

Platform for Agricultural Risk Management

INFORMATIONAL ASSESSEMENT STUDY

FINAL REPORT

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Informational Assessment of Agricultural Risk Management Information Systems (ARM-IS)

Final Report



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

May 2016

**Informational Assessment of Agricultural
Risk Management Information Systems (ARM-IS) in the
following Africa Countries: Cabo Verde, Cameroon, Ethiopia,
Mozambique, Niger, Senegal and Uganda**

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Project Conducted for IFAD by:

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General overview

This report summarizes 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 Country Report.

1. Assessment of the Information systems for agricultural risk management

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.

1.1. A note about dissemination devices, accessibility and types of information and data provided

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. 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.

1.2. How to interpret the scores

The interpretation of the overall scores (0-100) of sub-blocks or blocks is as follows. The reported figures 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. Low values of the overall score (≤ 20) 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 values of the overall score (21-40) would indicate that the available information would merely allow poor risk assessments in the corresponding thematic sub-block or block. Medium values of the overall score (41-69) would mean that available information would permit a preliminary risk assessment. Finally, high values of the overall score (≥ 70) would mean that the information available enables a proper risk assessment and management in the concerned thematic sub-block or block. In the next sections we will summarize the assessment of the IS for all blocks and sub-blocks.

2. Assessment of the Information systems for agricultural risk management for the blocks of information

BLOCK 1: Meteorological, climate and soils information

Sub-block 1.1 Meteorological and climate information

The main information system for meteorological and climate information in Senegal is ANACIM. Actually, the rest of national, regional and international sources of information on meteorological and climate topics in Senegal get that information from ANACIM, including AGRHYMET (a regional IS hosted by CILSS).

ANACIM is a good provider of services through bulletins, internet and a platform of communication to disseminate meteorological and climate alerts and forecasts. However, 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. The regional information system from AGRHYMET (CILSS) is very valuable, but it has severe restrictions on accessibility.

The main weaknesses of ANACIM are the lack of accessibility to metadata and to complete data that ANACIM has, the short length of data series, poor updated of some information and insufficient geographical coverage of the meteorological stations. ANACIM's geographical coverage is much better in the West than in the East of Senegal.

The network, number, location and type (manual or automatic) of meteorological stations is a key element to assess meteorological and climate information. On the website of ANACIM

there is no information about the weather stations. Nevertheless, the *Centre de Suivi Ecologique* (CSE) has published a yearbook (2009) where the meteorological network in Senegal is described. According to the information provided by the local consultant, in 2015 there were 13 agro climatic stations, 12 synoptic stations and 350 rainfall stations. The daily precipitation series expand for more than 60 years in manual stations. Nevertheless, the automatic stations are more recent, and have 10 years data for all variables.

As a provider of alerts and forecasts services, ANACIM is very useful since it shows that information to farmers, fishermen and public in general. The scoring assigned to ANACIM as provider of data series and information on meteorological and climate (sub-block 1.1) is 70/100, due to the constraints and weaknesses mentioned above.

Given that ANACIM is the unique source of meteorological and climate information for Senegal we assigned an overall scoring of 60/100 to the sub-block 1.1.

Sub-block 1.2 Soils information

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. These soil analytical data are available for 15,564 profiles of which 14,197 are geo-referenced. The original values are standardized according to e-SOTER's conventions and validated according to routine rules. In the case of Senegal there are 311 profiles, all of them geo-referenced.

Data downloading of ISRIC is slow and somewhat complicated because the application interface is not easy to use. The soil information system from ISRIC has a sufficient number of soils with profile details, except for information on erosion or soil quality. This information is required to monitor trends in these variables, to highlight risks related to sustainability of the production systems. Taking into account the fact 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*), we assigned an overall score of 70/100 to the sub-block 1.2.

BLOCK 2: Satellite image information and Communications

Sub-block 2.1 Satellite image information

The assessment of the IS from the sub-block 2.1 (remote sensing) in Senegal can be summarized in the following way. FAO is a good remote sensing information system (93/100) and covers several statistical indexes that can provide a first approach to risk assessment: NDVI anomalies, Agricultural Stress Index, Vegetation Health Index among others. Private companies, like VITO nv (82/100), have a good infrastructure and accessibility to data to calculate several useful indexes. However, this work has to be maintained, so for everyday task the cost will be extraordinary high.

Within the different national systems, the role of CSE is remarkable reaching a score of 74/100. We would like to point out the biomass data that CSE shows in its bulletins, which are based in a strong fieldwork, publishing indexes related to crops and fires. The main limitations and weaknesses are that CSE's web does not provide all bulletins and data are not totally open to the public. 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. The IS from ICARDA has the same score (75/100) that CSE. The main weaknesses of ICARDA IS on remote sensing are the short length and the lack of update of the data.

Inspecting the IS, few technical problems were found: (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 (complicated interface potentially hinders the research); (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.

Taking into account all these IS and the weaknesses and strengths aforementioned, we assigned an overall score of 78/100 to the whole Sub-block 2.1.

Sub-block 2.2 Communications

Compared with other African countries, Senegal has a rather good mobile penetration indicator and internet users and of secure internet servers indicators. The broadcast news media for radio and TV have a wide coverage. However, newspapers have lower penetration indicators. Considering these issues, we assigned an overall scoring of 70/100 to the communications (Sub-block 2.2) in Senegal.

BLOCK 3: Prices, trade and input prices information

Sub-block 3.1 Prices

The two main information systems on commodity prices in Senegal are CSA and Manobi. The first one is a national public system and Manobi is a national private information system. 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. The two public national systems CSA and ANSD received moderate scores.

The CSA is a national organization aimed to monitor agricultural markets and stocks, in order to guarantee food security in Senegal. This market information system (MIS) is focused on cereals, and among its main activities there are the food security stock management, the assistance to vulnerable groups and the food price monitoring.

Concerning market information, originally the CSA used to publish two types of documents:

- Monthly bulletins about monitoring of agricultural markets (SIM bulletins): These bulletins are available from January 2008 to date, and provide the evolution of different prices by commodity (rice, maize, sorghum, millet, livestock, cowpeas, pulses) and in some cases by region. Retail and producer prices are considered.
- Monthly bulletins joined by PAM-WFP (Marsé bulletins): These bulletins are only available from 2011 to 2013, and provide the evolution and comparison of prices for different commodities in Senegal.

However, after two years, the “Marsé bulletins” content was integrated into the SIM bulletins in order to avoid duplicity of the analyses and information. This way, monthly bulletins are issued by the CSA and submitted to the WFP before released for observations and additional analyses/information.

Price information is available by market, department and region. However, only national information and analyses are disseminated within the bulletins. Despite this, disaggregated data are available by request to the CSA.

The CSA has data collection staff in every region of Senegal (researchers and a regional coordinator). These regional collection teams gather price data on a weekly basis. The regional coordinator transmits the “collection cards” to the national team, which is in charge of validating and analyzing the information. The main validation method used by the CSA to check data quality is the comparison of the data with previous trends and other information systems.

Concerning dissemination channels, from 1989 to 1999 the CSA used to disseminate information by the national radio (RTS), newspapers (“Le Soleil”) and in hard copy. However, for the last 15 years the main distribution channel has been the CSA’s website and the mailing list.

CSA’s score is 68/100 due to some weaknesses identified, mainly concerning to decentralization, frequency, coverage and update. ANSD system has better scores on decentralization and length, but it is very weak on updating. About the quality and reliability of price information, CSA representatives verify and control de data quality taking into account their experience in CSA (at least 17 years).

CSA has much more information not currently available that can be obtained upon request. In other words, CSA has rather complete information on commodity prices but not all is on the web page and therefore there is a problem of accessibility and insufficient dissemination. For this reason, in addition to the the limited commodity coverage, the assigned score to CSA is 70/100.

Manobi is a private information system aimed to provide services to small producers. It facilitates access to information and technology, as well as commodity marketing since all stakeholders are connected through the same platform.

Manobi’s main services are the census and geo-positioning of farmers, the traceability of productions, to collect and solve demand/supply offers, to issue alerts about extreme events coming, meteorological previsions, and the market information. In this regard, information about agricultural prices and alerts can be obtained in real-time only by SMS, not on-line. In fact, Manobi’s website does not offer more information about its market monitoring activities, commodities covered, length of time series available, frequency of data and other information attributes.

Manobi collects daily price information of domestic commodities such as fruits, vegetables and cereals but it does not collect any livestock price. Manobi provides daily retail and wholesale prices by market, from year 2001 to date. Prices are collected by agents in the markets that act as “brokers” among buyers and sellers. This is the way by which prices are obtained for each of the main markets and for each variety of the commodities sold. Buyers and sellers can place their offers (prices) through the platform (smartphone app) or through the market agents. As an output of this main activity, farmers can obtain daily prices for the commodities they select by SMS. Although it is not usual for smallholders, if any farmer wants to have access to complete historical price data Manobi provides these upon request. Manobi’s supervisors at the headquarters are in charge of validating the information transmitted by the collection/market agents. Due to all these advantages and strengths the scoring of Manobi is

high (80/100), although it has some weaknesses such as incomplete commodity coverage (there are no livestock prices) and lack of information on the services and functioning of this market information system.

Concerning input price information systems in Senegal, we did not find any national information system. We found just two systems, one regional (AFO) and the other international (FAO) but none of them presents high scores: AFO (59/100) and FAOSTAT (57/100). The main limitations of both systems are limited inputs coverage, insufficient spatial disaggregation, low data price frequency and especially lack of input price updating.

The existence of Manobi with diversification of services and a strong dissemination strategy is a positive element for the sub-block 3.1, which can be considered as a positive element of commodity price information systems in Senegal. 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 in different systems. Nevertheless, the international price information systems (FAO, WFP or USAID) get the information from the national systems thus reducing such problem. The existence of different IS could make sense if the covered products were different (complementarities), which is not the case except for FAOSTAT. But this system is not that useful mainly due to the lack of update and spatial aggregation (country level).

Based on all the assessment criteria and taking into account the weaknesses and strengths of the IS of the Sub-block 3.1 and the way to upgrade or downgrade the score of the best national IS we assigned an overall score to the sub-block 3.1 price information systems of 75/100.

Sub-bloc 3.2 Stocks

There has not been identified any proper information system providing regular, systematic and reliable information about national stocks and/or input availability.

Neither has there been found any information system in Senegal providing regular information about input availability. However, some sources offer some useful information.

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.

The international information systems publish some data on stocks, though they are just estimations. Data to estimate stocks can be found in FAO or USDA, as these institutions use data on food production, foreign trade and consumption (balance sheets) to estimate stocks variations in some countries but in general, the data on stocks are not very reliable.

Based on the lack of information on inputs availability and the severe limitations to the access to stocks information we assigned a very low score (10/100) to the sub-block 3.2.

Sub-block 3.3 Trade

We found six foreign trade information systems in Senegal: Three international (FAOSTAT, UN Comtrade and US Foreign Service); two regional (UNECA and AfDB); and one national system (ANSD).

The best trade information system in Senegal is UN Comtrade (80/100) 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 sub-block 3.3 is the ANSD. ANSD's website publishes

monthly bulletins on trade (import and exports) and trade indices, but the unavailability of the website is so frequent that it is almost impossible to access it. In addition, the data on-line on foreign trade are incomplete. The conclusion is that the information available in the international source (UN Comtrade) is more complete than the information published by the ANSD is surprising since the unique source for foreign trade information in Senegal is the ANSD.

The UN Comtrade is a good and complete information system with broad commodities coverage (80/100) but the absence or unavailability of complete and updated trade information in the websites of national system ANSD is a negative element. Based on this consideration and in the weaknesses and strengths of sub-block 3.3, we assigned an overall score of 70/100 to the IS of sub-block 3.3.

BLOCK 4: Plant production, yields and health

Sub-block 4.1 Plant production and yields

There are four main national information sources and systems for the sub-block 4.1: DAPSA, ANSD, CSE and ISRA

The *Direction de l'Analyse, de la Prévision et des Statistiques* (DAPSA) is responsible for collection, centralization, processing and dissemination of agricultural information and statistics, from 42 agricultural departments that cover all the Country. The Data Portal provides the information from 2012 to 2014 covering cropland, yields and production for the main crops. The representative of DAPSA attending the seminar explained that they have complete and spatial disaggregated information on yields, cropland and production that they provide to CountrySTAT (FAO) and ANSD. 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.

FAO and ANSD systems feed on national statistical data from DAPSA and thus they show similar performance in some criteria but not in others. The score is nearly the same in both systems (67/100 and 64/100 respectively). Both systems show good assessment for frequency and accessibility. The national systems (ANSD) is better than CountrySTAT (FAO) in geographical representativeness and level of aggregation (68/100 instead 34/100) but FAO is much better than ANSD in time series length (85/100 instead 17/100). Ironically, CountrySTAT (FAO) feeds on national statistical data (DAPSA). The main limitation of ANSD information for plant production and yields is the length of the data series (17/100) which is a severe constraint for agricultural risk assessment. The main weakness of CountrySTAT (FAO) information for plant production and yields is the very low geographical representativeness as it refers to country scale which is not enough for agricultural risk assessment. DAPSA has much better and disaggregated information on yields and plant production, but these information and data are not yet accessible on-line.

Taking into account the assessment of the IS of the sub-block 4.1 and the weaknesses and strengths of the sub-block 4.1, we assigned an overall assessment of the information systems of sub-block 4.1 of 60/100 which means that in Senegal 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 in this relevant sub-block. Nevertheless, the services of weather alerts and harvest forecasts provided by ANACIM

and DAPSA to the farmers and producer organizations through bulletins or the local offices of the Ministry of agriculture are very satisfactory.

Sub-block 4.2 Plant health

The *Direction de la Protection des Vegetaux Vegetal* (DPV), under the *Ministry de l'Agriculture et l'Equipement Rural* (MAER), is the Central Technical Unit for pest monitoring and control. It provides national technical supervision of actions against the attack of pests and provides, through financial and material resources made available by the state, support in goods, services and equipment required for decentralized structures of MAER (Regional Directorates of Rural Development), the Committees for the Fight Village (CLV) and producer organizations.

The Directorate of Plant Protection (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. These bulletins include prospected surfaces, diseased or pest-ridden surfaces and treated surfaces. The DPV has the following information: global situation phytosanitary by zone of intervention, situation of fruits and vegetables, total quantities of pesticides annually imported, quantities of pesticides in circulation and crop damages. However, there are no historical data to make risk analysis. The Directorate of Plant Protection (DPV) alerts farmers about pest and diseases through farmer organizations and local offices of MAER.

ANACIM publishes every 10 days an agro-meteorological information bulletin on agricultural and pastoral situation and plant health, highlighting incidents by agro-ecological zones. Nevertheless, the website has not an easy interface and document searching is not easy. There are only available bulletins published in 2015. There is no database and during the course of this project, this information is no longer available, as the website has been changed.

The Inter-African Phytosanitary Council of the African Union (IAPC-AU) has programs related to the collection, evaluation and dissemination of plant protection information relevant to Africa, but it has low accessibility online. The IAPC has published the *“For better Plant Health in Africa”* as Strategic Plan for 2014 to 2020. Its second programmatic area is “Plant Pest Risk Reduction”, and the IAPC-AU has tasks of facilitation and support decision-support tools, pest risk analysis, testing and monitoring.

The International Plant Protection Convention shows an Official Contact Point, related with the *“Direction de la protection des Vegetaux “* (DPV) and updated in 2015. The latest Pest Reports from Senegal were updated in 2008. The IPPC Official Contact Point is recently updated (September of 2015) but there is little information available in this site.

The conclusion is that presently a proper IS for plant health does not exist in Senegal. There is only some information from scattered information sources. The systems for Plant Health are still under construction by the Inter-African Phytosanitary Council of the African Union. Given the lack of IS and historical and systematic information on plant health it can be stated that the information on plant health is totally insufficient for making risk analysis and management. Plant Health ISs are still under construction in the framework of IAPC-AU and therefore we assign an overall quantitative assessment to the information systems of block 4.2 plant health of 20/100. Nevertheless, the services of plant health alerts to the farmers provided by the DPV

through bulletins, local offices of the MAER and farmer organizations can be assessed as satisfactory.

BLOCK 5: Animal production and animal and human health

Sub-block 5.1 Animal production

Most of the sources analyzed in thematic block about Senegal are not properly IS. Excluding some international (Factfish, FAOSTAT, OIE, WHO-Health Statistics and Information Systems) and national (ANSD) information systems, the majority of the other sources merely include not serial and systematic information (reports, journals, scientific papers, book and book chapters, etc.)

There is a lack of updated information related to animal production and cost of animal diseases (sub-block 5.1) in Senegal. At producer level, farmers lack ready access to the prices and demand for livestock, red and white meats and dairy products, in order to time their off take and maximize returns. Planning for the sector is also constrained by the lack of accessible information on the extent to which market factors may be limiting production.

The website of the "*Ministère de l'Élevage et des Productions Animales*" does not have relevant information about animal production. When trying to access the *Système d'information de gestion de l'élevage* (SIGEL) it was impossible (April, 2016) because the website takes too long to give an answer. The representative of the *Direction des Services Vétérinaires* (DSV) attending the seminar informed that the Ministry is working to organize and upload livestock information on the web page and improve the accessibility of the site

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. Another potential source of information is the International Livestock Research Institute (ILRI), but upon typing "Senegal" this site gives several results, many of them related with books devoted to animal production in the region, but not many specific for Senegal.

The webpage of the *Project Régional d'Appui au Pastoralisme au Sahel* (PRAP) does not yield relevant information about this essential way of raising livestock. The website only describes the project launched by the World Bank and some of the milestones in the project's history.

The information from OIE (89/10) and FAOSTAT (86/100) 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 (domestic trade and movement of live animals, border trade and movement of live animals, livestock holdings etc).

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. Both national IS therefore have low assessment scores (36/100 and 44/100, respectively), mainly due to the absence of serial information and the fact that the website of the statistical agency does not work enough quickly and efficiently, and has some essential sections without information.

More detailed national information should be needed (locality-wide census of the animal population, with location, type, and number of livestock and poultry, type of holdings, etc.).

The existence of many sources and IS without a clear complementarity is not an advantage. There is a deficit of information sources about animal production, trade, movements and holdings. Based on all these considerations and the weaknesses and strength we assigned an overall assessment score of 45/100 to the whole information systems for Sub-block 5.1.

Sub-block 5.2 Animal health

The main sources and information systems for the sub-block 5.2 (animal diseases) are basically the same than those for the sub-block 5.1. Similar comments can be made about the lack of proper IS and information because the information on some key variables is not provided by any source or information system.

The representative of DSV attending the seminar informed that the DSV has much information on animal diseases collected from the local animal health services of the DSV and they are working to organize and load information on animal diseases on the site of DSV within the web of the Ministry. DSV provides animal health alert services to the farmers through local offices, bulletins and farmers organizations.

We found a substantial number of sources and some information systems on risk of endemic and emerging diseases. Two IS stand out above the rest due to their websites with many and useful information: OIE (89/100) and WHO's Health Statistics and Information Systems (90/100) 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* (38/100), *Ministère de l'Élevage et des Productions Animales* (44/100), and *Agence Nationale de Statistique et de la Démographie* (39/100).

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. The existence of a lot of sources and systems without a clear complementarity is not a positive element. OIE and WHO Health Statistics and Information Systems cover most of the necessary fields, but the national systems should be strengthened in order to provide complete and up to date information. Based in all these considerations we assigned an overall score of 55/100 to the Sub-block 5.2.

BLOCK 6: Policies

This block includes just some policy variables: market intervention measures, early warning systems to trigger safety nets, trade barriers and insurance information. We did not find properly information systems on agricultural policies in Senegal, although DAPSA is carrying out policy monitoring and evaluation, and publishes some reports. We found scarce and occasional information about policies related to agriculture and food such as trade policies, market interventions, producer or consumer safety nets, risk management (insurance policies), food security and emergency policies but we did not find systematic, periodic updated and well organized information on those policies.

Senegal is not yet included in the policy information systems as FAO's MAFAP but DAPSA recently started the contacts with FAO and the process to be included in the MAFAP program is now ongoing. The World Bank, the OECD and the USAID provide some information on trade measures and price support indicators.

Concerning early warning systems for food security Senegal disposes of a national early warning system from 2006 (SAP), when it was launched by the *Secretariat Executif of Conseil National de Sécurité Alimentaire* (CNSA). Its objective is to collect, analyze and disseminate the information concerning food security. The Secretariat is supported by Regional Committees and Technical Work Groups, and its members meet weekly to assess the situation of crops and markets during critic periods. Besides that, at national level the SAP includes the assessment of the Work Group established by the Permanent Interstates Committee for Drought Control in the Sahel (CILSS). To assess the needs, the food and nutrition situation of rural households is considered along with the evolution of climatic and market indicators. Until 2011, the results were published in “*Bulletins d’Information*” with the support of the international cooperation. Since then, data are not published and the website is not functional. Apparently, SAP is in a difficult situation, but its managers are trying to reactivate it despite some problems of coordination and budget allocation.

In addition there is one regional international early warning systems for food security (*Système Pastoral d’Alerte et d’Information pour le Ferlo*) and four international systems (*GIEWS-FAO, VAM-WFP, FEWS-NET and IPC*) that provides good early warning on food security for Senegal.

Regarding agricultural insurance, there have been found some references to agricultural insurance products in Senegal, particularly to index-crop insurance (The World Bank). In addition, 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 the pilot projects.

The conclusion is that there is some information on this thematic block, although it is not updated and not complete. There is a lack of national system providing systematic and complete information on policies and thus we assigned an overall score of 55/100 to that block.

BLOCK 7: Socio-economic sector

The *Direction de l’Analyse, de la Prevision et des Statistiques Agricoles* (DAPSA) of the MAER works in partnership with international organizations such as WFP, FAO and IFAD. Its main functions are the analysis and tracking of agricultural policies, programs and development projects as we mentioned in the block 6. In addition, DAPSA is in charge of the collection, centralization, processing and dissemination of agricultural data and statistics. At this aim, DAPSA carries out agricultural surveys and censuses. However, in DAPSA’s website there are only available financial documents and, although interim results of the agricultural census 2015 are stated to be published now, only the methodology is available. There is a specific portal for the dissemination of the agro-survey results, but at moment only production, cultivated area and yield data (by region for millet, sorghum, maize and peanut oil) 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.

There has generally been a lack of information and specific indicators on pastoralism (seasonal transhumance patterns, vulnerability of pastoral households, variations in the price of livestock and foodstuffs, etc.). This lack of information is compounded by the absence of any official framework for consultation. It was in response to these challenges that CIRAD and partners developed the *Système d'information sur le Pastoralisme au Sahel* (SIPSA), which includes six CILSS countries: Burkina Faso, Mali, Mauritania, Niger, Senegal and Chad.

SIPSA should provide relevant information on the state of and trends in Sahelian pastoral systems, and serves to develop information products that satisfy the requirements of players and partners on different decision-making levels, before, during and after crises. However, the only specific reference to this information system has been identified within FAO's website. Unfortunately, the link to the SIPSA database is not working and only outdated documents about the project are available. Again, the issue of accessibility is a negative element of the assessment of that information system.

The African Risk Capacity (ARC) is a specialized agency of the African Union with the objective of assist AU Member States (including Senegal) to reduce the risk of loss and damage caused by extreme weather events and natural disasters. Within its studies, there can be found recent reports (2014/2015) containing information about issues such as population, livestock or food security by region and department. However, this is not a proper information system and the information provided is very limited.

Concerning other international sources of information, the African Development Bank Group (AfDB) and The World Bank (WB) provide different datasets with annual socio-economic information and indicators. However, the sectorial information offered by the international institutions is very aggregated and not enough for agricultural risk assessments.

The conclusion is that information systems of block 7 provide poor aggregated sectorial information with lack of disaggregated socio-economic indicators. The sectorial statistics and information from DAPSA is rather complete but it is not available in the web page of DAPSA yet. Due to all these deficiencies found in the accessible information for this block the overall score is 50/100.

BLOCK 8: Integrated information systems

Some national, regional and international information systems provide information on several thematic blocks. But these information systems are multi-blocks information systems but not properly integrated information systems because they do not integrate in an interrelated way different blocks of information but just provides information on several thematic blocks.

In some cases the different information blocks are even collected and elaborated in an independent way by different department of the same institution (World Bank, FAO, ANSD etc). The unique proper integrated system 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. This private integrated system makes the difference in Senegal compared with other West African countries.

3. Summary of the assessment of the IS-ARM for blocks and sub-blocks

In the Table i we summarize the overall scores (0-100) of all the thematic sub-blocks/blocks. The results show that 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.

Table i. Summary of the overall scores of all the thematic sub-blocks and blocks.

Thematic Block	Quantitative assessment
1.1 Meteorological & climate information.	60
1.2 Soils	70
2. 1. Satellite image information	75
2.2. Communications	70
3.1. Prices	75
3.2. Commodity stocks and inputs availability	10
3.3. Trade	70
4.1. Production levels and yields	60
4.2 Plant health	20
5.1. Costs of animal diseases	45
5.2. Risks of endemic and emerging diseases	55
6. Policies	55
7. Socio-economic & sectorial information	50

4. Recommendations

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, sometimes too 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 and could be designed as the 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.

Concerning the provision of services, open 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.

Concerning the provision of time series of data, a common problem in most of the national information systems in Senegal is the lack of on-line accessibility of information and data. In general, the national sources have much more, better and detailed information than the information found in the web site of the corresponding sources and IS. This is because a large part of the available information and data are not uploaded on the web site of the concerned sources or IS. The main cause of this limited on-line accessibility to the available information is the lack of resources to organize and load all this information on the web site, or the confidentiality regulations in Senegal. It is crucial to overcome this problem allocating additional resources to complete the information provided on-line and reviewing the confidentiality regulation of Senegal. We recommend paying special attention to solve this constraint in ANSD, ANACIM, CSA, DAPSA, DPV and DSV. Some of this IS stated that all the available information can be obtained by request but in our view it is not enough.

In the case of some national IS there is an additional problem affecting the on-line accessibility of information and data that is caused by poor working and difficult access to the web page. Thus, we recommend improving the working and access to the web page especially in the case of ANSD.

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.

We recommend strengthening the cooperation between the national and international systems in a win-win way: The national system would provide information to the international system and this would provide financing and technical cooperation to the national systems to improve the on-line accessibility of the information available in the national system. In particular, the interoperability and automatic data transfer between national information systems and other valuable international or regional IS strengthened.

This recommendation can be applied 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.

Focusing the recommendations on priority national information systems

To limit the number of recommendations and concentrate the efforts and resources devoted to improve the IS-ARM for Senegal, we will focus on the following ten priority national information systems: ANSD, ANACIM, CSA, Manobi DPV, DSV, DAPSA, MAFAP, SAP and CNAA. In the following paragraphs we will present specific recommendations for these priority national information systems and blocks.

Blocks 1 and 2

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.

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 AGRHYMET, and both organizations should work closely coordinated. We recommend to build a partnership ANACIM-AGRYHMET and to take advantage of the Regional Food Reserves in West Africa Project financed by EU-DEVCO, since such project has an important budget to strength and improve the information systems for agriculture and food security (component 1) executed by CILSS.

Block 3

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. CSA has complete and good information on commodity prices and food reserves but the information and data on the web site is rather limited. We

recommend loading in the CSA website all the available commodity price and food reserves information instead of having to request to CSA the complete information

It is recommended that Manobi should disseminate the data price collected by its market agents through the website (currently it is disseminated by mobile SMS and extension agents). The web of Manobi should inform about all the services provided, the costs and the modus operandi of this valuable market information system. It is proposed to widen the commodity price coverage should be widened. Further efforts should be made to collect input price information.

Block 4

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.

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 on-going process of construction of DAPSA Portal and bringing together all the DAPSA available information on this Portal.

ANACIM coordinates the Groupe de Travail Pluridisciplinaire (GTP) that collect data on meteorology, agricultural hydrology, pastoralism, phytosanitary and markets to produce weekly a multidisciplinary bulletin. We recommend uploading all the information and data included in those bulletins on the ANACIM web site.

Although the DPV provides some bulletins with good information, the DPV should improve the information on plant health uploaded on its web site. In the future, the DPV should move forward to setting a proper information system on plant health (Plant Health Portal, PHP). The Inter-African Phytosanitary Council of the African Union could help to reach this target.

Block 5

Dissemination through the national webs should be improved (the low performance of *Agence Nationale de Statistique et de la Démographie -ANSD-* is a real problem that needs to be urgently addressed). Although improvements have been made in recent weeks in the ANSD webpage (now it is possible to access to the livestock and fisheries statistics of year 2013, both published in February 2016), no serial data are available. 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 animal and human health issues. Something similar may be applied to the website of the *Ministère de la Santé et de L'Action Sociale* and public health issues. The SIGEL web should be functional regularly.

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.

Blocks 6 and 7

DAPSA started already the process to include Senegal in the MAFPA-FAO program. We recommend accelerating the implementation of MAFAP Program in Senegal.

It is recommended implementing new pilot insurances on crops and livestock, based on the experience and evaluation of the CNAA-agro-insurances, in order to strengthen the farmers' capacity to cope with increasing risks.

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.

1. Introduction

The Platform for Agricultural Risk Management (PARM), a G8-G20 initiative hosted by the International Fund for Agricultural development (IFAD), provides technical support to Governments on Agricultural Risk Management (www.p4arrn.org). PARM Secretariat is working in the African continent in strategic partnership with the NEPAD Agency (African Union's New Partnership for Africa's Development) which, in collaboration with the Food and Agriculture Organization (FAO), has been establishing since 2011 an Agriculture and Food Insecurity Risk Management (AFIRM) initiative to support African countries in mainstreaming agriculture and food security risk management into their Comprehensive Africa Agriculture Development Programme (CAADP) implementation (Antonaci et Al, 2013). Seven countries have currently been selected to participate in PARM: Cabo Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda.

The PARM activities are oriented to facilitating the development of Agricultural Risk Management knowledge and tools, creating synergies and complementarities among different partners and stakeholders.

The final objective of the whole process is facilitating the integration of a holistic risk management strategy into national policy documents and agricultural investment plan, and its implementation, by matching the demand and supply of ARM tools suitable for farmers, market level stakeholders and Governments.

Information is the key input for any risk management activity. Without appropriate information farmers cannot identify their main risks and select the appropriate tools to manage them, and governments cannot design their agricultural policies and respond to risks with preparedness. Lack of reliable information also discourages private sector investments or the cost to protect them is so high that the final product is not affordable for smallholders. Weak information systems will lead to wrong investments and ARM decisions.

In this context, information systems have been identified as main limiting factors to develop Agricultural Risk Management tools in several African countries where PARM has already begun its activities. Information systems are powerful ARM tools. They are also an important requirement to develop other ARM tools such as insurance, forward contracts and warehouse receipts.

This is the reason for which IFAD has hired the services of Technical University of Madrid that with the collaboration of Complutense University of Madrid are in charge of the study entitled Informational Assessment of Agricultural Risk Management Information Systems (ARM-IS) in the following Africa Countries: Cabo Verde, Cameroon, Ethiopia, Mozambique, Niger, Senegal and Uganda.

One of the outcomes of the study should be a single separated study for each country, but common methodologies and indicators will be developed across all countries. A final comparison report will be undertaken using common criteria and indicators to understand and compare the different situation of IS in each country.

The purpose of this report is to collect the research results of the availability and quality of information for agricultural risk management purposes in Senegal. Both the existence of the information and the timely and useful access by stakeholders at micro-meso-macro level (and their interconnections) 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 assessed. A special emphasis will be made 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.

The approach will be holistic, covering all sources of risks in agriculture, in particular risks from the following thematic blocks:

1. Meteorological, climate and soils information
2. Satellite image information & 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 information

2. Methodology

The methodological approach (Figure 1) is based on a framework consisting of:

- A develop of a benchmark for **Agricultural Risks Management Information Systems (ARM-IS)**, hereafter referred as **Bchmk-ARM-IS**,
- A search of information systems from different sources analyzing academic literature, bibliographic sources, websites, public and private, national regional and international institutions supporting information systems and offering information services
- Checking and contrast some inconsistencies, doubts and gaps found in the information systems analyzed through local consultants.
- Identification of weaknesses and strengths of ARM-IS of the thematic sub-blocks and blocks in each country.
- Qualitative/quantitative assessment of information systems of the thematic sub-blocks and blocks defined in the **Bchmk-ARM-IS**
- Feedback from the national governments and selected stakeholders, gathered in a public workshops hold in each country's capital.
- Comparison of the revised quantitative/qualitative assessments across countries and discussion
- Recommendations for improving and strengthening the ARM-IS of the thematic sub-blocks and blocks and their interactions, to prepare each country to carry out further analysis of the agricultural and veterinary risks.

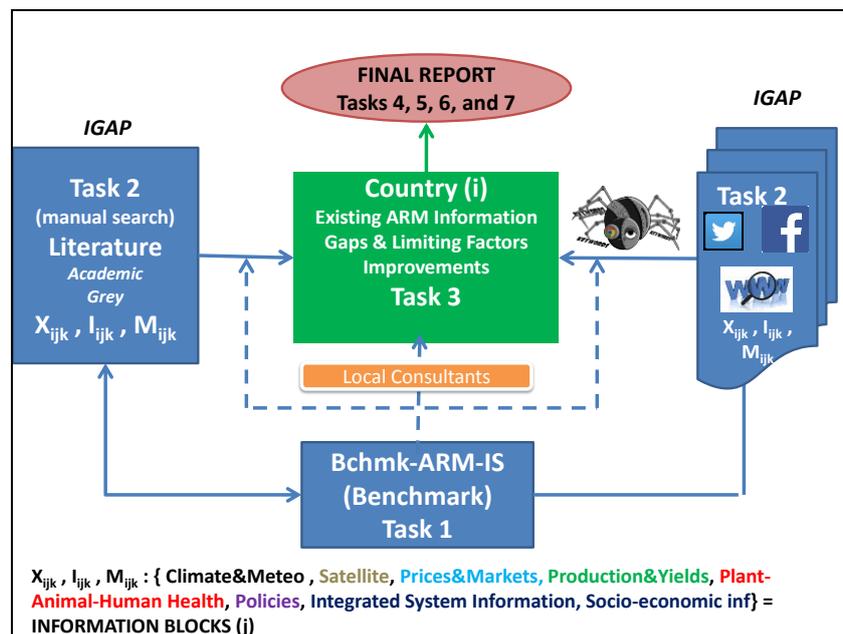


Figure 1 Methodology Scheme

Notes: IGAP, Information Generation and Assesment Process; Bchmk-ARM-IS A benchmark for Agricultural Risks Management Information Systems (ARM-IS).

This approach will be implemented taking into account the specificities of Senegal and of each block and sub-block of information, but following a common pattern analysis in all the target countries of this study.

3. Benchmark

The benchmark will allow to assess the ARM-IS and represents a canonical system whose components, structure and logic are defined according to the worldwide experience and best practices on agricultural risk assessment and management.

The components of Benchmark developed are:

- i. Primary data
- ii. Variables
- iii. Assessment criteria
- iv. Thresholds (reference and desirable)
- v. Sources of information

The reference threshold indicates the type and amount of information on primary data and variables required to proceed to a *preliminary agricultural risk assessment* for corresponding thematic sub-block or block. The desirable threshold indicates the type and amount of information on to proceed to a *proper, not optimal, risk assessment and management*.

Upon reviewing the information sources, sites and literature, the information systems (IS) providing information on primary data and variables (basic and derived) of the different sub-blocks and blocks considered in the benchmark will be assessed based on a set of defined criteria. There are two sort of criteria: 1) features of information (primary data or variables); and 2) attributes of the information system. The number and type of criteria to assessing the information systems of each thematic sub-block or block will be different to take into account its specificities. See below some examples of both sorts of criteria:

1) Features of the information

- Frequency of information
- Spatial aggregation of information
- Continuity of information
- Up-dating of information
- Reliability of information
- Length of data series

2) Attributes of the information system

- Accessibility
- Institutional framework
- Diversification of services
- Dissemination channels

The criteria to assessing the IS have a hierarchical structure and order, and may becomes less objectively measurable and more subject to be assessed by experts' judgment. The criteria and its translation into scores to proceed to a quantitative assessment of IS for each thematic sub-block or block are presented in the Appendix 2. We insist again on the fact that each thematic block or sub-block follows a somewhat different structure. In some cases, primary data suffice to describe the topic, in some others more elaboration is required to include variables (basic and derived). The full benchmark is presented in the Appendix 1.

4. Brief country profile

<http://www.eoearth.org/view/article/155977/>

The former capital of French West Africa, Senegal is a semi-arid country located on the westernmost point of Africa. It is bounded by the Atlantic Ocean, Mauritania, Mali, Guinea, and Guinea-Bissau. The Gambia penetrates more than 320 kilometers (200 mi.) into Senegal. With a surface area of 196,712 km² is divided in 14 regions (Figure 2) and an estimated total population of 14,548,000 (<http://data.un.org/CountryProfile.aspx?crName=Senegal#Top>).

Well-defined dry and humid seasons result from northeast winter winds and southwest summer winds. Senegal is generally low, rolling, plains rising to foothills in southeast. It represents the western edge of the Sahel. About 45% of Senegal is forest or woodland. Senegal is susceptible to having its lowlands seasonally flooded and to periodic droughts.



Figure 2. Political Map of Senegal's regions and main cities

www.mapsoftheworld.com

Predominantly rural (58%) and with limited natural resources, the country earns foreign exchange from fish, phosphates, peanuts, tourism, and services. Its economy is highly vulnerable to variations in rainfall and changes in world commodity prices. The GDP per capita is US\$1,906 (2012); agriculture sector contributes with 17%, industry 24% and services 59%.

The fishing sector is Senegal's export leader. In 2007, fishery products contributed 22% of Senegal's export earnings and employed about 15% of the population. Receipts from tourism, the second major foreign exchange earner, contribute between 4.6%-6.8% of GDP annually. Agriculture employs 77% of the economically active populace, while groundnut cultivation (which in 1960 had provided 80% of Senegal's export earnings) engages about 10% of the population and is done on 50% of sown land in rotation with millet and sorghum. Mining, especially of phosphates, employs about 33,000 people and provides about 15% of export value.

With less than 1 % of agricultural land under irrigation, the growing season in Senegal strongly correlates to the rainy season. This strong dependence of crop production on rainfall results in highly variable production, as both rainfall amounts and the onset and cessation of the rains are subject to marked space-time variability and temporal changes.

Although Senegal encompasses more than 19 million ha, the area available for agriculture is limited by poor soils and climate to less than 10 million ha. 43% of the land area remains as undeveloped bush available for grazing, whereas a significant proportion of the remainder receives less than 500 mm of rainfall so that yields are severely constrained and much of the agriculture that is undertaken is inadequate even for subsistence.

Where there is adequate moisture, the main crops cultivated are groundnuts and millet, which together account for almost 75% of the planted area. Maize, rice sorghum, cowpeas, and cotton make up about 25 % and less than 1 % is sown to other crops, including vegetables.

