will be considered for each sub-block.

Thematic Block 6: Policy

In this block we do not include information about all agricultural policies, but rather only the policies that may affect the agricultural risks (macroeconomic policies-exchange rate). We also include those that can be used as a risk preventing tool (early warning systems) or coping with agricultural risk (protection and assistance). In the next step we will translate the variables of the policy benchmark into qualitative and quantitative indicators to define in a more concrete way the policy benchmark.

**Table AP1. 7:** Benchmark for policy information (Block 6)

Sub-blocks	Primary data	Variables	Potential Sources
6.1. Policy	Exchange rate	Frequency (daily, weekly, monthly, quarterly)	INSTITUTIONS Ministries of Agriculture & Trade Open data for Africa FAO (MAFAP) World Bank (databank) Famine Early Warning systems network (FEWS NET) Global Information and Early Warning system - GIEWS (FAO) African development Bank International Food Policy research institute (IFPRI)
	Nominal rate of protection *	Coverage (number and relevance of commodities covered) Frequency (annual)	
	Nominal rate of assistance *	Coverage (number and relevance of commodities covered) Frequency (annual)	
	Market development gap *	Coverage Frequency (annual)	PRIVATE ORGANIZATIONS Trade barriers org
	Governance **	Control of corruption Government effectiveness Rule of Law Voice and accountability Political stability and absence of violence Regulatory quality	RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
	Early warning	Early warning for food market prices Early warning for food security	
6.2. Trade measures	Frequency of past instituted export or import bans	Will permit assessing the risk of unannounced trade measures and, as a consequence, the risk of market disruptions.	INSTITUTIONS Ministries of Agriculture & Trade Open data for Africa World Bank (databank) Agritrade (European Union) African development Bank World trade organization (WTO) Système d'information sur les marchés agricoles (simaniger) FAO (MAFAP) PRIVATE ORGANIZATIONS Trade barriers org RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
6.3. Insurance and other risk management policies	Existence of: Private insurance, public insurance or mixed private-public systems	Will permit assessing the quality and predisposition to implement both public and private risk management measures.	INSTITUTIONS Ministries of Agriculture & Trade African development Bank World trade organization (WTO) United Nations development programme (UNDP) Global facility for disaster reduction and recovery (GFDRR) PRIVATE ORGANIZATIONS AG Risk Prevention web RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
	Other ad-hoc measures, aids and disaster assistance		

* Market development gap, Nominal rate of protection and Nominal rate of assistance are indicators developed by FAO (MAFAP). Market development gap measures the level of development of the infrastructures available for food market efficiency (roads, ports, storage facilities, logistics for marketing....).

** These indicators are published by World Bank, World governance indicators (<http://info.worldbank.org/governance/wgi/index.aspx#home>).



Thematic Block 7: Socio-economic and sectorial info

In this block we will only include information on sectorial variables that can constraint or condition the implementation of risk management measures.

Table AP1. 8: Benchmark for socio-economic and sectorial information (Block 7)

Sub-blocks	Primary data	Variables	Potential sources
7.1 Related to Agricultural production	Census (agricultural holdings)	Total number and distribution by size	INSTITUTIONS Ministries of Agriculture National Statistical agencies Open data for Africa World Bank (databank) African development Bank RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
	Agricultural land	% of total land	
	Irrigated land	Total and % of total agricultural land	
7.2. Related Livestock	Census	Total number by species Distribution of holdings by LSU	INSTITUTIONS Ministries of Agriculture National Statistical agencies Open data for Africa World Bank (databank) African development Bank Agricultural Trade intelligence for Africa (JADAFA) RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
	Pastoralist	% by species	
7.3.Other	Rural Population	Total and % of total population	INSTITUTIONS National Statistical agencies Open data for Africa World Bank (databank) African development Bank RESEARCH AND LITERATURE REVIEW FAO reports World Bank reports Scientific journals
	Income	GDP per capita GNI per capita	
		Agricultural value added (%GDP) Agricultural value added per worker	

AP2. Methodology used for quantitative assessment of IS for ARM

General methodology to quantitative assess of Information Systems

The general methodology aims to provide a quantitative assessment (scoring) of information systems (IS) for seven Thematic Blocks according to the variables on which information is provided by the IS. Most of the blocks were subdivided in sub-blocks to gain homogeneity in the variables considered. The variables, features and attributes to assess the quality and accuracy of the IS for each block or sub-block to do a proper agricultural risk assessment and management are listed in the Benchmark (see Appendix 1). This Annex presents the general methodology that will be particularized and applied to the different thematic sub-blocks and blocks of information.

The rationale/underlying assumptions or statistical/mathematical logic behind the formula used in the study is to obtain scores of available IS, and then upscale the scores of the IS providing data and information for a given block. With this, an overall score for a thematic block will be obtained.

The following stepwise process was carried out for the quantitative assessment of the IS in the different sub-blocks or blocks.

Step-1: Typology of sub-blocks/blocks according to the number and nature of variables

We distinguished two types of sub-blocks or blocks of information according to the number and nature of considered variables. The Type I corresponds to sub-blocks or blocks that have many variables but very similar in nature e.g. commodity prices (sub-block 3.1) where the variables are different commodity prices. The Type II corresponds to sub-blocks or blocks that have very different in nature e.g. climate and meteorological (sub-block 1.1) with variables as temperature, precipitation, humidity, winds and others. For the sub-blocks or blocks Type I we will not distinguish variables and for the Type II we will.

Step-2: Defining the assessment criteria

The method to make a quantitative assessment of the information systems for each sub-block or block is based on the selected assessment criteria "Criteria" (features of information and attributes of information systems) following the benchmark for each thematic sub-block/block (Appendix 1).

Step-3: Assignment of numerical scale to the criteria

The procedure of assigning a numerical scale to each considered criterion was based on the Analytic Hierarchical Process. Such method permits assigning values (0-100) to each criterion (features of the information and attributes of the information systems) under a structured technique for group decision making. A joint meeting of experts proposed and justified the translation of criteria into values (0-100). After a general agreement the values are assigned to the criteria.

In the sub-blocks or blocks of Type I the values of criteria are assigned to the whole information system. In the case of sub-block or block Type II the values of criteria are assigned to each variable.

Step-4: Weighting the values of the criteria

The next step is assign weights to the different criteria (features of information and attributes of information system). A joint meeting of experts proposed and justified the weights (0-1) of the criteria values (0-100). After a general agreement the weight is assigned to the criteria.

Step-5: Weighting the variables

In addition for the sub-blocks or blocks type II it is needed to assign weights to the different variables. A joint meeting of experts proposed and justified the weights (0-1) of the considered variables. After a general agreement the weight are assigned to the considered variables.

Step-6: Calculation of the final score

In the case of sub-blocks or block of type I the final scores are computed with the following formula (single weighting):

$$FS_i^B = \sum_{j=1}^N V_{ij}^B \cdot \alpha_j^B \quad [1]$$

Being

$$0 \leq FS_i^B \leq 100 \quad [2]$$

$$\sum_{j=1}^N \alpha_j^B = 1 \quad [3]$$

- where FS_i^B represents the final score of the information system (i) for a specific thematic block or sub-block (B) in a country;
- where $k=1... N$ are the criteria (features of the information and attributes of the information systems of the sub-block or block B in a country;
- where V_{ij}^B represents the values (0-100) of the *criteria j* for the information system (i) of the thematic block or sub-block B. See for instance the rows of the Table AP1.4 for the sub-block 3.1;
- where α_j^B represents the weights (0-1) of the *criteria j* selected to assess the information systems of the thematic block or sub-block B in a country. See for instance the table AP1.4 for the sub-block 3.1.

In the case of sub-blocks or blocks of type II the final score is computed with the following formula (double weighting):

$$FS_i^B = \sum_{k,j} V_{ikj}^B \cdot \beta_k^B \cdot \alpha_j^B \quad [4]$$

Being

$$0 \leq FS_i^B \leq 100 \quad [5]$$

$$\sum_{k=1}^M \beta_k^B = 1 \quad [6]$$

$$\sum_{j=1}^N \alpha_j^B = 1 \quad [7]$$

- where FS_i^B represents the final score of the information system (i) for a specific thematic block or sub-block (B) in a country;
- where $k=1... M$ are the variables of the information systems of the sub-block or blocks B;
- where $k=1... N$ are the criteria (features of the information and attributes of the information systems of the sub-block or block B in a country;
- where V_{ikj}^B represents the values (0-100) of the *criteria j for k variables* in the information system (i) of the thematic block or sub-block B in country. See for instance the rows of the table AP1.1 for the sub-block 1.1;
- where β_k^B represents the weights (0-1) of the variables k of the IS in the sub-block/block B. See for instance the head row in the table A.3.1 for the sub-block 1.1
- where α_j^B represents the weights (0-1) of *criteria j* to assess the IS of the thematic block/sub-block B. See for instance the table A.3.2 for the sub-block 1.1.