Much of Senegal's livestock sector, especially ruminants, remains under a traditional extensive or mixed farming system. Pastoralists produce animal products that are supplemented, in the case of agro-pastoralists, by crops. The annual production is primarily self-consumed but some portion is marketed. Although Senegal's livestock sector is substantial, the country is dependent upon imports to meet its growing demand for meat.

According to FAO data, the main species are cattle, sheep, goats, pigs, poultry, equines, and camels. Livestock are kept largely for meat, and to a lesser extent, for dairy and other products. They are also important for draft power.

5. Sources of information

The first step has been to identify the sources of information, and the second one to identify the information systems for each thematic sub-block or block. The distinction between information source and information system is crucial in this study. An information source is an organization that collects and disseminates information. These organizations may be international, regional or national public institutions, professional private organization, private companies, universities and research centers, scientific journal, newspapers, other mass media and social networks (twitter, facebook etc). The information collected and disseminated by the information sources may be occasional, scattered and discontinued or systematic, continued, structured and organized. We just can consider that an information system exists when the provided information is systematic, continued, structured and organized. Therefore, not all the information sources become information systems on the contrary just a few information sources originate proper information systems.

The terms of reference of this study establish clearly that the focus is on information systems, without forgetting those information sources that do not properly originate information systems. Anyway we proceeded first to identify and analyze the information sources and then to identify and analyze the information systems.

According to the benchmark (see the last column of the full benchmark in the Appendix 1), the potential information sources can be classified into several categories following two criteria. The first criteria is the scale or geographical scope of the information source (international or global, regional and national); and the second criteria is the nature or type of institutional framework (public institution, private professional organization, exchange. private company, academic and research center, mass media, professional and social networks).

In order to tracking all that kinds of information sources, two type of methodologies of research were implemented. At a first stage, research of potential sources was a “smart search”. National Ministries, statistical agencies, international organisms were identified and overviewed. Once main national and international organisms were identified, a “blind quest” was conducted in order to obtain additional international, regional or national sources. This research was carried out by entering “key words” in the internet search engines. As a result, new sources were identified within national public institutions and private companies, regional networks, scientific and technical publications, reports, or news in newspaper and mass media. One research leads to a new resource, and this new one to another, in a sequential way.

Some identified information sources presented different problems: (a) the information sources were temporary programs/projects or policies offering few data; (b) communications may be complicated in some countries, as at random days websites were not working or under maintenance; (c) at the beginning of the resources search, there were some databanks and websites where information was of free access. But some weeks later, when consulted again, the user is asked to register in order to access the data; (d) some potential institutions of interest (mainly producer associations or specific agencies) are referenced, but there is no way to find any website or link from which gather information. For all of these reasons the field work based on local consultants, experts and official consultations emerged as a key way to complement the searching of information sources and systems from HQ and fill the gaps and answer the questions that emerged in the searching from HQ.

Despite these inconveniences, and after a meticulous search process, the complete list of information sources identified in Senegal for different categories of sources and thematic sub-blocks and blocks is provided in the Annex 2.

6. Description and assessment of the Information Systems

After ending the first stage of searching (sources of information), we proceeded to identify the proper information systems in Senegal. The list of identified information systems (IS) for each block organized by scope and nature is at the beginning of each thematic block section.

The description of the IS will cover the all the considered criteria (features of information and attributes of information system) of each sub-block or block (see the methodological Appendix 2). It will be based on the information collected from brochures, academic articles, newspapers, websites of the concerned IS, and from the fieldwork carried out by the local consultants (the list of people that was interviewed in Senegal and questionnaires are in the Annex 3).

Spite our efforts we were not able to capture full information on all the identified information systems due to two main problems: incomplete or non-accessible on-line information on some IS; and insufficient information and incomplete answers from the local consultants and experts. In addition, the workshop with stakeholders and authorities in Senegal to get the country feedback to this national report draft has not been hold yet.

In the Table 1 below, we show the number and nature of the information systems found in Senegal for the seven thematic blocks. The total number of identified IS for the seven blocks is large (90); the international systems are dominant (44), the regional IS are 23 and the national systems are just 22. The blocks with more information systems/sources are animal and human health (21), and price and markets (15). It would be boring to describe in the text all the 90 information systems identified in Senegal and we decided to move the IS description for each thematic sub-block or block to Annex 1.

Table 1 Number of IS identified for Senegal by thematic block

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 quantitative assessment of the IS for each sub-block or block will be realized based on the primary data, variables and the reference and desirable thresholds values of the criteria (features of information and attributes of the IS) following the Benchmark (Appendix 1). The definition of thresholds allow us to assign values (0-100) to the criteria considered for each sub-block or block and weighting the criteria we reached a score (0-100) for each IS of specific sub-block or block (see the details of the method used for quantitative assessment of IS in the Appendix 2).

The next step was to moving from assessing a single information system of a specific sub-block or block to assessing the set of information systems in a specific sub-block or block i.e. to move from assessing single information systems to assessing sub-blocks or blocks.

The assessing of the thematic sub-blocks or blocks will be qualitative and quantitative. The qualitative assessing will be based on the weaknesses and strengthens of the set of IS systems analyzed in the corresponding thematic sub-block or block. 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 assigned is that of the best rated IS down-graded between 10 and 30 points depending on the lack of coordination among the IS and the relevance of the information gaps (relevance of variables information covered deficiently or even do not covered for any IS).
- If only international systems are good -or even only international information exists- we downgrade between 5 and 10 points the score of the best international system, as the lack of good national systems is a negative element
- 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 on the same 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 an 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 or strengths (up-grading) and negative elements or weaknesses (down-grading) to assign the overall score to the 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 method used for the quantitative assessment of the IS and the thematic sub-blocks or blocks is presented in detail in Appendix 2.

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-bloc or block. Low-medium scores (20-40) would indicate that the information available allows for a poor risk assessment in the corresponding thematic sub-bloc 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.

We will present in the following sections organized by thematic blocks the list of identified IS, the quantitative assessment of IS and the qualitative and quantitative assessment of the thematic sub-block or block IS.

6.1. Meteorological, climate and soils information

We list below in Table 2 the IS identified in Senegal for the Thematic Block 1. The description of these IS can be consulted in Annex 1.

Table 2 List of IS on Meteorological, climate and soils information

Type	Name	URL
National	L'Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM)	http://www.anacim.sn/
	Agence Nationale de Statistique et de la Démographie- Ministère de l'Economie et des Finances du Sénégal	http://www.ansd.sn/
	Institut National De Pédologie	www.inp.sn
Regional	African Center of Meteorological Application for Development	http://acmad.net/rcc/metadatasenegal.php
	Centre Regional AGRHYMET	http://www.agrhymet.ne/bulletin.html
International	CountryStat-FAO	http://www.countrystat.org
	FAO-Aquastat	http://www.fao.org/nr/water/aquastat/climateinfo/fotool/index.stm
	Centre for Research on the Epidemiology of Disaster-CRED. (The International Disaster Database).	http://www.emdat.be/advanced_search/index.html
	The World Bank Group (Climate Change Knowledge Portal)	http://sdwebx.worldbank.org/climateportal/home.cfm?page=country_profile&CCCode=SEN&thisTab=RiskOverview
	European Soil Data Centre (ESDAC)	http://eussoils.jrc.ec.europa.eu/esdb_archive/EuDASM/Africa/indexes/map.htm
	ISRIC_World Soil information	http://www.isric.org/content/world-data-centre-soils

6.1.1. Information Systems' assessment of the Thematic Block 1

We found (11) information systems in Senegal: (7) meteorological and climate, (3) on soils, and (1) disaster-linked information. Three national information systems (L'Agence Nationale de l'Aviation Civile et de la Météorologie; Agence Nationale de Statistique et de la Démographie- Ministère de l'Economie et des Finances du Sénégal; Institut National De Pédologie). Two

regional information systems (African Center of Meteorological Application for Development ; Centre Regional AGRHYMET) and six international information systems : CountryStat-FAO; FAO-Aquastat ; Centre for Research on the Epidemiology of Disaster-CRED (The International Disaster Database); The World Bank Group (Climate Change Knowledge Portal); European Soil Data Centre (ESDAC) and ISRIC (World Soil information).

Following the benchmark for the Thematic Block 1 (Meteorological, climate and soils), we considered the following six criteria (features of information and attributes of the information systems) to assess the information systems found in Senegal for this block:

1. Frequency
2. Representativeness (geographical)
3. Aggregation level
4. Length of data series
5. Accessibility
6. Continuity/update

The values and weights of the assessment criteria for the block 1 are reported in the Appendix 2. The weights in this block rely on an established prioritization of climate information and variables. In this, temperature and precipitation are the main drivers for weather and are considered as fundamental to reference information while weather forecast are considered basic for short-term risk responses by farmers and governments. These three variables cover 80% of the weight.

The quantitative assessment undertaken and shown in the following tables relies on IS either accessible (on-line information) or described by the field consultant. There are only 3 (two for climate and one for soils) out of 11 information systems in Block 1 for which we were able to get sufficient information on that six criteria to assess the IS: the national IS ANACIM and the international IS CountryStat-FAO for climate information; and the international ISRIC for soils information. This represents a strong weakness of the IS of the Block 1 in Senegal especially for meteorological and climate information. In fact, AGRHYMET is known to have desirable climate data for risk assessment but it is not accessible (non-open information system).

Table 3 and Table 4 show the weighted quantitative assessment for the two IS for climate information, and the last column of Table 4 shows the IS scores (0-100). The Country STAT-FAO system reaches a very low score (18/100) as it is deficient in all criteria (see Table 4). The national (ANACIM) reaches a medium-high score (70/100). Climate information with a desirable level can be obtained in most variables in ANACIM although improvement on Length, Accessibility, and Continuity/update should be achieved as the value for these criteria are medium or low (60, 64, and 27 respectively). This would require long-term investment and commitment.

Table 5 and Table 6 show the weighted quantitative assessment for the Soils data from ISRIC. Although it is lacking information on erosion, or soil quality losses ISRIC does reach a score of 85/100 that is a high score.

Table 3. Quantitative assessment of Meteorological and climate IS

Information System	Frequency	Representativeness (geographical)	Aggregation level	Length	Accessibility	Continuity/update
L'Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM)	76	77	88	60	64	27
CountryStat-FAO	9	23	30	15	30	15

Table 4. Weighted quantitative assessment of Meteorological and climate IS

Information System	Frequency (30%)	Representativeness (geographical) (10%)	Aggregation level (20%)	Length (20%)	Accessibility (10%)	Continuity/update (10%)	Total Score (weighted)
L'Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM)	23	8	17	12	6	3	70
CountryStat-FAO	3	2	6	3	3	1	18
MAX. SCORE	30	10	20	20	10	10	100

Table 5. Quantitative of assessment of soils IS

Information System	Representativeness (geographical)	Aggregation level	Accessibility
ISRIC_World Soil information: Africa Soil Profiles Database	85	85	85

Table 6. Weighted quantitative assessment of Soil IS

Information System	Representativeness (geographical) (40%)	Aggregation level (40%)	Accessibility (20%)	Total Score (weighted)
ISRIC_World Soil information: Africa Soil Profiles Database	34	34	17	85
MAX. SCORE	40	40	20	100

6.1.2. Overall assessment of the Thematic Block 1

After the revision of all Information systems found for the thematic Block 1 (Meteorological, climate and soils information) in Senegal, the following strengths and weaknesses have been identified and summarized in the Table 7.

Table 7. Strengths and Weaknesses of Meteorological, climate and soils IS

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - Websites are up to date and working in international and regional IS - Diversification of information (bulletins, Reports) - Soil information in international systems is adequate 	<ul style="list-style-type: none"> - Metadata of weather stations are not open and the data quality needs to be checked - Time and land resolutions are too low: the weather/climate data should be provided at agro-ecological zone scale and on a daily base or at least weekly - Weather data generation in international systems does not allow always to capture the extreme weather events

Quantitative assessment of the sub-block 1.1 (meteorological and climate)

Climate information from national and regional IS could provide the desirable level (see benchmark specifications) of meteorological and climate information for risk assessment. However, the webs do not have the data accessible and data quality cannot be checked. The low accessibility in regional and national information systems (not open or only under request) hinders the analysis. On the other hand, the international IS for Sub-block 1.1 do not have the desirable resolution (geographical scale) as the information provided by these IS is at national level and only provide monthly date that could be used only complementarily.

Taking into account all these negative element and the weaknesses of this sub-block we downgrade the score of the best IS (70) and assign an overall score to the information systems of the sub-block 1.1 (Meteorological and Climate information systems) of 60/100.

Quantitative assessment of the sub-block 1.2 (soils)

The soil information system ISRIC have sufficient number of soils with profile details, except information on erosion or soil quality, which is information needed to monitor trends in these variables to highlight risks related to sustainability of the production systems. Taking into account that lack of some variables do not covered b y any other IS on soils i.e. incomplete coverage, we downgrade the score of ISRIC (85/100) and assign an overall score to the IS of sub-block 1.2 of (70/100)

6.2. Satellite image information & Communications

Sub-block 2.1. Satellite image information

A search on keywords that includes the name of the country (Senegal) and remote sensing was conducted the first of September 2015. The results were 413700 notes and web pages containing both keywords. From this data base we began to select and classify the information that appear in each web sites founding several institutions, journals, reports on different issues related to remote sensing. Studying these different sources it was realized that the information was repeated in different versions and formats after a certain numbers of websites.

At the same time, we contacted to the African Association of Remote Sensing of the Environment (one of the institutions that appear in the search) asking for more information where to look for reports and services given to Senegal. They kindly point us several organizations with its web with websites that hold information to Africa, including Senegal.

Also we had a meeting with Indra Espacio S.A. stuff to ask for some private or semiprivate companies with some work done in Senegal, even this country could be included in a bigger area of research.

In the academic context, we have been searching with the same keywords appearing 10300 sources of information. These were coming mainly from academic journals, abstracts and proceedings from congresses. Again, it was realized that the information was repeated in different versions and formats after a studying several websites.

After a global study of the different sources of information we have classified the Information System as the following: Institutions, Private Companies, Academic Journals, and Research a complete IS list is showed in Annex 2. From this list we have selected the institutions (international and nationals) and private companies to make a summary description of each one that is written in Annex 1. We list below in

Table 8 the IS identified in Senegal for the Thematic Sub-Block 2.1.

Table 8. List of IS on Satellite image information

INSTITUTIONS	URL
United Nations (UN Spider)	http://www.un-spider.org/space-application/space-technologies-in-the-un/eca
National Aeronautics and Space Administration (NASA)	http://visibleearth.nasa.gov/view.php?id=42097 http://visibleearth.nasa.gov/view.php?id=11953 http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=19080
European Space Agency (ESA)	http://www.gmfs.info/ https://earth.esa.int/web/guest/featured-image/-/article/senegal-river-senegal-and-mauritania
Food and Agriculture Organization of the United Nations (FAO)	http://www.fao.org/about/en/ http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=SEN
U.S. Geological Survey	http://eros.usgs.gov/senegal-guinea http://eros.usgs.gov/senegal-river-delta http://earlywarning.usgs.gov/fews/search/Africa/West%20Africa http://rmgsc.cr.usgs.gov/ecosystems/africa.shtml
African Association of Remote Sensing of the Environment	http://africanremotesensing.org/
Google Earth	http://jssolichin.com/remote-sensing/
CGIAR Consortium for Spatial Information (CGIAR – CSI)	http://www.cgiar-csi.org/
World Bank	http://water.worldbank.org/WPP-Food-Security http://ears.org/news/geoville-to-perform-world-bank-study-in-dakar-senegal
The International Center for Agricultural Research in the Dry Areas (ICARDA)	http://geoagro.icarda.org/en/ http://geoagro.icarda.org/en/default/index/facilities
Agence Nationale de L'Aviation Civile et de la Météorologie (ANACIM)	http://www.anacim.sn/
Centre de Suivi Ecologique (CSE)	http://www.cse.sn/
AGRHYMET REGIONAL CENTRE (ARC)	http://www.agrhymet.ne/eng/index.html
PRIVATE COMPANIES	
Terra Remote Sensing Inc.	http://www.terraremove.com/about/services/ http://www.terraremove.com/environment/vegetation-mapping/ http://www.terraremove.com/environment/watershed-assessment/
Remote Sensing Applications Consultants Ltd.	http://www.rsac.co.uk/apps.html
Vito nv	https://vito.be/en/file/1347 https://rs.vito.be/africa/en/home/Pages/home.aspx

6.2.1. Information Systems' assessment of the Thematic Sub-Block 2.1

The assessment of the IS for remote sensing will be realized based on the benchmark variables, indicators and thresholds or reference and desirable values, and combining qualitative and quantitative assessments. A first approach is indicated in Table 9, where we have made list of the variables founded in the different information sources and indicating the presence or absence of the variable.

Table 9. Information Systems versus the benchmark variables in the RS Block

SENEGAL		Vegetation Indices	Land surface temperatures	Atmospheric Indices	Soil Moisture Indices	Rainfall indices	Soil erosion indices	Other indices
INSTITUTIONS	UN Spider	X						
	NASA	X	X	X	X	X		X
	ESA	X						X
	FAO	X	X	X	X	X		X
	USGS	X				X		
	AARSE	X	X	X	X	X	X	X
	Google Earth	X	X			X	X	X
	CGIAR – CSI	X	X	X	X	X	X	X
	World Bank	X						X
	ICARDA	X	X	X	X	X		X
	ANACIM		X			X		
	CSE	X	X			X	X	
ARC	X	X	X	X	X		X	
PRIVATE COMPANIES	Terra Remote Sensing Inc.	X	X	X	X	X		X
	RSAC	X	X	X	X	X		X
	Vito nv	X	X	X	X	X		X
ACADEMIC JOURNALS	International Journals	X	X	X	X	X	X	X
	National Journals	X				X		X
RESEARCH	Proceedings&Abstracts	X				X		X
	PhD Master Thesis							

In almost of the sources Vegetation Indices are present as well as Land surface temperatures, soil moisture and rainfall indices. It is less common to find soil erosion indices. Based in this result and in the different satellites used we have made a distinction between vegetative indices (VI) and the meteorological ones (MI) in the quantitative assessment of the IS.

In Appendix 2 we show the quantification method and the weights applied. The score given to each attribute it is in the range of 0 to 100. All of them have been ordered so more score means better punctuated criteria (number of indexes, frequency, update, length, accessibility, and dissemination channels).

Highest weight has been chosen for length (20%) and accessibility (25%) as in this context both are of great importance. Then update (15%) and frequency of vegetation indexes (15%) have a medium weight, as both are necessary to follow extreme events in this country. The lowest weight is present in number of indexes (8%), dissemination channels (4% and 8% for MI and VI respectively) and frequency of MI (5%).

The different weights related to frequency and dissemination of both type of indexes is due to the scenarios we have found where many of the rainfall indexes sometimes is based on remote sensing, other times on meteorological stations and the rest in a mix of both systems. Therefore, we have preferred to give more weight to VI where the only source could be remote sensing.

Beside this considerations, we have reduced the number of institutions to be quantified as some of them are the main base of data sources (NASA and ESA) and keep collaborations with the rest of institutions in several projects which maintain the IS for this country or generally in Africa. First in Table 10 we show the original score of the items explained in Annex 1. In this table, we can observe that private companies in general have a higher punctuation in the items related to number of indexes and data frequency, update and length meanwhile in accessibility and dissemination show lower values in the score.

In Table 11 the weighted scores of IS are calculated. The best punctuated in international institutions is FAO (93) followed by CGIAR-CSI (78). The difference between them is due that in each item, except number of indexes, CGIAR-CSI pointed a little lower than FAO finding the maximum difference in number of indexes and in accessibility. The best punctuated in national institutions is ICARDA (75) followed by CSE (74) being the maximum difference with FAO due to length and update of the data showed and the data accessibility respectively. The information given by the local consultant has been localized on people working at ANACIM. Even they work in a certain number of indexes, indicating an important activity, the items of not working with V.I. and low accessibility decreases the score to 54. Respect to ARC, the items of update, length and accessibility to the indexes have decrease its score to 58. Finally, in the group of private companies VITO obtains the best score (80) due mainly to accessibility and dissemination of VI reflecting the impressive work in research projects in Africa collaborating with several institutions.

Table 10. Quantitative assessment of Remote Sensing IS

Information System	Num. indexes	Freq. M.I.	Freq. V.I.	Update	Length	Accessibility	Dissem. M.I.	Dissem. V.I.
UN Spider	30	50	80	50	80	50	50	50
FAO	100	100	100	100	100	70	100	100
USGS	70	100	100	80	90	50	60	60
AARSE	100	90	90	100	100	30	50	80
Google Earth	100	90	90	70	90	30	50	50
CGIAR – CSI	100	90	90	90	90	50	70	70
World Bank	50	80	80	90	80	50	70	70
ICARDA	100	90	90	80	90	50	50	50
ANCIM	50	100	20	80	60	50	100	20
CSE	60	50	90	90	80	70	50	50
ARC	100	80	80	50	60	30	60	60
Terra Remote Sensing Inc.	100	40	100	100	100	20	10	20
RSAC	100	40	100	100	100	20	10	20
Vito nv	100	40	100	100	100	60	10	80

Original score of each item (from 0 to 100) following the quantification specified in Appendix 2 of each Information System (IS) in Senegal: number of indexes (Num. indexes), frequency of meteorological indexes (Freq. M.I.), frequency of vegetation indexes (Freq. V.I.), update of the indexes (Update), length of the data (Length), accessibility, dissemination channels of meteorological indexes (Dissem. M.I.) and dissemination channels of vegetation indexes (Dissem. V.I.). Institutions marked in grey are local or national.

Table 11. Weighted quantitative assessment of Remote Sensing IS

WEIGHT	8%	5%	15%	15%	20%	25%	4%	8%	
Information System	Num. indexes	Freq. M.I.	Freq. V.I.	Update	Length	Accessibility	Dissem. M.I.	Dissem. V.I.	TOTAL
UN Spider	2	3	12	8	16	13	2	4	59
FAO	8	5	15	15	20	18	4	8	93
USGS	6	5	15	12	18	13	2	5	75
AARSE	8	5	14	15	20	8	2	6	77
Google Earth	8	5	14	11	18	8	2	4	68
CGIAR – CSI	8	5	14	14	18	13	3	6	78
World Bank	4	4	12	14	16	13	3	6	70
ICARDA	8	5	14	12	18	13	2	4	75
ANACIM	4	5	3	12	12	13	4	2	54
CSE	5	3	14	14	16	18	2	4	74
ARC	8	4	12	8	12	8	2	5	58
Terra Remote Sensing Inc.	8	2	15	15	20	5	0	2	67
RSAC	8	2	15	15	20	5	0	2	67
Vito nv	8	2	15	15	20	15	0	6	82
MAXIMUM SCORE	8	5	15	15	20	18	4	8	93

Weighted score of each item (from 0 to 100) following the quantification specified in Appendix 2 of each Information System (IS) in Senegal: number of indexes (Num. indexes), frequency of meteorological indexes (Freq. M.I.), frequency of vegetation indexes (Freq. V.I.), update of the indexes (Update), length of the data (Length), accessibility, dissemination channels of meteorological indexes (Dissem. M.I.) and dissemination channels of vegetation indexes (Dissem. V.I.). Institutions marked in grey are local or national.

6.2.2. Overall assessment of Thematic Sub-Block 2.1

After the revision of all Information systems found for the thematic sub-block 2.1 (satellite image information) in Senegal, the following strengths and weaknesses have been identified and summarized in the Table 12.

Table 12. Strengths and Weaknesses of Satellite Image IS

Strengths of IS for Satellite Image Information (Thematic Sub-Block 2.1)	Weaknesses of IS for Satellite Image Information (Thematic Sub-Block 2.1)
<ul style="list-style-type: none"> - Reliable information - Global systems (international sources with experience) - Diversification of services - Long data set on time from private companies - Use of different sensors at different scales - Several experience in Africa - Some systems provide periodic bulletins with maps - Variety of information using remote sensing and dem (some information focus in drought and water supply) - Methodology and information very complete - The CSE includes fieldwork and indexes related to crops and fires 	<ul style="list-style-type: none"> - Data and reports offered by some systems cannot be downloaded or printed - Some of the data are based mainly in MODIS - Radiometric and Spatial resolution sometimes is not specified. - Organization of some websites is too complicated (complicated interface hinders the research) - Length of data in some sensors is not enough for statistics. - Very few services on hazards warning - Some national systems are linked to International Remote Sensing Institutions for data sources. - Some data are not totally open to the public - Maps sometimes don't have a good resolution - Some data are not provided by free - Not clear the products of each sensor that some systems used. - Not clear the terms to use free data from some private companies - CSE website does not provide all the bulletins

Quantitative assessment of the sub-block 2.1 (satellite image)

The overall assessment of sub-block 2.1 IS (remote sensing) in Senegal can be summarized in the following way. FAO is a good remote sensing information system (93/100) and covers several statistical indexes that can give a first approach to risk assessment: NDVI anomalies, Agricultural Stress Index, Vegetation Health Index among others. 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.

Within the different national systems, the role of ICARDA and CSE is remarkable and can be improved calculating several indexes useful from the risk assessment point of view and trying to increase the dissemination of the indexes, their accessibility of the data showed. We would like to point out the biomass data that CSE shows in their bulletins that are based in a strong work in the field. ARC must strengthen efforts to improve the website and its structure and functioning that indirectly will improve it work's dissemination in Senegal.

Taking into account all these elements and the weaknesses and strength and following the criteria for upgrading or downgrading the scores of the best IS of sub-block 2.1, we assign an overall assessment indicator (score) of 78/100 to the whole Sub-block 2.1.

6.2.3. Assessment of Sub-block 2.2. Communications

Senegal has a very good mobile penetration indicator and good internet users and secure internet servers indicators. The broadcast news media for radio, TV and internet have a great coverage. Newspapers have lower penetration indicators. For all these reasons, we assign an overall assessment indicator (score) of 70/100 to the Sub-block 2.2.

Table 13. How to mark in a communications and media benchmarking

INDICATOR	Indicator Weight	Indicator Mark	How to mark the indicators: 10 points corresponds to
Mobile Penetration	28,00%	0 to 10	100% penetration. Max 10 points
Fixed Penetration	8,00%	0 to 10	10% penetration
Fixed Broadband Penetration	4,00%	0 to 10	5% penetration
Internet Penetration	9,00%	0 to 10	40% penetration
Facebook Penetration	4,50%	0 to 10	10% penetration
Secure Internet servers (per million)	1,50%	0 to 10	5 servers. Max. 10 points
Broadcast Media TV (no of channels)	12,00%	0 to 10	10 channels
Broadcast Media Radio (no of channels)	24,00%	0 to 10	25 channels
Internet News Media	4,00%	0 to 10	35 channels
Magazine News Media	0,50%	0 to 10	3 Magazines
Press Agency News Media	1,00%	0 to 10	3 Agencies
Newspapers and News Media (National)	1,50%	0 to 10	4 Newspapers
Newspapers and News Media (Local)	2,00%	0 to 10	12 newspapers

Table 14. Communications and media benchmarking

INDICATOR	Frecuency	Length of Series	Accessibility	Accuracy	Reliability	Continuity	Aggregation Level
Mobile Penetration	Yearly	15 years	Very Good	Good	Very good	Yes	National
Fixed Penetration	Yearly	15 years	Very Good	Good	Very good	Yes	National
Fixed Broadband Penetration	Yearly	15 years	Very Good	Good	Very good	Yes	National
Internet Penetration	Yearly	18 years	Very Good	Good	Very good	Yes	National
Facebook Penetration	Unknown	Unknown	Very Good	Unknown	Unknown	Unknown	National
Secure Internet servers (per million)	Yearly	10 years	Very Good	Good	Good	Yes	National
Broadcast Media TV (no of channels)	Unknown	20 years	Very Good	Good	Good	Yes	National
Broadcast Media Radio (no of channels)	Unknown	20 years	Very Good	Good	Good	Yes	National
Internet News Media	Unknown	15 years	Very Good	Unknown	Unknown	Yes	National
Magazine News Media	Unknown	15 years	Very Good	Unknown	Unknown	Yes	National
Press Agency News Media	Unknown	15 years	Very Good	Unknown	Unknown	Yes	National
Newspapers and News Media (National)	Unknown	15 years	Very Good	Unknown	Unknown	Yes	National
Newspapers and News Media (Local)	Unknown	15 years	Very Good	Unknown	Unknown	Yes	National

6.3. Prices of commodities, inputs and market components

We list below in Table 16 the IS identified in Senegal for the Thematic Block 3. The description of these IS can be consulted in Annex 1.

Table 16. List of IS on prices, stocks and trade information

Type	Name	URL
National institution	Agence Nationale de la Statistique et de la Démographie (ANSD)	http://www.ansd.sn/
	Manobi Senegal	http://www2.manobi.com/
	Commisariat à la Sécurité Alimentaire	http://csa.sn/site/
Regional institutions	West African Market Information System Network (RESIMAO)	http://www.resimao.net/market_region.php?coi d=111381517
	African Development Bank Group (AfDB)	http://senegal.opendataforafrica.org/
	United Nations Economic Commission for Africa (UNECA)	http://comtrade.un.org/pb/CountryPagesNew.aspx?y=2013
	Regional Agricultural Input Market Information System (AMITSA)	http://amitsa.org/
	AfricanFertilizer (AFO)	http://africafertilizer.org/
	JRC/AfDB initiative	-
International institutions	Global Information and Early Warning System (GIEWS-FAO)	http://www.fao.org/giews/pricetool/?seriesQuery=79
	Famine Early Warning Systems Network (FEWS NET)	http://www.fews.net/west-africa/senegal
	Food and Agriculture Organization of the United Nations (FAO)	http://faostat.fao.org/
	CountrySTAT (FAO)	http://www.countrystat.org/home.aspx?c=SEN
	World Food Programme (WFP-VAM)	http://foodprices.vam.wfp.org/
	US foreign Service	http://www.fas.usda.gov/regions/senegal

6.3.1. Information Systems' assessment of Thematic Block 3

Sub-block 3.1 Commodity and Input Prices

Following the benchmark for Sub-block 3.1 (commodity and input prices) we considered 10 features of the price information and attributes of the price information systems to assess the price information systems identified in Senegal:

1. Coverage (number and weight of covered products)
2. Decentralization (level of geographical disaggregation)
3. Food chain price position
4. Frequency
5. Updating
6. Length
7. Accessibility

8. Dissemination channels
9. Continuity
10. Diversification of services offered

The way to assign values and weights to these features and attributes for the different price information systems can be consulted in methodological Appendix 2. It is necessary to warn that in some cases the definition of weight is a difficult task. We may illustrate that assert with an example. The length of price series should have a considerable weight if that information is addressed and will be used to market risk assessment and risk management policies. But the weight should be considerably lesser if the information is addressed and will be used mainly for private operator in the food chain. We might give different weight to the same price information feature according to the Institutional nature/objectives of the different price information system i.e. public or private but this would prevent to compare the assessment indicators between the different price information systems.

We found 10 price information systems (PIS) in Senegal. Three of them are national systems (ANSD, Manobi and CSA); four international systems from FAO (GIEWS and FAOSTAT), WFP-VAM and FEWS_NET (USAID; and three regional systems (RESIMAO and AfDB for commodities and AFO for input prices). Just one of these price information systems provide commodity and input prices information (FAOSTAT).

The values assigned to each feature and attribute of the commodity price information systems (CPIS) found in Senegal and the calculations to weight it and figure out the final assessment indicator ranging from 0 to 100 are shown in the Table 17 and Table 18 respectively. The assessment for each commodity price information system is in the last column of Table 18 measured by an indicator that ranges between 0 and 100, except in some information systems for which we don't have information on some of the features or attributes.

As we can see in the Table 18, the features with more variability are in coverage (3 to 9 within the range 0-10); Updating (4 to 15 within the range 0-15); and Length (1 to 5 within the range 0-5). The values for the three attributes considered (Accessibility, Dissemination channels and Diversification of services) show a great variability on accessibility with the minimum value (3 Of 10) from Manobi and much less variability on Dissemination and services diversification that are good in general terms in all commodity price information systems in Senegal.

The assessment indicator values in the last column of Table 18 shows a considerable variation from 87/100 for the best CPIS (Manobi) to 56/100 for the worst (AfDB).

Within the three national systems in Senegal the Manobi is the best system for commodity price information with a high score (87/100) as shown in the Table 18. The main weaknesses of Manobi are accessibility (3 of 10), since information is available under payment, and coverage (6 of 10). The CSA, which reaches a medium score (68/100) presents some weaknesses at decentralization (7 of 15), frequency (7 of 15), coverage (6 of 10) and updating (9 of 15). The ANSD system reaches 64/100 and has better score on decentralization and length but is very weak on updating (4 of 15).

Concerning to the regional CPIS in Senegal we found two systems (RESIMAO and AfDB) but none of them presents high assessment values. RESIMAO has an assessment value of 50/75 and AfDB 56/100.

In the case of international CPIS we have one good system FEWS NET (USAID) with 77/100. The limitations of this system are coverage (3 of 10), frequency (7 of 15) and length (1 of 5). GIEWS-FAO has a score of 69/100 with strong limitations on coverage (3 of 10) and up-dating (4 of 15) and less on frequency (7 of 15). FAOSTAT (63/100) and WFP-VAN (48/70) have less and equivalent scores. It is worth to say that GIEWS, FEWS-NET and WFP-VAN are good information systems for food security and food crisis early warning, the main focus of those systems, and the two first ones are also good for market risk management purposes.

Concerning the input price information systems (see Table 19 and Table 20), we found two systems in Senegal (see Table 19 and Table 20). None of them presents high scores: AFO (59/100) and FAOSTAT (57/100). The main limitations of both systems are coverage (3 of 6), decentralization (7 of 15) frequency (7 of 15) and especially updating (0 and 4 of 15).

All the price information systems are public except Manobi. The existence of Manobi can be considered as a positive element of CPIS in Senegal. 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. Nevertheless, the international price information systems (FAO, WFP or USAID) get information from the national systems thus reducing that problem. The existence of different CPIS could make sense if the covered products were different (complementarity), which is not the case except FAOSTAT but this system is not good due mainly to the lack of updating.

There are two important feature/attributes of price information systems, we were not able to assess in a quantitative way due to the lack of detailed information from web site or even from the local consultant. One is the method of treatment and verification of the collected price information used by the system; and the second is the reliability of information. In certain way, these two elements are connected as to the extent in which price information collected is treated and verified we can expect that the price information will be more reliable. Our experience and information suggest that the national price information systems use methods for treatment and verification of collected price information in a less systematic way than the international price information systems. For instance, FAO, WFP or USAID use some methods for the treatment and verification of the collected price information based on the expertise of their local offices and the application of some statistical methods in Headquarters. Nevertheless, most of the price information of the international systems is collected from national sources, systems and institutions, and therefore the reliability of price information would not be significantly different in national and international systems.

Table 17. Quantitative assessment of commodity price information systems

Information System	Coverage	Decentralization	Position	Frequency	Update	Length	Accessibility	Dissem. Channels	Diversif. Services	Continuity
Agence Nationale de la Statistique et de la Démographie (ANSD)	50	80	50	50	30	100	70	80	50	100
Manobi Senegal	60	100	80	100	100	100	30	90	100	100
Commisariat á la Sécurité Alimentaire (CSA)	60	50	80	50	60	70	100	80	50	100
African Development Bank Group (AFDB)	30	80	50	50	0	30	100	80	50	90
West African Market Information System Network (WAMIS-NET - RESIMAO)	40	100	80	50	30	N.A.	N.A.	100	100	N.A.
Global Information and Early Warning System (GIEWS-FAO)	30	100	50	50	30	70	100	80	100	100
World Food Programme (WFP - VAM)	30	100	50	50	N.A.	N.A.	70	80	100	N.A.
Famine Early Warning Systems Network (FEWS-NET)	30	100	50	50	100	30	100	80	100	100
Food and Agriculture organization of the United Nations (FAO)	90	50	50	30	30	100	100	80	50	100

Table 18. Weighted quantitative assessment of commodity price information systems

Information System	10% Coverage	15% Decentralization	5% Position	15% Frequency	15% Update	5% Length	10% Accessibility	10% Dissem. Channels	5% Diversif. Services	10% Continuity	100% TOTAL
Agence Nationale de la Statistique et de la Démographie (ANSD)	5	12	2	7	4	5	7	8	2	10	64
Manobi Senegal	6	15	4	15	15	5	3	9	5	10	87
Commisariat á la Sécurité Alimentaire (CSA)	6	7	4	7	9	3	10	8	2	10	68
African Development Bank Group (AFDB)	3	12	2	7	0	1	10	8	2	9	56
West African Market Information System Network (WAMIS-NET - RESIMAO)	4	15	4	7	4	N.A.	N.A.	10	5	N.A.	50 *2
Global Information and Early Warning System (GIEWS-FAO)	3	15	2	7	4	3	10	8	5	10	69
World Food Programme (WFP - VAM)	3	15	2	7	N.A.	N.A.	7	8	5	N.A.	48 *1
Famine Early Warning Systems Network (FEWS-NET)	3	15	2	7	15	1	10	8	5	10	77
Food and Agriculture organization of the United Nations (FAO)	9	7	2	4	4	5	10	8	2	10	63
MAX. SCORE	10	15	5	15	15	5	10	10	5	10	100

*1 Due to the unavailability of some of its characteristics, this MIS is valued up to 70

*2 Due to the unavailability of some of its characteristics, this MIS is valued up to 75

Table 19. Quantitative assessment of input price information systems

Information System	Coverage	Decentralization	Position	Frequency	Update	Length	Accessibility	Dissem. Channels	Diversif. Services
Africa Fertilizer (AFO)	50	50	50	50	30	50	100	80	50
Food and Agriculture organization of the United Nations (FAO)	50	50	50	50	0	100	100	80	50

Table 20. Weighted quantitative assessment of input price information systems

Information System	6%	15%	8%	15%	15%	6%	15%	15%	5%	100%
	Coverage	Decentralization	Position	Frequency	Update	Length	Accessibility	Dissem. Channels	Diversif. Services	TOTAL
Africa Fertilizer (AFO)	3	7	4	7	4	3	15	12	2	59
Food and Agriculture organization of the United Nations (FAO)	3	7	4	7	0	6	15	12	2	57
MAX. SCORE	6	15	8	15	15	6	15	15	5	100

Sub-block 3.2 Stocks and Inputs

There has not been identified any proper information system providing regular, systematic and reliable information about national stocks and/or input availability.

Sub-block 3.3 Trade (imports and exports)

Following the benchmark for Sub-block 3.3 (export and import trade), we considered 6 features of the trade information and attributes of the trade information systems to assess the trade information systems found in Senegal:

1. Coverage (number and weight of covered products)
2. Frequency
3. Updating
4. Length
5. Accessibility
6. Dissemination channels

The way to assign values and weights to these features and attributes for the different price information systems can be consulted in Appendix 2.

We found 6 trade information systems (TIS) in Senegal: Three international systems (FAOSTAT, UN Comtrade and US Foreign Service); two regional systems (UNECA and AfDB); and one national system (ASND).