Overall quantitative assessment for thematic blocks or sub-blocks

The general methodology for quantitative assessment is performed at level of Information Systems (IS) identified (national, regional or international), so that a comparison among them within a thematic sub-block or block can be made. But to have a final score at thematic sub-block or block level we cannot weight the different systems found into a given sub-block or block assigning weights to the different information systems because this would distort the final (overall) score of the thematic sub-block or block. The basic idea was that the scores of one thematic block's IS should not be averaged out.

The quantitative assessment of the thematic sub-blocks is based on the quantitative assessment of the IS identified in the corresponding thematic sub-block or block. But to have a final score at thematic sub-block or block level we cannot weight the different systems found into a given sub-block or block assigning weights to the different information systems because this would distort the overall score of the thematic sub-block or block. The basic idea is that the scores of the IS of the thematic sub-block or block should not be averaged out.

Instead, the overall score for a specific thematic sub-blocks or blocks will be set up-grading or down-grading the score of the best information system according to the following criteria:

- If the information systems of the sub-block or block are complementary (covered variables), the numerical value assigned to the whole sub-block or block is that of the best rated IS up-graded between 5 and 20 points depending on the degree of the information complementarity and coordination among IS.
- If the information systems of the sub-block or block are not complementary at all, the numerical value taken is that of the best rated IS down-graded between 10 and 30 points depending on the lack of coordination among IS and the relevance of the information gaps.
- If the number of information systems is large and they are not complementary the overall score is down-graded between 5 and 10 points depending on the number of IS and the degree of coincidence of the data provided by the IS (consistency criteria). A large number of IS giving different data/information for the same or similar variables is a confusing situation and we will down-grade the overall score by 5-10 points.
- If there are public and private IS within the sub-block, the value of overall score is increased because the existence of public and private systems is considered as a positive element of the sub-block or block. The increasing of the overall score (between 5 and 10 points) will depend on the quality and accessibility of the private systems and the cooperation between private and public systems.
- Given the very different nature of the diverse sub-blocks and blocks we took into account some specific positive elements (up-grading) or negative elements (down-grading) to assign the overall score to the whole thematic sub-block or block.

At the end we will have an overall score (0-100) for the corresponding thematic sub-block or block. The interpretation of the overall scores of sub-blocks or blocks is as follows. Low values (≤ 20) of the overall score would indicate that the available information would permit only a very poor or irrelevant risk assessment in the corresponding thematic sub-block or block. Low-medium scores (20-40) would indicate that the information available allows for a poor risk assessment in the corresponding thematic sub-block or block. Medium values (41-69) would mean that the available information would permit a preliminary risk assessment in the corresponding thematic sub-block or block. Finally, high values (≥ 70) would mean that the information available enables a proper risk assessment and management in the corresponding thematic sub-block or block.

Caveats on the general methodology

The followed approach to do the quantitative assessments leaves out three criteria (features of the information and attributes of the information systems): 1) institutional nature of the systems (public/private); 2) data reliability and validation methods used by the information systems (IS) in order to ensure the reliability of the information; and 3) the sustainability of the information systems.

It is difficult to assign a numerical value based on the public or private nature of the system because this should not prejudice the IS on this basis. Therefore, this concept has been taken into account in a qualitative manner for the overall sub-blocks assessment as we explained above. Regarding the data validation methods (reliability of the information), despite the consultations with the local experts' fieldwork, this issue could not be clarified in full. In addition, this links directly to the reliability of the information, which may be assessed with further research. At this moment, the information gathered on the validation methods does not warrant the use of a quantitative assessment. Finally, it is also difficult to get information on the systems' financial sustainability, especially for private systems but also for public ones. We know that some systems are supported for international cooperation agencies, which brought about the question about the financial sustainability of the system. Unfortunately, the authors were not able to foresee or predict what will occur when the cooperation project is finished.

Application of the general methodology to the thematic sub-blocks or blocks

In the next sections of this Annex we will present the particularization of this general methodology for the different Thematic Blocks. The criteria values and weights are presented in a different way for each thematic block. In some blocks with very different information we will distinguish sub-blocks. In some sub-blocks with many variables different in nature (e.g. sub-block 1.1 for meteorology and climate) we proceeded to a double weighting according to variables and criteria weights.



Thematic Block 1: Meteorological, climate and soils information

Table AP2.1: Values of the criteria and variables to assess the IS of Meteorological and Climate (sub-block 1.1)

subBlock 1.1	Weather forecast (20%)	Temperature (30%)	Precipitation (30%)	Solar radiation (2%)	RH average (2%)	Wind speed (2%)	Extreme events (14%)
Frequency	daily=40 3 days=50 Weekly=60 Monthly=80 Quarterly=100	Annual=30 Quarterly=40 Monthly=50 Weekly=80 Daily=100	Annual=30 Quarterly=40 Monthly=50 Weekly=80 Daily=100	Annual=30 Quarterly=40 Monthly=50 Weekly=80 Daily=100	Annual=30 Quarterly=40 Monthly=50 Weekly=80 Daily=100	Annual=30 Quarterly=40 Monthly=50 Weekly=80 Daily=100	Not applicable
Representativeness (geographical)	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100
Aggregation level	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100
Data series length	Not applicable	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 10 years=50 15 years=80 30 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100
Accessibility	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100
Continuity/update	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 last periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 last periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10

The weighting of the criteria (features and attributes) within the sub-block 1.1 can be found in the following table:

Table AP2.2: Weighting of attributes for sub-block 1.1

Weighting	
Frequency	30%
Representativeness (geographical)	10%
Aggregation level	20%
Length	20%
Accessibility	10%
Continuity/update	10%

Table AP2.3. Values of criteria considered by variables to assess the IS of Soils (sub-block 1.2)

subBlock 1.2	Soil Types (25%)	Profiles (depth, texture, ph...) by layers (60%)	Soil erosion, quality loss, salinity (15%)
Representativeness (geographical)	One location (only one) = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100	One location = 30 One location in main cropping areas=50 All agricultural areas covered=75 All agricultural areas covered (several locations)=100
Aggregation level	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Zone Agroecologique=50 Province=80 Locality=100	Country=40 Zone Agroecologique=50 Province=80 Locality=100
Accessibility	Bulletin=20% Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20% Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20% Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100

In addition, the weighting of the criteria (features and attributes) within the sub-block 1.2 can be found in the following table:

Table AP2.4: Weighting of attributes for sub-block 1.2

Weighting	
Representativeness (geographical)	40%
Aggregation level	35%
Accessibility	25%



Thematic Block 2: Satellite image information & Communications

Score given to each criterion (features and attributes) is in the range of 0 to 100. All of them have been ordered so more score means better punctuated that attribute. The weight factor applied is written beside each item in parenthesis.

1. Number of variables/indexes (8%)

Two = 50
Four = 70
More than four =100

2. Frequency (20%)

Table AP2.5: Values of “frequency” Block 2

Meteorological Indexes (5%)	Vegetation Indexes (15%)
Annual=30	Annual=30
Quarterly =40	Quarterly =60
Monthly =50	Monthly =80
Weekly=80	Weekly=100
Dairy=100	

3. Update (15%)

Recently =100
Missing the last 4 periods=50
Missing between 4 and 8 periods =30
Missing the whole last year =0

4. Length (20%)

Less than 5 years=30
Between 5 and 10 years=60
More than 10 years=100

5. Accessibility (25%)

Exist but there is no access =20
By payment=30
By request=50
Open data but web is not always functional =70
Open data and web is always functional =100

6. Dissemination channels (12%)

Table AP2.6: Values of “dissemination channels”

Meteorological Indexes (4%)	Vegetation Indexes (8%)
Bulletins and radio=50	Bulletins=50
Bulletins, radio and SMS=80	Bulletins and SMS =70
Bulletins, radio, SMS and internet (mail or web)=100	Bulletins, SMS and internet (mail or web)=100

Thematic Block 3: Prices of commodities, inputs and market components

Owing to the very nature of the different sub-blocks composing this thematic block, its quantitative assessment has been performed separately for each sub-block. Sub-blocks and variables, features of information and attributes of information systems have been taken from the benchmark (see Appendix 1).

Sub-block 3.1: Domestic commodity prices

The criteria (features of information and attributes of information systems) considered in this thematic sub-block have been the following:

- Coverage: it refers to the number of commodities considered within the IS.
- Decentralization: it refers to the spatial disaggregation of the data.
- Position: it refers to the type of price provided by the IS (producer, wholesale, retail, consumer, etc.).
- Frequency: it refers to the frequency at which data are provided.
- Update: it relates to the last available data.
- Length: it refers to the length of the historical data series.
- Accessibility: it relates to the availability of the data (they may exist but there is no way to obtain, they may be available under payment or request, the web may not work properly, etc.).
- Dissemination channels: it refers to the dissemination channels used by the IS to disseminate information.
- Diversification of services: it relates to the additional services (apart from providing information) that the IS offers.
- Continuity: it refers to the number of gaps within the data series. Since an accurate evaluation of the gaps would take so much time (it might bring entering each data series for each commodity for each IS), an overall assessment of this variable has been performed.