The values assigned to each feature and attribute of the trade information systems (TIS) found in Senegal and the calculations to weight it and figure out the final assessment indicator ranging from 0 to 100 are shown in the Table 22 and Table 23 for exports and Table 24 and Table 25 for imports. The assessment for each trade information system appears in the last column of Table 23 for exports and Table 25 for imports, measured by an indicator that ranges between 0 and 100, except in some of the information systems for which we don't have information on some of the features or attributes. The information on export and import flow is provided for the same information systems and only differs on the grade of import and export coverage.

As we can see in the Table 23 and Table 25 the features with more variability are coverage (4 to 20 in exports and 6 to 20 in imports within the range of 0-20); Updating (7.5 to 25 within the range 0-25); Frequency (4.5 to 12 within the range 0-15); Accessibility (5 to 20 within the range 0-20); and Length (3 to 10 within the range 0-10). The values for the "dissemination channels" attribute show little variability and can be considered as good in general terms for all trade information systems.

The assessment values presented in the last column of Table 23 and Table 25 show a considerable variation from 80/100 for the best TIS (UN Comtrade) to 49/100 for the worst TIS (UNECA regional system).

The assessment of national TIS is negative. The CSA website does not publish any trade information (exports/imports); and although the ASND website publishes monthly bulletins on trade (import and exports) and trade indices, the unavailability of the website is so frequent that is almost impossible to have access to this trade information. The best TIS in Senegal is UN Comtrade (80/100) and its main limitation is frequency (4 of 15).

There is one important feature of trade information we were not able to properly assess in a quantitative way due to the lack of detailed information from web site or even from the local consultant. Presumably the reliability of trade information should be good as the source of information is the border control and registration systems, but that systems do not work well in some developing countries. Some method of control to ensure the consistency of trade series and identify unexplained jumps can be applied in some cases, but we were not able to get this information.

6.3.2. Overall assessment of Thematic Block 3

After the revision of all Market Information Systems (MIS) found for the thematic Block 3 (Price and Markets) in Senegal, the following strengths and weaknesses have been identified and reported in Table 21.

Table 21. Strengths and Weaknesses of Prices and Markets IS

Strengths of IS for Price and Markets (Thematic Block 3)	Weaknesses of IS for Price and Markets (Thematic Block 3)
<ul style="list-style-type: none"> - Reliable market information - Disaggregated information is available - Variety of dissemination channels used - Diversification of services implemented - Historical data have good continuity - Information for market and food security risk assessments - Global/Regional Integrated Systems (FAO, WFP, FEWS-NET, AfDB) offering different kind of information, reports and tools (risk management and early warning tools) - Quality control applied in Global Price Information Systems (FAO, WFP and FEWS-NET) - There is regular information on fertilizer prices (AFO) - Existence of a private integrated IS providing valuable information on market prices, climate, production and trade and offering several market services to the stakeholders (Manobi) 	<ul style="list-style-type: none"> - There is no information on the data processing followed in national MIS - There is no information on the control of quality method followed in national MIS - Very limited and unclear information on stocks as there is no a clear distinction between public stock for emergency or for market stabilization and private stock - Limited information on transport and other market elements - Websites or sections of national MIS are not working properly most of the time - Recent information is available (update) - Price information is provided at different positions of the chain

Quantitative assessment of sub-block 3.1 (commodity and input prices)

The two public national systems CSA (68/100) and ANSD (64/100) have not high assessment scores. Nevertheless FEWS-NET has a better assessment (77/100). The presence of a private system (Manobi) with diversification of services and good dissemination is a positive element for the sub-block 3.1 IS in Senegal although the web site of that system does not inform about the updating, length and other key features of the price monitoring. The systems on input price information present low scores around 50/100. The existence of many systems without a clear complementarity is not an asset of the price information system in Senegal. Based on all these elements and taking into account the weaknesses and strengths of the Sub-block 3.1 and the criteria to upgrade or downgrade the score of the best national and/or international IS we assign an overall score to the sub-block 3.1 price information systems of 75/100.

Quantitative assessment of the sub-block 3.2 (stocks and input availability)

The public market information system in Senegal (CSA) that is also the institution managing public reserves does not provide regular information about stocks.

The international information systems publish few data on stocks and are estimate not real stocks. Data to estimate stocks can be found in FAO or USDA, as these institutions use data on food production, trade and consumption (balance sheets) to estimate stocks variations in some countries but in general, the data on estimated stocks are not very reliable.

There has not been identified any information system in Senegal providing regular information about input availability. However, some sources offer some kinds of useful information. Bases on the lack and strong limitations of stocks information and input availability we assign to this sub-block a very low score (10/100).

Quantitative assessment of the sub-block 3.3 (trade)

UN Comtrade is a good and complete (broad coverage) system of ITS (80/100) but the absence or unavailability of complete and updated trade information in the websites of the national institutions/systems (CSA and ANSD) is a relevant negative element (downgrading) of the trade information systems in Senegal. Based on this consideration, the scores of the IS of sub-block 3.3 and the weaknesses and strength of sub-block 3.3, and following the criteria for upgrading and downgrading the score of the best IS, we assign an overall quantitative assessment to the information systems of block 3.3 (Trade) of 70/100.

Table 22. Quantitative assessment of commodity trade IS (exports)

Information System	Coverage	Frequency	Update	Length	Accessibility	Dissem. Channels
Agence Nationale de la Statistique et de la Démographie (ANSD)	100	80	70	30	25	80
African Development Bank Group (AFDB)	100	30	50	80	100	80
United Nations Economic Commission for Africa (UNECA)	20	30	40	30	100	80
Food and Agriculture organization of the United Nations (FAO)	90	30	30	100	100	80
U.S. Foreign Agricultural Service	30	80	100	100	70	80
UN Comtrade Database	100	30	70	100	100	80

Table 23. Weighted quantitative assessment of commodity trade IS (exports)

Information System	20% Coverage	15% Frequency	25% Update	10% Length	20% Accessibility	10% Dissem. Channels	100% TOTAL
Agence Nationale de la Statistique et de la Démographie (ANSD)	20	12	17	3	5	8	65
African Development Bank Group (AFDB)	20	4	12	8	20	8	73
United Nations Economic Commission for Africa (UNECA)	4	4	10	3	20	8	49
Food and Agriculture organization of the United Nations (FAO)	18	4	7	10	20	8	68
U.S. Foreign Agricultural Service	6	12	25	10	14	8	75
UN Comtrade Database	20	4	17	10	20	8	80
MAX. SCORE	20	15	25	10	20	10	100

Table 24. Quantitative assessment of commodity trade IS(imports)

Information System	Coverage	Frequency	Update	Length	Accessibility	Dissem. Channels
Agence Nationale de la Statistique et de la Démographie (ANSD)	100	80	70	30	25	80
African Development Bank Group (AFDB)	100	30	50	80	100	80
United Nations Economic Commission for Africa (UNECA)	30	30	40	30	100	80
Food and Agriculture organization of the United Nations (FAO)	90	30	30	100	100	80
U.S. Foreign Agricultural Service	30	80	100	100	70	80
UN Comtrade Database	100	30	70	100	100	80

Table 25. Weighted Quantitative assessment of commodity trade IS (imports)

Information System	20% Coverage	15% Frequency	25% Update	10% Length	20% Accessibility	10% Dissem. Channels	100% TOTAL
Agence Nationale de la Statistique et de la Démographie (ANSD)	20	12	17	3	5	8	65
African Development Bank Group (AFDB)	20	4	12	8	20	8	73
United Nations Economic Commission for Africa (UNECA)	6	4	10	3	20	8	51
Food and Agriculture organization of the United Nations (FAO)	18	4	7	10	20	8	68
U.S. Foreign Agricultural Service	6	12	25	10	14	8	75
UN Comtrade Database	20	4	17	10	20	8	80
MAX. SCORE	20	15	25	10	20	10	100

6.4. Plant production, yields and health

The area of agricultural land and the harvested production are the main statistics at regional level. The yield is derived from those.

We list below in Table 26 the IS identified in Senegal for the Thematic Block 4. The description of that IS can be consulted in Annex 1.

Table 26. List of IS on Production levels and yields. Plant health

International, Regional or Country	Name	URL
National	Agence Nationale de Statistique et de la Démographie	http://www.ansd.sn/
	Direction de L'analyse, de la Prevision et des Statistiques Agricoles (DAPSA)	http://www.dapsa.gouv.sn http://senegalma.africadata.org/
	Centre de Suivi Ecologique	http://www.cse.sn/
	IFLEX Le Projet de Promotion des Exportations Agricoles (PPEA)	http://www.iflexsenegal.org/quisommes_nous_partenaires.html
	L'Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM) (*)	http://www.anacim.sn/meteo/bulletinsgtp.php
	l'Institut Sénégalais de Recherches Agricoles (ISRA)	http://www.isra.sn/
	Direction de la protection des Vegetaux (DPV)	http://dpvsenegal.com/index.php/bulletin-phyto
Regional	African Development Bank Group (Application)	http://senegal.opendataforafrica.org/
	Centre Régional AGRHYMET	http://www.agrhymet.ne/bulletin.html
	Forum for Agricultural Research in Africa (The eRAILS)	http://www.erails.net/SN/profile/
	The Africa Rice Center (AfricaRice) Application	http://www.ricehub.org/SN/
International	CountryStat-FAO	http://www.countrystat.org/home.aspx?c=SEN
	FAO-crop calendar	http://www.fao.org/agriculture/seed/cropcalendar/welcome.do
	Plantwise	http://www.plantwise.org/KnowledgeBank/CountryHome.aspx

(*) ANACIM web site has changed during the course of our project and does not seem to include any Plant Health data. It is included here in case data appear again this website.

6.4.1. Information Systems' assessment of the Thematic Block 4

We found 14 crop production and plant health information systems in Senegal: six national systems (Agence Nationale de Statistique et de la Démographie, Direction de L'analyse, de la Prevision et des Statistiques Agricoles (DAPSA), Centre de Suivi Ecologique, IFLEX Le Projet de Promotion des Exportations Agricoles (PPEA), L'Agence Nationale de l'Aviation Civile et de la Météorologie, l'Institut Sénégalais de Recherches Agricoles (ISRA), Direction de la protection des Vegetaux (DPV)); four regional systems (African Development Bank Group (Application), Centre Régional AGRHYMET, Forum for Agricultural Research in Africa (The eRAILS), The Africa Rice Center (AfricaRice) Application); and three international systems (CountryStat-FAO, FAO-crop calendar, and Plantwise). Two of these are from FAO and FAOSTAT and though FAO

estimates are from the countries themselves, FAO may review and/or then report the official data (national systems) when available.

Following the benchmark for block 4 (Production levels and yields, Plant health) we considered the following six criteria (features of the crop production and plant health information systems) to make a quantitative assessing of the IS for Block 4 found in Senegal.

1. Frequency
2. Representativeness (geographical distribution)
3. Aggregation level
4. Data series length
5. Accessibility
6. Continuity and update

The method and the values and weights of these assessment criteria can be consulted in Appendix 2. It is necessary to warn that in some cases the definition of weight is a difficult task. For Production levels and yields systems the production (quantity) and the acreage for each crop (crop land) are the main features, they cover the 75% of the weight. Yield is commonly estimated from production and acreage, and in few cases appears as unique data. For example, FAOSTAT reports production and acreage, and FAOSTAT calculated data from total production and acreage.

Sub-block 4.1 Plant production and Yields

The National Agency of Statistics and Demography (ANSD) website is not always available and connection is slow. Within the agriculture and meteorology sections there are no published any data. There are statistical bulletins in which production data appears aggregated at province level, since season 2012/13 at 2014/2015, also it produces publications addressing various disciplines. The website is not yet complete in all the topics, the level of aggregation is by provides, also it have a complicated interface hinders the research and there is no information on agricultural inputs (Fertilizers, machinery, seeds).

The *Direction de l'Analyse, de la Prévision et des Statistiques* is responsible for collection, centralization, processing and dissemination of agricultural information and statistics, from 42 agricultural departments that they covers all the Country. The responsibility is cover from the Division des Statistiques de la Documentation et de l'Information Agricole (DSDIA). The Data Portal provide the information (<http://senegalma.africadata.org/>), it is cover data from 2012 to 2014 for the main crops thatn cover crop land, yields and production.

CountrySTAT is a web-based information technology system for food and agriculture statistics at the national and sub national levels provided and supported by FAO. In practice, it is a hub centre which centralizes and integrates the data coming from various sources and allows harmonizing it according to international standards while ensuring data quality and reliability. Data are obtained at national and regional level from FAO surveys, but data are update with the Official data provided by the National Agency of Statistics and Demography. In the case of Senegal, CountrySTAT has production data and area harvested for primary crops, since 1997 untill 2013. This is a long-term sustainable system, there are no gaps within the time series and technical assistance from FAO experts is provided, the main limitation of this system is the low

data resolution: the aggregation level is the country. In addition, there is information about consumption (tons) of pesticides per year (1998-2012). Concerning fertilizers there are data on exports and imports, however, any consumption data is available. This information from this FAO website could be completed with FAO-crop calendar. The Crop Calendar is a tool that provides timely information about seeds to promote local crop production. It contains information on planting, sowing and harvesting periods of locally adapted crops in specific agro-ecological zones. It also provides information on the sowing rates of seed and planting material and the main agricultural practices. The Crop Calendar provides information for more than 130 crops, located in 283 agro-ecological zones of 44 countries. In the case of Senegal, it is divided into six agroecological zones. For example, in the Niayes zone, it has information on 20 horticultural crops, because about 80% of the horticultural production of the country is provided by this zone, it could completed information related to crop management and calendars.

The remaining systems found have a limited data available, and it has not been possible to make quantitative assessment. The Centre de Suivi Ecologique specializes in the production and dissemination of data and information on the environment and natural resources. It aims to contribute to sustainable development by supporting decision making at different levels and in different sectors (central government, local business, community organizations, non-governmental organizations). Although there is a section called "crop season" the information is limited and not updated, and there is no agriculture-related information. The Fruit and Vegetable Export Information (IFLEX) is service dissemination for information and communication developed in Senegal for professionals in the fruit and vegetable export, and institutional, private or public partners sector, however, the website is not up to date and the latest bulletin was published in 2005. The Institut Sénégalais de Recherches Agricoles (ISRA) should have technical publications and research result, cannot be downloaded and the website not always available.

We explore at regional level other information systems but data are still poor. The website of African Development Bank Group has an application (opendataforafrica.org), in which data or general statistics refer to different topics, including agricultural production. In the case of Senegal, there are data for the years only 2012 and 2014, and its main source is the *Agence Nationale de Statistique et de la Démographie*. The AGRHYMET Regional Centre is a specialized institution of the Permanent Interstate Committee for the Fight against Drought in the Sahel, although the agricultural statistics is an area of competence, there is no open access to agricultural data (This is not necessarily a weakness, because the data quality needs to be checked). The Forum for Agricultural Research in Africa (The eRAILS) is a continental African online platform for agricultural knowledge, information and learning system with the purpose of improving the access, sharing of research results on technologies and good agricultural practices. However, in the case of Senegal, there is no information of agroecological data or crop production. The only information available is a list of projects, a brief profile of the country and some links of interest.

At level of specific crops, The Africa Rice Center (AfricaRice) Application Ricehub. The virtual platform 'Rice Hubs' is in countries where research products and services and local innovations are integrated across the rice value chain to achieve development outcomes and impact. In the

website there is general information on rice management (crop establishment, pests and diseases, land preparation, harvest, seeds...); however there are still no data uploaded in the website.

Therefore, due to the lack of online data, it has only been possible to assess quantitatively two systems: *Agence Nationale de Statistique et de la Démographie* and CountryStat-FAO. The quantitative assessment for these two IS for sub-block 4.1 are shown in Table 27 ranging from 0 to 100 for each criteria. Table 28 shows the weighted quantitative assessment, and the last column shows the overall weighted values or scores (0-100).

FAO system feeds on national statistical data and thus it shows similar performance in some criteria but not in others. The result is that the final score is the same in both systems showing a medium value (64/100). Both systems show good assessment for frequency and accessibility (85/100). The national systems (ANSD) is better than CountryStat-FAO in geographical representativeness (64 instead 26/100) and in level of aggregation (68 instead 34/100) but FAO is much better than ANSD in time series length (85 instead 17/100). This is amazing as CountryStat-FAO feeds on national statistical data. The main limitation of ANSD information for plan production and yields is the length of the data series (17/100). CountryStat-FAO information for plan production and yields is the very low geographical representativeness, as it refers to country scale that is a strong limitation for agricultural risk assessment

Sub-block 4.2 Plant Health

The Directorate of Plant Protection (DPV), structure of the Ministry of Agriculture and Rural Equipment (MAER) is the Central Technical Unit for pest monitoring and control. It provides national, technical supervision of actions against the attack of pests and provides, through financial and material resources made available by the state support in goods, services and equipment required for decentralized structures of MAER (Regional Directorates of Rural Development), the Committees for the Fight Village (CLV) and producer organizations.

The Directorate of Plant Protection (DPV) publishes a weekly bulletin also monthly and annual report, but there are no structured systems to collect and disseminate data about plant health with the six features considered (frequency, geographical distribution, aggregation level, data series length, accessibility, continuity and update). These bulletins include surfaces prospected, diseased or pest-ridden surfaces, treated surfaces. Nevertheless, there does not seem to be any information of previous newsletters. According to information provided by the consultant, the Directorate of Plant Protection has the following information: Situation global phytosanitary by zone of intervention, situation of fruits and vegetables, total quantities of pesticides annually imported, quantities of pesticides in circulation and crop damages. However, there are no historical data. The Directorate of Plant Protection (DPV) alerts to farmer about pest and diseases through farmer organizations.

Although the *L'Agence Nationale de l'Aviation Civile et de la Météorologie* has the mission of *"The public agency publishes every 10 days an agro-meteorological information bulletin on agricultural and pastoral situation and plant health, highlighting incidents by agroecological zones. Nevertheless, the website has not an easy interface and document search is not easy.*

There are only 2015 bulletins published. There is no database", during the course of this project, this information has disappeared and the website has been changed.

Plantwise is an online and offline gateway to actionable plant health information and services, but there are no historical data, needed to the risk assessment analysis. In addition, the Plantwise website has a "Diagnostic Field Guide" to help farmers and other agricultural advisors to diagnose plant health problems before providing management recommendations. This guide provides images and descriptions of many typical symptoms associated with factors that harm plant health. The publication helps to make diagnoses by showing the relationships between common symptoms on plants and the various possible causes. The guide also provides a short overview of the important principles for giving good advice, which are underpinned by an integrated pest management approach. There are 349 registered pests and diseases in Senegal. Each of them has its corresponding information (pictures, description, symptoms, prevention, and control).

Related to plant health, there are two organizations at regional level: the Inter-African Phytosanitary Council (AU-IAPSC) and the International Plant Protection Convention (IPPC), with competences in plant protection information. The Inter-African Phytosanitary Council has activity programs related to collect, evaluate and disseminate plant protection information relevant to Africa, but it has low accessibility online. In the same manner, the International Plant Protection Convention shows an Official Contact Point, related with the "*Direction de la protection des Vegetaux*" (DPV) and updated in 2015. The latest Pest Reports from Senegal were updated in 2008. National reporting obligations are related to: description of the Plant Health & Regulatory Department, legislation phytosanitary Requirements/Restrictions/Prohibitions, Entry Points, List of Regulated Pests, Official Pest, Reports Organizational Arrangements of Plant Protection, Rationale for Phytosanitary Requirements, Non-compliance, Pest status and emergency Actions. The IPPC Official Contact Point is recently updated (September of 2015) but there is low information available in this site. In this sense, the Inter-African Phytosanitary Council has published the "[For better Plant Health in Africa](#)" as Strategic Plan for 2014 to 2020. Its second programmatic area is "Plant Pest Risk Reduction", and the Inter-African Phytosanitary Council of the African Union functions, related to this study, has as tasks of facilitation and support decision-support tools, pest risk analysis, testing and monitoring.

The conclusion is that currently IS for plant health does not properly exist in Senegal. There is just some occasional information from scattered information sources. The systems for Plant Health are still under construction by the Inter-African Phytosanitary Council of the African Union.

Table 27. Quantitative assessment of Production levels and yields

Information System	Frequency	Representativeness (geographical)	Aggregation level	Length	Accessibility	Continuity/ update
Agence Nationale de Statistique et de la Démographie (ANSD)	85	64	68	17	85	64
CountryStat-FAO	85	26	34	85	85	64

Table 28. Weighted quantitative assessment of Production levels and yields

Information System	Frequency (30%)	Representativeness (geographical) (10%)	Aggregation level (20%)	Length (20%)	Accessibility (10%)	Continuity/ update (10%)	Total Score (weighted)
Agence Nationale de Statistique et de la Démographie (ANSD)	25	6	14	3	8	6	64
CountryStat-FAO	25	3	7	17	8	6	67
MAX. SCORE	30	10	20	20	10	10	100

6.4.2. Overall assessment of Thematic Block 4

After the revision of the different Information Systems (IS) found for the thematic Block 4 (Production levels and yields, Plant health) in Senegal, the following strengths and weaknesses of Thematic Block 4 IS have been identified.

Table 29 Strengths and Weaknesses of Production levels and yields and Plant health IS

Strengths of the IS of Thematic Block 4	Weaknesses of the IS of Thematic Block 4
<ul style="list-style-type: none"> - Long term sustainable international IS - Open data in international IS - Diversification of services and product delivered in international IS - Websites are up to date and working in international and regional IS - The aggregation level of information such as average sowing and harvest dates, and sowing rates, in IS, is presented by agro ecological region - There is updated information on the phytosanitary status of crops 	<ul style="list-style-type: none"> - In general information on production, cultivated area, and yield are given at low resolution, at country level - There is insufficient information on agricultural inputs (Fertilizers, machinery, seeds) - There is no database of pests and diseases - Some national websites are not working well - Dissemination mainly through on-line channels

Quantitative assessment of Sub-block 4.1 (production levels and yields)

International and regional web pages are well maintained and functional. Nevertheless most of information is at country level and no information on inputs use is provided. Increase of resolution and disaggregation of some regional or international IS would significantly improve risk analyses. There is a lack of good national systems in this sub-block which is a relevant weakness for agricultural risk assessment. Taking into account these elements and considerations, the score of the IS and the weaknesses and strength of sub-block 4.1, and following the criteria for upgrading and downgrading the score of the best IS, we assign an overall quantitative assessment of the information systems of block 4.1 (Production levels and yields information systems) of 60/100.

Quantitative assessment of Sub-block 4.2 (plant health)

Given the lack of IS and the scarce relevance of occasional information found, we conclude that the information on plant health is totally insufficient for risk analysis. Plant Health IS are still under construction and therefore we assign an overall quantitative assessment to information systems of block 4.2-plant health of 20/100.

6.5. Animal and human health Risk Management IS

Table 30 List of Animal and Human Health Information Systems

Type	Name	URL
National	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Institut Sénégalais de Recherches Agricoles	http://www.isra.sn/index.php
	Ministère de la Santé et de L'Action Sociale	http://www.sante.gouv.sn/
	Ministre de l'Economie des Finances et du Plan	http://www.finances.gouv.sn/
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	AU-IBAR	http://www.au-ibar.org/
	WHO's Regional Office for Africa	http://www.afro.who.int/en.html
International	Centers for Disease Control and Prevention (CDC)	http://www.cdc.gov/
	Emergency Prevention System for Animal Health (EMPRES)	http://www.fao.org/AG/AGInfo/programmes/en/empres/home.asp
	Factfish	http://www.factfish.com/catalog/geography%20and%20agriculture
	Food and Agriculture Organization of the United Nations (FAO)	http://www.fao.org/home/en/
	Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	http://faostat3.fao.org/home/E
	International Atomic Energy Agency (IAEA)	https://www.iaea.org/
	World Organisation for Animal Health (OIE)	http://www.oie.int
	ProMED-mail	http://www.promedmail.org/
	PubMed	http://www.ncbi.nlm.nih.gov/pubmed
	UNdata	http://data.un.org/
	United States Agency for International Development in Senegal (USAID)	https://www.usaid.gov/
	WHO's Health Metrics Network	http://www.who.int/healthmetrics/en/
	WHO's Health Statistics and Information Systems	http://www.who.int/healthinfo/en/
	World Bank	http://www.worldbank.org/

6.5.1. Information Systems' assessment of Thematic Block 5

The importance of regular, timely and accurate animal and human health information systems (HIS) has continued to evolve over the years. HIS are a fundamental part of the existing strategies for the prevention and control of diseases, especially epidemic, emerging and transboundary diseases. HIS involves the ongoing systematic collection, gathering, analysis and interpretation of data on disease occurrence, and animal and public health related events and dissemination of the information obtained from such data for speedy health actions.

Several factors have hampered the development of efficient information systems for general use, while other limitations might be more institutional in nature. Many countries have not sufficient resources to deliver all the components of a practical IS within the ideal epidemiological delivery system, and quality of international administrations HIS depends on the capability of the country for disease and disease-related-factors surveillance. Therefore,

the crucial data collection for risk assessment for specific countries or regions depends on the depth and reliability of the surveillance and monitoring information arising from the country. The use of accurate animal and human health data and information has gradually evolved to become a critical tool for planning, policy design, regulation, promotion of trade, etc. Precise and reliable data is also essential for research and even training health professionals. However, despite its importance, many countries do not have a solid system in place, and where present, it does not always meet the needs of users' adequately. The HIS can be National, Regional or International, with substantial differences between them and depending the regional and international HIS on effective local capabilities.

An operational and efficient HIS allows early detection of disease outbreaks that will prompt intervention for the reduction of morbidity and mortality that may result from the epidemics of these infectious diseases.

In the field of Public Health, HIS provide the base for decision-making and has some key functions: data generation (data collection from health sector and other related sectors), compilation, analysis (to ensure quality and accuracy), communication (information) and use.

In the area of Animal Health, the range of data collection has similarly advanced over the years to cover all areas of animal resources including capacity and available human resources, livestock census, role of livestock in national economies, vaccine and diagnostic capabilities, etc.

Most of the sources analyzed in this study about Senegal are not real IS. Excluding some international (Factfish, FAOSTAT, OIE, UNdata, WHO Health Statistics and Information Systems) and national (*Agence Nationale de Statistique et de la Démographie*) organizations, the majority of the other sources merely include not serial information (reports, journals, scientific papers, book and book chapters, etc.). Among these IS, UNdata and Factfish collect data from other sources (i.e. FAOSTAT); consequently there are only three real IS related to animal and human health issues in Senegal: OIE, WHO Health Statistics and Information Systems, and the *Agence Nationale de Statistique et de la Démographie*. This national IS should improve the quality of the webpage and the quality of the data related with animal production and public and animal health.

However, AU-IBAR has developed an information system known as the "Animal Resources Information System" (ARIS) whose goal is to promote the culture of timely data collection and reporting by Member States, including AU-IBAR-OIE-FAO interoperability between their respective information systems. This HIS has not been included in the study because, as far as we know, there is not a platform to provide free access to the data and the "demo" link does not work by January 21, 2016 (<http://demo.au-aris.org/reports/public>).

Nevertheless, we consider that the international, regional and national sources that cannot be considered as a proper IS (CDC, EMPRES, FAO, IAEA, Promed-mail, PubMed, USAID, WHO's Regional Office for Africa, World Bank, AU-IBAR, *Ministère de la Santé et de L'Action Sociale*, *Ministère de l'Élevage et des Productions animales*, etc.), provide irregular and occasional but key data that may be very interesting in a future risk-analysis process.

Sub-block 5.1. Cost of animal diseases

Following the benchmark for Sub-block 5.1 (Information systems to estimate the cost of Animal Diseases), we considered 9 criteria (features of information and attributes of IS) to assess the cost of animal diseases information systems found in Senegal:

1. Decentralization
2. Frequency
3. Availability
4. Length
5. Accessibility
6. Dissemination
7. Language
8. Usability
9. Organization

The way to assign values and weights to these criteria for the different cost of animal diseases information systems can be consulted in Appendix 2. It is necessary to warn that in some cases the definition of weight is a difficult task.

We found a quite small number of sources to estimate the cost of animal diseases in Senegal. As mentioned before a low number of real IS were found (6 that can be reduced to 4).

The values assigned to each criterion (feature and attribute) of the cost of animal diseases information systems found in Senegal and the calculations to weight it and figure out the final assessment indicator or score ranging from 0 to 100 are shown in the Table 31 and Table 32 respectively. Although the calculation was made for each considered variable (animal census, animal production systems, trade, etc.), just the final integrated tables by IS are showed.

As can be seen in Table 32 the value with less variability is “Organization”, where should be noted that the low value of OIE is due to the necessary complexity of the webpage, full of data and with many headers and a complex hierarchy. There is no doubt that OIE’s webpage is the reference webpage in this sub-block. Frequency is the value with higher differences, aggregated in two groups (13 and 1). “Accessibility” is a value relatively homogenous. In general, there is a deficit of information sources about trade and animal holdings.

The assessment indicator values in the last column of Table 32 shows a substantial variation from values higher than 89 (OIE) to 44 for USAID (a not real IS, but with high quality irregular information). The *Agence Nationale de Statistique et de la Démographie* (36) ranks last due to its low performance in most of the criteria.

Within the national IS, we only found one real system, the *Agence Nationale de Statistique et de la Démographie*. All the Ministries included have several limitations because there are not real IS. However, the *Ministre de l’Economie des Finances et du Plan* got a high total indicator (80).

In the Regional side, only one source was included (AU-IBAR), which cannot be considered an IS, which is the reason it ranks only a little above 50.

In the case of international IS about Senegal we found one well assessed systems OIE (89), followed by FAOSTAT (86) and FactFish (79) The main weaknesses of OIE is “Organization”, but this IS obtains the maximum values in all of the other items.

Table 31. Quantitative assessment of cost of Animal Diseases

Information System	Decentralization	Frequency	Availability	Length	Accessibility	Dissemination	Language	Usability	Organization
African Union-Interafrican Bureau for Animal Resources (AU-IBAR)	50	10	10	10	100	70	60	70	100
Agence Nationale de Statistique et de la Démographie	80	10	10	30	60	70	50	10	40
Factfish	50	90	100	30	100	80	70	100	100
Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	50	90	50	100	100	80	70	100	100
Food and Agriculture Organization of the United Nations (FAO)	50	10	10	10	100	30	70	100	100
Institut Sénégalais de Recherches Agricoles	80	10	10	10	60	20	50	50	100
International Atomic Energy Agency (IAEA)	50	10	10	10	100	80	60	100	100
Ministère de la Santé et de L'Action Sociale	80	10	10	10	60	20	50	50	100
Ministre de l'Economie des Finances et du Plan	80	100	100	30	100	70	60	100	100
Ministre de l'Élevage et des Productions Animales	80	10	10	10	60	80	50	60	100
PubMed	50	10	10	10	100	30	60	100	100
UNdata	50	90	20	100	100	80	50	70	100
United States Agency for International Development (USAID)	50	10	10	10	100	30	50	50	100
World Bank	50	10	10	10	100	80	70	70	100
World Organisation for Animal Health (OIE)	80	90	100	100	100	80	70	100	50

Table 32. Weighted quantitative assessment of cost of Animal Diseases

Information System	6%	15%	8%	15%	15%	6%	15%	15%	5%	100%
	Decentralization	Frequency	Availability	Length	Accessibility	Dissemination	Language	Usability	Organization	TOTAL
African Union-Interafrican Bureau for Animal Resources (AU-IBAR)	3	1	1	1	15	4	9	10	5	50
Agence Nationale de Statistique et de la Démographie	5	1	1	4	9	4	7	1	2	36
Factfish	3	13	8	4	15	5	10	15	5	79
Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	3	13	4	15	15	5	10	15	5	86
Food and Agriculture Organization of the United Nations (FAO)	3	1	1	1	15	2	10	15	5	54
Institut Sénégalais de Recherches Agricoles	5	1	1	1	9	1	7	7	5	39
International Atomic Energy Agency (IAEA)	3	1	1	1	15	5	9	15	5	56
Ministère de la Santé et de L'Action Sociale	5	1	1	1	9	1	7	7	5	39
Ministre de l'Economie des Finances et du Plan	5	15	8	4	15	4	9	15	5	80
Ministre de l'Élevage et des Productions Animales	5	1	1	1	9	5	7	9	5	44
PubMed	3	1	1	1	15	2	9	15	5	53
UNdata	3	13	2	15	15	5	7	10	5	76
United States Agency for International Development (USAID)	3	1	1	1	15	2	7	7	5	44
World Bank	3	1	1	1	15	5	10	10	5	53
World Organisation for Animal Health (OIE)	5	13	8	15	15	5	10	15	2	89

Sub-blocks 5.2 and 5.3 Risk of endemic and emerging diseases

Following the benchmark for Sub-blocks 5.2 and 5.3 (Information systems and sources on the risk of endemic and emerging diseases), we considered 9 criteria to assess the IS:

1. Decentralization
2. Frequency
3. Availability
4. Length
5. Accessibility
6. Dissemination
7. Language
8. Usability
9. Organization

The way to assign values and weights to these criteria (features and attributes) for the different information systems can be consulted in Appendix 2. It is necessary to warn that in some cases the definition of weight is a difficult task.

We found a larger number of sources to estimate the risk of endemic and emerging diseases in Senegal comparing with sub-block 5.1. But as mentioned before, a low number of real IS were found.

The values assigned to each feature and attribute of the risk of endemic and emerging diseases information systems found in Senegal and the calculations to weight it and figure out the final assessment indicator or score of the IS ranging from 0 to 100 are shown in the Table 33 and Table 34 respectively.

As can be seen in Table 33 the value with less variability is “Organization”, where should be noted, as mentioned above, that the low value of OIE is due to the necessary complexity of the webpage, full of data and with many headers and a complex hierarchy. There is no doubt that OIE’s webpage is also the reference webpage for animal endemic and emerging diseases in this sub-block. Frequency is the value with higher differences, aggregated mainly in two groups (13 and 1). This is due to the abundance of sources with no serial information.

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.

Most of the comments included for Sub-Block 1 can be applied for Sub-Blocks 2 and 3, but including another well assessed IS (WHO’s Health Statistics and Information Systems: 90). The IS analyzed are predominantly the same, but some not real IS were included (CDC, EMPRES and ProMED-mail). Among them, EMPRES has a significantly worst assessment (39) due to its low value in many parameters (frequency, availability, etc.). CDC and ProMED-mail received the same assessment (64).

Table 33. Quantitative assessment of the risk of endemic and emerging diseases

Information System	Decentralization	Frequency	Availability	Length	Accessibility	Dissemination	Language	Usability	Organization
African Union-Interafrican Bureau for Animal Resources (AU-IBAR)	50	10	10	10	100	70	60	70	100
Agence Nationale de Statistique et de la Démographie	80	10	10	30	60	70	50	10	40
Centers for Disease Control and Prevention (CDC)	50	70	10	10	100	100	50	100	100
Emergency Prevention System for Animal Health (EMPRES)	50	10	10	10	70	20	70	50	50
Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	50	90	50	100	100	80	70	100	100
Food and Agriculture Organization of the United Nations (FAO)	50	10	10	10	100	30	70	100	100
International Atomic Energy Agency (IAEA)	50	10	10	10	100	80	60	100	100
Ministère de la Santé et de L'Action Sociale	80	10	10	10	60	20	50	50	100
Ministre de l'Élevage et des Productions animales	80	10	10	10	60	80	50	60	100
ProMED-mail	50	70	10	10	100	100	50	100	100
PubMed	50	10	10	10	100	30	60	100	100
UNdata	50	90	20	100	100	80	50	70	100
United States Agency for International Development (USAID)	50	10	10	10	100	30	50	50	100
WHO's Health Statistics and Information Systems	50	90	100	100	100	80	70	100	100
WHO's Regional Office for Africa	50	10	10	10	100	30	50	100	100
World Organisation for Animal Health (OIE)	80	90	100	100	100	80	70	100	50

Table 34. Weighted quantitative assessment on the risk of endemic & emerging diseases

Information System	6%	15%	8%	15%	15%	6%	15%	15%	5%	100%
	Decentralization	Frequency	Availability	Length	Accessibility	Dissemination	Language	Usability	Organization	TOTAL
African Union-Interafrican Bureau for Animal Resources (AU-IBAR)	3	1	1	1	15	4	9	10	5	50
Agence Nationale de Statistique et de la Démographie	5	1	1	4	9	4	7	1	2	36
Centers for Disease Control and Prevention (CDC)	3	10	1	1	15	6	7	15	5	64
Emergency Prevention System for Animal Health (EMPRES)	3	1	1	1	10	1	10	7	2	39
Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	3	13	4	15	15	5	10	15	5	86
Food and Agriculture Organization of the United Nations (FAO)	3	1	1	1	15	2	10	15	5	54
International Atomic Energy Agency (IAEA)	3	1	1	1	15	5	9	15	5	56
Ministère de la Santé et de L'Action Sociale	5	1	1	1	9	1	7	7	5	39
Ministre de l'Élevage et des Productions animaux	5	1	1	1	9	5	7	9	5	44
ProMED-mail	3	10	1	1	15	6	7	15	5	64
PubMed	3	1	1	1	15	2	9	15	5	53
UNdata	3	13	2	15	15	5	7	10	5	76
United States Agency for International Development (USAID)	3	1	1	1	15	2	7	7	5	44
WHO's Health Statistics and Information Systems	3	13	8	15	15	5	10	15	5	90
WHO's Regional Office for Africa	3	1	1	1	15	2	7	15	5	51
World Organisation for Animal Health (OIE)	5	13	8	15	15	5	10	15	2	89

6.5.2. Overall assessment of Thematic Block 5

After the revision of the different Market Information Systems (MIS) found for the thematic Block 5 (Animal and Human Health) in Senegal, the following overall strengths and weaknesses for these MIS have been identified.

Table 35. Strengths and Weaknesses of animal and human health IS

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - Information about livestock census, animal and animal products production, and trade of livestock from 1961 until 2013 (FAOSTAT) - Extensive quantitative and qualitative information on animal health (annual report from OIE) - Valuable non-periodic reports from FAO, OIE, WB - Reliability - Transparency - Integrated system offering variety of information - Websites from international IS work properly - Valuable international sources of information (CDC, WB and Factfish) 	<ul style="list-style-type: none"> - Level of aggregation of data in international and regional IS at national level - Websites of some national IS do not work with sufficient speed or efficacy (Dec. 2015) - The dissemination is mainly through on-line channels - The information is not always updated - Two out of the three national IS on animal health are almost empty of relevant data (statistics, alerts, etc.) - The information on animal health from WHO is not updated in some fields related to Senegal - There is no specific data or alerts about animal health in Senegal from AU-IBAR - Insufficient integration of animal and human health information

Quantitative assessment of the Sub-block 5.1

All the information systems analyzed in this sub-block are public systems. We did not include some private sources like “Report Linker” (www.reportlinker.com) since most of them are quite expensive. However, the information of this kind of private IS is based on official sources, so we do not consider this a problem. 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, domestic movements of animals), livestock holdings and distribution, biosecurity, slaughterhouses, markets, etc.