The weighting of the criteria (features and attributes) within the sub-block 3.1 can be found in the following table:

Table AP2.7: Weighting of criteria considered for commodity price information (sub-block 3.1)

Weighting	
Coverage	10%
Decentralization	15%
Position	5%
Frequency	15%
Update	15%
Length	5%
Accessibility	10%
Dissem. Chan.	10%
S. Diversification	5%
Continuity	10%

Values (0-100) for these criteria are detailed within the following table:

Table AP2.8: Values of criteria to assess IS of the sub-block 3.1

Coverage		Decentralization		Position		Frequency		Update	
Interpolation with the main productions of the country, and the most complete IS identified		National	50	Index	40	Annual	30	>5 periods missing	0
		Regional	80	1 type	50	Quarterly	40	3 to 5 periods missing	30
		Sub-regional	100	2 types	80	Monthly	50	2 periods missing	50
				3 types	100	Weekly	80	Recent	100
						Daily	100		
Length		Accessibility		Dissemination Channels		S. Diversification		Continuity	
1 to 4 years	30	No obtainment	20	Bulletins & radio	50	No	50	Many gaps	0
5 years	50	Under payment	30	Bulletins, radio & SMS	80	Yes	100	Some gaps	50
10 years	80	Open by request	50	Internet	80			No gaps	100
>10 years	100	Web not always works	70	Bulletins, radio, SMS & internet	100				
		Open data	100						

Sub-block 3.1: Input prices

For a description of the criteria considered in this sub-block, see the description provided in the sub-block 3.1-Domestic commodity prices.

The weighting of the criteria within this sub-block 3.1-input prices can be found in the following table:

Table AP2.9: Weighting of criteria considered to assess input price information (sub-block 3.1)

Weighting
Coverage
Decentralization
Position
Frequency
Update
Length
Accessibility
Dissem. Chan.
S. Diversification



Numerical values for the assessment of these criteria are detailed within the following table:

Table AP2.10: Values of criteria considered for of input price information (sub-block 3.1)

Coverage		Decentralization		Position		Frequency		Update	
1 type	30	National	50	Index	40	Annual	30	>5 periods missing	0
Fertilizers	50	Regional	80	1 type	50	Quarterly	40	3 to 5 periods missing	30
2 types	70	Sub-regional	100	2 types	80	Monthly	50	2 periods missing	50
4 types	100			3 types	100	Weekly	80	Recent	100
						Daily	100		
Length		Accessibility		Dissemination Channels		S. Diversification			
1 to 4 years	30	No obtainment	20	Bulletins & radio	50	No	50		
5 years	50	Under payment	30	Bulletins, radio & SMS	80	Yes	100		
10 years	80	Open by request	50	Internet	80				
>10 years	100	Web not always works	70	Bulletins, radio, SMS & internet	100				
		Open data	100						

Sub-block 3.2: Market (commodity stocks and input availability)

The weighting of the criteria to assess the sub-block 3.2 can be found in the following table:

Table AP2.11: Weighting of criteria considered to assess the IS of sub-block 3.2

Weighting	
Coverage	15%
Frequency	15%
Update	30%
Length	10%
Accessibility	30%

Numerical values of the criteria to assess the IS of this sub-block are detailed within the following table:

Table AP2.12: Values of criteria to assess the IS of national commodity stocks information (sub-block 3.2)

Coverage		Frequency		Update	
Interpolation with the main staple foods		Annual	30	>5 periods missing	0
		Quarterly/Half-year	80	3 to 5 periods missing	30
		Monthly	100	2 periods missing	50
				Recent	100
Length		Accessibility			
1 to 4 years	30	No obtainment	20		
5 years	50	Under payment	30		
10 years	80	Open by request	50		
>10 years	100	Web does not always work	70		
		Open data	100		

Sub-block 3.3: Trade (Commodity exports/imports)

The weighting of the criteria to assess the IS of the sub-block 3.3 can be found in the following table:

Table AP2.13: Weighting of criteria considered to assess IS of trade information (sub-block 3.3)

Weighting	
Coverage	20%
Frequency	15%
Update	25%
Length	10%
Accessibility	20%
Dissem. Chan.	10%

Numerical values of the criteria for the assessment of IS of sub-block 3.3 are detailed within the following table:

Table AP2.14: Values of criteria considered to assess the IS of the sub-block 3.3

Coverage		Frequency		Update	
Interpolation with the main export/import products		Annual	30	>5 periods missing	0
		Quarterly	50	3 to 5 periods missing	30
		Monthly	80	2 periods missing	50
		Weekly/Daily	100	Recent	100
Length		Accessibility		Dissemination Channels	
1 to 4 years	30	No obtainment	20	Foreign Trade Yearbook	50
5 years	50	On payment basis	30	F.T.Yearbook + Others	80
10 years	80	Open by request	50	Website	80
>10 years	100	Web not always works	70		
		Open data	100		

Thematic Block 4: Production levels and yields, Plant health

The weighting of the criteria to assess the IS of sub-block 4.1 and 4.2 can be found in the following table:

Table AP2.15: Weighting of criteria to assess the IS of thematic block 4

Weighting	
Frequency	30%
Representativeness (geographical)	10%
Aggregation level	20%
Length	20%
Accessibility	10%
Continuity/update	10%

Table AP2.16: Criteria values for the different variables considered into IS for production in sub-block 4.1

subBlock 4.1	Production for each crop (40)	Acreage for each crop (35)	Yield for each crop (10)	N° households (10)	Crop management (5)
Frequency	Census (10 years)=50 2-3 years=70 Annual or seasonal=100	Census (10 years)=50 2-3 years=70 Annual or seasonal=100	Census (10 years)=50 2-3 years=70 Annual or seasonal=100	Census (10 years)=50 2-3 years=70 Annual or seasonal=100	Not applicable
Representativeness (geographical)	Location=30 Main agricultural areas=50 75 Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75% Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75% Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75% Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75 Agricultural area=75 All country=100
Aggregation level	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100
Data series length	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	Not applicable
Accessibility	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100
Continuity/update	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10

**Table AP2.17:** Criteria values for the different variables considered in the IS for plant health (sub-block 4.2)

subBlock 4.2	Number of notified pest or disease (30)	Area affected by pests or diseases (40)	Pesticides used or other control methods (IPM) (15)	Damage (10)	Labs and clinics (Crop protection) (5)
Frequency	Census (10 years)=50 2-3 years=70 Annual or seasonal=100	Census (10 years)=50 2-3 years=70 Annual or seasonal=100	Census (10 years)=50 2-3 years=70% Annual or seasonal=100	Census (10 years)=50 2-3 years=70 Annual or seasonal=100	Not applicable
Representativeness (geographical)	Location=30 Main agricultural areas=50 75 Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75 Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75% Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75 Agricultural area=75 All country=100	Location=30 Main agricultural areas=50 75 Agricultural area=75 All country=100
Aggregation level	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Agroecological zone=50 Province=80 Locality=100	Country=40 Zone Agroecological zone=50 Province=80 Locality=100	Not applicable
Data series length	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	< 5 years=20 5 years=50 10 years=80 15 years=100	Not applicable
Accessibility	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100	Bulletin=20 Paid for (format paper)=50 Paid for (format digital)=80 By request=90 Open data=100
Continuity/update	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10	Recent (less than the 2 last periods missing) = 100 2 most recent years missing = 75 2 to 5 most recent periods missing = 50 More than 5 most recent periods missing= 10

Thematic Block 5 – Animal and human health

The selected criteria to assess the S of block 5 are displayed in the following table:

Table AP2.18: Criteria considered to assess the IS of Block 5

#	Criteria	Description
1	Decentralization	Level of data aggregation (National, Regional, Geographical)
2	Frequency	Regularity of the information
3	Availability	Period/s of data acquirable
4	Length	Extension (years) of available data
5	Accessibility	Is data available and how
6	Dissemination	Channels used to spread the data
7	Language	Idiom(s) of the webpage
8	Usability	Simplicity of use of a website
9	Organization	Basic structure of the site

The weights for the criteria to assess the IS of Block 5 are shown in the following table:

Table AP2.19: Final weights assigned to the first level criteria

#	Criteria	Weight (%)
1	Decentralization	6
2	Frequency	15
3	Length	8
4	Availability	15
5	Accessibility	15
6	Dissemination	6
7	Language	15
8	Usability	15
9	Organization	5

Each criterion was stratified depending on the features of the accessible data. The criteria hierarchy is displayed in the following table.

Table AP2.20: Criteria hierarchy

#	1 st level criteria	#	2 nd level criteria
1	Decentralization	1.1	National
1	Decentralization	1.2	Regional
1	Decentralization	1.3	Geographical
2	Frequency	2.1	Occasional/irregular (>5 years)
2	Frequency	2.2	Occasional/irregular (>3 years)
2	Frequency	2.3	Occasional/irregular (>1 years)
2	Frequency	2.4	When required (i.e. event-based)
2	Frequency	2.5	Annual
2	Frequency	2.6	Biannual
3	Length	3.1	Occasional/irregular
3	Length	3.2	Between 1 and 5 years
3	Length	3.3	5 years
3	Length	3.4	10 years
3	Length	3.5	More than 10 years
4	Availability	4.1	Occasional/irregular
4	Availability	4.2	Between 1 and 5 years
4	Availability	4.3	5 years
4	Availability	4.4	10 years
4	Availability	4.5	More than 10 years
5	Accessibility	5.1	The data exists but is not accessible
5	Accessibility	5.2	Accessible by request

(...)