OIE is a good and comprehensive (broad coverage) information system (89.1/100), although this information system is penalized due to the complex hierarchy of the webpage, full of information. However, the absence or unavailability of serial livestock information in the national websites (*Agence Nationale de Statistique et de la Démographie*, and *Ministère de l’Élevage et des Productions Animales*, mainly) is a negative element in order to estimate the cost of animal disease in Senegal. Both national IS have low assessment scores (35.8/100 and 43.9/100, respectively), mainly due to the absence of serial information and the fact that the webpage of the statistical agency does not work with sufficient speed and efficacy, and has some essential subpages without information. The presence of the *Ministère de l’Economie des Finances et du Plan* (80.5/100) with key data, is a positive element, but not enough to overcome the deficit of information at national level.

A more detailed national information should be provided (locality-wide census of the animal population, with location, type, and number of livestock and poultry, type of holdings, etc.). The existence of systems without a clear complementarity is not an advantage for the

estimation of the cost of animal diseases information system in Senegal. In general, there is a huge deficit of information sources about trade and animal holdings.

Based on these considerations and the table of weaknesses and strength and following the criteria for upgrading or down-grading the scores of the best IS of sub-block 5.1, we assign an overall assessment value to the whole information systems for Sub-block 5.1 of 45/100.

Quantitative assessment of the Sub-blocks 5. 2 and 5.3 (Information on the risk of endemic and emerging diseases)

We found a substantial number of information systems for both sub-blocks. Two IS stand out above the rest thanks to their webpages with abundant and useful information: OIE (89/100) and WHO's Health Statistics and Information Systems (89.9) for animal and human diseases, respectively. The national systems ranked very low due to their low performance [*Ministère de la Santé et de L'Action Sociale* (38.8/100), *Ministre de l'Élevage et des Productions Animales* (43/100), and *Agence Nationale de Statistique et de la Démographie* (35.8/100)], however, both Ministries are not a real IS.

In general, there is a huge deficit of national information sources about animal and human diseases. The existence of systems without a clear complementarity is not an advantage for the estimation on the risk of endemic and emerging diseases. OIE and WHO's Health Statistics and Information Systems cover most of the necessary fields, but the national systems should be strengthened in order to provide up to date information.

Based on these considerations and the table of weaknesses and strength and following the criteria for upgrading or down-grading the scores of the best IS of sub-blocks 5.2 y 5.3, we assign an overall assessment value to the Sub-blocks 5.2 and 5.3 of 55/100.

6.6. Policy

Table 36. List of IS on Policies information

Type	Name	URL
National Institution	Systeme d'alerte precoce (SAP)	-
Regional Institutions	Système Pastoral d'Alerte et d'Information pour le Ferlo	www.spaif.org
	Banque Central des Etats de l'Africa de l'Ouest (BCEAO)	http://www.bceao.int/
	African Risk Capacity (ARC)	http://www.africanriskcapacity.org/home
International Institutions	Global information and Early Warning System (GIEWS-FAO)	http://www.fao.org/giews
	Famine Early Warning Systems Network (FEWS NET)	http://www.fews.net/west-africa/senegal
	World Food Program	www.wfp.org
	Humanitarian Data Exchange	https://data.hdx.rwlab.org/group
	Integrated Food Security Phase Classification (IPC)	http://www.ipcinfo.org/
	The World Bank	www.govindicators.org

6.6.1. Overall assessment of Thematic Block 6

The overall quantitative assessment of this block includes policy measures, trade barriers and insurance information, as it described in the benchmark. Regarding policy measures, Senegal is not included in the policy information systems as FAO's MAFAP program neither the data bases of the World Bank.

We did not find properly information systems on policies in Senegal. 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.

As stated before, Senegal is not included in any international policy information system as MAFAP or WB. The Banque Central des Etats de l'Africa de l'Ouest (BCEAO), The World Bank, the OECD and the USAID provide some information on trade measures and indicators.

Concerning early warning, there has not been identified any national Early Warning System in Senegal and only international early warning systems are available. However, some references to international projects aimed to strengthen the national EWS for food security and nutrition monitoring have been found.

Regarding agricultural insurance, there have been found some references to agricultural insurance products in Senegal, particularly to index-crop insurance (The World Bank). In addition, 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 however there is no any systematic information.

The conclusion is that there is some information on this thematic block, though deficiencies have found in all sub-blocks and thus we assign an overall score of 55/100.

Table 37. Weighted quantitative assessment of Block 6

Information System	70% Policy	15% Trade Measures	15% Insurance	100% TOTAL
	51	30	50	55
MAX. SCORE	70	15	15	100

6.7. Socio-economic and sectorial information

Table 38. List of IS on socio-economic information

Type	Name	URL
National Institution	Agence Nationale de la Statistique et de la Démographie (ANSD)	http://www.ansd.sn/
	Direction de l'analyse, de la prevision et des statistiques agricoles (DAPSA)	http://www.dapsa.gouv.sn/
Regional Institution	Système d'information sur le pastoralisme au Sahel (SIPSA)	http://www.fao.org/agriculture/lead/themes0/drylands/information0/en/
	African Development Bank Group (AFDB)	http://senegal.opendataforafrica.org/ http://dataportal.afdb.org/DataAnalysis.aspx
International Institution	The World Bank	http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GNP.PCAP.CD&period=

6.7.1. Information Systems' assessment of Thematic Block 7

The overall numerical evaluation of this block considers the existing national and international information systems. Regarding the first ones, the institution in charge of the national statistics (ANSD) provides many socio-economic and sectorial information through its annual yearbooks and censuses. However, this information has some deficiencies such as the lack of enough disaggregated information and indicators, or the lack of update. In addition, the ANSD website does not always work properly.

Concerning regional and international institutions, the African Development Bank Group (AfDB) and The World Bank (WB) provide different datasets with annual socio-economic information, more or less updated. However, sectorial information offered by the international institutions is insufficient. Particularly for pastoralism information, there has generally been a lack of information and specific indicators. This lack of information is compounded by the absence of any official framework for consultation, and it was in response to these challenges that CIRAD (and partners) developed the *système d'information sur le pastoralisme au Sahel* (SIPSA). There is no specific website of this programme, but general information and documents can be found within FAO's website. However, the link to the "SIPSA database" does not work.

Due to all the deficiencies found in the available information, the overall quantitative assessment of this thematic block is low (50/100).

Table 39. Weighted quantitative assessment of thematic block 7

Information System	40%	40%	20%	100%
	Agr. Prod.	Livestock	Other	TOTAL
International	50	0	80	36
National	50	35	60	46
MAX. SCORE	40	40	20	100

6.7.2. Overall assessment of Thematic Block 7

After the revision of the different Information Systems found for the thematic Block 7 (Socio-economic and sectorial information) in Senegal, the following overall strengths and weaknesses for these IS have been identified.

Table 40. Strengths and Weaknesses for socio-economic IS

Strengths of IS for socio-economic and sectorial information Thematic Block 7	Weaknesses of IS for socio-economic and sectorial information (T. Block 7)
<ul style="list-style-type: none"> - Coverage of socio-economic information and indicators at macro level - Length of macroeconomic data series - Continuity and an updating of the main macroeconomic information/indicators from global and regional IS - Annual reports and statistical yearbooks 	<ul style="list-style-type: none"> - Weak sectorial information - Lack of disaggregated socio-economic information and indicators - The data on some socio-economic and sectorial information from national IS are short and not updated - The ANSD website does not always work properly

7. Relationships and integration among different thematic blocks

Some international and regional information systems provide information on several thematic blocks: FAOSTAT/CountrySTAT (thematic blocks 1, 3, 4 and 7); World Databank from the World Bank (thematic blocks 3, 6 and 7); FAO-GIEWS, WFP-VAM and FEWS-NET from USAID (thematic blocks 3 and 6); AGRHYMET (thematic blocks 1, 4 and 7), AfDB (3, 4 and 7) and GYGA (thematic blocks 1 and 4). We summarize in the following table the different information blocks covered by some IS in Senegal.

Table 41 Multi-blocks information systems

	Block 1 Meteo	Block 2 Remote	Block 3 Prices	Block 4 Plants	Block 5 Animal	Block 6 Policies	Block 7 Socio-econ
FAOSTAT	X		X	X	X		X
CountrySTAT	X		X	X	X		X
World Databank			X			X	X
FAO-GIEWS			X			X	
WFP-VAM			X			X	
FEWS-NET	X		X			X	
AGRHYMET	X			X			X
AfDB			X	X			X
Manobi	X		X	X	X		
ANSD			X	X	X		X

Most of the multi-blocks information systems are not properly integrated information systems as they don't integrate in an interrelated way different blocks of information but just provides information on several thematic blocks. In some cases the different information blocks are even collected and elaborated in an independent way by different department of the same institution (World Bank, FAO, ANSD etc). The unique proper integrated system is Manobi, a private system integrating information on price, markets and climate and harvest in an interrelated way and offering diverse market services to the farmers and other actors of the food chain. This private integrated system makes the difference in Senegal compared with other West African countries. The problem is that the web site of Manobi does not inform about the updating, length and other key features of the data price of the system but we ask about this system to the local consultant. Based on the information collected by the local consultant through interview to Manobi manager we report below the main features and attributes of this integrated system

Manobi Senegal

<http://www2.manobi.com/>

This integrated MIS is a private initiative aimed to provide services to small producers. It is focused on facilitating the access to information and technology, as well as the products commercialization (since all stakeholders are connected through the same platform).

Manobi's main services are the census and geo positioning of farmers, the traceability of productions, to collect and solve demand/supply offers, to advising about extreme events

coming, meteorological previsions, and the market information). At this respect, information about agricultural prices and alerts can be obtained at real-time by SMS and on-line.

However, as mentioned above Manobi’s webpage does not offer more information about its market monitoring activities, so commodities covered, time series available, frequency of communications and other information attributes cannot be analyzed.

According to the local expert, Manobi collects daily price information of domestic commodities such as fruits, vegetables and cereals. Manobi provides daily retail and wholesale prices by market, from year 2001 to date. Information is collected by Manobi agents present on the main markets of the country. Information is transmitted to the central with an application installed on smart phones. Manobi supervisors at the central are in charge of validating the information transmitted by the collection agents.

The following are the main strengths and weaknesses identified from this system.

Table 42. Strengths and Weaknesses of Manobi

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - Different markets and commodities monitored - Dissemination by using ITCs. - Integrated system - Empowering market stakeholders - Transparency of the system - Facilitating market access - Risk management tool 	<ul style="list-style-type: none"> - There is no detail on-line about information characteristics and attributes. - It integrates only few blocks of information (mainly market and climate information)

The rest of IS listed in the Table 41 are just multi-blocks information systems based on genuine relationships between some thematic blocks. It is the case of the relationships between thematic block 1 (climate information) and 4 (plant yield, production and pests) as it is evident the strong relationship between climate variability and extreme climate events on plant yields, productions and pests. Even there is some relationship from block 1 and 4 with food security early warning (policies block 6). Another clear and strong relationship is between thematic block 3 (price and markets) and thematic block 6 (early warning and policies). Prices are one of the most important elements within an early warning system for market volatility and food insecurity risks. But price information is not enough and the three international early warning systems considered (FAO-GIEWS, WFP.VMA and FEWS-NET) includes other information and facts to release the alerts on food insecurity (climate, stocks, yields, harvest predictions, national policies etc), but cannot be considered as information systems for these information blocks.

In addition to the integration based in genuine relationships among the different thematic blocks, there are blocks information integration due to the nature and mission of some international or regional sources of information and IS like World Bank, AfDB, FAO and others. In the case of World Bank, a global and general financing agency for development and poverty alleviation, the IS World Databank provides information on socioeconomic block 7, policy block 6 and price and markets block 3. In a similar way acts the AfDB but at African level (African countries information) instead of globally level (world countries information). In the case of FAO, a global and general technical UN agency for agricultural development and food security, the IS FAOSTAT and CountrySTAT provide information on climate variability block 1, food price and markets block 3, plant yield, production and pest block 4, animal production and health

block 5 and sectorial socio-economic information block 7. In addition FAO provides early warning and policy information in a different information system (FAO-GIEWS) and in specific programs like MAFAP.

At national level the ANSD provides information on different blocks, but the website is not working well.

Taking into account that all systems listed in the Table 41 except Manobi are not really integrated systems but just multi-blocks information systems, the quantitative assessment and the weaknesses and strengths of Manobi, we assign an overall score to the integrated systems of Block 8 of 50/100.

8. Overview of the ARM-IS in Senegal

Building the traditional information systems (IS) for agriculture had the following objectives:

- To improve public policies by helping policymakers to take better account of sensible information to assess the agricultural risks
- To build early warning systems for food security to trigger public action as safety nets and other measures to cope with food crisis
- To render the markets more transparent and efficient helping to prevent or reduce food market instability

Consistently with these objectives the main users of traditional IS for agriculture were officials of public institutions, donors and cooperation agencies, policymakers, agricultural professional and experts and academic and research community.

The modern IS for agriculture incorporate a new objective

- Agricultural risk management in order to prevent, manage and cope with the different type of agricultural risks

This new objective leads to the involvement of public policy makers as well as private actors along to the food chain as users, individually or through professional organizations, of modern IF for agriculture risk management. For this reason along with the classical variables and attributes to assess the traditional IF for agriculture emerges new variables and attributes of modern IS for ARM collecting information and disseminating information through ICT, public-private institutional arrangements, accessibility, users participation mechanisms, providing multiple services and integrating different kind of information to move towards integrated information systems for ARM. All these new variables and attributes must be taking into account in the assessment of information systems for agricultural risk management.

Following a general methodology particularized to each thematic block (see Appendix 2) we assess in a quantitative way (scores in the range 0-100) the information systems for the different blocks or sub-blocks as well as the whole block or sub-block (see chapter 6). In the Table 43 we summarize the scores and useful comments for the different thematic sub-blocks or blocks.

The interpretation of the overall scores (0-100) of sub-blocks or blocks is as follows. The reported figures 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 (see the Benchmark in Appendix 1). Low values of the overall score (≤ 20) would indicate that the available information would permit only a very poor or irrelevant risk assessments in the corresponding thematic sub-block or block. Low-medium values of the overall score (21-40) would indicate that the available information would merely allow poor risk assessments in the corresponding thematic sub-block or block. Medium values of the overall score (41-69) would mean that available information would permit a preliminary risk assessment in the concerned thematic sub-block or block. Finally, high values of the overall score (≥ 70) would mean that the information available enables a proper risk assessment and management in the concerned thematic sub-block or block.

As it can be seen in the Table 43 the result of the overall quantitative assessment i.e. overall scores (0-100) of the different thematic blocks shows that the information systems for ARM in Senegal are uneven, although there are many thematic blocks or sub-blocks with a medium-high or high scores. 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 Senegal. The comments from the last column of table WW contributes to complement and/or justify the overall score of the concerned thematic sub-blocks or blocks.

The recommendations to improve ARM-IS will be presented in the next chapter and will be based on the Table 43 (score and comments) and on the weaknesses of the sub-blocks and blocks presented in the chapter 6.

Table 43. Assessment of the IS for agricultural risk management in Senegal

Thematic Block	Quantitative assessment	Comments
1.1 Meteorological & climate information.	60	a) National weather forecasts are provided by National IS (ANACIM) through bulletins as mobile and internet access seems restricted in rural areas. Weather forecasts are in place and updated. b) Risk assessment: national IS (ANACIM) can provide data for risk analysis but open access is limited c) 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 regional sources provide full and updated information for climate risk assessment but the data are not open access. Some information on extreme events is based on model simulations instead of on real events
1.2 Soils	70	Soil information from international allows for a correct risk assessment because they include soil profiles, and management recommendations.
2. 1. Satellite image information	78	The coverage of information from international sources allows for a first step in risk assessment although limitations would be due to length of the data. The national IS don't provide full and updated map of vegetation and soil indices information. Information on NDVI maps exists in other International Institutions, the rest of remote sensing indices are scarce to find. Private companies can provide many of the data needed to establish a robust system but data are not open access.
2.2. Communications	70	Senegal has a very good mobile penetration indicator and good internet users and secure internet servers indicators. The broadcast news media for radio, TV and internet have a great coverage. Newspapers have lower penetration indicators.
3. 1 Prices	75	The two public national systems CSA and ANSD have not high assessment scores (less than 70). The presence of a private system (Manobi) with some diversification of services and ICT dissemination is a positive element although the web site of that system does not inform about the updating, length and other key features of the data price which are not open access. The input price information systems have lower scores than commodity price information systems
3.2. Commodity stocks and inputs availability	10	The information on availability of inputs, commodity stocks and transportation costs is very scarce and irregular. It can be said except input price information (AFO) that there is no any proper IS on this sub block of market information which are relevant for market and food security risk assessment
3.3 Trade	70	UN Comtrade is a good international system of trade information (import and exports) but the absence or unavailability of trade information in the websites of the national institutions/systems (CSA and ANSD) is a negative element of the trade information systems in Senegal. It is almost impossible to access to the site with trade into the web page of ANSD.
4.1 Production levels and yields	60	International and regional web pages are well maintained and functional. Nevertheless most of information is at country level and no information on inputs use is provided. Increase of resolution and disaggregation of some regional or international IS would significantly improve risk analyses. There is a lack of good national systems in this sub-block which is a relevant weakness for agricultural risk assessment. National systems (ANSD and DAPSA) provide a higher level of disaggregation, but its digitized database are recent, so it would useful series from longer time series.
4.2 Plant health	20	Plant health warnings exist but information data is deficient: there are neither series nor trends on pests and disease impacts to allow for a basic risk assessment based on hind cast analyses.
5.1. Costs of animal diseases	45	The annual reports from OIE and FAO punctual surveys on animal health (EMPRES) and statistics on animal production and trade (FAOSTAT and CountrySTAT are effective of information. But in Senegal there is no sufficient regular and disaggregated information on animal health, production and holdings. There is little evidence of integration of animal and human health in national IS. Lack of integration between animal health with climate and trade. Lack of information on domestic and border trade (livestock movement) IS and absence of information on cost of the main endemic diseases.
5.2. Risks of endemic and emerging diseases	55	The OIE annual reports are the main strength in this sub-block. There is a lack of integration of animal and human health and lack of good information on animal diseases in national IS
6. Policies	55	In Senegal 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. Senegal is not included in any international policy information system as MAFAP or WB. The only exception are the good international early warning systems (FAO-GIEWS, WFP-VAM and FEWS-NET) that are a tool for triggering safety nets and other policies to cope with market volatility and food crisis and emergencies but Senegal does not have any national early warning system. Some information has been found on trade measures as trade facilitation indicators and insurance.
7. Socio-economic & sectorial information	50	The national institutions in charge of the national statistics provides socio-economic information but it presents deficiencies as lack of enough disaggregated socio-economic information and indicators and not updated. Besides that web site does not always work properly. The international systems offers good but non-disaggregated and non-complete information especially on sectorial information which not always is updated

8. Integrated systems of information	50	Manobi is a valuable national private integrated IS providing price and climate information and offering services to small farmers. Nevertheless the web site of Manobi does not inform about the updating, length and other key features of the data price of the system and it is not a free access system. The national ANSD and some international and regional institutions/IS provides information on different thematic blocks with different level but scarce in general of interaction and integration among them.
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9. Recommendations

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, sometimes too 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 within the MAER could be designed as the 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 to make an agricultural risk assessment and management.

Concerning the provision of services, open weather and harvest forecasts and alert systems related to meteorological and climate conditions, plant health and animal health for direct use by stakeholders - farmers (crops, cattle), fishermen, agricultural organizations, etc.- seem established or are presently being upgraded (use of protocols), either through 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) 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 of internet by farmers in the rural areas, but it is rather limited.

Concerning the provision of time series of data, a common problem in most of the national information systems in Senegal is the lack of on-line accessibility of information and data. In general, the national sources have much more, better and detailed information than the information found in the web site of the corresponding sources and IS. This is because a large part of the available information and data are not uploaded on the web site of the concerned sources or IS. The main cause of that limited on-line accessibility to the available information is the lack of resources to organize and load all this information on the web site, or the confidentiality regulations in Senegal. It is crucial to overcome this problem allocating additional resources to complete the information provided on-line and reviewing the confidentiality regulation of Senegal. We recommend paying special attention to solve this constraint in ANSD, ANACIM, CSA, DAPSA, DPV and DSV. Some of this IS stated that all the available information can be obtained by request but in our view it is not enough.

In the case of some national IS there is an additional problem affecting the on-line accessibility of information and data that is caused by the bad working and difficult access to the web page. Thus we recommend improving the working and access to the web page especially in the case of ANSD.

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 web pages than the own national institutions 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.

We recommend strengthening the cooperation between the national and international systems in a win-win way: The national system would provide information to the international system and this would provide financing and technical cooperation to the national systems to improve the on-line accessibility of the information available in the national system. In particular, the interoperability and automatic data transfer between national information systems and other valuable international or regional IS strengthened.

This recommendation can be applied 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.

Focusing the recommendations on priority national information systems

To limit the number of recommendations and concentrate the efforts and resources devoted to improve the IS-ARM for Senegal, we will focus on the following ten priority national information systems: ANSD, ANACIM, CSA, Manobi DPV, DSV, DAPSA, MAFAP, SAP and CNAA. In the following paragraphs we will present specific recommendations for these priority national information systems and blocks.

Blocks 1 and 2

It is recommended making further improvements such as: making access to ANACIM's web stable; consolidating automatic recording of weather variables (automatic weather station, moving from manual weather stations that only provide temperature and rainfall). Increase the number of complete weather stations that will provide daily data in each agro-ecological zone; the decision about the number and location of those stations should be made by ministerial departments involved in agriculture, or else 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 AGRHYMET and both organizations should work closely coordinated. We recommend to build a partnership ANACIM-AGRYHMET and to take advantage of the Regional Food Reserves in West Africa Project financed by EU-DEVCO, as that project has an important budget to strength and improve the information systems for agriculture and food security (component 1) executed by CILSS.

Block 3

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. CSA has complete and good information on commodity prices and food reserves but the

information and data on the web site is rather limited. We recommend loading in the CSA web site all the available commodity price and food reserves information instead of to having to request to CSA the complete information

It is recommended that Manobi should disseminate the data price collected by its market agents through the web page (currently it is disseminated by mobile sms and extension agents). The web of Manobi should inform about all the services provided, the costs and the modus operandi of this valuable market information system. It is proposed that the commodity price coverage should be widened. Efforts to collect input price information should be launch.

Block 4

The digitalized database on crop production and yields from the Direction de l'Analyse, de la Prévision et des Statistiques Agricoles (DAPSA) and the Agence Nationale de Statistique et de Démographie (ANSD) and are recent. Thus, these information systems provide a preliminary database but improvements on the length of the data series would be needed.

DAPSA has good information on cultivated land, yields and crop production at the level of province or lower level but this information is not in the DAPSA web site. We recommend accelerating the on-going process of construction of DAPSA Portal and putting all the DAPSA available information on this Portal.

ANACIM coordinates the Groupe de Travail Pluridisciplinaire (GTP) that collect data on meteorology, agricultural hydrology, pastoralism, phytosanitary and markets to produce weekly a multidisciplinary bulletin. We recommend uploading all the information and data included in those bulletins on the ANACIM web site.

Although the Directorate of Plant Protection (DPV) provides some bulletins with good information, the DPV should improve the information on plan health uploaded on its web site. In the future, the DPV should move forward to setting a proper information system on plan health (Plant Health Portal, PHP). The Inter-African Phytosanitary Council of the African Union could help to reach this target.

Block 5

Dissemination through the national webs should be improved (the low performance of *Agence Nationale de Statistique et de la Démographie -ANSD-* is a real problem that needs to be urgently addressed). Although improvements have been made in recent weeks in the ANSD webpage (now it is possible to access to the livestock and fisheries statistics of year 2013, both published in February 2016), no serial data are available. 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 animal and human health issues. Something similar may be applied to the webpage of the *Ministère de la Santé et de L'Action Sociale* and public health issues. The SIGEL webpage should be functional all the time.

The DSV (*Direction de Services Vétérinaires*) 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.

Blocks 6 y 7

DAPSA started already the process to include Senegal in the MAFPA-FAO program. We recommend accelerating the implementation of MAFPA Program in Senegal.

It is recommended to implement new pilot insurances on crops and livestock insurances based on the experience and evaluation of the CNAA-agro-insurances to strengthening the farmers' capacity to cope with increasing risks.

Improving the on-line availability of the sectorial statistics elaborated by DAPSA and the socio-economic and sectorial data from ANSD including foreign trade and to fix the ANSD web page should be initiated as soon as possible.

ANNEX 1 – Description of the Information Systems identified

Thematic Block 1 - Meteorological, climate and soils information

Sub - Block 1.1 Climate

NATIONAL

L'Agence Nationale de l'Aviation Civile et de la Météorologie

<http://www.anacim.sn/>

The National Agency of Civil Aviation and Meteorology (ANACIM) was born from the merger of the former agencies of civil aviation and meteorology. The ANACIM is governed by two bodies: the Supervisory Board and Executive Management.

The ANACIM has various functions as:

- Monitoring the State's commitments to civil aviation and meteorology;
- The development of a technical regulation of civil aviation and meteorology in accordance with ICAO standards and the World Meteorological Organization (WMO);
- Coordination of the supervision and control of all aeronautical and meteorological Senegal activities and monitor the activities of international and regional organizations active in the field of civil aviation and meteorology;
- The ANACIM also responsible for coordinating the supervision and control of all weather activities Senegal in accordance with the rules of the World Meteorological Organization (WMO).

The daily weather forecasts are presented in a country map, highlighting temperature, wind speed and cloud cover for major provinces (fourteen); a related newsletter is also published. The forecast to 72 hours gives the weather evolution and future state of the sky for all country.

In addition, the ANACIM provides a seasonal forecast that aims to predict the trend of the meteorological parameters such as temperature and precipitation to three to six months throughout the country or region. Nevertheless, the information is not detailed, but provides information on major trends likely values.

The public agency publishes every 10 days an agro-meteorological information bulletin on the meteorological and hydrological situation. The only published bulletins correspond to 2015. This bulletin publishes the accumulated rainfall of 25 weather stations, comparing the situation to the previous year. However, there are no details of other climatic variables.

In addition, the daily forecast is published on the web. In the course of this project we have seen improvements in the website. For example, now it is easier to find the information.

According to information provided by the consultant, the variables recorded of weather station are in the next table. However metadata is not accessible unless it is paid.

Table A1. 1. Variables recorded of ANACIM

Variable		Yes/No	Comments
Temperature (Temp max and Temp min)		YES	Around 25 stations who collect those data
Precipitation		YES	More than 350 rainy stations
Wind		YES	Around ten synoptic station who collect daily this parameter in every three hours by day
Solar radiation		YES	Around ten synoptic station who collect daily this parameter in every three hours by day
Relative humidity		YES	Around ten synoptic station who collect daily this parameter in every three hours by day
Other services	Weather forecast	YES	Every day the forecasters update their predictions and produce two bulletins by day
	Extreme events	YES	In case of events
	Early warning systems	YES	With the help of projects
	Others (Seasonal forecasting on the profile of the wintering)	YES	In beginning of every wintering

On the website of ANACIM there is no information about the weather stations (location, types, etc ...). Nevertheless, the *Centre de Suivi Ecologique* (see block 4) has published a yearbook of 2009 where the meteorological network in Senegal is described.

ANACIM would have a network of observations from 12 synoptic stations, 8 agro-meteorological stations, 11 climatological stations, and 79 rainfall stations. However, there is no information on how many stations are still operational. However, according to information provided by the consultant there are 13 agro climatic stations, 12 synoptic stations and 350 rainfall stations. The daily precipitation series expand for more than 60 years in manual stations are. Nevertheless, the automatic stations are more recent, and have 10 years data for all variables

Table A1. 2. Strengths and weaknesses of ANACIM

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - National source - Diversification of information - Potentially it could have many features to help farmers - Could comply with desirable data for risk analyses (Daily weather data) 	<ul style="list-style-type: none"> - The weather data can only be obtained upon request by paid - There is need to check data quality - There is no information about the weather stations

Some of the functions of the National Agency of Statistics and Demography (ANSD) are to:

- Centralize and disseminate statistical summaries of the data produced by the national statistical system
- Ensure the development and implementation of the multiannual and annual programs of statistical activities
- Prepare the files to be submitted to the meetings of the National Statistics Council and the Technical Committee of statistical programs
- Control the economic situation and economic outlook in connection with the service in charge of forecasting and conditions

However, the website is not always available and load is slow. In the section on meteorology there are no published data.

Table A1. 3. Strengths and weaknesses of ANSD

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Diversification of information	<ul style="list-style-type: none">- Website not always available and load is slow- The site is not yet complete- There are no data on meteorology

REGIONAL

African Center of Meteorological Application for Development

<http://acmad.net/rcc/metadatasenegal.php>

ACMAD is the Weather and Climate Centre with African continental competence. It was created in 1987 by the Conference of Ministers of the United Nations Economic Commission for Africa (UNECA) and the World Meteorological Organization (WMO).

African Regional Climate Centre does various activities and provides numerous products, such as development of quality controlled regional datasets for Africa, climate database and archiving services, climate diagnostics and assessment, establishment of climatic references, implementation of a regional climate watch...

In the case of Senegal this website has metadata for twelve weather stations though data access is on request.

Table A1. 4. Strengths and weaknesses of ACMAD

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Diversification of services and uses- Website is up to date and working properly	<ul style="list-style-type: none">- The weather data are not available: databases must be obtained upon request (data quality needs to be checked)

Centre Regional AGRHYMET

<http://www.agrhymet.ne/bulletin.html>

Created in 1974, the AGRHYMET Regional Centre is a specialized institution of the Permanent Interstate Committee for the Fight against Drought in the Sahel (CILSS) grouping thirteen countries are: Benin, Burkina Faso, Cape Verde, Ivory Coast, Gambia, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Senegal, Chad and Togo. This is an interstate public institution with legal personality and financial autonomy. It is based in Niamey, Niger.

Specific areas of competence of the AGRHYMET Regional Centre:

- Vocational training, agronomy, plant protection, water resources management, agro-meteorology.
- Management databases
- Agricultural statistics
- Diagnosis of phytosanitary problems
- Geographic Information Systems, Remote Sensing
- Analysis of watersheds and irrigation schemes; irrigation management
- Mathematical modelling and numerical simulation

The website has published several bulletins, technical documents and annual report. However, weather data cannot be downloaded.

Table A1. 5. Strengths and Weaknesses of AGRHYMET

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- Regional source (reliability)- Diversification of services (bulletins, reports...)- Website is very up to date and working- Could comply with desirable data for risk analyses (Daily weather data)	<ul style="list-style-type: none">- There is no open access to weather data (the data quality needs to be checked)- There is need to check data quality (however this is a renowned centre)

INTERNATIONAL

CountryStat-FAO

<http://www.countrystat.org>

CountrySTAT is a web-based information technology system for food and agriculture statistics at the national and sub national levels. In practice, it is a hub centre which centralizes and integrates the data coming from various sources and allows harmonizing it according to international standards while ensuring data quality and reliability.

In the case of Senegal, there are annual rainfall data for 18 locations (2000-2010). Although this is the only climatic variable reported.

Table A1. 6. Strengths and Weaknesses of CountryStat-FAO

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - This is a long-term sustainable system - There are no gaps within the time series - Summary tables and graphs are provided at request - Data from different countries can be compared - Technical assistance from FAO experts is provided 	<ul style="list-style-type: none"> - Limited to precipitation data - Non-updated time series (2000-2010).

FAO-Aquastat

<http://www.fao.org/nr/water/aquastat/climateinfotool/index.stm>

FAO-Aquastat is an interactive tool to query a spatial data-set containing mean monthly climate data. The data-set covers the global land surface for the period 1961-1990 only. The tool displays the latitude, longitude and elevation of the chosen location, and the following climate variables per month:

- Precipitation in mm/month and mm/day
- Coefficient of Variation of precipitation
- Number of wet days
- Mean temperature Tmean, Tmax and Tmin
- Days of ground frost
- Relative humidity
- Sunshine fraction
- Wind speed at 2 meters above the surface in m/s
- Reference evapotranspiration in mm/month and mm/day

The data available refer to mean values of the whole 1961-1990 series (i.e.: only one value per month average of the 30 years). These data have been obtained by interpolating data from different climate stations.

Table A1. 7. Strengths and weaknesses of FAO-Aquastat

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Level of aggregation: Location - Most weather variables are included - Open access 	<ul style="list-style-type: none"> - Mean monthly climate data of 30 years which is insufficient - The data give an indication of climatic conditions but can never replace data obtained through stations - When using weather generators the capture of extreme events may be limited

Centre for Research on the Epidemiology of Disaster-CRED. (The International Disaster Database)

http://www.emdat.be/advanced_search/index.html

Since 1988 the Centre for Research on the Epidemiology of Disasters (CRED) has been maintaining an Emergency Events Database EM-DAT. It contains essential core data on the occurrence and effects of over 18,000 mass disasters in the world from 1900 to present. The

database is compiled from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies.

EM-DAT distinguishes between two generic categories for disasters (natural and technological). With respect to natural disasters that are of interest to us, there are 5 sub-groups: Geophysical, Meteorological, Hydrological, Climate and Biological. The disasters that are included are earthquakes, volcanic activity, storms, extreme temperatures, fog, floods, droughts, epidemic, etc. For example in the case of Senegal, the data recorded in the past ten years (2004-2014) there are eight floods and two droughts.

Table A1. 8. Strengths and weaknesses of CRED

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Diversification of services - Website is very up to date and working properly - Open access to disaster data 	<ul style="list-style-type: none"> - The level of aggregation of data is country, it would be desirable to increase resolution (e.g. by agro ecological region)

The World Bank Group (Climate Change Knowledge Portal)

http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCode=SEN&hisTab=RiskOverview

The Climate Change Knowledge Portal (CCKP) is a central hub of information, data and reports about climate change around the world. In this web allows for submitting data requests, maps, comparisons, and charts, and summarizes key climate and climate-related information.

Sources on climate and climate related information are linked through the country profiles' on-line platform, which is periodically updated. The series is developed by the Global Facility for Disaster Reduction and Recovery (GFDRR), the Global Support Program of the Climate Investment Funds, and the Climate Change Team of the Environment Department of the World Bank and was made possible with the support of the Government of Luxemburg, the World Bank, and the Climate Investment Funds.

The profiles of countries are geared towards providing a quick reference source for development practitioners to better integrate climate resilience in development planning and operations. Users are able to evaluate climate-related vulnerability and risks by interpreting climate and climate-related data at multiple levels of detail.

Table A1. 9. Strengths and weaknesses of CCKP

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Diversification of services and uses - Information of extremes events, temperature and precipitation. 	<ul style="list-style-type: none"> - Data and reports cannot be downloaded or printed - Monthly mean data is given for several years and are displayed only in maps (colours representing value ranges) - Capture of extreme events is limited because weather generators are used to provide climate data

Sub-block 1.2. Soil

According to information provided by the consultant, the national authority responsible for the information of soil is the *Institut National De Pédologie* but the web is not operational.

European Soil Data Centre (ESDAC)

http://eusoils.jrc.ec.europa.eu/esdb_archive/EuDASM/Africa/lists/ccm.htm

The European Soil Data Centre (ESDAC) is the thematic centre for soil related data in Europe. It contains a number of resources that are organized and presented in various ways: datasets, services/applications, maps, documents, events, projects and external links.

The European digital archive of soil maps (EUDASM) launched the project “Soil Maps of Africa” whose main objective was translation of soil information from paper maps and reports into digital format. It is a prerequisite of the next step - the development of a digital information system on soil and terrain that may be drawn upon for manifold applications. Two thousand maps have been scanned that are of different scales and applications.

Table A1. 10. Strengths and weaknesses of ESDAC

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Website is very up to date and working - Open access to maps 	<ul style="list-style-type: none"> - Level of aggregation: Continent and Country - Some maps are quite old, and their usefulness is limited

ISRIC_World Soil information: Africa Soil Profiles Database

<http://www.isric.org/content/world-data-centre-soils>

ISRIC - World Soil Information is an independent, science-based foundation. The institute was founded in 1966 following a recommendation of the International Soil Science Society (ISSS) and a resolution of the United Nations Educational, Scientific and Cultural Organization (UNESCO)

The Africa Soil Profiles Database includes soil profile layer attributes inventoried and compiled from a wide variety of data sources. These soil analytical data are available for 15,564 profiles of which 14,197 are georeferenced. The original attribute values are standardized according to e-SOTER conventions and validated according to routine rules. In the case of Senegal, there are 311 profiles all georeferenced.

Table A1. 11. Strengths and weaknesses of ISRIC

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Information on geo-referenced soil profiles - The variables provided are adequate and complies with desirable data for risk analyses The variables provided are adequate 	<ul style="list-style-type: none"> - Data downloading is slow and somewhat complicated because the application interface is not easy to use.

Thematic Block 2 -Satellite image information & Communications

Remote sensing processes began in the earlier 19th century. It have been relieved in the 20th century by very sophisticated spatial data collecting methods linked to the opening of digital or numerical era in 1970-1980 through the CD and the computer. The creation of Global Positioning System (GPS) and it freeing in 1990 and the launching of Geographical Information System (GIS) enabled the development of very rapid and sophisticated communication systems that benefit from the constellation of satellites in the space. The context is that of geomatics and Information and Communication Technologies (ICT), those completely transformed the world in the last decades (1990-2000) and made remote sensing and mapping processes very successful. African continent that has been since very much marginalized by industrial and technological development is trying to benefit from this opportunity offered by the world history.

After a global study of the different sources of information we have classified the Information Systems as the following: Institutions, Private Companies, Academic Journals, and Research. A complete IS list is showed in Annex 2. From this list we have selected the institutions (international and nationals) and private companies to make a description of each one that is written as follows.

INSTITUTIONS

United Nations (UN Spider)

<http://www.un-spider.org/space-application/space-technologies-in-the-un/eca>

In its resolution 61/110 of 14 December 2006 the United Nations General Assembly agreed to establish the "United Nations Platform for Space-based Information for Disaster Management and Emergency Response - UN-SPIDER" as a new United Nations program, with the following mission statement: "Ensure that all countries and international and regional organizations have access to and develop the capacity to use all types of space-based information to support the full disaster management cycle". The UN-SPIDER programs are achieving this by focusing on being a gateway to space information for disaster management support, by serving as a bridge to connect the disaster management, risk management and space communities and by being a facilitator of capacity-building and institutional strengthening, in particular for developing countries. Now, it is collaborating intensively with United Nations Economic Commission for Africa (UN-ECA) to promote the economic and social development of its member States, foster intra-regional integration, and promote international cooperation for Africa's development.

Table A1. 12. Strengths and weaknesses of UN Spider

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Diversification of services- Cover all the continent	<ul style="list-style-type: none">- Data and reports cannot be downloaded or printed- They are based mainly in MODIS- Radiometric and Spatial resolution sometimes is not specified.