(...) #	1 st level criteria	#	2 nd level criteria
5	Accessibility	5.3	Information is available online for a fee
5	Accessibility	5.4	Open data but information is difficult to find
5	Accessibility	5.5	Open data but webpage does not work with sufficient speed or efficacy
5	Accessibility	5.6	Open data and webpage works adequately
6	Dissemination	6.1	News
6	Dissemination	6.2	Reports / Journals / Papers
6	Dissemination	6.3	Newsletters / Bulletins
6	Dissemination	6.4	Specific subpage directly from a FrontPage or web browse/search
6	Dissemination	6.5	Subscription (mailing list) / automatic alerts
7	Language	7.1	National language
7	Language	7.2	English (when not national language)
7	Language	7.3	Additional(s) international language(s) to English (when not national language)
7	Language	7.4	National language(s) and one or more international languages
8	Usability	8.1	Error pages to data access
8	Usability	8.2	Absence of searching engine and/or difficult browsing
8	Usability	8.3	Absence of searching engine but easy browsing
8	Usability	8.4	Inefficient searching engine but easy browsing
8	Usability	8.5	Easy browsing but absence of data in some fields
8	Usability	8.6	Easy browsing but data is limited
8	Usability	8.7	Unfriendly webpage but efficient search
8	Usability	8.8	Friendly webpage plenty of data
9	Organization	9.1	Error pages to data access
9	Organization	9.2	Navigational headers are unclear
9	Organization	9.3	Complex hierarchy
9	Organization	9.4	Good navigational headers but complex hierarchy
9	Organization	9.5	Good navigational headers and rational hierarchy

The assignment of numerical values (0-100) to the criteria hierarchy criteria was carried out by using the Delphi method. During the process, the evaluators were concerned that necessary data to establish superficial risk analysis should be valued with the 50% of the total value. The result of this procedure shows the criteria numerical values in the following Table.

Table AP2.21: Values of considered criteria to assess the IS of Block 5

#	2 nd level criteria	Pondered value (%)
1.1	National	50
1.2	Regional	80
1.3	Geographical	100
2.1	Occasional/irregular (>5 years)	10

(...)



(...) #	2 nd level criteria	Pondered value (%)
2.2	Occasional/irregular (>3 years)	30
2.3	Occasional/irregular (>1 years)	60
2.4	When required (i.e. event-based)	70
2.5	Annual	90
2.6	Biannual	100
3.1	Occasional/irregular	10
3.2	Between 1 and 5 years	20
3.3	5 years	40
3.4	10 years	50
3.5	More than 10 years	100
4.1	Occasional/irregular	10
4.2	Between 1 and 5 years	30
4.3	5 years	50
4.4	10 years	80
4.5	More than 10 years	100
5.1	The data exists but is not accessible	10
5.2	Accessible by request	30
5.3	Information is available online for a fee	50
5.4	Open data but information is difficult to find	60
5.5	Open data but webpage does not work with sufficient speed or efficacy	70
5.6	Open data and webpage works adequately	100
6.1	News	20
6.2	Reports / Journals / Papers	30
6.3	Newsletters / Bulletins	70
6.4	Specific subpage directly from a FrontPage or web browse/search	80
6.5	Subscription (mailing list) / automatic alerts	100
7.1	National language	50
7.2	English (when not national language)	60
7.3	Additional(s)international language(s)to English (when not national language)	70
7.4	National language(s) and one or more international languages	100
8.1	Error pages to data access	0
8.2	Absence of searching engine and/or difficult browsing	10
8.3	Absence of searching engine but easy browsing	40
8.4	Inefficient searching engine but easy browsing	50
8.5	Easy browsing but absence of data in some fields	50
8.6	Easy browsing but data is limited	60
(...)		

(...) #	2 nd level criteria	Pondered value (%)
8.7	Unfriendly webpage but efficient search	70
8.8	Friendly webpage plenty of data	100
9.1	Error pages to data access	0
9.2	Navigational headers are unclear	30
9.3	Complex hierarchy	40
9.4	Good navigational headers but complex hierarchy	50
9.5	Good navigational headers and rational hierarchy	100

Thematic Block 6: Policy

For the case of the Thematic Block 6, the quantitative assessment has not been performed at IS level, due to the absence of organized and systematic information sources about policy variables. For this reason, the methodology used for this thematic block is slightly different and has been implemented for the three variables (sub-blocks) considered in the Block 6.

In this case, it is possible to have an overall score for the whole thematic block 6 by weighting each variable of information as follows:

Table AP2.22: Weighting of variables of information in the Block 6

Weighting	
Policy	70%
Trade measures	15%
Insurance	15%

The methodology used to assign a numerical value to each variable is detailed below.

Sub-block 6.1: Policy

Exchange rate: The frequency of the exchange rate has been assessed according to the following table.

Table AP2.23: Values of frequency of “exchange rate” information (Block 6)

Exchange rate	
Annual	30
Quarterly	40
Monthly	50
Weekly	80
Daily	100

Nominal rate of protection, nominal rate of assistance, market development gap: These three variables have been assessed whether the country is within MAFAP and The World Bank projects or not, as follows:

Table AP2.24: Values of nominal rates and market development gap (Block 6)

Nominal Rates and Market Development Gap	
The country is in MAFAP programme	100
The country is in The World Bank's project "Distortions to Agricultural Incentives"	50
The country is not in these programmes	0

Governance: As all these indicators are provided by The World Bank, 100 points are assigned if all 6 indicators are available for the country. If not, this score is decreased.

Early Warning: The existence or not of early warning systems has been valued as follows:

Table AP2.25: Values for the type of early warning systems found (Block 6)

Early Warning Systems	
International EWS	50
International EWS + National EWS under construction	70
International + National EWS	100

All these variables have a weighting within the sub-block 6.1 as explained in the following table:

Table AP2.26: Weighting of the variables considered within the sub-block 6.1

Weighting	
Exchange rate	10%
N.R. Protection	10%
N.R. Assistance	10%
M. D. Gap	20%
Governance	20%
Early Warning	30%

Sub-block 6.2: Trade Measures

In this sub-block the variable considered has been the existence of information about trade barriers. In this respect, the quantitative assessment has been performed as follows:

Table AP2.27: Values for trade barriers information (sub-block 6.2)

Trade Barriers	
The country is not in the USDA Foreign Agricultural Service Trade Yearbook, and does not have a national one	0
The country is in the USDA Foreign Agricultural Service Trade Yearbook	50
The country has a national foreign trade yearbook	100

Sub-block 6.3: Insurance and other risk management policies

Due to the absence of IS on agricultural insurance, and given the importance of agro-insurance in risk management, the scarce information available about this topic has been evaluated as follows:

Table AP2.28: Values for insurance information (sub-block 6.3)

Agricultural Insurance	
No agricultural insurance	0
Emerging agricultural insurance (scattered references)	50
Agricultural insurance with detailed and technical information	100

Thematic Block 7: Socio-economic and sectorial information

As for the case of the Thematic Block 6, and due to the nature of the variables within this Thematic Block 7, the quantitative assessment has followed a particular methodology by variable.

In this case the evaluation has been performed making a distinction between international and national systems. Each sub-block has its own numerical value, and the whole Thematic Block 7 has a final score by the following weighting of the sub-blocks:

Table AP2.29: Weighting of variables (sub-blocks) within the thematic block 7

Weighting	
Agricultural Production	40%
Livestock	40%
Other	20%

The methodology used to assign a numerical value to each sub-block is detailed below.

Sub-block 7.1: Related to Agricultural Production

The evaluation of the variables within this thematic sub-block refers to whether or not there is available information about such topics. This way, if there is available information on the variable 100 points are assigned; if there is no information available 0 points are assigned.

Variables considered within this thematic sub-block and its weights are the following:

Table AP2.30: Weighting of the variables considered within the sub-block 7.1

Weighting	
Number of agricultural holdings	30%
Distribution by size of agricultural holdings	20%
Total agricultural land	30%
Total irrigated land	20%

Sub-block 7.2: Related to Livestock

The evaluation of the variables within this thematic sub-block refers to the availability or not of information about such topics. This way, if there is available information on the variable 100 points are assigned; if there is no information available 0 points are assigned.

Variables considered within this thematic sub-block and its weights are the following:

Table AP2.31: Weighting of the variables considered within the sub-block 7.2

Weighting	
Census by Species	35%
Distribution of holdings by LSU	35%
% Pastoralist by species	30%

Sub-block 7.3: Other

The evaluation of the variables within this thematic sub-block refers to the availability or not of information about such topics. This way, if there is available information on the variable 100 points are assigned; if there is no information available 0 points are assigned.

Variables considered within this thematic sub-block and its weights are the following:

Table AP2.32: Weighting of the variables considered within the sub-block 7.3

Weighting	
Rural population	20%
GDP per capita	20%
GNI per capita	20%
Agricultural value added	20%
Agricultural value added per worker	20%





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