National Aeronautics and Space Administration (NASA)

<http://visibleearth.nasa.gov/view.php?id=42097>

<http://visibleearth.nasa.gov/view.php?id=11953>

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=19080>

President Eisenhower established the NASA in 1958. It grew out of the National Advisory Committee on Aeronautics (NACA), which had been researching flight technology for more than 40 years. DEVELOP, part of NASA's Applied Sciences Program, addresses environmental and public policy issues through interdisciplinary research projects that apply the lens of NASA Earth observations to community concerns around the globe. Bridging the gap between NASA Earth Science and society, DEVELOP builds capacity in both participants and partner organizations to better prepare them to address the challenges that face our society and future generations. With the competitive nature and growing societal role of science and technology in today's global workplace, DEVELOP is fostering an adept corps of tomorrow's scientists and leaders.

Table A1. 13. Strengths and weaknesses of NASA

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Diversification of services- They offer several sensors	<ul style="list-style-type: none">- Organization of the web is too complicated- Radiometric and Spatial resolution sometimes is not specified.

European Space Agency (ESA)

<http://www.gmfs.info/>

<https://earth.esa.int/web/guest/featured-image/-/article/senegal-river-senegal-and-mauritania>

It is Europe's gateway to space. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe and the world. ESA is an international organization with 22 Member States. By coordinating the financial and intellectual resources of its members have approached many international programs.

Table A1. 14. Strengths and weaknesses of ESA

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Diversification of services- They offer several sensors	<ul style="list-style-type: none">- Organization of the web is too complicate- Length of data in some sensors is not enough for statistics.- Radiometric and Spatial resolution sometimes is not specified.

Food and Agriculture Organization of the United Nations (FAO)

<http://www.fao.org/about/en/>

<http://www.fao.org/giews/earthobservation/country/index.jsp?lang=en&code=SEN>

This organization has three main goals: the eradication of hunger, food insecurity and malnutrition; the elimination of poverty and the driving forward of economic and social

progress for all; and, the sustainable management and utilization of natural resources, including land, water, air, climate and genetic resources for the benefit of present and future generations.

Table A1. 15. Strengths and weaknesses of FAO

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Diversification of services - They offer several indexes 	<ul style="list-style-type: none"> - Organization of the web is too complicate - Length of data in some indexes is not clear - Radiometric and Spatial resolution sometimes is not specified.

U.S. Geological Survey (USGS)

<http://eros.usgs.gov/senegal-guinea>

<http://eros.usgs.gov/senegal-river-delta>

<http://earlywarning.usgs.gov/fews/search/Africa/West%20Africa>

<http://rmgsc.cr.usgs.gov/ecosystems/africa.shtml>

It has maintained a key role in the field of remote sensing since its founding in 1879. The USGS is not only a user of remote sensing data but also one of the world's largest providers of the data, employing the best tools and techniques to carry out its mission of observing and understanding the world around us, thus expanding our knowledge of the Earth. The Remote Sensing Technologies (RST) Project has been established to provide technical expertise and services to the USGS and partners across government, industry, and academia, with focus on satellite sensors capabilities, reliability, and accuracy. The USGS, worked with partners around the world to establish an online Catalog of prime candidate worldwide test sites for the post launch characterization and calibration of space-based optical imaging sensors. The online Catalog provides easy public Web site access to this vital information for the global community.

Table A1. 16. Strengths and weaknesses of USGS

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Diversification of services - They offer several sensors 	<ul style="list-style-type: none"> - Length of data in some sensors is not enough for statistics. - Radiometric and Spatial resolution sometimes is not specified.

African Association of Remote Sensing of the Environment (AARSE)

<http://africanremotesensing.org/>

The African Association of Remote Sensing of the Environment (AARSE) was founded in 1992 and was incorporated in 2008 as an international Non-Government Organization (NGO) under Section 21 of the South African Companies Act 61 of 1973. AARSE is a partner of several dedicated international organizations. The primary aim of AARSE is to increase the awareness of African governments and their institutions, the private sector and the society at large, about

the empowering and enhancing benefits of developing, applying and utilizing responsibly, the products and services of Earth Observation Systems and Geo-information Technology.

Table A1. 17. Strengths and weaknesses of AARSE

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - Continental source specify in Africa - Variety of news on remote sensing - Cover different aspects 	<ul style="list-style-type: none"> - Data and reports cannot be downloaded or printed. - Very few services on hazards warning

Google Earth

<http://jssolichin.com/remote-sensing/>

Google is making headway with their Google Earth Engine Beta project, software currently available by sign up that allows remote sensing via their hosted cloud computation platform. Similarly, they have begun collecting data that is becoming more publicly available to augment their current remote sensing library, employed on Google Earth, through EE's Data Catalog. Increasing availability of publicly accessible remotely sensed data and software via Google Earth has provided a unique tool for a broader audience which has historically been limited to industry professionals. Presently, the only publicly available software known to the general public for remote sensing analysis is, by and large, Google Earth.

Table A1. 18. Strengths and weaknesses of Google Earth

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Variety of news on remote sensing - Cover different aspects 	<ul style="list-style-type: none"> - Length of data could be not enough for statistics depending on sensors - Very few services on hazards warning

CGIAR Consortium for Spatial Information (CGIAR – CSI)

<http://www.cgiar-csi.org/>

The CGIAR is a global partnership of research organizations dedicated to reducing poverty and hunger, improving human health and nutrition, and enhancing ecosystem resilience through agricultural research. Consortium for Spatial Information (CGIAR-CSI) is spatial science community that facilitates CGIAR's international agricultural development research using spatial analysis, GIS, and remote sensing.

Table A1. 19. Strengths and weaknesses of CGIAR-CSI

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Variety of information using remote sensing and dem - Methodology and information very complete 	<ul style="list-style-type: none"> - Length of data could be not enough for statistics. - Very few services on hazards warning

World Bank

<http://water.worldbank.org/WPP-Food-Security>

<http://ears.org/news/geoville-to-perform-world-bank-study-in-dakar-senegal>

This institution is participating in the Water Partnership Program (WPP). Through WPP is targeting interventions where resources can make the most impact. This includes aiming at countries with weak capacity and financial resources; sectors that have the most to lose if they do not incorporate water; and new technological areas to fill existing global knowledge gaps. Core contributions are seen through targeting non-water sectors and key geographies, broadening partnerships, and developing niche tools and approaches.

Table A1. 20. Strengths and weaknesses of WB

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Diversification of services- Related mainly with water supply	<ul style="list-style-type: none">- Organization of the web is too complicate- Linked to International Remote Sensing Institutions for data sources.

The International Center for Agricultural Research in the Dry Areas (ICARDA)

<http://geoagro.icarda.org/en/>

<http://geoagro.icarda.org/en/default/index/facilities>

It was established in 1977. It is one of 15 such centers supported by the CGIAR. ICARDA's founding mandate to promote agricultural development in the dry areas of developing countries remains highly relevant today. ICARDA works with a tight focus on the problem-solving needs of resource-poor farmers, achieving this through the in-field delivery of its research outputs. Although global food production has increased by 20 per cent in the past decade, food insecurity and poverty remain widespread, while the natural resource base continues to decline.

Table A1. 21. Strengths and weaknesses of ICARDA

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Variety of information using remote sensing- Methodology and information very complete	<ul style="list-style-type: none">- Very few services on hazards warning- Data is not totally open to the public

Agence Nationale de L'Aviation Civile et de la Météorologie (ANACIM)

<http://www.anacim.sn/>

This agency was established by Decree 2011-1055 of July 28, 2011. It was born as the merger of the former agencies of civil aviation and meteorology for reasons of consistency, efficiency and optimization of financial resources. Supervising the safety and security of civil aviation is one of the main functions of the ANACIM.

Table A1. 22. Strengths and weaknesses of ANACIM

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Update of meteorological variables- Rain maps useful for users	<ul style="list-style-type: none">- Hazards warning focus mainly in aviation- Remote sensing data is not open to the public

Centre de Suivi Ecologique (CSE)

<http://www.cse.sn/>

Created in 1986, it was the first operated in draft form before becoming a non-profit association in 1993. The CSE's mission is to "contribute to the understanding and sustainable management of natural resources and the environment through the production and distribution of products and decision support services including the State, communities local, private sector, civil society, research institutions and development, producer organizations and development partners". As such, the CSE interventions cover diverse areas such as support for spatial planning and urban management, scientific and technical support for sustainable land management, contribution to the decentralized management of natural resources and environmental and social assessment, monitoring efforts against poverty, support for the fight against climate change, etc.

Table A1. 23. Strengths and weaknesses of CSE

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Indexes related to crops and fires- Field work added	<ul style="list-style-type: none">- Web doesn't provide some bulletins- Data is not totally open to the public- Web page is only in French

AGRHYMET REGIONAL CENTRE (ARC)

<http://www.agrhymet.ne/eng/index.html>

Created in 1974, AGRHYMET is a specialized agency of the Permanent Inter-State Committee against Drought in the Sahel (CILSS) of thirteen countries. These are: Benin, Burkina Faso, Cape Verde, Chad, Ivory Coast, Gambia, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Senegal and Togo. This is a public interstate with legal personality and financial autonomy. It has an international status with headquarters in Niamey, Niger. Its main objectives are to contribute to food security and increased agricultural production in member countries of CILSS and ECOWASO and to help improve the management of natural resources of the Sahel and West Africa. Providing information and training of development agents and their partners in the fields of agro-ecology in the broadest sense.

Table A1. 24. Strengths and weaknesses of ARC

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Information using remote sensing focus mainly in drought- Periodic bulletin with maps	<ul style="list-style-type: none">- Mainly focus in drought hazards- Data is not totally open to the public- Maps sometimes don't have a good resolution

PRIVATE COMPANIES

Terra Remote Sensing Inc.

<http://www.terraremote.com/about/services/>

<http://www.terraremote.com/environment/vegetation-mapping/>

<http://www.terraremote.com/environment/watershed-assessment/>

It is an internationally based Canadian remote sensing company with a background of 40 years of experience. Terra operates a full range of integrated and cutting-edge remote sensing technologies, on land and in marine environments. Their operational capabilities include: airborne LiDAR, digital ortho-photography, hyper-spectral, multi-beam bathymetry, marine geophysics, thermal imaging, and GIS support services. In addition to the collection of geospatial data, Terra has developed unique software and internal processes to integrate and manage differing remote sensing datasets into synergetic products. These products have been relied on by industry leading companies for cost-effective solutions for a range of complex applications, including environment. Terra has provided data for many environmental projects ranging from wind farm feasibility studies to watershed mapping, and site assessments.

Table A1. 25. Strengths and weaknesses of Terra Remote Sensing Inc.

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International company - Use of different sensors at different scales 	<ul style="list-style-type: none"> - Data not free - Radiometric and resolution sometimes is not specified.

Remote Sensing Applications Consultants Ltd. (RSAC)

<http://www.rsac.co.uk/apps.html>

RSAC applies operational computer-based satellite image analysis techniques with active participation in UK, European Space Agency (ESA) and European Union (EU) projects. The company has in-depth experience of a range of commercially available satellite imagery: IKONOS, Quickbird, SPOT, Landsat, IRS, ERS, Envisat and RADARSAT. Since 2002, RSAC has provided daily acquisition planning for the CHRIS instrument onboard ESA's PROBA satellite. RSAC is constantly seeking to develop operational uses for remote sensing data where the unique capabilities and cost advantages of satellite imagery find practical application. Supporting this work is the in-house development of customized systems that incorporate remote sensing, GIS, GPS and database technologies.

Table A1. 26. Strengths and weaknesses of RSAC

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International company - Use a big variety of sensors - Long data set on time 	<ul style="list-style-type: none"> - Data not free - Not clear the products of each sensor they used.

VITO nv

<https://vito.be/en/file/1347>

<https://rs.vito.be/africa/en/home/Pages/home.aspx>

It is an European independent research and technology organization in the areas of cleantech and sustainable development, elaborating solutions for the large societal challenges of today. They can observe, evaluate and, visualize phenomena on land and on the surface of the water.

Table A1. 27. Strengths and weaknesses of VITO nv.

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International company- Long data set on time in some sensors- Several projects developed in Africa	<ul style="list-style-type: none">- Some of the data is not free- Not clear the terms to use free data.

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

Sub-Block 3.1 – Commodity prices

NATIONAL

Agence Nationale de la Statistique et de la Démographie (ANSD)

<http://www.ansd.sn/>

The ANSD is the official statistical agency of Senegal. As an official agency, the ANSD provides different datasets on agriculture, foreign trade, national accounting, livelihood, demographic data, employment, energy, environment, justice, health, communications, etc. However, some of these thematic sections of its website do not work properly (agriculture, and horticulture among them. Last checked January 29th).

Within the ANSD, other official websites are cited: “Portail des données”, “Banque des données (ANADS)”, “Système Statistique National (SSN)” and “Recensement Général de la Population et de l’Habitat, de l’Agriculture et de l’Elevage 2013 (RGPHAE)”. The ANADS offers some market and food security analyses under license, while the websites of the SSN and the RGPHAE are not available (last checked January 29th).

The ANSD within its “Banque de Données des Indicateurs Sociaux 2007-2009 (BADIS)” publishes producer prices from 1961 to 2009 for the following commodities: cotton, rice, sorghum, peanut, maize, cassava, cowpea. In addition, the production value and producer price index are provided for the same commodities. Some other recent datasets (2008 to 2015) were identified, but since the website does fail many times, this information has not been analyzed.

According to the local fieldwork performed by the local consultant, the ANSD does not produce any data and they collect them from the Commisariat à la Sécurité Alimentaire (CSA). Recent commodity price information is available for download within the monthly bulletins published in the “Economical Synthesis” section of the ANSD website. However, this section does not work (last checked January 29th). When available to consult, the only price information found within this web section has been price indices but not “raw” price data.

Within this section usually unavailable, there have been also identified the monthly bulletins of foreign trade. These bulletins consist of different analyses of the evolution of national imports and exports by commodity groups (both in quantity and value). The foreign trade bulletins are available from November 2012 to November 2015, and are usually updated 45 days after the end of the analyzed month.

Also as an output of the fieldwork, it is known that the datasets from the ANADS (database) are available only under license due to the national regulations (to preserve the confidentiality of the researches). Only users registered within the mailing list (registration on-line) have access to these files. However, this information has not been found within the ANSD website.

Information is collected by surveys (usually quarterly), from censuses (10 years) and gathering it from the data-producing partners.

The main dissemination channels used by the ANSD are the website and the mailing list, to which users can subscribe on-line.

After the revision of this market information system, the following strengths and weaknesses have been identified.

Table A1. 28. Strengths and Weaknesses of ANSD

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - National source (reliability) - Many different information provided - Long time series - Commodities covered 	<ul style="list-style-type: none"> - No recent information available as open data - Information at regional level not provided - No inputs or stocks information - Publications are not easy to find - Datasets available under authorization - Some sections of thematic statistics do not work properly - The whole website many times is not available

Manobi Senegal

<http://www2.manobi.com/>

This integrated MIS is a private initiative aimed to provide services to small producers. It is focused on facilitating the access to information and technology, as well as the products commercialization (since all stakeholders are connected through the same platform).

Manobi’s main services are the census and geopositioning of farmers, the traceability of productions, to collect and solve demand/supply offers, to advising about extreme events coming, meteorological previsions, and the market information). At this respect, information about agricultural prices and alerts can be obtained at real-time by SMS.

However, Manobi’s website does not offer more information about its market monitoring activities, so commodities covered, time series available, frequency of communications and other information attributes cannot be analyzed.

According to the local expert, Manobi collects daily price information of domestic commodities such as fruits, vegetables and cereals. Manobi provides daily retail and wholesale prices by market, from year 2001 to date. Information is collected by Manobi agents present on the main markets of the country. Information is transmitted to the central with an application installed on smart phones. Manobi supervisors at the central are in charge of validating the information transmitted by the collection agents.

According to the responsables of Manobi services, prices are collected by agents in the markets that act as “brokers” among buyers and sellers. This is the way by which prices are obtained for each of the main markets and for each variety of the commodities sold. Buyers and sellers can place they offers both by the platform (smarphone app) or through the market agents. As an output of this main activity, farmers can obtain daily prices for the commodities they select by SMS. Although it is not usual for smallholders, if any farmer wants to have access to complete historical price data Manobi provides these upon request.

The following are the early strengths and weaknesses identified from this MIS.

Table A1. 29. Strengths and Weaknesses of Manobi

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - Different markets and commodities monitored - Dissemination by using ITCs. - Integrated system - Empowering market stakeholders - Transparency of the system - Facilitating market access - Risk management tool 	<ul style="list-style-type: none"> - There is no detail on-line about information characteristics and attributes.

Commisariat à la Sécurité Alimentaire (CSA)

<http://csa.sn/site>

The CSA is a national organization aimed to monitor agricultural markets and stocks, in order to guarantee food security in Senegal. This MIS is focused on cereals, and among its main activities there can be found: the food security stock management, the assistance to vulnerable groups and the food price monitoring.

Concerning market information, originally the CSA used to publish two types of documents:

- Monthly bulletins about monitoring of agricultural markets (SIM bulletins): These bulletins are available from January 2008 to date, and provide the evolution of different prices by commodity (rice, maize, sorghum, millet, livestock, cowpeas, pulses) and in some cases by region. Retail and producer prices are considered.
- Monthly bulletins joined by PAM-WFP (Marsé bulletins): These bulletins are only available from 2011 to 2013, and provide the evolution and comparison of prices for different commodities in Senegal.

However, after two years, the “Marsé bulletins” content was integrated within the SIM bulletins in order to avoid duplicity of the analyses and information. This way, monthly bulletins are conducted by the CSA and submitted to the WFP before released for observations and additional analyses/information.

According to the local consultant, price information is available by market, department and region. However, only national information and analyses are disseminated within the bulletins. Despite this, disaggregated data are available by request to the CSA.

The CSA has data collection staff in every region of Senegal (researchers and a regional coordinator). These regional collection teams gather price data on a weekly basis. Is the regional coordinator who transmits the “collection cards” to the national team, which is in charge of validating and analyzing the information. The main validation method used by the CSA to check data quality is the comparison of the data with previous trends and other information systems.

Concerning dissemination channels, the local expert states that from 1989 to 1999 the CSA used to disseminate information by the national radio (RTS), newspapers (“Le Soleil”) and in hard copy. However, for the last 15 years the main distribution channel has been the CSA’s website and the mailing list.

After the revision of the CSA as a MIS, the following are the main strengths and weaknesses identified.

Table A1. 30. Strengths and Weaknesses of CSA

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - Different commodities monitored - Information provided by region - Retail and producer prices provided - Reliability (national official source) - Integrated system - Risk management tool 	<ul style="list-style-type: none"> - No clear and detailed information about stocks - No information about agricultural inputs or trade - There is few information about data collection and validation methods - Information is summarized in bulletins but raw data are not accessible - Few dissemination channels available

REGIONAL

West African Market Information System Network (WAMIS-NET -RESIMAO)

http://www.resimao.net/market_region.php?coid=111381517

The WAMIS-NET is an official market information system operating in different countries from West Africa to provide information on 400 commodity markets to all interested stakeholders. Its main objective is the contribution to food security and to poverty reduction, while promoting the regional trade. This MIS provides to the stakeholders equitable access to market information, which enhances the decision-making process. In addition, the activity of this regional MIS contributes to a better development of the different national MIS of each country.

Concerning Senegal, RESIMAO provides wholesaler and consumer prices (not producer prices) for the following commodities: Local sorghum, rice (imported), French potato (imported), local onion, cassava, sounan millet.

This information can be found by market (29 markets) and commodity, but not all stated commodities are available for all markets.

In addition, there is the option to select livestock and agricultural inputs (fertilizers or seeds) information. Seeds selection is available for Senegal in some markets (onion seeds), and also some pesticides prices can be found for certain markets.

These open access data are collected weekly from “les dispositifs pays” through market surveys (by phone). Information is displayed graphically, but is not completely updated. However, the application shows updated information about last and next market days (Periodicity of the market and surveys is stated for each market). The access to the complete price time series is not available, there are only published the last one or two week records.

Regarding dissemination channels, RESIMAO MIS publishes weekly directories gathering different market parameters (prices, quantities, flows, etc.). In addition to these directories, RESIMAO publishes weekly, monthly and semi-annual bulletins and price yearbooks, as well as posting on its website other reports on agricultural products and food security, information on business opportunities and disseminates exchanging price data among traders. In order to inform their subscribers, the WAMIS-NET distributes price information also by radio, e-mail, SMS, hard copy and the internet.

In addition to price collection and dissemination, the WAMIS-NET –RESIMAO acts as a marketplace for traders (forum) and facilitates new business opportunities (virtual market). Capacity building and training activities are part of the MIS action plan in order to help to the improvement of domestic MIS.

After the revision of information provided by RESIMAO MISin Senegal, and pending the outcome of the fieldwork performed by the local consultants, the following strengths and weaknesses of the system have been identified.

Table A1. 31. Strengths and Weaknesses of WAMIS-NET -RESIMAO

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - Easy access to market - Risk management tool - Capacity building activities - User-friendly interface - Official MIS (reliability) - Diversification of services (business opportunities) - New dissemination channels (SMS) 	<ul style="list-style-type: none"> - There is no detailed information on the data source and evaluation methods - There is no access to the historical price data - Not recently updated - Limited commodities reported - No information about trade prices, stocks or livestock - Empty sections (there are markets with no information) - Not all information is available in all markets - No producer prices

United Nations Economic Commission for Africa (UNECA)

<http://comtrade.un.org/pb/CountryPagesNew.aspx?y=2013>

This United Nations’ MIS provides export and import prices at country level on an annual basis. Both prices are published as “open data” and cover the period from 2011 to 2013 without gaps in the time series. Commodities considered in both cases are the following:

- Export values: fish, molluscs, groundnut oil
- Import values: rice, wheat, palm oil, cane or beet sugar

After the revision of this MIS for Senegal, the following strengths and weaknesses of the system have been identified.

Table A1. 32. Strengths and Weaknesses of UNECA

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - This is a long-term sustainable system - There are no gaps within the time series - Summary maps, tables and graphics are provided 	<ul style="list-style-type: none"> - There is no information on agricultural input prices, stock or market prices - Information is provided at national level and annual basis - Short time series - No recent data - It is not properly a database as information is provided within bulletins or reports

African Development Bank Group (AFDB)

<http://senegal.opendataforafrica.org>

Within the AFDB open data system, three types of commodity price data can be found:

- **Market price data:** Commodities with this information available are: millet, rice (imported) and sorghum. These data are available for 11 locations of Senegal on a monthly basis, providing retail prices. Period covered goes from January 2007 to August 2011, without almost any gaps within the time series. These data come from the AFDB itself, and published as “Open data”.
- **Export / Import values:** This information comes from the United Nations’ Statistics Division, and covers a huge range of commodities. However many of these commodities have many gaps within the time series, which goes from 2004 to 2014. This information is provided at national level on an annual basis.

In addition to the information on commodity prices, this integrated system provides other information about early warning systems, socio-economic indicators, agricultural and livestock production, fertilizer consumption, trade, education, food supply, vulnerability indicators, etc.

After the revision of the AFDB-MIS for Senegal, the following strengths and weaknesses of the system have been identified.

Table A1. 33. Strengths and Weaknesses of AFDB

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none">- User-friendly interface- Wide database offering information about different topics and from different specified sources- Number of domestic markets monitored- Application provides graphics and charts, and allows comparisons- Integrated system regularly updated- Characteristics of each dataset are detailed	<ul style="list-style-type: none">- There is no information on agricultural input prices or stocks- Information is provided at national level and annual basis- There are sections not containing any data- There are different ways to access the same database, which leads to confusion- There is no information on dissemination channels- Few commodities reported (market prices)

Africa Fertilizer(AFO)

<http://africafertilizer.org/>

Africa Fertilizer is a global initiative led by the IFDC in partnership with other international and regional organizations such as the International Fertilizer Industry Association (IFA), the African Fertilizer and Agribusiness Partnership (AFAP), the Food and Agriculture organization of the United Nations (FAO-CountrySTAT) and the African Union Commission (AUC-NEPAD).

AFO provides international and national prices for different fertilizers in 18 countries. In the case of Senegal, AFO provides national annual prices for the following fertilizers:

- DAP
- NPK (10:10:20)
- Urea
- NPK (15:15:15)
- NPK (15:10:10)
- NPK (16:26:12 +TE)
- NPK (14:16:28)
- NPK (9:23:30)
- NPK (6:20:10)

These prices are available on a monthly basis, from September 2010 to August 2015.

In addition to this price-providing main activity, this MIS provides a Business and production directories. These are tools by which the users can search for agro-dealers by location, sector and services.

The analysis of AFO allows us to identify the following strengths and weaknesses.

Table A1. 34. Strengths and Weaknesses of AFO

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - User-friendly interface - Wide range of fertilizers considered - Regularly updated - Comparisons are possible - Provides additional services for users 	<ul style="list-style-type: none"> - Only fertilizers are considered within this system - Information is provided at national level - There is no information on dissemination channels

JRC/AfDB initiative

A new initiative called the Africa Food Prices Collection was launched in June 2014 by the European Commission’s Joint Research Centre (JRC) and the African Development Bank (AfDB), in partnership with Knoema. Its main objective is to collect weekly prices in Africa of various agricultural products including cereals, meat, fish, vegetables, oils, fruits and dairy products, using modern technologies and crowd-sourcing techniques. The dataset is intended to be open-access. The consultation process is currently underway. Various issues such as reliability, representativeness and sustainability will be critical in assessing the usefulness of the price data collected in this way. If and when proven effective and efficient, this approach would force changes in standard price datasets, such as those GPIS presented above.

INTERNATIONAL

The rising volatility and periodic hikes in food prices in recent years have become a major concern for policymakers worldwide. Sharp spikes in food prices have serious food security consequences as they can affect large numbers of vulnerable people and governments/countries that are heavily dependent on food imports. To address food security and agricultural development challenges, policymakers need easy access to up-to-date prices and analysis not only from within developing countries, but also across borders, regionally and globally. Whether for early warnings or longer term development planning, the need for a comprehensive, reliable and timely global price datasets is apparent and urgent.

International food price data and related analytical products are currently provided by United Nations agencies (FAO and WFP), international organizations (World Bank, IMF and IFPRI) and other national or regional systems (USAID's FEWS NET). Among these, FAO, WFP and FEWS NET are the main providers of national and sub-national food commodity price data, together covering 104 countries. Therefore, we will focus on those three Global Price Information Systems (GPIS). The World Bank, IMF and IFPRI also collect raw commodity price data and develop various aggregated price indices, indicators and other analytical products to inform policymakers about global food market changes and food security impacts. However, depending on their source of information, there is generally no open access to most of their raw price data although their analysis and analytical products are disseminated as global public goods.

Global information and Early Warning System (GIEWS-FAO)

<http://www.fao.org/giews/pricetool/?seriesQuery=79>

FAO has four main food price datasets: (a) International Commodity Prices, covering around 40 price quotations of all major food and agricultural commodities; (b) FAO Food Price Index, with the 70 price quotations that go into its calculations; (c) the Global Information and Early-Warning System (FAO GIEWS) food price data and analysis tool, which presents over 1200 price series for 89 countries; and (d) the FAOSTAT historical dataset, including producer prices and consumer price index for most countries. The most reliable, due to the rigorous control of quality of the price information collected and most up-dated information on food prices comes from FAO-GIEWS. In addition the length of the food price series from FAO-GIEWS are larger than the other two because FAO-GIEWS started much before.

The FAO GIEWS price dataset displays commodity prices for selected markets in urban and rural areas (or the national averages in some cases). The tool aims to give early warning of impending food emergencies and to provide markets and food security analysis. The dataset includes consumer price indices and official US dollar exchange rates of national currencies to allow quick conversions to real and USD prices for more meaningful comparisons over time and across countries. The entire price dataset is intended to be an open access global public good as part of FAO's global data provision mandate. It also meets food security monitoring, analysis and policymaking needs within and outside the organization.

The FAO GIEWS price tool allows users to download and create various price charts, over-time comparisons and the basic statistical descriptors of the series. However, it requires fast internet access. The price tool is a component of the Food Price Monitoring and Analysis (FPMA) activities, which include a website and the Global Food Price Monitor. Analysis of current price data is also presented in other GIEWS publications such as the quarterly Crop Prospects and Food Situation reports and through periodic alerts/updates on food security analysis. With 75 percent of the price series updated during the previous month, FAO GIEWS prices are the most up-to-date among the three datasets compared in this report.

Commodities considered in this MIS for Senegal are millet, sorghum and rice (imported). Information is provided by commodity and market (11 markets), and consists of monthly retail prices. These are available from January 2007 to August 2015. The source for this price information is ASND (Agence Nationale de la Statistique et de la Démographie).

The main dissemination method of the GIEWS is the food price monitoring and analysis tool. In addition to this tool, GIEWS releases at least four country briefs a year, gathering all data analyses. In addition to this price information, GIEWS provides price alerts, international commodity prices, food related policies.

After the revision of GIEWS information in Senegal, the following strengths and weaknesses of the system have been identified.

Table A1. 35. Strengths and Weaknesses of FAO-GIEWS

Strengths of the FAO-GIEWS	Weaknesses of the FAO-GIEWS
<ul style="list-style-type: none"> - Integrated system offering different information - Recent information available - Long time series - Diversification of services - Early Warning System - Risk management tool - Reliability 	<ul style="list-style-type: none"> - There is no information on the data collecting or processing methods - The only dissemination channel seems to be online bulletins publication - Limited commodities reported

World Food Programme (WFP-VAM)

<http://foodprices.vam.wfp.org/>

WFP's Vulnerability Analysis Mapping (VAM) food and commodity prices data system includes food price information from 75 countries, mainly where WFP is active. Although the system primarily serves internal demand to support program decision-making, the price collection and the analytical information generated is a global public good. WFP's food price dataset is the largest of the three datasets in terms of the number of price series; it is ten times larger than that of FAO and seven times that of FEWS NET. It has wider coverage in terms of sub-national rural remote markets and in some cases, in addition to basic food commodities it incorporates the prices of other food security related items such as fuel, wages and non-food products. It sometimes contains prices of nutritionally important commodities such as vegetables, fruits and animal products.

The system does not support the automatic conversion of nominal prices to real or USD prices. However, users can make USD-equivalent conversions using the formal/informal exchange rates reported as part of the dataset. WFP price series are less up-to-date than those of FAO and FEWS NET.

The WFP VAM price tool allows data downloads and price charts. Analytical products include the Alert for Price Spikes (ALPS), seasonally adjusted prices, changes to the cost of the food basket, country specific bulletins and the quarterly publication, The Market Monitor.

WFP-VAM usually collects price information from national official sources (CSA¹). For the case of Senegal, this information covers more than 75 markets in urban and rural areas but only retail prices for 4 commodities are available (rice (local/imported), millet, sorghum (local/imported), maize). This information is provided on a monthly basis from 2000 to 2015,

¹ WFP(2015). "Review of Global Food Price Databases. Overlaps, Gaps and Opportunities to Improve Harmonization". Food Security Information Network (FSIN).

however a “routine error” on the application does not allow the access to these data (last checked January 28th).

In addition, WFP VAM publishes national bulletins with price evolution (available from 2011 to 2014) and specific bulletins for certain commodities (available for rice in year 2008).

After the revision of this MIS, the following strengths and weaknesses have been identified.

Table A1. 36. Strengths and Weaknesses of WFP-VAM

Strengths of the WFP-VAM	Weaknesses of the WFP-VAM
<ul style="list-style-type: none"> - Integrated system - Recent information available - High number of markets covered - Information provided on a monthly basis - Early Warning System (ALPS) - Reliability 	<ul style="list-style-type: none"> - There is no detailed information on the origin of the data and processing methods, which makes difficult an evaluation of its reliability and quality - An error of the application does not permit the access to data - Few commodities reported - The only dissemination channel seems to be online publication

Famine Early Warning Systems Network (FEWS NET)

<http://www.fews.net/west-africa/senegal>

The Famine Early Warning Systems Network was created in 1985 by the US Agency for International Development (USAID) in order to help governments to plan and respond after food insecurity and humanitarian crises. FEWS has an active role within development communities to improve statistics, remote sensing, national early warning systems, weather services and other issues which could help the food security analysis.

USAID’s FEWS NET maintains 1790 monthly price series for selected regions and countries. It covers 52 countries, divided into 21 FEWS NET Presence Countries, 14 Remote Monitoring Countries and the remaining Other Countries that cover internationally or regionally important reference markets. Its coverage of markets and commodities is wider than that of FAO, but smaller than that of WFP. The data is primarily intended for internal use and thus not meant to be a global public good. Data sharing is limited since some of the countries and data providers may not want their data disseminated. The strengths of the system include the ability to collect or facilitate price data generation in countries where FEWS NET operates.

FEWS NET publishes analysis of market prices and other changes affecting food security via its monthly price bulletins and food security reports, as well as periodic web alerts updates.

Concerning commodity price information, FEWS publishes on a monthly basis a global price watch for all countries within the network, and a monthly price bulletin for each country. Commodities covered for Senegal are: rice, millet, maize and sorghum (this last one is not always reported).

Prices provided for these commodities are nominal retail prices for 5 domestic markets. An historical archive of these monthly bulletins is available from January 2012 to date. Information is provided by market, and a comparison among prices of the current year, previous year and 5 year average is provided graphically.

Source of price data, as well as collection methods are not specified by FEWS, but it is known that are taken from the SIMA/CSA². The only reference found in the monthly price bulletins is an acknowledgement to the local government agencies, market information systems, UN agencies, NGOs, and private sector partners.

Concerning dissemination channels, FEWS releases all its documents, analysis and reports in specific country profiles within its website. However, more information about this issue will be researched.

Other analyses and activities conducted by FEWS in addition to price information are food security alerts, regional cross trade border reports, digital mapping of indicators such as food crises, production and trade, weather information and hazards, seasonal monitor of climate indicators, climate change analyses, etc.

After the revision of FEWS NET information in Senegal, and pending the outcome of further research, the following strengths and weaknesses of the system have been identified.

Table A1. 37. Strengths and Weaknesses of FEWS-NET

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - Integrated system offering many different information - Recent information available - Diversification of services - Early Warning System - Risk management tool 	<ul style="list-style-type: none"> - There is no detailed information on the origin of the data and processing methods, which makes difficult an evaluation of its reliability and quality - The only dissemination channel seems to be online publication - Limited commodities reported - Limited markets covered

Food and Agriculture Organization of the United Nations (FAO) – Statistics Division
<http://faostat.fao.org/>

Through its statistics division (FAOSTAT), FAO provides a huge range of datasets concerning production, trade, food security, emissions, agricultural inputs, agri-environmental indicators, etc.

Concerning price information in Senegal, this MIS provides annual producer prices, consumer and producer price indices, inputs information and commodity trade. Each of these indicators has its particular attributes which are specified in the following table.

² WFP(2015). “Review of Global Food Price Databases. Overlaps, Gaps and Opportunities to Improve Harmonization”. Food Security Information Network (FSIN).

Table A1. 38. Indicators' attributes of FAOSTAT

Commodities / Inputs covered	Decentralization	Type of price	Frequency	Continuity	Time Series	Accessibility
Cashew nuts, cassava, cotton lint, cotton seed, cow peas (dry), eggs, meat (ass, camel, cattle, chicken, goat, horse, pig, sheep), milk (cow), millet, sorghum, sugar cane, tomato, tubers & roots, fonio, fruit, groundnuts, honey, maize, oil seeds, pulses, rice, spices, sweet potato, tobacco	Country	Producer	Annual	No gaps	1991-2011	Open data
ammonium sulphate, concent superphosphate, muriate over 45% k2o, single superphosphate, urea, potassium sulphate	Country	Input price paid by farmer	annual	Many gaps	1966-1991	Open data
More than 30 commodities	Country	Export value	annual	Some gaps	1961-2011	Open data
More than 30 comodities	Country	Import value	annual	Some gaps	1961-2011	Open data

As can be seen all information offered by FAO is gathered at country level, which could be negative in the event that regional or local assessments were required. In most cases, the time series available is very long but presents some information “gaps” and it is not updated. In other cases, the time series stops recording very early. The main source of the data provided by FAO is stated to be the “Agence Nationale de la Statistique et la Démographie” (ANSD)³.

After the revision of the FAOSTAT in Senegal, the following strengths and weaknesses of the system have been identified.

Table A1. 39. Strengths and Weaknesses of FAO

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none"> - High number of commodities covered - Reliability - Transparency of the market - Integrated system offering a wide variety of information 	<ul style="list-style-type: none"> - There is no recent information available - Information provided on annual and national basis - There is no information on the collection and dissemination methods. - There is no information about stocks - This database is such big that occasionally is difficult to deal with

³ WFP(2015). “Review of Global Food Price Databases. Overlaps, Gaps and Opportunities to Improve Harmonization”. Food Security Information Network (FSIN).

CountrySTAT (FAO)

<http://www.countrystat.org/home.aspx?c=SEN>

CountrySTAT is an information system carried out by the statistics division of the FAO, aimed to provide food and agriculture statistics at regional, national and sub-national level. This MIS provides a profile of each country including variables such as production data, price information, land use information, population, gender statistics, fertilizers consumption and import (quantity), forestry, fisheries, etc.

Concerning commodity price information, there are three types of prices available:

- Market price: This price is available for 17 commodities (cashew nuts, cassava, cotton lint, cow milk, cowpeas (dry), fonio, fruit, groundnuts, eggs, honey, maize, millet, rice, sorghum, sweet potato, tobacco and tomato) at country level on an annual basis, from year 1980 to 2011.
- Export value: Export price is only available for pesticides (insecticides, fungicides, herbicides) on annual basis from 1997 to 2011 (country level).
- Import value: Export price is only available for pesticides on annual basis from 1997 to 2011 (country level).

CountrySTAT MIS gathers information from different international and domestic sources. However, for the case of Senegal, there is not a specific source cited but there can be found links to the main national information sources.

As CountrySTAT is a web-based MIS, its main channel of distribution is the on-line platform. Data are stored and distributed through FENIX database and XML-based facilities.

As mentioned before, CountrySTAT publishes a country profile with other relevant information such as key indicators for socio-demographic conditions, poverty and hunger, economy and trade or agricultural production.

After a first revision of this market information system for Senegal, the following strengths and weaknesses of the system have been identified.

Table A1. 40. Strengths and Weaknesses of CountrySTAT

Strengths of the MIS	Weaknesses of the MIS
<ul style="list-style-type: none">- Integrated Information system- This is a long-term sustainable system- There are no gaps within the time series- Long time series provided- Number of commodities covered- Summary maps, tables and graphics are provided- Data from different countries can be compared- CountrySTAT performs capacity building activities to local experts in order to ensure data quality and to strengthen the national capacities- Technical assistance from FAO experts is provided- Risk management tool (food security monitoring)	<ul style="list-style-type: none">- There is no information on agricultural input prices, stocks or commodity trade values- Information is provided at national level- Information is provided on annual basis- Pesticides are grouped (not single references)- There are sections not containing any data- Information source not specified- Processing methods are not available

Sub-Block 3.2 – Markets (stocks and inputs)

National Commodity Stocks

Stock information is strategic for market stabilization and food security policies but unfortunately there are not regular information about food stocks in Senegal, as the private sector actually handle most of the marketed cereals and storage and they do not publish this information due to the confidentiality of that information.

The public market information system in Senegal (CSA) that is also the institution managing public reserves does not provide regular information about stocks.

The international information systems publish few data on stocks. Data to estimate stocks can be found in FAO or USDA, as these institutions use data on food production, trade and consumption (balance sheets) to estimate stocks variations in some countries but in general the data on estimated stocks are not very reliable.

National Input availability

There has not been identified any information system in Senegal providing regular information about input availability. However, the following sources offer some kinds of useful information.

REGIONAL

Regional Agricultural Input Market Information System (AMITSA)

<http://amitsa.org/>

AMITSA is an agricultural input MIS resulting from the collaboration among different international and regional organizations: the Common Market for Eastern and Southern Africa (COMESA), the East African Community (EAC), the IFDC (international public organization focused on food security, the alleviation of hunger and poverty and sustainable development) and Africa Fertilizer.

This MIS provides international and national prices of fertilizers, domestic prices of seeds and pesticides, fertilizers consumption, production and export/import data. However, only fertilizer production data and fertilizer trade information are available for Senegal (not prices).

INTERNATIONAL

CountrySTAT is an information system carried out by the statistics division of the FAO, aimed to provide food and agriculture statistics at regional, national and sub-national level. This MIS provides a profile of each country including variables such as production data, price information, land use information, population, gender statistics, fertilizers consumption and import (quantity), forestry, fisheries, etc.

Sub-Block 3.3 – Trade

NATIONAL

Agence Nationale de la Statistique et de la Démographie (ANSD)

<http://www.ansd.sn/>

The ANSD publishes monthly bulletins and indices of foreign trade. However, links to this information usually do not work properly.

Within the “Economic Synthesis” section of the ANSD website usually unavailable, there have been also identified the monthly bulletins of foreign trade. These bulletins consist of different analyses of the evolution of national imports and exports by commodity groups (both in quantity and value). The foreign trade bulletins are available from November 2012 to November 2015, and are usually updated 45 days after the end of the analyzed month.

REGIONAL

African Development Bank Group (AFDB)

<http://senegal.opendataforafrica.org/>

The AFDB provides import/export information, coming from the United Nations’ Statistics Division, for a huge range of commodities. However many of these commodities have many gaps within the time series, which goes from 2004 to 2014. This information is provided at country level at an annual basis.

Regional Agricultural Input Market Information System (AMITSA)

<http://amitsa.org/>

This MIS provides fertilizers export/import data for Senegal by nutrients and products, from 1995 to 2007 and from 2000 to 2008, respectively.

This is important information since it reveals the existence of inputs within the country, which could be a critical issue while implementing improvement programmes of agricultural practices and others.

INTERNATIONAL

Food and Agriculture Organization of the United Nations (FAO) – Statistics Division

<http://faostat3.fao.org/home/E>

FAO publishes regularly data on trade, including import and export quantities and values (\$), and trade indices, import and export values and quantities, being 2004-2006=100. The last update is 2011.

CountrySTAT (FAO)

<http://www.countrystat.org/home.aspx?c=SEN>

CountrySTAT is an information system carried out by the statistics division of the FAO, aimed to provide food and agriculture statistics at regional, national and sub-national level. This MIS provides a profile of each country including trade data (export and import, quantities and values, of products and live animals).

U.S. Foreign Service

<http://www.fas.usda.gov/regions/senegal>

Regularly, the USDA publishes world markets and trade monthly reports including world trade on grains (barley, corn, sorghum, oats, rice, wheat) and oilseeds. However, this information is not specific for Senegal. Although there is no access to the historical series, this information seems to be collected from January 2001 and the last update is from February 9th, 2016.

UN Comtrade Database

<http://comtrade.un.org/>

UN Comtrade is a repository of official trade statistics of free access. It contains annual export and imports, in quantities and values, of the main agricultural products trade by Senegal. This information is available from 1996 to 2014, covering a wide range of commodities (by code, flow, partner, reporter) such as cassava, maize, rice, onion, potato, sorghum, meat, millet, etc.

Famine Early Warning Systems Network (FEWS NET)

<https://www.fews.net/sectors/markets-trade>

FEWS publishes the **Production and Trade Flow Maps** capturing the market networks for a product, including their catchments and trade flow patterns including livestock transboundary trade. These maps are available for cowpeas, livestock, millet, maize and rice for Senegal in normal years.

Thematic Block 4 - Production levels and yields, Plant health

Sub-block 4.1. Production levels and yields

NATIONAL

Agence Nationale de Statistique et de la Démographie

<http://www.ansd.sn/>

Some of the functions of the National Agency of Statistics and Demography (ANSD) are to:

- Centralize and disseminate statistical summaries of the data produced by the national statistical system.
- Ensure the development and implementation of the multiannual and annual programs of statistical activities.
- Prepare the files to be submitted to the meetings of the National Statistics Council and the Technical Committee of statistical programs.
- Control the economic situation and economic outlook in connection with the service in charge of forecasting and conditions.

However, the website is not always available and connection is slow. In the agriculture and meteorology sections there are no published any data.

There are a statistical bulletins in which production data appears aggregated at province level, since season 2012/13 at 2014/2015.

Table A1. 41. Strengths and weaknesses of ANSD

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source (reliability)- Diversification of information (bulletins, publications, addressing various disciplines)	<ul style="list-style-type: none">- Website not always available- The site is not yet complete- Complicated interface hinders the research- There is no information on agricultural inputs (Fertilizers, machinery, seeds).

Centre de Suivi Ecologique Direction de L'analyse, de la Prevision et des Statistiques Agricoles (DAPSA)

<http://www.dapsa.gouv.sn>

<http://senegalma.africadata.org>

The *Direction de l'Analyse, de la Prévision et des Statistiques* is responsible for collection, centralization, processing and dissemination of agricultural information and statistics, from 42 agricultural departments that they covers all the Country. The responsibility is cover from the Division des Statistiques de la Documentation et de l'Information Agricole (DSDIA). The Data Portal provide the information (<http://senegalma.africadata.org/>), it is cover data from 2012 to 2014 for the main crops thatn cover crop land, yields and production. The actual information is limited to risk analysis two a low years of data availability.

Centre de Suivi Ecologique

<http://www.cse.sn/>

Centre de Suivi Ecologique was established in 1986 by the Senegalese authorities with the Programme of Assistance to the Sudano-Sahelian Office (UNSO) and funding from the Danish Agency for International Development of the United Nations (DANIDA).

It specializes in the production and dissemination of data and information on the environment and natural resources. It aims to contribute to sustainable development by supporting decision making at different levels and in different sectors (central government, local business, community organizations, non-governmental)

Although there is a section called "crop season", the information is limited and is not updated.

Table A1. 42. Strengths and weaknesses of CSE

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Diversification of information- Website is working properly	<ul style="list-style-type: none">- There is no agriculture-related information- The site is not yet complete

IFLEX Le Projet de Promotion des Exportations Agricoles (PPEA)

http://www.iflexsenegal.org/quisommesnous_partenaires.html

IFLEX (Fruit and Vegetable Export Information) is a service dissemination for information and communication developed in Senegal for professionals in the fruit and vegetable export, and institutional, private or public partners sector. IFLEX first appeared in 2000 as a regular newsletter published by the Project for the Promotion of Agricultural Exports (PPEA).

IFLEX reports:

- bulletins and special issue papers;
- technical publications (CD-ROM Repository Origin Senegal Quality, product data sheets, guide export mango quality, product specifications, etc.);
- business management tools (detailed financial records by product, accounting for tracking campaign kit, kit traceability, weekly market monitoring, etc.).

However, the website is not up to date. The latest bulletin was published in 2005.

Table A1. 43. Strengths and weaknesses of IFLEX

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- Professional Source- Diversification of information	<ul style="list-style-type: none">- Website is not up to date- The latest bulletin was published in 2005- The documents cannot be downloaded

l'Institut Sénégalais de Recherches Agricoles (ISRA)

<http://www.isra.sn/>

The main tasks of ISRA are:

- design and execution of research programs on plant production, forestry, animal and fishery and rural economy;
- creation of scientific knowledge, the generation of technological innovations and the development of decision support tools to improve the agricultural sector;
- valuation and transfer of research results;
- promotion and research training through research;
- development of scientific cooperation as well as with the Inter-African and international research institutions and universities in Senegal.

Although should have technical publications and research result, cannot be downloaded. The Bureau d'analyses macro-économiques from ISRA (<http://www.bameinfopol.info>) use some information of plant production and it shows studies and related documents.

Table A1. 44. Strengths and weaknesses of ISRA

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Diversification of information	<ul style="list-style-type: none">- Website not always available- The documents are not accessible

REGIONAL

African Development Bank Group (Application)

<http://senegal.opendataforafrica.org/>

The overarching objective of the African Development Bank (AfDB) Group is to spur sustainable economic development and social progress in its regional member countries (RMCs), thus contributing to poverty reduction. The Bank Group achieves this objective by mobilizing and allocating resources for investment in RMCs, and providing policy advice and technical assistance to support development efforts.

The website of African Development Bank Group has an application (opendataforafrica.org), in which data or general statistics refer to different topics, including agricultural production. In the case of Senegal, there are data for the years only 2012 and 2014, and its main source alone is the "Agence Nationale de Statistique et de la Démographie". The level of aggregation is by province.

Table A1. 45. Strengths and Weaknesses of AfDB

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- Regional source (reliability)- Website is very up to date and works correctly	<ul style="list-style-type: none">- Low data series length.- There is no information on agricultural inputs (Fertilizers, machinery, seeds)

Centre Regional AGRHYMET

<http://www.agrhymet.ne/bulletin.html>

Created in 1974, the AGRHYMET Regional Centre is a specialized institution of the Permanent Interstate Committee for the Fight against Drought in the Sahel (CILSS) grouping thirteen countries are: Benin, Burkina Faso, Cape Verde, Ivory Coast, Gambia, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Senegal, Chad and Togo. This is an interstate public institution with legal personality and financial autonomy. It based in Niamey, Niger.

Specific areas of competence of the AGRHYMET Regional Centre:

- Vocational training, agronomy, plant protection, water resources management, agro-meteorology.
- Management databases
- Agricultural statistics
- Diagnosis of phytosanitary problems
- Geographic Information Systems, Remote Sensing
- Analysis of watersheds and irrigation schemes; irrigation management
- Mathematical modelling and numerical simulation

The website has published several bulletins, technical documents and annual report. However, you cannot download scientific articles and agricultural statistical raw data are not available.

Table A1. 46. Strengths and Weaknesses of AGRHYMET

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- Regional source (reliability)- Diversification of services (bulletins, reports...)- Website is very up to date and working	<ul style="list-style-type: none">- There is no open access to agricultural data (This is not necessarily a weakness: the data quality needs to be checked)

Forum for Agricultural Research in Africa (The eRAILS)

<http://www.erails.net/SN/profile/>

The eRAILS system was developed within the framework of the Promotion of Science and Technology for Agricultural Development in Africa (PSTAD) project. PSTAD is a project initiated and coordinated by FARA, managed by the Sub-regional Organizations and implemented by the National Agricultural Research Systems (NARS) in 34 countries in Sub-Saharan Africa.

It is a continental African online platform for agricultural knowledge, information and learning system with the purpose of improving the access, sharing of research results on technologies and good agricultural practices.

However, in the case of Senegal there is no information of agroecological data, crop production etc. Although there is the list of projects, a brief profile of the country and links of interest.

Table A1. 47. Strengths and Weaknesses of The eRAILS

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - Regional source - Website working properly 	<ul style="list-style-type: none"> - The availability of information varies by country. - There is a lack of certain information for Senegal

The Africa Rice Center (AfricaRice) Application Ricehub

<http://www.ricehub.org/RT/>

AfricaRice is one of the 15 international agricultural research centres that are members of the CGIAR Consortium. It is also an intergovernmental association of African member countries. Africa Rice Center (AfricaRice) was formed in 1971 by 11 countries with the assistance of the United Nations Development Programme (UNDP), the Food and Agriculture Organization of the United Nations (FAO), and the Economic Commission for Africa (ECA). Today its membership comprises 24 countries, covering West, Central, East and North African regions, namely Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of Congo, Egypt, Gabon, the Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Madagascar, Mali, Mauritania, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Sierra Leone, Togo and Uganda.

Its mission is to contribute to poverty alleviation and food security in Africa, through research, development and partnership activities aimed at increasing the productivity and profitability of the rice sector in ways that ensure the sustainability of the farming environment. The modus operandi of the Center is partnership at all levels. Its research and development activities are conducted in collaboration with various stakeholders—primarily the National Agricultural Research Systems (NARS), academic institutions, advanced research institutions, farmers' organizations, non-governmental organizations, and donors.

The virtual platform 'Rice Hubs' is in countries where research products and services and local innovations are integrated across the rice value chain to achieve development outcomes and impact. In the website there is general information on rice management (crop establishment, pests and diseases, land preparation, harvest, seeds...); however there are still no data uploaded in the website.

Table A1. 48. Strengths and Weaknesses of Ricehub

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - Regional source - Potentially it could have many features to help farmers - Information of rice management 	<ul style="list-style-type: none"> - There are no data - Sometimes, the documents are not accessible - Website not always available - The site is not yet complete - Information is uneven across countries

INTERNATIONAL

CountryStat-FAO

<http://www.countrystat.org>

CountrySTAT is a web-based information technology system for food and agriculture statistics at the national and sub national levels. In practice, it is a hub centre which centralizes and integrates the data coming from various sources and allows harmonizing it according to international standards while ensuring data quality and reliability.

In the case of Senegal, it has production data and area harvested for primary crops, since 1997 till 2013. Also, there is consumption (tons) of pesticides per year (1998-2012). About to fertilizers there are data on exports and imports, however, no consumption data.

Table A1. 49. Strengths and Weaknesses of CountryStat-FAO

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - This is a long-term sustainable system - There are no gaps within the time series - Summary tables and graphs are provided at request - Data from different countries can be compared - Technical assistance from FAO experts is provided 	<ul style="list-style-type: none"> - Low data resolution: the aggregation level is the country.

FAO-crop calendar

<http://www.fao.org/agriculture/seed/cropcalendar/welcome.do>

The Crop Calendar is a tool that provides timely information about seeds to promote local crop production. It contains information on planting, sowing and harvesting periods of locally adapted crops in specific agro-ecological zones. It also provides information on the sowing rates of seed and planting material and the main agricultural practices.

This tool supports farmers and agriculture professionals across the world in taking appropriate decisions on crops and their sowing period, respecting the agro-ecological dimension. It also provides a solid base for emergency planning of the rehabilitation of farming systems after disasters.

The Crop Calendar provides information for more than 130 crops, located in 283 agro-ecological zones of 44 countries. In the case of Senegal, it is divided into six agroecological zones. For example, in the Niayes zone, it has information on 20 horticultural crops, because about 80% of the horticultural production of the country is provided by this zone.

Table A1. 50. Strengths and Weaknesses of FAO-Crop Calendar

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - This is a long-term sustainable system - Summary tables and graphics are provided - Data from different countries can be compared - Technical assistance from FAO experts is provided - Level aggregation: zone Agroecological 	<ul style="list-style-type: none"> - Lately the site is not working well, access is not stable

Sub-block 4.2. Plant Health

NATIONAL

Direction de la protection des Vegetaux (DPV)

<http://dpsenegal.com/index.php/bulletin-phyto>

The Directorate of Plant Protection (DPV), structure of the Ministry of Agriculture and Rural Equipment (MAER) is the Central Technical Unit for pest monitoring and control. It provides national, technical supervision of actions against the attack of pests and provides, through financial and material resources made available by the state support in goods, services and equipment required for decentralized structures of MAER (Regional Directorates of Rural Development), the Committees for the Fight Village (CLV) and producer organizations.

A weekly bulletin is published on phytosanitary topics (the last one corresponded to the week of 16 November 2015). Nevertheless, there does not seem to be any information of previous newsletters.

According to information provided by the consultant, the Directorate of Plant Protection has the following information:

- Phytosanitary Bulletin: surfaces prospected, diseased or pest-ridden surfaces, treated surfaces.
- Situation global phytosanitary by zone of intervention.
- Situation of fruits and vegetables: quantities of imported, exported products.
- Notification on the situation of pesticides: total quantities of pesticides annually imported, quantities of pesticides in circulation in Senegal.
- Damages: rate of infestation according to the pest/disease aimed at or found in the prospecting zone.

However, the website does not show any information related to the above.

Table A1. 51. Strengths and Weaknesses of DPV

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Website is up to date- Potentially it could have many features to help farmers	<ul style="list-style-type: none">- There are no historical data.

L'Agence Nationale de l'Aviation Civile et de la Météorologie

<http://www.anacim.sn/meteo/bulletinsgtp.php>

See Block 1 for description The National Agency of Civil Aviation and Meteorology (ANACIM). In the early draft report we described the following:

"The public agency publishes every 10 days an agro-meteorological information bulletin on agricultural and pastoral situation and plant health, highlighting incidents by agroecological zones. Nevertheless, the website has not an easy interface and document search is not easy. There are only 2015 bulletins published. There is no database."

However, during the course of this project, this information has disappeared and the website has been changed.

REGIONAL

Related to plant health there are two organizations at regional level: the Inter-African Phytosanitary Council (<http://www.au-iapsc.org/>) and the International Plant Protection Convention

(<https://www.ippc.int/en/countries/senegal>/<https://www.ippc.int/en/countries/ethiopia/>) with competence in plant protection information. The Inter-African Phytosanitary Council has activity programs related to collect, evaluate and disseminate plant protection information relevant to Africa, but with it has low accessibility online.

In the same manner, the International Plant Protection Convention shows an Official Contact Point, related with *Direction de la protection des Vegetaux* (DPV) and update in 2015, the latest Pest Reports from Senegal were updated in 2008. National reporting obligations are related to: Description of the Plant Health & Regulatory Department, legislation phytosanitary Requirements/Restrictions/Prohibitions, Entry Points, List of Regulated Pests, Official Pest, Reports Organizational Arrangements of Plant Protection, Rationale for Phytosanitary Requirements, Non-compliance, Pest status and emergency Actions. The IPPC Official Contact Point is recently update (September of 2015) but there is low information available in this site. In this sense, the Inter-African Phytosanitary Council has published the “[For better Plant Health in Africa](#)” as Strategic Plan for 2014 to 2020. Its second programmatic area is “Plant Pest Risk Reduction”, and the Inter-African Phytosanitary Council of the African Union functions, related to this study, has as tasks of facilitation and support decision-support tools, pest risk analysis, testing and monitoring.

INTERNATIONAL

Plantwise

<http://www.plantwise.org/KnowledgeBank/CountryHome.aspx>

This is an online and offline gateway to actionable plant health information and services. In addition, the Plantwise website has a Diagnostic Field Guide to help farmers and other agricultural advisors diagnose plant health problems before making management recommendations. The guide provides images and descriptions of many typical symptoms associated with factors that harm plant health. The publication helps to make diagnoses by showing the relationships between common symptoms on plants and the various possible causes. The guide also provides a short overview of the important principles for giving good advice, which are underpinned by an integrated pest management approach.

There are 349 registered pests and diseases in Senegal. Each of them has its corresponding information (pictures, description, symptoms, prevention, and control).

Table A1. 52. Strengths and Weaknesses of Plantwise

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Open access to information - Direct support to growers - Website is very up to date and works correctly 	<ul style="list-style-type: none"> - There are no historical data.

Thematic Block 5 – Animal and human health

NATIONAL

Agence Nationale de Statistique et de la Démographie

www.ansd.sn

The webpage of the National Agency of Statistics and Demography (www.ansd.sn) does not work with sufficient speed or efficacy. The subpage with the livestock sector statistics is under maintenance (January 27, 2016), and the subpage with the agriculture sector statistics is empty (January 27, 2016). However, the monthly Economic Statistics Bulletins (the last available bulletin is from October 2015, http://www.ansd.sn/ressources/publications/Bulletin_octobre_2015_DD.pdf) give some data about livestock census, slaughtered animals (by species, with cumulative data of years 2014 and 2015). In the Health header is possible to find the report entitled “*Situation économique et sociale du Sénégal en 2012*” (http://www.ansd.sn/index.php?option=com_ansd&view=theme&id=16&Itemid=301) with some interesting data about the Senegal’s health system, morbidity, sanitary politics, etc. However not serial information could be find.

Table A1. 53. Strengths and Weaknesses of the ANSD

Strengths of the IS	Weaknesses of the IS
- National source	<ul style="list-style-type: none"> - Does not work with sufficient speed or efficacy (January, 2016) - French only - No access to bulletins collection (bulletin series are not available) or archives collection in general - The subpage with the livestock sector statistics is under maintenance (January 27, 2016) - The subpage with the agriculture sector statistics is empty (January 27, 2016) - Many subpages are empty

Institut Sénégalais de Recherches Agricoles

<http://www.isra.sn/index.php>

The main tasks of the Senegalese Agricultural Research Institute (ISRA) (<http://www.isra.sn/index.php>) are:

- the design and execution of research programs on crop, forest, animal and fish production and rural economy
- the creation of scientific knowledge
- the generation of technological innovations
- the development of decision support tools to improve the agricultural sector
- the transfer of research results
- the development of scientific cooperation

The webpage do not show relevant information about animal health or animal production, and most of the subpages are empty of information by January 2016. The only interesting information showed in the ISRA’s webpage is the definition of six agro ecological regions in which the country is divided (*Fleuve Sénégal, Sylvo-Pastorale, Niayes, Bassin Arachidier, Orientale et Haute Casamance* and *Bass et Moyenne Casamance*). The main page of the ISRA, also contains the links to webpages of associated centers, most of them devoted to agronomic issues (*Centre d’étude régional pour l’amélioration de l’adaptation à la sécheresse –CERAAS-, - Centre National de Recherches Agronomiques-Bambey, etc.*). The most relevant center is the *Bureau d’analyses macro-économiques* (<http://www.bameinfopol.info/spip.php?lang=fr>). Using the search engine of the webpage with the term “elevage” there is a series of entries, including official documents about agricultural policies in Senegal, but some promising documents have a broken link. Most of the documents are out-of-date.

The webpage of the *Laboratoire National d’Elevage et de Recherches Vétérinaires* (http://www.isra.sn/index.php?option=com_content&view=article&id=108) is a subpage of the *Institut Sénégalais de Recherches Agricoles* (ISRA) (<http://www.isra.sn/index.php>) which does not give too much information about its activities. The specific page for the laboratory only indicates the number of vaccines produced and enumerates some activities related with animal health and animal production.

Table A1. 54. Strengths and Weaknesses of the ISRA

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - National source - Links to associated centers, including the <i>Bureau d’analyses macro-économiques</i> 	<ul style="list-style-type: none"> - Does not give relevant information about animal health or animal production issues - Only in French - Many links are broken

Ministère de la Santé et de L’Action Sociale

<http://www.sante.gouv.sn/>

This is the official webpage of the Ministry of Health and Social Action (<http://www.sante.gouv.sn/>). The webpage do not provide too much information. The webpage is mainly focused on delivering information to Senegal’s population about health actions and health programs. The webpage gives information about the health structure of the country (an enumeration of hospitals, clinics, health centers, etc.), the health politics, etc. Under the “Publications” header, the subpage entitled “General documents” (<http://www.sante.gouv.sn/page-reader-content-details.php?page=NjM=&jmenu=OQ==>) give a list of some documents (bulletins, reports, action plans, etc.) with relevant information about health issues in Senegal. However, there is no serial information. The searching engine does not work adequately.

Table A1. 55. Strengths and Weaknesses of the Ministère de la Santé et de L’Action Sociale

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - National source - Simple and easy to use - Useful information for the public 	<ul style="list-style-type: none"> - Almost empty of relevant data (statistics, alerts, etc.) - No serial information - Searching engine does not work satisfactorily - Only in French

Ministre de l'Économie des Finances et du Plan

<http://www.finances.gouv.sn/>

The webpage of the Ministry of Economy (<http://www.finances.gouv.sn/>) has two relevant information series: the Monthly Bulletin of Foreign Trade Statistics (available from June 2014 until November 2015 on a monthly basis) (<http://www.finances.gouv.sn/index.php/bulletin-mensuel-des-statistiques-du-commerce-exterieur>), and the Monthly Bulletin of Economic Statistics (available from June 2014 until October 2015 on a monthly basis) (<http://www.finances.gouv.sn/index.php/bulletin-mensuel-des-statistiques-economiques>).

The first one gives general information about exports/imports of live animals and animal products, while the second one has significant data about number of livestock of different species (cattle, sheep, goats, swine, horses, donkeys and camels) slaughtered in controlled abattoirs and live animal's trade (global)

Table A1. 56. Strengths and Weaknesses of the *Ministre de l'Économie des Finances et du Plan*

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Statistics about animal slaughtered in controlled abattoirs, live animal exports and imports, etc.- Monthly bulletins- French and English	<ul style="list-style-type: none">- No detailed information about origin/destination of imports/exports of live animal and animal products

Ministre de l'Élevage et des Productions Animales

<http://www.elevage.gouv.sn/>

The webpage of the Ministry of Livestock and Animal Productions (<http://www.elevage.gouv.sn/>) is mainly focused on the description of the structure of the ministry and some ministry projects and actions. The only collateral source of information is the Journal Agropasteur (<http://www.elevage.gouv.sn/index.php/tutorials-mainmenu-48/publications>), but no relevant data is shown.

Table A1. 57. Strengths and Weaknesses of the *de l'Élevage et des Productions Animales*

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- National source- Mainly focused to give information for the public	<ul style="list-style-type: none">- Almost empty of relevant data (statistics, alerts, etc.)- Some links and headers are empty of information- No serial information- Only in French

REGIONAL

African Union Interafrican Bureau for Animal Resources (AU-IBAR)

<http://www.au-ibar.org/>

The African Union Interafrican Bureau for Animal Resources (AU-IBAR) is a specialized technical office of the Department of Rural Economy and Agriculture (DREA) of the African Union Commission (AUC). AU-IBAR provides leadership in the development of animal resources for Africa. Founded in 1951 to study the epidemiological situation and fight rinderpest in Africa, AU-IBAR's mandate covers all aspects of animal resources, including livestock, fisheries and wildlife in Africa, supporting and coordinating the use of animals (livestock, fisheries and wildlife) as a resource for human wellbeing in the Member States of the AU, contributing to economic development. The specific areas of the AU-IBAR's mandate are to:

- Improve public and animal health through the control and possible eradication of transboundary animal diseases and zoonoses
- Improve the management of animal resources and the natural resource bases on which they depend
- Explore investment options and enhance competitiveness of African animal products
- Contribute to the development of relevant standards and regulations and enhance compliance by Member States
- Strengthen institutional capacity and support policy development and harmonization
- Disseminate information and knowledge on animal resources to Member States, Regional Economic Communities and other relevant institutions
- Provide essential support to Member States with special needs or in emergency situations

Table A1. 58. Strengths and Weaknesses of AU-IBAR

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International (Regional-specific) source - Source of general information about animal health and animal production (including trade) in Africa (projects, books, reports, monographic series, news, etc.) - Strategic plans and projects for AU Member States - Access to the Transboundary Animal Diseases and Zoonoses Compendium for Africa - Available in English and French 	<ul style="list-style-type: none"> - Not updated - The alerts section is a "dead" section (it only shows one event –May, 2013) - Not specific data about Senegal

WHO Regional Office for Africa

<http://www.afro.who.int/>

The WHO African Region (<http://www.afro.who.int/>) is one of the six regions of WHO. The Organization's presence in the region consists of the WHO Regional Committee for Africa, a Secretariat for the African region, three Inter-country Support Teams and WHO Country and Liaison Offices located in 47 Member States, including Senegal (<http://www.afro.who.int/fr/senegal/bureau-de-pays-de-loms--senegal.html>). The mission of WHO in the African Region is the attainment by all peoples of the highest level of health.

There are some useful reports about Senegal (<http://www.afro.who.int/fr/senegal/senegal-publications.html>) with data about some specific diseases (Ebola, tuberculosis, malaria) vaccination coverage, etc.

Table A1. 59. Strengths and Weaknesses of WHO's Regional Office for Africa

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Useful information about Senegal's public health - Quantitative and qualitative data 	<ul style="list-style-type: none"> - Some of the information is available only in French or English - Not updated in some fields related to Senegal - Some subpages related to Senegal have no information - The quality of the information is variable and range from detailed and thorough reports to simple declarations

INTERNATIONAL

Centers for Disease Control and Prevention (CDC)

<http://www.cdc.gov/>

The Centers for Disease Control and Prevention (CDC) is a USA federal agency linked with the Department of Health and Human Services. It is especially focused on infectious disease, food borne pathogens, environmental health, occupational safety and health, health promotion, injury prevention and educational activities designed to improve the health of United States citizens. In addition, the CDC researches and provides information on non-infectious diseases. The CDC is organized into "Centers, Institutes, and Offices" (CIOs) which allow it to be responsive and effective in its interface with public health concerns. Each organizational unit implements the agency's response in a particular area of expertise.

There is some useful information about Senegal (key facts) (<http://www.cdc.gov/globalhealth/countries/senegal/default.htm>) and global health (<http://www.cdc.gov/globalhealth/index.html>).

There are two CDC publications that surpass the national level:

- The Morbidity and Mortality Weekly Report (MMWR), which is the agency's primary vehicle for scientific publication of public health information and recommendations (national and international) (<http://www.cdc.gov/mmwr/index.html>)
- The Journal of Emerging Infectious Diseases, a peer-reviewed journal established specifically to promote the recognition of emerging and reemerging infectious diseases around the world (<http://wwwnc.cdc.gov/eid/>)

In both publications it is easy to find specific information about Senegal's animal diseases (including zoonoses) (Rift Valley Fever, Crimean-Congo Hemorrhagic Fever, Peste des Petits Ruminants, West Nile Virus, etc.) and public health diseases (Malaria, Dengue, Multidrug-Resistant *Salmonella*, etc.). Some of the information is included in studies that involve more countries (i.e. reviews of transboundary diseases).

Table A1. 60. Strengths and Weaknesses of the CDC

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International sources - Useful information - Quantitative / qualitative information - Easy to use - Good searching engine - Availability of some reviews 	<ul style="list-style-type: none"> - Only in English and Spanish - Most of the information is research based - Not updated - Search results can't be sorted - Not serial information

Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES)

<http://www.fao.org/AG/AGInfo/programmes/en/empres/home.asp>

In 1994, FAO established the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) (<http://www.fao.org/AG/AGInfo/programmes/en/empres/home.asp>). The mission of the EMPRES-Livestock program is to promote the effective containment and control of the most serious epidemic livestock diseases, as well as newly emerging diseases by progressive elimination on a regional and global basis through international cooperation, involving early warning and reaction.

The webpage has a subpage with information resources, including some bulletins (EMPRES Animal Health 360° and EMPRES Transboundary Animal Diseases, for example), manuals, books, research articles, disease information on selected animal diseases, etc. (http://www.fao.org/eims/secretariat/empres/eims_search/e_publi.asp?lang=en).

Table A1. 61. Strengths and Weaknesses of EMPRES

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Official source - Diversification of information - Easy to use - Website works properly 	<ul style="list-style-type: none"> - Not updated in many fields - Not serial information - The search engine does not work effectively (typewriting the keyword "Senegal" the following message merge: "The query contains invalid characters, please try again") - The early warning system (early warning messages) is out-of-date (2004)

Factfish

<http://www.factfish.com/>

Factfish World Statistics and Data Research provides statistics and data research for more than 200 countries. Topics included in this webpage are economy, population, health, trade, education, animal census and environment among others. Factfish offers essential and confident facts in an easy to read maps and charts with up-to-date and historical data.

This information system includes a large number of information about Senegal (country level).

Table A1. 62. Strengths and Weaknesses of Factfish

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Based on official data - Full of useful information - Friendly interface - Useful graphics - Good searching engine - Most of the information is up-to-date - This information system ranks the countries in each category - Quantitative information 	<ul style="list-style-type: none"> - Only in English, Deutsch and Chinese - Some information is out-of-date - Sometimes it is difficult to find a specific information

FAO

<http://www.fao.org/home/en/> (FAO Regional Office for Africa: <http://www.fao.org/africa/es/>)

The Food and Agriculture Organization of the United Nations (FAO) (<http://www.fao.org/home/en/>) is an intergovernmental organization, with 194 Member Nations, 2 associate members and one member organization, the European Union. FAO is composed of six departments: Agriculture and Consumer Protection, Economic and Social Development, Fisheries and Aquaculture, Forestry, Corporate Services and, finally, Technical Cooperation and Program Management.

There are some FAO's reports about livestock, livestock production systems, livestock trade and livestock products market (<http://www.fao.org/search/en/?cx=018170620143701104933%3Aqq82jsfba7w&q=senegal+livestock&cof=FORID%3A9&siteurl=www.fao.org%2Fhome%2Fen%2F&ref=&ss=2482j726694j10>), using the key words "Senegal + livestock" or "Senegal + Animal Health" in the embedded search engine (some of them emerge in both searches).

FAO's division of Animal Production and Health (<http://www.fao.org/ag/againfo/home/en/index.htm>) is habitually involved in emergency responses to emerging transboundary animal diseases or to natural and man-made disasters (droughts, floods, earthquakes, civil conflicts, etc.). Both types of emergency have in common that they can severely affect animal health and livestock-related livelihoods.

Table A1. 63. Strengths and Weaknesses of FAO

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Official source - Diversification of information - Number of items covered - Integrated system offering a wide variety of information - Easy to use - In English, Spanish, French, Chinese, Arab and Russian 	<ul style="list-style-type: none"> - Few specific reports about Senegal's livestock - Not fully updated - Not serial information - Most of the information is report-based / news-based (irregular information)

FAOSTAT

<http://faostat3.fao.org/home/E>

The Food and Agriculture Organization Corporate Statistical Database (FAOSTAT) website (<http://faostat3.fao.org/home/E>) publishes statistical information collected by the Food and Agriculture Organization of the United Nations (FAO) (<http://www.fao.org/home/en/>). FAOSTAT data are provided from 1961 up to 2013 in most fields for 245 countries in English, Spanish and French.

In short, the FAO Statistics Division supports the development of national statistical strategies and the upgrade of statistical systems. The FAOSTAT system is a major component of FAO's information systems, contributing to the organization's strategic objective of collecting, analyzing, interpreting, and disseminating information relating to nutrition, food and agriculture for development and the fight against global hunger and malnutrition.

FAOSTAT provides information about Senegal's livestock census (asses, beehives, buffaloes, camels and other camelids, cattle, different birds, goats, horses, mules, pigs, and sheep), animal and animal products production, and trade of livestock and livestock products from 1961 until 2013.

FAO also has published the report "Senegal: livestock sector brief" (2005) (http://www.fao.org/ag/againfo/resources/en/publications/sector_briefs/lsb_SEN.pdf), with general data about the country, livestock production, animal products consumption and main livestock diseases. However, the information is totally obsolete, but the report gives a general frame to understand the livestock sector in Senegal.

There is another out-of-date report entitled "Trade, political influence and liberalization: situating the poor in the political economy of livestock in Senegal" (Gning, 2004) (<http://www.fao.org/ag/againfo/programmes/en/pplpi/docarc/wp8.pdf>) including information about trade and commerce of livestock products.

Table A1. 64. Strengths and Weaknesses of FAOSTAT

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none">- International source- Official source- Diversification of services- Number of items covered- Reliability- Transparency- Integrated system offering a wide variety of information- Easy to use- Website works properly	<ul style="list-style-type: none">- Not fully updated (last year: 2013)- The level of aggregation of data is country; it would be desirable to increase resolution (province level)

International Atomic Energy Agency

<https://www.iaea.org/>

The International Atomic Energy Agency (IAEA) (<https://www.iaea.org/>) is widely known as the world's "Atoms for Peace" organization within the United Nations family. Established in 1957 as the world's center for cooperation in the nuclear field, the IAEA works with its Member

States and multiple partners worldwide to promote the safe, secure and peaceful use of nuclear technologies.

There is a specific subpage devoted to animal health and animal production (<https://www.iaea.org/newscenter/focus/animal-health>) with general info (links, videos and podcasts), but no specific info about Senegal can be found.

Using the embedded search engine with the keywords “Senegal + Health”, there is a series of entries related with animal and human diseases, animal production and food security and agriculture. Many of the entries do not give relevant information about animal and public health in Senegal.

There is a subpage devoted to the Joint FAO/IAEA Programme about nuclear techniques in food and agriculture (<http://www.naweb.iaea.org/nafa/index.html>), including sections related with livestock, food and environment, among others. None of them has significant information about Senegal.

Table A1. 65. Strengths and Weaknesses of the International Atomic Energy Agency

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Joint program with FAO - General information about human and animal health, animal production and food security 	<ul style="list-style-type: none"> - Not many information related to Senegal

Office International des Epizooties (OIE)

<http://www.oie.int>

The World Organisation for Animal Health was previously known as the *Office International des Epizooties* (OIE) (<http://www.oie.int>) and is an intergovernmental organization coordinating, supporting and promoting animal disease control, which does not depend on the United Nations (UN) system, with both institutional and financial autonomy. The OIE is recognized since 1998 by the World Trade Organization (WTO) (<https://www.wto.org/>) as the reference international body for animal health in relation to global trade and counts with 180 members by December 2015.

The main objective of the OIE is to control epizootic diseases and thus to prevent their spread, including transparency and knowledge of the world animal health situation. Timely dissemination of information is crucial to containing outbreaks. To ensure this, each Member Country accepts to report the animal diseases that it detects on its territory. The OIE then spreads the information to other countries, which can take the required preventive actions. This information also includes diseases transmissible to humans and intentional introduction of pathogens. Information is sent out immediately or periodically depending on the seriousness of the disease. Dissemination is via e-mail, Disease Information and the World Animal Health Information Database (WAHID) Interface (http://www.oie.int/wahis_2/public/wahid.php/Wahidhome/Home) [which provides access to all data held within OIE's new World Animal Health Information System (WAHIS)]. WAHID includes animal health data, including livestock census, and information on resources (veterinary structure, vaccine production, etc.).

In the WAHID database, there are semester and annual reports since 2005 until the first semester of 2015 (**Error! Reference source not found.**). This Senegal’s annual animal health report on the notification of the absence or presence of all diseases includes a summary on OIE-listed and non-listed diseases/infections present and absent in Senegal (including zoonoses in humans), containing the date of the last occurrence, species affected (individual or multispecies), control measures and official vaccination if applicable, among other issues. The level of aggregation is country/province. The database offers also information about animal census (country level), veterinary personnel (veterinarians and paraveterinarians) working for the public administration and the private sector (only private accredited practitioners). The report also includes the two National reference laboratories (*Laboratoire National de l’Elevage et de Recherches Vétérinaires* and LNERV/ISRA), the diagnostic tests available, the vaccine manufacturers (ISRA-Production) and the vaccines produced (10).

The OIE also have the Regional Representation for Africa (http://www.rr-africa.oie.int/en/en_index.html), which is part of the five regional representations (Americas, Asia and the Pacific, Europe and the Middle East) established by OIE. The purpose of this representation is to provide to the Member States, services that are adapted to the regional level, so that they may strengthen both surveillance and control of diseases in Africa. The webpage gives national information about veterinary training, veterinary councils, regional reference centers, regional programs, etc. According to this webpage, Senegal has one Veterinary Faculty [*Ecole Inter - Etats des Sciences et Médecine Vétérinaires* (<http://eismv.org/>)], and a Veterinary Council [*Ordre des Docteurs Vétérinaires du Sénégal* (www.ordreveterinaires.sn)] (the link redirects to the *Agence Universitaire de la Francophonie*, <https://www.auf.org/>).

Year	Semester 1	Semester 2	Annual
2005	✓	✓	✓
2006	✓	✓	✓
2007	✓	✓	✓
2008	✓	✓	✓
2009	✓	✓	✓
2010	✓	✓	✓
2011	✓	✓	✓
2012	✓	✓	✓
2013	✓	✓	✓
2014	✓	✓	✓
2015	✓	X	X

Figure A1. 1. OIE’s reporting history: Senegal

There are some publications (12 entries, using Google’s search command “OIE+Senegal”) related to Senegal issues on the OIE webpage ([http://www.oie.int/doc/en_ListDocument.php?line_0\[value\]=3000305&line_0\[field\]=descripteur&typerec=Index](http://www.oie.int/doc/en_ListDocument.php?line_0[value]=3000305&line_0[field]=descripteur&typerec=Index)), including technical factsheets, bulletins and research papers, some of them very out-of-date, and several other entries (105) using the OIE’s search engine (“Senegal”).

Table A1. 66. Strengths and Weaknesses of OIE

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Web of reference in animal health - Quantity of data - Quality of data - Wide variety of reports and other different information sources (scientific papers, bulletins, reference documents, etc.) - Website is quite up to date (first semester of 2015 by December 2015) and working properly - The level of aggregation of Senegal's data in some fields is country/province 	<ul style="list-style-type: none"> - The interface should allow the user to easily export the generated results to an excel file - Only in English, French and Spanish

Program for Monitoring Emerging Diseases (ProMED-mail)

<http://www.promedmail.org/>

The Program for Monitoring Emerging Diseases (ProMED-mail) (<http://www.promedmail.org/>) is a public-internet-based reporting system of the International Society for Infectious Diseases (<http://www.isid.org/>) that spreads information on outbreaks of infectious diseases involving humans, animals, and plants.

Open to all sources, free of political constraints, and available to users free of charge, ProMED-mail take advantage of the speed and ubiquity of the Internet to serve as an early warning system for the detection of emerging disease outbreaks.

The importance of using unofficial sources of information for public health surveillance has become increasingly recognized. Sometimes referred to as “event-based surveillance” or “epidemic intelligence,” informal disease reporting services, pioneered by ProMED, have become a crucial component of the overall global infectious disease surveillance picture. According to the WHO, more than 60% of the initial outbreak reports come from informal sources, including ProMED-mail.

ProMED is also available in several languages and as regional networks:

- ProMED-PORT (Portuguese language posts focusing on Latin America)
- ProMED-ESP (Spanish language posts focusing on Latin America)
- ProMED-RUS (Russian language posts focusing on the independent states of the former Soviet Union)
- ProMED-MBDS (English language posts focusing on the Mekong Basin region of Southeast Asia)
- ProMED-FRA (French language posts focusing on Francophone Africa)
- ProMED-EAFR (English language posts focusing on Anglophone Africa)
- ProMED-MENA (English language posts focusing on the Middle East)
- ProMED- SoAs (English language posts focusing on South Asia)

There have been 64 health alerts recorded about Senegal from December 1995 until November 2015. Some of the entries are cross related and are focused in the same episode. This indicates a low level of communication about diseases in Senegal in this platform. In the

ProMED-FRA there are 48 entries about Senegal, some of them overlapping with the general database.

Table A1. 67. Strengths and Weaknesses of ProMED-mail

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Easy to use website - Rapid dissemination of information [(webpage or by mail (only for subscribers, but free of charge))] - Also available in several languages and as regional networks 	<ul style="list-style-type: none"> - Unofficial source - Variable level of information (event-based surveillance) - Low level of information about Senegal

PubMed

<http://www.ncbi.nlm.nih.gov/pubmed>

PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>) is a service of the US National Library of Medicine (NLM) that provides free access to MEDLINE, the NLM database of indexed citations and abstracts to medical, nursing, dental, veterinary, health care, and preclinical sciences journal articles. PubMed comprises more than 25 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites (some of them freely available).

Table A1. 68. Strengths and Weaknesses of PubMed

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Easy to use website - Simple search engine - High quality of information - Up to date - Some full-text content is freely available 	<ul style="list-style-type: none"> - Unofficial source - Research oriented - No serial information

United Nation Statistics Division (UNdata)

<http://data.un.org/>

UNdata is an internet-based, data service launched by the United Nation Statistics Division (UNSD) of the Department of Economic and Social Affairs. It allows the user to find the data of UN statistical data bases in a single entry point

Useful features like Country Profiles, Advanced Search and Glossaries are also provided to aid research. The numerous databases, tables and glossaries containing over 60 million data points cover a wide range of themes including Agriculture, Crime, Education, Employment, Energy, Environment, Health, HIV/AIDS, Human Development, Industry, Information and Communication Technology, National Accounts, Population, Refugees, Tourism, Trade, as well as the Millennium Development Goals indicators. Whilst this initial version of UNdata is fully equipped with all the functionalities for data access, the development team is continuously adding new databases and features to further enhance the usefulness to users. When fully

developed, UNdata will have a comprehensive array of international and national databases providing the world instant access to a wealth of statistical information.

It provides data about livestock of Senegal.

Table A1. 69. Strengths and Weaknesses of UNdata

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Data from reliable sources - Includes data from many different countries - Interface allows comparisons between more than one country 	<ul style="list-style-type: none"> - Only updated up to 2007 - The website is not user-friendly - The data is difficult to find

USAID

<https://www.usaid.gov/>

The United States Agency for International Development in Senegal works in partnership with the Government of Senegal to support the ten years National Plan for Health and Development (PNDS 2010 - 2018) (USAID information webpage about Senegal: <https://www.usaid.gov/senegal>). USAID has published several documents about Senegal. The following links shows a short and non-exhaustive list of documents related to Senegal:

- Senegal Country Development Cooperation Strategy 2012-2016 (<https://www.usaid.gov/sites/default/files/documents/1860/SenegalCDCS.pdf>) (February 2012), with general data about economy (including out-of-date data of livestock contribution to GDP growth) and health.
- Mid-Term Evaluation of USAID/Senegal Health Program (http://pdf.usaid.gov/pdf_docs/pa00kd87.pdf) (January 2015)
- USAID/Senegal Health Project 2016-2021: Redacted Project Appraisal Document (PAD) (<https://www.usaid.gov/sites/default/files/documents/1860/USAID%20Senegal%20Health%20Redacted%20PAD%20DRAFT%202011-August-2015.pdf>) (August 2015)

Table A1. 70. Strengths and Weaknesses of the USAID

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Useful information - Quantitative / qualitative information 	<ul style="list-style-type: none"> - Only in English - Report based information - Not updated - Not serial information

WHO Health Metrics Network

<http://www.who.int/healthmetrics/en/>

The mission of WHO's Health Metrics Network (HMN) (<http://www.who.int/healthmetrics/en/>) is to mobilize partners to strengthen health information systems and to increase the availability of information for decisions to improve health outcomes in countries. Established in 2005, the HMN vision was to operate as a

network of global, regional and country partners promoting common, standards-based solutions articulated in the HMN Framework and Standards for Country Health Information Systems. HMN is the first global partnership dedicated to strengthening national health information systems. As a country-owned and partner-driven platform, it assesses health information systems and sustainably improves them, using the HMN Framework.

Over the past six years, HMN and its network partners have:

- Successfully advocated and demonstrated the need and demand for investment in Health Information Systems (HIS), and tracked increasing financial investments by countries and donors
- Developed the HMN Framework which is now in widespread use by countries and development agencies
- Supported use of the HMN Framework and related tools in more than 80 countries
- Assessed the status of HIS in 56 countries
- Developed strategic plans for HIS strengthening in 26 countries

The working paper entitled “Country Health Information Systems Assessments for UN Commission on Information and Accountability Priority Countries” published in November 2012 (http://www.who.int/healthmetrics/resources/Working_Paper_1_HMN_COIA.pdf?ua=1) presents the countries self-evaluated scores of their health information systems. The report presents all assessment score sheets and reports available for 40 (54%) of the 74 Commission on Information and Accountability (COIA) countries. According to this paper Senegal scored its HIS above 50%, meaning that the HIS is present and adequate. A quantitative approach to Senegal’s HIS can be found in another working paper, entitled “Country Health Information Systems

Assessments: Overview and Lessons Learned”

(http://www.who.int/healthmetrics/resources/Working_Paper_3_HMN_Lessons_Learned.pdf?ua=1).

Table A1. 71. Strengths and Weaknesses of HMN

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Useful information about Senegal’s HIS - Integrated systems approach - Country-owned - Partner-driven - Generate comparative information on HIS (Regional and International) 	<ul style="list-style-type: none"> - Not a real IS (no data about public health) - Only in English

WHO Health Statistics and Information Systems

<http://www.who.int/healthinfo/en/>

The goal of WHO (<http://www.who.int>) in health statistics (<http://www.who.int/healthinfo/en/>) is to improve country, regional and global public health information. This kind of information is crucial for public health decision making, health sector reviews, planning and resource allocation and program monitoring and evaluation. WHO contributes to improve health information through its activities in three main areas: the Global

Health Observatory (<http://www.who.int/gho/en/>), the common gateway to the wealth of WHO data and statistics, analysis and reports on key health themes; standards, tools and methods for data collection, compilation, analysis, and dissemination and country measurement and evaluation, collaborating with countries on data collection, analysis and approaches to address priority data gaps and strengthen country health information systems. Senegal’s country statistics can be find in the following link: <http://www.who.int/gho/countries/sen/en/>.

Table A1. 72. Strengths and Weaknesses of WHO’s Health Statistics and Information Systems

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - World and regional general statistics and specific data for Senegal - Easy to use - Data on key topics (world and country-specific) (civil registration and vital statistics, country monitoring and evaluation, data analysis, health facility assessment, indicators, universal health coverage monitoring, etc.) 	<ul style="list-style-type: none"> - Not updated in some fields related to Senegal

World Bank

<http://www.worldbank.org/>

Since its foundation in 1944, the World Bank (<http://www.worldbank.org/>) has expanded from a single institution to a closely associated group of five development institutions. Its mission evolved from the original International Bank for Reconstruction and Development (IBRD) as facilitator of post-war reconstruction and development to the present-day mandate of worldwide poverty alleviation through an inclusive and sustainable globalization, always in close coordination with its affiliate, the International Development Association (IDA), and the other members of the World Bank Group (the International Finance Corporation -IFC-, the Multilateral Guarantee Agency –MIGA-, and the International Centre for the Settlement of Investment Disputes –ICSID-).

The World Bank’s assistance to Senegal (<http://www.worldbank.org/en/country/senegal>) focuses on three points: accelerated growth and wealth creation; human development and shared growth; and rural and urban synergies. There is a recent (August 2015) specific report about Senegal: Agricultural sector risk assessment (http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/09/11/090224b0830cfc26/1_0/Rendered/PDF/Senegal000Agri0ctor0risk0assessment.pdf). The objective of this assessment was in short to assist the government of Senegal to:

- Identify, analyze, quantify, and prioritize principal risks facing the agricultural sector
- Analyze the impact of these risks
- Identify and prioritize appropriate risk management interventions that may contribute to improved stability, reduced vulnerability, and increased resilience of agricultural supply chains

The report includes data on livestock production systems, livestock prices, major livestock diseases, etc.

Table A1. 73. Strengths and Weaknesses of World Bank

Strengths of the IS	Weaknesses of the IS
<ul style="list-style-type: none"> - International source - Official - World and regional general data and specific data for Senegal (statistics, reports, etc.) - Easy to use - Plentiful of data - Quantitative and qualitative data - Report: Senegal's Agricultural sector risk assessment (2015) 	<ul style="list-style-type: none"> - Not updated in some fields related to animal health in Senegal - Some figures related with Senegal are based in out-of-date data

Sub-block 5.1. Information to Estimate the Cost of Animal Diseases

(See description of information systems above)

Animal census

Table A1. 74. Animal Census Information systems

Type	Name	URL
National	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Ministre de l'Economie des Finances et du Plan	http://www.finances.gouv.sn/
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	AU-IBAR	http://www.au-ibar.org/
International	Factfish	http://www.factfish.com/catalog/geography%20and%20agriculture
	Food and Agriculture Organization of the United Nations (FAO)	http://www.fao.org/home/en/
	Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	http://faostat3.fao.org/home/E
	World Organisation for Animal Health (OIE)	http://www.oie.int
	UNdata	http://data.un.org/
	United States Agency for International Development in Senegal (USAID)	https://www.usaid.gov/
	World Bank	http://www.worldbank.org/

Animal Production Systems

Table A1. 75. Animal Production Systems

Type	Name	URL
Senegal	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Institut Sénégalais de Recherches Agricoles	http://www.isra.sn/index.php
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	AU-IBAR	http://www.au-ibar.org/
International	Factfish	http://www.factfish.com/catalog/geography%20and%20agriculture
	Food and Agriculture Organization of the United Nations (FAO)	http://www.fao.org/home/en/
	Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	http://faostat3.fao.org/home/E
	International Atomic Energy Agency (IAEA)	https://www.iaea.org/
	PubMed	http://www.ncbi.nlm.nih.gov/pubmed
	United States Agency for International Development in Senegal (USAID)	https://www.usaid.gov/

Trade

Table A1. 76. Trade

Type	Name	URL
National	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Ministre de l'Economie des Finances et du Plan	http://www.finances.gouv.sn/
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	AU-IBAR	http://www.au-ibar.org/
International	Factfish	http://www.factfish.com/catalog/geography%20and%20agriculture
	Food and Agriculture Organization of the United Nations (FAO)	http://www.fao.org/home/en/
	Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	http://faostat3.fao.org/home/E
	PubMed	http://www.ncbi.nlm.nih.gov/pubmed
	UNdata	http://data.un.org/
	United States Agency for International Development in Senegal (USAID)	https://www.usaid.gov/
	World Bank	http://www.worldbank.org/

Animal and Human Health Resources Available

Table A1. 77. Animal and Human Health Resources Available

Type	Name	URL
National	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Ministère de la Santé et de L'Action Sociale	http://www.sante.gouv.sn/
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	WHO's Regional Office for Africa	http://www.afro.who.int/en.html
International	World Organisation for Animal Health (OIE)	http://www.oie.int
	UNdata	http://data.un.org/
	WHO's Health Statistics and Information Systems	http://www.who.int/healthinfo/en/

Sub-block 5.2. Information on the Risk of Endemic Diseases

(See description of information systems above)

Table A1. 78. Risk of Endemic Diseases

Type	Name	URL
National	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Ministère de la Santé et de L'Action Sociale	http://www.sante.gouv.sn/
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	AU-IBAR	http://www.au-ibar.org/
	WHO's Regional Office for Africa	http://www.afro.who.int/en.html
International	Centers for Disease Control and Prevention (CDC)	http://www.cdc.gov/
	Emergency Prevention System for Animal Health (EMPRES)	http://www.fao.org/AG/AGInfo/programmes/en/empres/home.asp
	Food and Agriculture Organization of the United Nations (FAO)	http://www.fao.org/home/en/
	Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	http://faostat3.fao.org/home/E
	International Atomic Energy Agency (IAEA)	https://www.iaea.org/
	World Organisation for Animal Health (OIE)	http://www.oie.int
	ProMED-mail	http://www.promedmail.org/
	PubMed	http://www.ncbi.nlm.nih.gov/pubmed
	UNdata	http://data.un.org/
	United States Agency for International Development in Senegal (USAID)	https://www.usaid.gov/
WHO's Health Statistics and Information Systems	http://www.who.int/healthinfo/en/	

Sub-block 5.3. Information on the Risk of Emerging Diseases

(See description of information systems above)

Table A1. 79. Risk of Emerging Diseases

Type	Name	URL
National	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Ministère de la Santé et de L'Action Sociale	http://www.sante.gouv.sn/
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	AU-IBAR	http://www.au-ibar.org/
	WHO's Regional Office for Africa	http://www.afro.who.int/en.html
International	Centers for Disease Control and Prevention (CDC)	http://www.cdc.gov/
	Emergency Prevention System for Animal Health (EMPRES)	http://www.fao.org/AG/AGInfo/programmes/en/empres/home.asp
	Food and Agriculture Organization of the United Nations (FAO)	http://www.fao.org/home/en/
	Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)	http://faostat3.fao.org/home/E
	International Atomic Energy Agency	https://www.iaea.org/
	World Organisation for Animal Health (OIE)	http://www.oie.int
	ProMED-mail	http://www.promedmail.org/
	PubMed	http://www.ncbi.nlm.nih.gov/pubmed
	UNdata	http://data.un.org/
	United States Agency for International Development in Senegal (USAID)	https://www.usaid.gov/
WHO's Health Statistics and Information Systems	http://www.who.int/healthinfo/en/	

Thematic Block 6 – Policy

Sub-block 6.1 Policy

Exchange rate

Banque Central des Etats de l’Africa de l’Ouest (BCEAO)

<http://www.bceao.int/>

The Bank publishes the daily exchange rate of the common currency of 14 francophone African countries, the Franc CFA. There is also a search archive available

Policy Indicators

Senegal is not included in the FAO’s MAFAP program, or in the World Bank’s research project on “Distortions to Agricultural Incentives”, so any indicator or estimator of rate of protection or assistance is available.

Governance

World Bank

www.govindicators.org

The World Bank publishes a Worldwide Governance Indicators (WGI). It is a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms. The indicators are calculated annually for 215 countries, including Senegal. The 2015 update is available on line.

Table A1. 80. Governance Indicators

Indicator	Description
Control of Corruption	Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.
Government Effectiveness	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.
Rule of Law	Captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e.

Indicator	Description
	ranging from approximately -2.5 to 2.5.
Voice and Accountability	Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.
Political Stability and Absence of Violence/Terrorism	Measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.
Regulatory Quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Early warning on food crisis

NATIONAL

Early warning system (Système d'alerte précoce - SAP)

Senegal disposes of an early warning system from 2006 (SAP), when it was launched by the Secretariat Exécutif of Conseil National de Sécurité Alimentaire (CNSA). Its objective is to collect, analyze and disseminate the information concerning food security. The Secretariat is supported by regional Committees and technical work groups, and its members meet weekly to assess the situation of crops and markets during critic periods. Besides that, at national level the SAP includes the assessment of the Work Group established by the Permanent Interstates Committee for Drought Control in the Sahel (CILSS). To assess the needs, the food and nutrition situation of rural households is considered along with the evolution of climatic and market indicators. Until 2011, the results were published in “*Bulletins d'Information*” with the support of the international cooperation. Since then, data are not published and the website does not work or it is under construction (www.secnsa.sn).

REGIONAL

Système Pastoral d'Alerte et d'Information pour le Ferlo

www.spaif.org

This is a system supported by *Agronomes et Vétérinaires Sans Frontières* (AVSF) with the objective of diffuse the information needed to the pastoralist activity in the Ferlo region that is in progress of implementation. The information considered is weather and climatic forecast, biomass situation, water resources, markets and animal health. It counts on a website currently under construction (www.spaif.org), radio broadcasts and mobile telephone messages. The system is considering also the establishment of warning centers in strategic locations.

INTERNATIONAL

Global information and Early Warning System (GIEWS-FAO)

<http://www.fao.org/giews>

The Global Information and Early Warning System is part of the Commodities and Trade Division of the Food and Agriculture Organization (FAO) and its objective is to monitor the world food/supply situations and provides early warning of avoiding food crisis in individual countries. It publishes regularly bulletins on food crop production and markets at global level, and situations reports at regional or country basis. Publications released by GIEWS are Crop prospect and Food Situations, Food outlook, Food Price Monitoring as well as numerous Special Alert and Special Reports describing the food supply and agricultural situations in countries or regions experiencing particular food supply difficulties. The food price and monitoring tool (see above) is part of GIEWS. The data is collected from a wide variety of official and unofficial sources.

Famine Early Warning Systems Network (FEWS NET)

<http://www.fews.net/west-africa/senegal>

The Famine Early Warning Systems Network was created in 1985 by the US Agency for International Development (USAID) in order to help governments to plan and respond after food insecurity and humanitarian crises. They collect information on weather hazards, food prices and food assistance needs and the information and analyses are disseminated on website through monthly reports and maps detailing current and projected food insecurity, timely alerts on emerging or likely crises and specialized reports on weather and climate, markets and trade, agricultural production, livelihoods, nutrition, and food assistance

World Food Program

www.wfp.org

WFP in cooperation with partners including FAO, OCHOA, UNHCR or FEWS NET undertakes a food security analysis, base for the design of emergency operations. It is accessible through the web site and includes the access to the latest food security data, publications and analytical tools. Country pages include information on key indicators as market prices or consumption scores.

Humanitarian Data Exchange

<https://data.hdx.rwllabs.org/group>.

Open platform for sharing data managed by the UN Office for the Coordination of Humanitarian Affairs. For Senegal includes 122 indicators and 48 databases.

Integrated Food Security Phase Classification (IPC)

<http://www.ipcinfo.org/>

It is a set of standardized tools supported by a group of eight agencies and international NGOs including: Care International, the Food and Agriculture Organization of the United Nations (FAO), the Famine Early Warning Systems Network (FEWS NET), the Joint Research Centre of the European Commission (EC-JRC), Oxfam Great Britain, Save the Children UK, Save the Children US, and the United Nations World Food Program (WFP). Its aim is providing a "common currency" for classifying the severity and magnitude of food insecurity.

Sub-block 6.2 Trade Measures

There is not systematic information related with agricultural trade measure imposed by Senegal.

However, the OECD has developed trade facilitation indicators for Senegal (April 2014) in order to help governments improve their border procedures, reduce trade costs, boost trade flows and reap greater benefits from international trade (<http://www.oecd.org/countries/senegal/senegal-oecd-trade-facilitation-indicators-april-2014.pdf>).

These trade facilitation indicators help to identify areas for action, and enable the potential impact of reforms to be assessed. Some of these indicators are:

- Information Availability
- Involvement of the Trade Community
- Advance Rulings
- Appeal Procedures
- Fees and Charges
- Documents
- Formalities-Automation
- Formalities-Procedures
- Internal Co-operation
- External Co-operation
- Governance and Impartiality

In addition to this information, there has been found a GAIN report from the USDA (January 2016), which provides information on export certificates required by the Government of Senegal (GOS) for processed food, animal products, live animals (cattle, pets, etc), plants, and products for animal consumption (<http://www.fas.usda.gov/data/senegal-fairs-export-certificate-report-0>)

Sub-block 6.3 Insurances

There have been found some references to agricultural insurance products in Senegal, particularly to index-crop insurance.

The World Bank report "Index-based Crop Insurance in Senegal. Promoting Access to Agricultural Insurance for Small Farmers" from April 2009, performs a review over agricultural

insurance in Senegal in the past years. This report states that there is no tradition of agricultural insurance in Senegal, but that the occurrence of extreme events has led the government to evaluate and adopt post-disaster measures. In this context some studies have been carried out in order to establish agricultural insurance in Senegal.

The Government of Senegal, 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 however there is no any systematic information.

African Risk Capacity (ARC)

<http://www.africanriskcapacity.org/home>

The African Risk Capacity (ARC) is a specialized agency of the African Union with the objective of assist AU Member States (including Senegal) to reduce the risk of loss and damage caused by extreme weather events and natural disasters. To achieve that, the African Risk Capacity (ARC) is setting up an innovative extreme weather insurance scheme designed to help African Union (AU) member states resist and recover from the ravages of drought at first. It works as a disaster risk pool.

It's accessible also the Bulletin Africa Risk View (ARV), regular publication of the Mutual Fund of Risk Management (African Risk Capacity), including weather data evolution and drought indexes. In addition some specific studies are accessible. In all cases the update is not recent.

Thematic Block 7 – Socio-economic and sectorial info

NATIONAL

Agence Nationale de la Statistique et de la Démographie (ANSD)

<http://www.ansd.sn/>

The ANSD provides many socio-economic information through its annual yearbooks and censuses. Concerning socio-economic indicators and information, the ones provided by the ANSD are the following:

- Total population (by region)
- Rural population (by region)
- GDP per capita
- Agricultural value added (% GDP)

These indicators are presented on an annual basis, and last document found is from year 2011.

Regarding sectorial information, the following regional indicators can be found within the statistical yearbooks:

- Agricultural area
- Irrigated land
- Livestock number by species

Direction de l'analyse, de la prevision et des statistiques agricoles (DAPSA)

<http://www.dapsa.gouv.sn/>

The DAPSA is a governmental directorate (MAER) working in partnership with international organizations such as WFP, FAO and IFAD. Its main functions are the analysis and tracking of agricultural policies, programmes and development projects. In addition, DAPSA is in charge of the collection, centralization, processing and dissemination of agricultural data and statistics. At this purpose, DAPSA carries out agricultural surveys and censuses. However within DAPSA website there are only available financial documents and, although interim results of the agricultural census 2015 are stated to be published, only methodology is available. There is a specific portal for the dissemination of the agro-survey results (<http://senegalma.africadata.org/>), but there are only available production, cultivated area and yield data (by region for millet, sorghum, maize and peanut oil).

REGIONAL

Système d'information sur le pastoralisme au Sahel (SIPSA)

<http://www.fao.org/agriculture/lead/themes0/drylands/information0/en/>

Concerning particularly pastoralism information, there has generally been a lack of information and specific indicators (seasonal transhumance patterns, vulnerability of pastoral households, variations in the price of livestock and foodstuffs, etc.). This lack of information is compounded

by the absence of any official framework for consultation, and it was in response to these challenges that CIRAD (and partners) developed the *système d'information sur le pastoralisme au Sahel* (SIPSA).

This information system is stated to be “a decision support tool for anticipating, managing and monitoring changes in pastoralism and its interactions with the environment in the Sahel, notably in six CILSS countries: Burkina Faso, Mali, Mauritania, Niger, Senegal and Chad” (<http://www.cirad.fr/en/research-operations/research-results/2014/sipsa-an-information-system-for-monitoring-pastoral-dynamics-in-the-sahel>)

It provides relevant information on the state of and trends in Sahelian pastoral systems, and serves to develop information products that satisfy the requirements of players and partners on different decision-making levels, before, during and after crises. It aims to facilitate the circulation and dissemination of information and foster decision-making by the various players, with the eventual objective of drafting and implementing pastoral policy.

On an organizational level, the SIPSA network comprises a regional technical commission and national coordination committees, one in each country.

However, the only specific reference to this information system has been identified within FAO's website. Unfortunately, the link to the SIPSA database is not working and only outdated documents about the project are available.

African Development Bank Group (AFDB)

<http://senegal.opendataforafrica.org/>

<http://dataportal.afdb.org/DataAnalysis.aspx>

The African Development Bank Group offers a huge repository of information from different sources. Concerning socio-economic indicators, the different datasets available on the AFDB website provide the following annual information, from year 2000 to 2013, at country level:

- Total population (by province)
- Rural population (by province)
- GDP per capita
- GNI per capita
- Agricultural value added (% GDP)

With respect to sectorial information, the following country indicators can be found annually from 2000 to 2011:

- Agricultural area
- Irrigated land

African Risk Capacity (ARC)

<http://www.africanriskcapacity.org/home>

The African Risk Capacity (ARC) is a specialized agency of the African Union with the objective of assist AU Member States (including Senegal) to reduce the risk of loss and damage caused by extreme weather events and natural disasters. Within its studies, there can be found recent reports (2014/2015) containing information about issues such as population, livestock or food security by region and department. However, this is not a proper information system.

INTERNATIONAL

The World Bank (WB)

<http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GNP.PCAP.CD&period=>

The World Databank is the statistical division of The World Bank, which started its activity in 1944. The World Bank is a source of reference of financial and technical assistance to developing countries. Its main objective is the poverty reduction.

Among its functions, it is worthy to mention the financial activity offering low-interest loans and credits to developing countries. This financial activity, along with investment in education, health, agriculture or infrastructure, provides solid foundations to improve the livelihood in such developing countries. However, the WB projects are usually co-financed with interested governments, multilateral institutions, commercial banks and private investors.

Another pillar of the WB activities is the share of knowledge. The WB provides research and technical assistance through policy advice to developing countries, in which capacity development is of great importance (conferences, forums, trainings, etc.).

The Open Data website of the WB (World Databank) is a free tool which provides development indicators by country for download. Concerning socio-economic information, the following annual indicators can be found within this system at country level, for the period 2000-2014:

- Rural population
- GDP per capita
- GNI per capita
- Agricultural value added (%GDP)

Regarding sectorial information, the WB open databank provides the following annual information at country level, for the period 2000 – 2013:

- Agricultural area

All the information gathered and processed by The World Bank is available on-line at its website as reports, studies, books, journals, technical papers, strategy documents, open databases etc. Some of these results are of free access and others may be purchased. In recent years, the access to this WB information is even possible with many different ant thematic mobile apps. With these applications global indicators are accessible and can be displayed as tables and charts.

ANNEX 2 - List of information sources

Thematic Block 1 - Meteorological, climate and soils information

1. Institutions

a. International

- World Meteorological Organization (WMO)
<http://wmo.asu.edu/#global>
- FAO
<http://www.fao.org>
- CountryStat-FAO
<http://www.countrystat.org/home.aspx?c=SEN>
- European Soil Data Centre (ESDAC)
http://eusoils.jrc.ec.europa.eu/esdb_archive/EuDASM/Africa/lists/ccm.htm
- International Maize and Wheat Improvement Center
<http://dtma.cimmyt.org/>
- International Water Management Institute
<http://waterdata.iwmi.org/>
- ISRIC_World Soil information
<http://www.isric.org/content/world-data-centre-soils>
- The World Bank Group (Climate Change Knowledge Portal)
http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCCode=CMR&ThisTab=RiskOverview
- An International Center for Soil Fertility and Agricultural Development
<http://ifdc.org/>
- Bureau d'Etudes Industrielles Energies Renouvelables et Environnement
<http://hmf.enseeiht.fr/travaux/CD0809/bei/beiere/groupe2/node/99>

b. Regional

- African Center of Meteorological Application for Development
<http://acmad.net/rcc/metadatasenegal.php>
- Centre Regional AGRHYMET
<http://www.agrhymet.ne/bulletin.html>
- West and Central African Council for Agricultural Research and Development (CORAF/WECARD)
<http://www.coraf.org/index.php/fr/>
- Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS)
<http://www.cilss.bf/>

c. National

- L'Agence Nationale de l'Aviation Civile et de la Météorologie
<http://www.anacim.sn/>

- Agence Nationale de Statistique et de la Démographie-Ministère de l'Economie et des Finances du Sénégal
<http://www.ansd.sn/>
- Centre de Suivi Ecologique
<http://www.cse.sn/>
- Ministère de l'Hydraulique et de l'Assainissement
<http://www.mha.gouv.sn/>
- Ministre de l'Environnement et du développement durable
<http://www.environnement.gouv.sn/?q=statistiques-g%C3%A9n%C3%A9rales>
- Centre National de Recherches Agronomiques de Bambey (ISRA)
<http://www.cnrabambey.sn/>
- Physio-Géo (journal)
<http://physio-geo.revues.org/4243>

Thematic Block 2 -Satellite image information & Communications

2.1. Sub-block Satellite image information

1. *Institutions*

- United Nations (UN Spider)
- National Aeronautics and Space Administration (NASA)
- European Space Agency (ESA)
- Food and Agriculture Organization of the United Nations (FAO)
- U.S. Geological Survey (USGS)
- African Association of Remote Sensing of the Environment (AARSE)
- Google Earth
- CGIAR Consortium for Spatial Information (CGIAR – CSI)
- World Bank
- The International Center for Agricultural Research in the Dry Areas (ICARDA)
- Agence Nationale de L'Aviation Civile et de la Météorologie (ANACIM)
- AGRHYMET REGIONAL CENTRE (ARC)

2. *Private Companies*

- Terra Remote Sensing Inc.
- Remote Sensing Applications Consultants Ltd. (RSAC)
- Vito nv

3. *Academic journals*

a. Remote Sensing of Environment

- ISPRS Journal of Photogrammetry and Remote Sensing
- IEEE Transactions on Geoscience and Remote Sensing
- Applied Earth Observation and Geoinformation
- IEEE Applied Earth Observations and Remote Sensing
- Remote Sensing
- Photogrammetric Engineering and Remote Sensing
- IEEE Geoscience and Remote Sensing Letters
- International Journal of Remote Sensing
- Remote Sensing Letters
- Canadian Journal of Remote Sensing
- GIScience & Remote Sensing
- The Photogrammetric Record
- Journal of Applied Remote Sensing
- Journal of the Indian Society of Remote Sensing

b. GIS

- International Journal of Geographical Information Science
- The Geographical Journal

- Geoforum
- Journal of Geographical Sciences
- Chinese Geographical Science
- Transactions in GIS
- Computers & Geosciences
- Journal of Spatial Science
- International Journal of Digital Earth
- GeoInformatica
- Journal of Geographical Systems
- Geocarto International
- Journal of Geographic Information System
- Geo-spatial Information Science
- GeoJournal
- Geographical Research
- Geography Compass
- GeoJournal
- International Journal of Spatial Data Infrastructures Research

c. Broader Relevance

- Public Library of Science One (PLOS One)
- Progress in Physical Geography
- Global Ecology and Biogeography
- Environmental Modelling & Software
- Journal of Environmental Management
- Canadian Journal of Forest Research
- European Journal of Forest Research
- Forest Ecology and Management
- Forestry
- Forest Science
- Geophysical Research Letters
- Global Change Biology
- Landscape Ecology
- Science
- Nature Geoscience
- Transportation Research Part B: Methodological
- Landscape and Urban Planning
- Data Mining and Knowledge Discovery
- Neural Networks
- IEEE Transactions on Neural Networks
- Ecography
- Ecological Modelling

4. Research

- Proceedings of International and National Congresses (Proceedings&Abstracts)

2.2. Sub-block communication

INDICATOR	SOURCE 1	SOURCE 2
Mobile Penetration	https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx	
Fixed Penetration	https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx	
Fixed Broadband Penetration	https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx	
Internet Penetration	https://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx	http://databank.worldbank.org/data/home.aspx
Facebook Penetration	http://www.internetworldstats.com/	
Secure Internet servers (per million)	http://databank.worldbank.org/data/home.aspx	
Broadcast Media TV (no of channels)	http://radiostationworld.com/africa.aspx	
Broadcast Media Radio (no of channels)	http://radiostationworld.com/africa.aspx	
Internet News Media	http://www.abyznewslinks.com/	
Magazine News Media	http://www.abyznewslinks.com/	
Press Agency News Media	http://www.abyznewslinks.com/	
Newspapers and News Media (National)	http://www.abyznewslinks.com/	
Newspapers and News Media (Local)	http://www.abyznewslinks.com/	

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

1. Institutions

a. International

- Food and Agriculture Organization of the United Nations (FAO)
<http://faostat.fao.org/site/422/DesktopDefault.aspx?PageID=422#ancor>
- CountrySTAT (FAO)
<http://www.countrystat.org/home.aspx?c=SEN>
- Global Information and Early Warning System (GIEWS-FAO)
<http://www.fao.org/giews/countrybrief/>
- Famine Early Warning Systems Network (FEWS NET)
<http://www.fews.net/west-africa/senegal>
- International Trade Centre
<http://www.intracen.org/itc/exporters/trade-at-hand/mobile-solution-types/#mPrices>

b. Regional

- African Development Bank Group (afdb)
<http://www.afdb.org/en/knowledge/statistics/data-portal/>
- Open data for Africa (afdb)
<http://senegal.opendataforafrica.org/>
- Regional Agriculture Trade Intelligence Network (RATIN)
<http://ratin.net/>
- African Agricultural Market Information Network (AFAMIN)
<http://www.afamin.net/>
- Economic Community of West African States(ECOWAS)
<http://www.ecowas.int/>
- West and Central African Council for agricultural research and development (WECARD)
<http://www.coraf.org/index.php/en/>
- West African Market Information System Network
http://www.resimao.net/market_region.php?coid=111381517

c. National

- Ministère de l'agriculture et de l'élevage
<http://www.agriculture.gouv.sn/>
- Ministère des Mines de l'Industrie de la Transformation Alimentaire des Produits Agricoles et des PME
- Institut Senegalais de Recherche Agricole (ISRA)
<http://www.isra.sn/>
- Agence nationale de la statistique et de la démographie
<http://www.ansd.sn/>
http://www.ansd.sn/ressources/publications/BADIS_2007-2009.pdf
- Institut de technologies alimentaires
<http://www.ita.sn/>
- Commissariat à la sécurité alimentaire
<http://csa.sn/site/>
- Agricultural Market Information System (SIARM)
- Market information system of Senegal (SIM)
- National Agricultural and Agro-Processing Research Fund (FNRAA)

2. *Private or Public-Private Market Information Systems*

- Manobi Senegal
<http://www2.manobi.com/>
- Knoema
<http://knoema.es/atlas/Senegal/topics/Agricultura>
- CommodAfrica
<http://www.commodafrica.com/>
- NationMaster
<http://www.nationmaster.com/country-info/profiles/Senegal/Agriculture>

3. *Professional Agricultural Organizations*

- National Union of Fresh Produce Growers of Senegal (UNPM)
- Walo Farmers' Association (ASESCAW)
- Bamba-Thialen group
- Kabiline Group
- Sugar institute
- Cashew institute
- Cotton institute
- Chambre De Commerce De Ziguinchor
- Centre de Gestion et d'Economie Rurale de vallée du fleuve Sénégal

Thematic Block 4 - Production levels and yields, Plant health

1. Institutions

a. International

- CountryStat-FAO
<http://www.countrystat.org/home.aspx?c=SEN>
- The World Bank Group
<http://www.wds.worldbank.org/>
- FAO
<http://www.fao.org/>
- FAO-crop calendar
<http://www.fao.org/agriculture/seed/cropcalendar/welcome.do>
- An International Center for Soil Fertility and Agricultural Development
<http://ifdc.org/>
International Food Policy Research Institute (IFPRI)
<http://www.ifpri.org/>
- International Maize and Wheat Improvement Center
<http://www.cimmyt.org/en/>
- The International Fertilizer Development Center- IFDC
<http://africafertilizer.org/>

b. Regional

- African Development Bank Group (Application)
<http://senegal.opendataforafrica.org/>
- Centre Régional AGRHYMET
<http://www.agrhymet.ne/bulletin.html>
- Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel (CILSS)
<http://www.cilss.bf/>
- Centre de Documentation Numérique (CILSS)
<http://www.cilss.bf/publication/index.cfm?sect1=subscribe&id=59>
- Forum for Agricultural Research in Africa (The eRAILS)
<http://www.erails.net/SN/profile/>
- Initiative Prospective Agricole et Rurale - IPAR
<http://www.ipar.sn/fr>
- Plateforme d'Appui aux acteurs du développement rural en Afrique de l'Ouest et du Centre
<http://www.hubrural.org/Zones-d-intervention.html?lang=fr>
- The Africa Rice Center (AfricaRice)
<http://www.africarice.org/>
- The Africa Rice Center (AfricaRice) Application
<http://www.ricehub.org/SN/>
- West and Central African Council for Agricultural Research and Development (CORAF/WECARD)
<http://www.coraf.org/index.php/fr/>

c. *National*

- Agence Nationale de Statistique et de la Démographie
<http://www.ansd.sn/>
- Bureau d'analyses macro-économiques (BAME) de l'Institut sénégalais de recherches agricoles (ISRA).
<http://www.bameinfopol.info/-Activites-.html?lang=fr>
- Centre de Suivi Ecologique
<http://www.cse.sn/>
- Centre National de Recherches Agronomiques de Bambey (ISRA)
<http://www.cnrabambey.sn/>
- Direction de la protection des Vegetaux (DPV)
<http://dpvsenegal.com/index.php/bulletin-phyto>
- IFLEX Le Projet de Promotion des Exportations Agricoles (PPEA) Le Programme de Développement des Marchés Agricoles du Sénégal est un programme voulu par le Gouvernement du Sénégal, soutenu par la Banque Mondiale,
http://www.iflexsenegal.org/consult_serie.html
- L'Agence Nationale de l'Aviation Civile et de la Météorologie
<http://www.anacim.sn/meteo/bulletinsgtp.php>
- l'Institut Sénégalais de Recherches Agricoles (ISRA)
<http://www.isra.sn/>
- Ministère de l'Agriculture du Senegal
<http://www.agriculture.gouv.sn>
- Université Cheikh Anta Diop de Dakar
<http://www.ucad.sn/>
- Université Gaston Berger de Saint-Louis
<http://www.ugb.sn/>

2. *Private organizations or Public-Private Partnerships*

- Syngenta Foundation for Sustainable Agriculture
<http://www.syngentafoundation.org/>
- Bayer- Cropscience
<http://www.cropscience.bayer.com/>
- Plantwise
<https://www.plantwise.org/about-plantwise/>

3. *Professional Agricultural Organizations*

- Platform for African-European partnership on Agricultural Research for Development (Paepard)
<http://paepard.org/wakka.php?wiki=InformationCommunication&lang=en>

Thematic Block 5– Animal and human health

1. Institutions

a. International

- Centers for Disease Control and Prevention (CDC)
<http://www.cdc.gov/>
- Food and Agriculture Organization of the United Nations (FAO)
<http://www.fao.org/home/en/>
- Food and Agriculture Organization Corporate Statistical Database (FAOSTAT)
<http://faostat3.fao.org/home/E>
- Emergency Prevention System for Animal Health (EMPRES)
<http://www.fao.org/AG/AGAInfo/programmes/en/empres/home.asp>
- International Atomic Energy Agency (IAEA)
<https://www.iaea.org/>
- United Nations Database
<http://data.un.org/>
- United States Agency for International Development in Senegal (USAID)
<https://www.usaid.gov/>
- The World Bank
<http://www.worldbank.org/>
- World Organisation for Animal Health (OIE)
<http://www.oie.int>
- WHO's Health Metrics Network
<http://www.who.int/healthmetrics/en/>
- WHO's Health Statistics and Information Systems
<http://www.who.int/healthinfo/en/>
- Program for Monitoring Emerging Diseases (ProMED-mail)
<http://www.promedmail.org/>
- PubMed
<http://www.ncbi.nlm.nih.gov/pubmed>

c. Regional

- African Union Interafrican Bureau for Animal Resources (AU-IBAR)
<http://www.au-ibar.org/>
- WHO's Regional Office for Africa

<http://www.afro.who.int/en.html>

d. National

- Agence Nationale de Statistique et de la Démographie
<http://www.ansd.sn/>
- Institut Sénégalais de Recherches Agricoles
<http://www.isra.sn/index.php>
- Ministère de la Santé et de L'Action Sociale
<http://www.sante.gouv.sn/>
- Ministre de l'Economie des Finances et du Plan
<http://www.finances.gouv.sn/>
- Ministre de l'Élevage et des Productions animales
<http://www.elevage.gouv.sn/>

2. Private organizations or Public-Private Partnerships

- Factfish
<http://www.factfish.com/catalog/geography%20and%20agriculture>

Thematic Block 6–Policy

1. Institutions

a. International

- **Monitoring and Analysing Food and Agricultural Policies (MAFAP - FAO)**
<http://www.fao.org/in-action/mafap/home/en/>
- **Global Information and Early Warning System (GIEWS-FAO)**
<http://www.fao.org/giews/countrybrief/>
<http://www.fao.org/giews/food-prices/price-warnings/en/>
- **Famine Early Warning Systems Network (FEWS NET)**
<http://www.fews.net/west-africa/senegal>
- **The World Bank**
<http://databank.worldbank.org/data/reports.aspx?source=worldwide-governance-indicators>
<http://info.worldbank.org/governance/wgi/index.aspx#countryReports>
http://www.ifc.org/wps/wcm/connect/98e2c00041d405b5840c8400caa2aa08/Senegal+Ag.+Insurance+FINAL+REPORT_ENG+6MAY09.pdf?MOD=AJPERES
- **World Trade Organization**
<https://www.wto.org/>
- **Global facility for Disaster Reduction and Recovery (GFDRR)**
<https://www.gfdrr.org>
- **Agricultural extension and advisory services worldwide (IFPRI)**
<http://www.worldwide-extension.org/africa>
- **US Aid**
<https://www.usaid.gov/sites/default/files/documents/1865/CCRD-IndexInsuranceFactSheet.pdf>

b. Regional

- **United Nations economic commission for Africa (UNECA)**
<http://www.uneca.org>
- **African Development Bank Group (afdb)**
<http://www.afdb.org/en/documents/project-related-procurement/policies-and-procedures/>
- **Open data for Africa (afdb)**
<http://cabo Verde.opendataforafrica.org/>
- **Southern African Development Community**
<http://www.sadc.int/documents-publications/show/921>

c. National

- **Ministère de l’agriculture et de l’élevage**
<http://www.agriculture.gouv.sn/>
- **Ministère des Mines de l’Industrie de la Transformation Alimentaire des Produits Agricoles et des PME**
- **Ministère du commerce, du secteur informel, de la consommation, de la promotion des produits locaux et des PME**
<http://www.commerce.gouv.sn/>
- **Institut Senegalais de Recherche Agricole (ISRA) - Bureau d’analyses macro-économiques**
<http://www.bameinfopol.info/Documents-officiels-sur-les.html?lang=fr>
<http://www.isra.sn/>
- **Commissariat à la sécurité alimentaire**
<http://csa.sn/site/>

2. Private Organizations or Public-Private-Partnerships

- **Prevention Web**

<http://www.preventionweb.net/english/>

- **Future-Agricultures**

<http://www.future-agricultures.org/publications/publication-by-theme/policy-processes>

- **Agritrade**

<http://agritrade.cta.int/>

- **TradeMark Southern Africa**

<http://tradebarriers.org/documents/survey-reports>

Thematic Block 7 – Socio-economic and sectorial information

1. Institutions

a. International

- **CountrySTAT (FAO)**

<http://www.countrystat.org>

- **The World Bank**

*[http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GNP.PCAP.CD
&period=](http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GNP.PCAP.CD&period=)*

b. Regional

- **African Development Bank Group (afdb)**

<http://www.afdb.org/en/knowledge/statistics/data-portal/>

<http://dataportal.afdb.org/Dashboards.aspx?key=25645>

<http://dataportal.afdb.org/DataAnalysis.aspx>

- **Open data for Africa (afdb)**

<http://senegal.opendataforafrica.org/>

- **African Economic outlook**

<http://www.africaneconomicoutlook.org/en/statistics/>

c. National

- **Ministère de l'agriculture et de l'élevage**

<http://www.agriculture.gouv.sn/>

- **Agence nationale de la statistique et de la démographie**

<http://www.ansd.sn/>

http://www.ansd.sn/ressources/publications/BADIS_2007-2009.pdf

http://www.ansd.sn/ressources/ses/SES_2012.pdf

- **Institut Senegalais de Recherche Agricole (ISRA)**

<http://www.isra.sn/>

- **Commisariat à la sécurité alimentaire**

<http://csa.sn/site/>

2. Private Organizations or Public-Private Partnerships

- **Statistiques-mondiales**

<http://www.statistiques-mondiales.com/senegal.htm>

- **Knoema**

<http://knoema.es/atlas/Senegal/topics/Agricultura>

- **Harvest choice**

<http://harvestchoice.org/products/publication>

ANNEX 3 - Fieldwork: local experts, list of contacts & questionnaires

LOCAL CONSULTANT

Mr. Mamadou Sagna
 Estadístico – Informático
 BP : 13961 Grand Yoff, Dakar
 Email : mosagna@gmail.com // mosagna@hotmail.com
 Mobile: +221- 77 - 657- 66 – 75

LIST OF CONTACTS

Block	Name	Organization/Position	Contact
1. METEOROLOGICAL AND CLIMATE	Diabel NDIAYE	L'Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM)/ Chef de Bureau du Système d'Information	+221 77 645 51 72 diabelndiaye@gmail.com
2. SATELLITE IMAGE	Diabel NDIAYE	ANACIM/ Chef de Bureau du Système d'Information	+221 77 645 51 72 diabelndiaye@gmail.com
3. PRICES OF COMMODITIES AND INPUTS, ACCESS TO MARKETS		ANSD/ DESK OF INFORMATION AND DIFFUSION	+221 33 869 21 60 statsenegal@ansd.sn
	Mouhamadou NDIAYE	<i>Commisariat à la Sécurité Alimentaire (CSA)</i> / Coordonnateur du Système Information des Marchés (SIM)	+221 77 520 12 58 dionkndiaye@yahoo.fr
4. PRODUCTION LEVELS AND YIELDS, PLANT HEALTH	Mouhamadou Bamba DIOP	Centre de Suivi Ecologique (CSE)/ Chargé de projet	+221 77.535.71.04 Bamba.diop@cse.sn
	Mme SENE WALY BINETOU FALL	Direction de la Protection des Végétaux (DPV)/ CHEF DE BUREAU LEGISLATION PHYTOSANITAIRE ET CONTROLE DES PESTICIDES	+221 78 186 10 06 b_walfal@yahoo.fr
	Djiby DIA	INSTITUT SENEGALAIS RECHERCHES AGRICOLES (ISRA)/ Directeur BAME (Bureau Analyses MacroEconomiques)	+221 33 859 17 55 Djiby.dia@isra.sn
5. ANIMAL AND HUMAN HEALTH	Dr Anta DIAW	Division du Système d'Information Sanitaire et Sociale (DSISS)/ Medecin	+221 77 335 44 79 Docanta70@gmail.com
	Baba SALL	Direction des Services Vétérinaires (DSV)/ Chef de Bureau du système d'information vétérinaires	+221 77 636 81 11 babasall@hotmail.com
	Dr Abba LEYE	Direction de l'Elevage (Direl)/ Chef de la Division des Filières animales	+221 33 823 43 99 Leye-sall @outlook.com
6. AGRICULTURAL POLICIES	Sokhna Mbaye	DIOP/ Conseiller Technique	+221 77 651 20 43 Soxna19@yahoo.fr

FIELDWORK QUESTIONNAIRE ON SENEGAL

Please provide concrete, and brief answers to these questions, and report your source: if it's a person provide name, position, organization, phone number and email address. If it is a document, please provide the most complete reference you can obtain.

Thematic Block 1 - Meteorological, climate and soils information

INFORMATION SYSTEMS IDENTIFIED

Type	Agency	Source
Senegal	L'Agence Nationale de l'Aviation Civile et de la Météorologie	http://www.anacim.sn/
Senegal	Agence Nationale de Statistique et de la Démographie-Ministère de l'Economie et des Finances du Sénégal	http://www.ansd.sn/
Regional	Centre Regional AGRHYMET	http://www.agrhymet.ne/bulletin.html

QUESTIONNAIRE

Questions to be addressed to the managers of the Information Systems identified and included in the table above:

METEOROLOGICAL INFORMATION SYSTEM:

1.1. Who collects the data?

Type of institution or agent	Yes/No	Name of institution/company
Meteorological Agency		
Private companies		
Public/Private platforms		
Other		

DATA COLLECTION

1.2. Which is the geographical scope or reference of the collected data?

1.3. Where are the data collected from? (Agro-ecological region, Country...)

1.4. How are the data collected?

Equipment	Estimated percentage of stations
Automatic weather stations	
Manual	
Data derived from satellites	
Equipment operative	

- 1.5. How often are the data collected? (Hourly, Daily, Weekly...)
 1.6. How is the data validation system? Who checks its quality?

SERVICES PROVIDED

- 1.7. What information is provided?

Variable		Yes/No	Comments
Temperature (Temp max and Tmin?)			
Precipitation			
Wind			
Solar radiation			
Relative humidity			
Other services	Weather forecast		
	Extreme events		
	Early warning systems		
	Others		

- 1.8. How is the access to the information? (Free, upon subscription or payment, under demand...)

GAPS OF INFORMATION TO BE CONFIRMED/CHECKED

- The L'Agence Nationale de l'Aviation Civile et de la Météorologie publishes weather forecast to three days, but the metadata of weather stations are not available freely and there is no weather station information (types, localization...). The weather data frequency should be daily. How you can get the data?
- In the Information Systems nationals, there is no information on soils (types, erosion, and salinity). What authority is responsible? How you can get the data?

Thematic Block 2 -Satellite image information & Communications

INFORMATION SYSTEMS IDENTIFIED

INSTITUTIONS	URL
United Nations (UN Spider)	http://www.un-spider.org/space-application/space-technologies-in-the-un/eca
National Aeronautics and Space Administration (NASA)	http://visibleearth.nasa.gov/view.php?id=42097 http://visibleearth.nasa.gov/view.php?id=11953 http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=19080
European Space Agency (ESA)	http://www.gmfs.info/ https://earth.esa.int/web/guest/featured-image/-/article/senegal-river-senegal-and-mauritania
U.S. Geological Survey	http://eros.usgs.gov/senegal-guinea http://eros.usgs.gov/senegal-river-delta http://earlywarning.usgs.gov/fews/search/Africa/West%20Africa http://rmgsc.cr.usgs.gov/ecosystems/africa.shtml
African Association of Remote Sensing of the Environment	http://africanremotesensing.org/
Google Earth	http://jssolichin.com/remote-sensing/
CGIAR Consortium for Spatial Information (CGIAR – CSI)	http://www.cgiar-csi.org/
World Bank	http://water.worldbank.org/WPP-Food-Security http://earsc.org/news/geoville-to-perform-world-bank-study-in-dakar-senegal
The International Center for Agricultural Research in the Dry Areas (ICARDA)	http://geoagro.icarda.org/en/ http://geoagro.icarda.org/en/default/index/facilities
AGRHYMET REGIONAL CENTRE (ARC)	http://www.agrhymet.ne/eng/index.html
PRIVATE COMPANIES	
Terra Remote Sensing Inc.	http://www.terraremote.com/about/services/ http://www.terraremote.com/environment/vegetation-mapping/ http://www.terraremote.com/environment/watershed-assessment/
Remote Sensing Applications Consultants Ltd.	http://www.rsac1.co.uk/apps.html
Vito nv	https://vito.be/en/file/1347 https://rs.vito.be/africa/en/home/Pages/home.aspx

DATA COLLECTION

- 2.1. Is there any national institution that collects the information given by the institutions and companies of the above table and publishes it on their websites?
- 2.2. Who collect the information?

Private Companies	Civil Servants	Others

2.3. How are the data collected?

Product	National Institutions	African Institutions	International Institutions	Space Agency Institutions	Others

2.4. How often are the data collected?

Product	Weekly	Monthly	Other

2.5. Which data are collected?

Product	Vegetation indices	Land surface temperatures	Soil moisture or Rainfall indices	Atmospheric indices	Others

SERVICES PROVIDED

2.6. What services are provided?

Send maps	Send alerts	Regional Events	Other services			
			Vegetation Index	Weather forecast	Irrigation and management	Others

2.7. How is the access to the information?

Free	Fees	Under demand	Other

2.8. Sustainability of the system:

Public support	Donor support	Fees	Advertising	Others

2.9. Channels for dissemination

SMS	Web	Bulletins	Newspapers	Mail to members	Others

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

INFORMATION SYSTEMS IDENTIFIED

Agency	Source
Agence Nationale de la Statistique et de la Démographie (ANSD)	http://www.ansd.sn/
Manobi Senegal	http://www2.manobi.com/
Commisariat à la Sécurité Alimentaire (CSA)	http://csa.sn/site/

QUESTIONNAIRE

Questions to be addressed to the managers of the Information Systems as indicated follows:

To the Agence Nationale de la Statistique et de la Démographie (ANSD)

- 3.1. Why there is not information on commodity prices since 2009?
- 3.2. Is there any information on commodity prices at province/market/area level?
- 3.3. Is there any information on commodity stocks?
- 3.4. Is there any information on agricultural inputs, prices and availability?
- 3.5. Is there any information on commodity trade? Which products or commodities are covered?
- 3.6. Why datasets from the ANADS (banque de données) are available only under authorization? Who is authorized to see them?
- 3.7. Is there any repository of publications to easy search and find?
- 3.8. Why some thematic sections of the website do not work properly? Is it a permanent error?
- 3.9. How is the information offered by ANSD collected?
- 3.10. How often is often is this information collected?
- 3.11. Which are the data validation methods employed by the ANSD to ensure data quality and reliability?
- 3.12. Which are the dissemination channels used by the ANSD?

To Manobi Senegal

- 3.13. Is there any information on domestic commodity prices, stocks, agricultural inputs or commodity trade?
- 3.14. Which years are available?
- 3.15. Is this information covered by market?
- 3.16. How is this information collected?
- 3.17. How often is often is this information collected?
- 3.18. Which are the validation methods used to check quality and reliability of the data?

To the Commissariat à la Sécurité Alimentaire (CSA)

- 3.19. Why there are no “Marsé bulletins” (joint communications WFP) available after 2013?
- 3.20. Why information is not always available by region or market?
- 3.21. Is there any information on commodity stocks?
- 3.22. How are the data collected?
- 3.23. How often is often is this information collected?
- 3.24. Which are the data validation methods employed by the CSA to ensure data quality and reliability?
- 3.25. Which are the dissemination channels used by the CSA?

QUESTIONARIE

Open questions to qualified agents or users, as international traders, medium-sized farmers, producers associations or agricultural companies that usually consult this kind of sources.

- 3.26. Could you please evaluate de reliability of the information obtained from the following sources?
 - Agence Nationale de la Statistique et de la Démographie (ANSD)
 - Manobi Senegal
 - Commissariat à la Sécurité Alimentaire (CSA)
- 3.27. Do you know any alternative and reliable sources of commodity prices/ stocks / inputs information?

GAPS OF INFORMATION TO BE CONFIRMED / CHECKED AND OTHER COMMENTS

- It would be very useful to find national sources of information (market information systems) which have information on:
 - Commodity stocks
 - Agricultural inputs prices
 - Commodity trade (import, export)
- Is there any other important market information system providing commodity prices, input prices or commodity trade prices information? Please, provide any important missing MIS and its attributes (collection, validation and dissemination methods).

Thematic Block 4 – Production levels and yields, Plant health

INFORMATION SYSTEMS IDENTIFIED

Agency	URL
Agence Nationale de Statistique et de la Démographie	http://www.ansd.sn/
Direction de la protection des Vegetaux (DPV)	http://dpvsenegal.com/index.php/bulletin-phyto
Centre de Suivi Ecologique	http://www.cse.sn/
IFLEX Le Projet de Promotion des Exportations Agricoles (PPEA)	http://www.iflexsenegal.org/quisommes-nous-partenaires.html
L'Agence Nationale de l'Aviation Civile et de la Météorologie	http://www.anacim.sn/meteo/bulletinsgtp.php
l'Institut Sénégalais de Recherches Agricoles (ISRA)	http://www.isra.sn/
Centre Régional AGRHYMET	http://www.agrhymet.ne/bulletin.html

QUESTIONNAIRE

Questions to be addressed to the managers of the Information Systems identified and included in the table above:

CROP PRODUCTION AND PROTECTION INFORMATION SYSTEM:

4.1 Which is the most important source of the data?

For the most important sources, answer the following questions.

DATA COLLECTION

4.2 Where are the data collected? (Data collection level: Agro ecological region, County, Farm holder...)

4.3 How and who collects the data?

4.4 How often are the data collected?

Product	Seasonal survey	Annual survey	Census	Other
Harvest				
Damages (*)				
Management (fertilizer, seed, pesticides)				
Storage				

(*): including birds, locus, hailstorms, floods, droughts, pests, diseases

4.5 How is the input, harvest and storage quality control done? Mark with an x

Product	Farmer/holder	Cooperatives	Official surveys	Private companies	Export companies	Others
Seeds						
Fertilizers						
Pesticides						
Harvest						
Storage						
Comments						

4.6 How is the data validated? (Supervisors, Ministries, Private companies, no validation)

SERVICES PROVIDED

4.7 What information is provided? Enumerate. (For example; production, area cultivated, crop damages, statistical bulletins...)

4.8 How is the access to the information? (Free, Fees, under demand...)

GAPS OF INFORMATION TO BE CONFIRMED/CHECKED

- The website of Ministère de l'Agriculture is inactive. In general, the webs of different ministries or agencies are slow and not always available. Is this usual?
- There are no information on crop management (sowing date, sowing rates, harvest date...) in the national Information Systems (IS). Do farmers use information systems? For example, where do they obtain/ buy the seeds?
- The *Direction de la protection des Végétaux* publishes a weekly bulletin; however, there does not seem to be any information of previous newsletters. How you can get the information? In addition, how are farmers informed of crops pests and diseases?
- The website of *Centre de Suivi Ecologique* has season bulletins; however the documents cannot be downloaded. How can one obtain the bulletins?
- The National Institute of Statistics (*Agence Nationale de Statistique et de la Démographie*) offers very few agricultural data, and many of the links do not work. It is also very slow. Is this usual?
- Are the regional information systems known to farmers?

Thematic Block 5 – Animal and human health

INFORMATION SYSTEMS IDENTIFIED

Type	Name	URL
National	Agence Nationale de Statistique et de la Démographie	www.ansd.sn
	Ministère de la Santé et de L'Action Sociale	http://www.sante.gouv.sn/
	Ministre de l'Élevage et des Productions animales	http://www.elevage.gouv.sn/
Regional	AU-IBAR	http://www.au-ibar.org/
	Ofitec	http://ofitecweb.com/es

Open questions to qualified agents or users, as identified above:

QUESTIONNAIRE

Specific on Senegal Information Systems

- 5.1 The webpage of the *Agence Nationale de Statistique et de la Démographie* (www.ansd.sn) does not work or works with insufficient speed or efficacy (by December 21, 2015). Is there any reason to explain this? Is there any plan to repair this problem? Is this a wrong link?
- 5.2 The webpages of the *Ministre de l'Élevage et des Productions Animales* (<http://www.elevage.gouv.sn/>) and the *Ministère de la Santé et de L'Action Sociale* (<http://www.sante.gouv.sn/>) do not offer relevant information about animal health and public health, and in our opinion are more oriented to give information about the structure of both ministries and to give useful information to the public. Is this a political decision? The problem is that the webpage of the National Agency of Statistics and Demography does not work, so it is very difficult to find relevant data about animal health and public health.
- 5.3 We found the webpage of the *Institut Sénégalais de Recherches Agricoles –ISRA-* (<http://www.isra.sn/index.php>) with a subpage devoted to the *Laboratoire National d'Élevage et de Recherches Vétérinaires – LNERV* (http://www.isra.sn/index.php?option=com_content&view=article&id=108) with almost no information. Is there any other national webpage with relevant information about animal disease cases, deaths, vaccine production, disease control programs, strategic plans on animal health and public health, etc.?

Animal Health

- 5.4 Are the national figures and the information sent to the OIE accurate? (vaccine production, diagnostic tests available, number of vets and paravets, etc.)
- 5.5 Are there any official studies on the cost of diseases?
- 5.6 Are there minimum standards for veterinarians and paraveterinarians skills? Are there plans for a quality training for veterinarians?
- 5.7 The “raw data” on census, number of animal disease cases, deaths, etc., can be found elsewhere than through internet searches?

- 5.8 The strategy, plans or control programmes on animal health are publicly available? Where? How can paraveterinarians and producers access to them?
- 5.9 Is there a national legislation that specifies which are the notifiable diseases?
- 5.10 Are livestock diseases prioritised? If yes, please, describe the parameters used.
- 5.11 Is there an animal identification system?
- 5.12 Is there information about location or number of farms (aggregated by kind of production, size, etc.), slaughterhouses, markets, etc.? Where?
- 5.13 Is there any information about animal and animal products trade? Is this aggregated by country and kind of livestock or product?
- 5.14 Is there information about professional associations related with animal health (i.e. veterinarians) or animal production (i.e. farmers)?
- 5.15 Are there any Groups for Sanitary Defence? (like associations of vets/paravets in charge of animal health)
- 5.16 Is there any economic compensation or rewards to motivate notification/collaboration with veterinary authorities or compliance with control programs?

Public Health

- 5.17 Is there information on notifiable diseases, frequency of notification, etc.?
- 5.18 Is there information on reference laboratories?
- 5.19 Is there information on vaccination programs? Coverage?
- 5.20 Is there information on human hospitals or health centres and on structure of medical services?
- 5.21 Is there information on number of health graduates and medicine schools or faculties?
- 5.22 Is there information on water and food availability and treatment?
- 5.23 Is there information on surveillance and control plans? Are they freely available?
- 5.24 Is there information about professional associations related with public health?

Thematic Block 6 – Policy

Regarding agricultural risk management it is important to find any available information source about:

- Agricultural insurance implementation
- Other ad hoc measures and policies
- National early warning systems
- Trade measures (export restrictions)

In this sense, the qualified users to whom you could ask would be international traders (trade measures), medium-sized farmers (insurance), producers associations, ministries, regional officers of international organisms, NGOs, etc.

QUESTIONARIE (open questions)

Please provide concrete and brief answers to these questions, and report your source: if it's a person provide name, position, organization, phone number and email address. If it is a document, please provide the most complete reference you can obtain.

- 6.1 Do you know about trade measures/agricultural insurance/ risk management policies?
- 6.2 How did you get to that information?
- 6.3 Is it usually updated?
- 6.4 Do you usually consult it for your professional activity?
- 6.5 Could you please evaluate the information reliability?

In the case of asking to any policy maker organism, the objective would be to know about the existence of such information, and if there is any way of dissemination or official source to consult.

APPENDIX 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) - World Meteorological Organization – WMO - Scidev.net - Agrhymet Regional Centre
	Temperature (Tmax, Tmin)	Temperature (diurnal, Tmax, Tmin)	
	Precipitation (daily mm)	Precipitation (daily mm)	

Sub-blocks	Reference Threshold *	Desirable threshold *	Potential Sources
	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)	<p>- National Meteorological Agency. - Ministry of Agriculture and/or Environment. - Ministry of Transport</p> <p>PRIVATE COMPANIES Agricultural Service Co Ex: <i>Infotrade</i></p> <p>UNIVERSITIES AND RESEARCH CENTRES - Incl. Centre for Research on the Epidemiology of Disaster-CRED - Schools of agriculture</p> <p>SCIENTIFIC JOURNALS, PROCEEDINGS, PhD THESES</p>
	RH average	Relative humidity or vapour pressure Deficit (RHmax, RHmin, %; VPD: kPa or mbar)	
	Wind speed qualitative	Wind speed daily (km/day) Wind direction	
	Rainfall daily (mm)	Rainfall intensity (mm/h) or peak rainfall (hours)	
	Tmax; Tmin	Tmax; Tmin	
	Wind (km/day)	Wind gusts (velocity and direction)	
	Specific extreme events (**)	Specific extreme events (**)	
1.2 Soil	Soil types	Soil types	<p>INSTITUTIONS - ISRIC-World Soil information - FAO - Institutes of cartography - Extension services</p> <p>PRIVATE COMPANIES - e.g. large production companies – mainly linked to exports</p> <p>UNIVERSITIES AND RESEARCH CENTRES Schools of agriculture</p> <p>RESEARCH AND DEVELOPMENT Foundations e.g.: AGRA, Bill and Melinda Gates Foundation</p> <p>SCIENTIFIC JOURNALS, PROCEEDINGS, PhD THESES</p>
	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	
	Linked to specific soil types or soil management	Salinity (dS/m or other) Specific areas	

(*) 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 – African Association of Remote Sensing of the Environment – Google Earth – CGIAR Consortium for Spatial Information (CGIAR – CSI) PRIVATE COMPANIES – Providers of satellite information and applications (e.g. Terra Remote Sensing Inc., Remote Sensing Applications Consultants Ltd., Vito nv) RESEARCH – Proceedings of International and National Congresses – PhD Thesis 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)
	Spatial resolution and coverage		
	Radiometric resolution	Land surface temperatures	
	Spectral resolution	Atmospheric indices	
	Spectral range	Soil moisture indices	
	Temporal coverage	Rainfall indices	
	Spatial resolution and coverage	Soil erosion indices	

* 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 PRIVATE COMPANIES PROFESSIONAL ORGANIZATIONS
	% 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	
	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 PRIVATE ORGANIZATIONS – e.g. FARMIS (infotrade) PROFESSIONAL AGRICULTURAL ORGANIZATIONS
		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%	
		Length (years of price time series)	> 5 years	> 10 years	
		Accessibility (Open data, by request, not free...)	any	open data	
		2) Attributes of MIS			
		Institutional arrangements (institutions responsible for the MIS) *	public	public - private	
		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
		Diversification of services (dissemination of additional information along with price info.)	No	Yes	<ul style="list-style-type: none"> Association of African Agricultural Professionals in the Diaspora (AAPD) <p>PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE</p> <ul style="list-style-type: none"> e.g. Ethiopia commodity exchange (ECX) <p>RESEARCH AND LITERATURE REVIEW</p> <ul style="list-style-type: none"> FAO reports World Bank reports Scientific journals
	Input prices	1) Variables on data price available			<p>INSTITUTIONS</p> <ul style="list-style-type: none"> Ministries of Agriculture & Trade National Statistical agencies African Development Bank FAO (Faostat, countrystat) World Bank (databank) United Nations (UNECA) <p>PRIVATE ORGANIZATIONS</p> <ul style="list-style-type: none"> e.g. FARMIS (infotrade) <p>PROFESSIONAL AGRICULTURAL ORGANIZATIONS</p> <ul style="list-style-type: none"> e.g. Association of African Agricultural Professionals in the Diaspora (AAPD) <p>PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE</p> <ul style="list-style-type: none"> e.g. Ethiopian coffee exchange (ECX) <p>RESEARCH AND LITERATURE REVIEW</p> <ul style="list-style-type: none"> FAO reports World Bank
		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%	
		Length (years of price time series)	> 2 years	> 5 years	
		Accessibility (Open data, by request, not free...)	any	open data	
		2) Attributes of MIS			
		Institutional arrangements (institutions responsible for the MIS) *	public	public - private	
		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
					reports – Scientific journals
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) PRIVATE COMPANIES – e.g. FARMIS (infotrade) PROFESSIONAL AGRICULTURAL ORGANIZATIONS – e.g. Association of African Agricultural Professionals in the Diaspora (AAPD) PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE – e.g. Ethiopian coffee exchange (ECX) RESEARCH AND LITERATURE REVIEW – FAO reports – World Bank reports – Scientific journals
		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%	
		Length (years of stock time series)	> 5 years	> 10 years	
		Accessibility (Open data, by request, not free...)	any	open data	
		2) Attributes of MIS			
		Institutional arrangements (institutions responsible for the MIS) *	public	public	
		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)	
	Coverage (number and relevance of inputs coverage)	-	any		
	Frequency of stock collection and dissemination (weekly, monthly ...)	-	any		
	Continuity (% of gaps within the input availability time)	-	any		

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

Sub-blocks	Primary data	Variables	Reference threshold	Desirable threshold	Potential Sources
					<ul style="list-style-type: none"> – Association of African Agricultural Professionals in the Diaspora (AAAPD) – Système d’information sur les marchés agricoles (simaniger) <p>PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE</p> <ul style="list-style-type: none"> – Ethiopia commodity exchange (ECX) <p>RESEARCH AND LITERATURE REVIEW</p> <ul style="list-style-type: none"> – FAO reports – World Bank reports – Scientific journals
	Commodity imports	1) Variables on data import available			<p>INSTITUTIONS</p> <ul style="list-style-type: none"> – 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 <p>PRIVATE COMPANIES</p> <ul style="list-style-type: none"> – e.g. FARMIS
		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	
		Accessibility (Open data, by request, not free...)	any	open data	
		2) Attributes of MIS			
		Public Institution and import statistics	public	public	
		Channel and method for data import dissemination ***	foreign trade yearbook	foreign trade yearbook & others	

Sub-blocks	Primary data	Variables	Reference threshold	Desirable threshold	Potential Sources
					(infotrade) PROFESSIONAL AGRICULTURAL ORGANIZATIONS – Association of African Agricultural Professionals in the Diaspora (AAAPD) – Système d’information sur les marchés agricoles (simaniger) PUBLIC AND/OR PRIVATE COMMODITIES EXCHANGE – Ethiopia commodity exchange (ECX) 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 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 UNIVERSITIES AND RESEARCH CENTRES - Research centres - Schools of agriculture RESEARCH AND DEVELOPMENT -Research journals, Proceedings
	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	
	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	
	Crop duration	Harvest date	
	Seed amount sold	Seeds (sowing rates, per ha)	
	Fertilizer sold	Fertilizers rates	
	Pesticides sold	Pesticides	
	Herbicides sold	Herbicides	
	Inputs quality (general information)	Inputs quality (specific information on seeds, fertilizer, pesticides)	
	Irrigation, irrigation systems	Irrigation, irrigation systems	

Sub-blocks	Reference Threshold *	Desirable Threshold **	Potential Sources
	Labour in agriculture	Labour (nb) per farm	- International projects e.g.: USAID CIRAD, GIZ, European Commission: FP7, H2020, PhD Theses NGOs
	Machinery	Tractors (nb) per farm	
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)

- a. Census (livestock and human population)
- b. Livestock holdings, number and distribution
- c. Socio-cultural issues (religion, festivities, political stability, importance per livestock species)
- d. 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.
- e. 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
- f. Vulnerabilities (including climate)
- g. 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
- h. 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)

- List of diseases which are present, classified by notifiability and zoonotic nature
- Laboratory confirmation or suspicion;
- 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)
- Number of years with the disease
- Disease-specific or multipurpose control and surveillance plans

5.3.SUB-BLOCK INFORMATION ON THE RISK OF EMERGING DISEASES (HUMAN AND ANIMAL)

- List of notifiable diseases which are absent, classified by zoonotic nature and species
- Date last detected, never reported or no information available
- 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 PRIVATE ORGANIZATIONS ACADEMIC JOURNALS RESEARCH
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	
		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	
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	
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) 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
	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	
	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 <ul style="list-style-type: none"> – 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) PRIVATE ORGANIZATIONS <ul style="list-style-type: none"> – Trade barriers org RESEARCH AND LITERATURE REVIEW <ul style="list-style-type: none"> – FAO reports – World Bank reports – Scientific journals
	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)	
	Governance **	Control of corruption Government effectiveness Rule of Law Voice and accountability Political stability and absence of violence Regulatory quality	
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 <ul style="list-style-type: none"> – 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 <ul style="list-style-type: none"> – Trade barriers org RESEARCH AND LITERATURE REVIEW <ul style="list-style-type: none"> – FAO reports – World Bank reports – Scientific journals
6.3. Insurance and other risk management	Existence of: Private insurance, public insurance or mixed	Will permit assessing the quality and predisposition to implement both public and private risk	INSTITUTIONS

Sub-blocks	Primary data	Variables	Potential Sources
policies	private-public systems	management measures.	<ul style="list-style-type: none"> – Ministries of Agriculture & Trade – African development Bank – World trade organization (WTO) – United Nations development programme (UNDP) – Global facility for disaster reduction and recovery (GFDRR) <p>PRIVATE ORGANIZATIONS</p> <ul style="list-style-type: none"> – AG Risk – Prevention web <p>RESEARCH AND LITERATURE REVIEW</p> <ul style="list-style-type: none"> – 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 <ul style="list-style-type: none"> – Ministries of Agriculture – National Statistical agencies – Open data for Africa – World Bank (databank) – African development Bank RESEARCH AND LITERATURE REVIEW <ul style="list-style-type: none"> – 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 <ul style="list-style-type: none"> – Ministries of Agriculture – National Statistical agencies – Open data for Africa – World Bank (databank) – African development Bank – Agricultural Trade intelligence for Africa (JADAFSA) RESEARCH AND LITERATURE REVIEW <ul style="list-style-type: none"> – FAO reports – World Bank reports – Scientific journals
	Pastoralist	% by species	
7.3.Other	Rural Population	Total and % of total population	INSTITUTIONS <ul style="list-style-type: none"> – National Statistical agencies – Open data for Africa – World Bank (databank) – African development Bank RESEARCH AND LITERATURE REVIEW <ul style="list-style-type: none"> – FAO reports – World Bank reports – Scientific journals
	Income	GDP per capita GNI per capita	
		Agricultural value added (%GDP) Agricultural value added per worker	

APPENDIX 2 - 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 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 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 criteria 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 are 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 $j = 1 \dots N$ 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 A.3.8 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 A.3.7 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 $k = 1 \dots M$ are the variables of the information systems of the sub-block or blocks B
- where $j = 1 \dots N$ 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 A.3.1 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	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	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							
Data series length	Not applicable	< 5 years=20 5 years=50 10 years=80 15 years=100	< 10 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	

subBlock 1.1	Weather forecast (20%)	Temperature (30%)	Precipitation (30%)	Solar radiation (2%)	RH average (2%)	Wind speed (2%)	Extreme events (14%)
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
					100	Weekly	80	Recent	100
				3 types	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	6%
Decentralization	15%
Position	8%
Frequency	15%
Update	15%
Length	6%
Accessibility	15%
Dissem. Chan.	15%
S. Diversification	5%

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)	Nº households (10)	Crop mangement (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

subBlock 4.1	Production for each crop (40)	Acreage for each crop (35)	Yield for each crop (10)	Nº households (10)	Crop mangement (5)
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	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

#	1 st level criteria	#	2 nd level criteria
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
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 concern 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
2.2	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
8.7	Unfriendly webpage but efficient search	70

#	2 nd level criteria	Pondered value (%)
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 bellow.

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 bellow.

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%