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EVALUATION REPORT OF METAGRI OPERATIONAL PROJECT (2012-2015)

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Monitoring reference: 2525-15/REM/PEX

Date: 31 December 2015

Project title: METAGRI Operational

Grant Number: 2525-15 SSA

Project data

Implementation status	Open
Type of monitoring report	External Evaluation of technical approach and impacts
Monitoring phase	Final
Type of project	Regional project
Donor	Ministry of Foreign Affairs of the Norwegian Government, AEMET (the State Meteorological Agency of Spain), Government of Greece, WMO
Title of the contract	METAGRI Operational
Implementing Agency	World Meteorological Organization
Geographical area	West Africa (Benin, Burkina Faso, Cape Verde, Chad, Côte d´Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo)
National Partners	National Meteorological Services
Responsible for the Implementing Agency	José Camacho (WMO Geneva)
M&E consultant	Vieri Tarchiani
Start-up date	01 January 2012
Closure date	31 December 2015
Dates of the M&E mission	9 April 2015 -16 January 2016

Appreciation

Project Relevance	A
Project Effectiveness	A
Implementation Efficiency	B
Impacts	B
Sustainability	A

A = high, B = medium, C = low

SUMMARY OF RESULTS

Relevance

The project was implemented by the World Meteorological Organization (WMO) in collaboration with the National Meteorological Services of Benin, Burkina Faso, Cape Verde, Chad, Côte d´Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo with funds provided by the Ministry of Foreign Affairs of the Norwegian Government but also by the Government of Greece and minor contributions from AEMET (Spain), EUMETSAT and WMO regular budget.

METAGRI OPS was designed as an operationalization phase of the METAGRI project, launched by WMO and AEMET to support West African Agriculture following the October 2007 Conference of Directors of National Meteorological and Hydrological Services of West Africa. The METAGRI project was formulated around the concept of Roving Seminars on Weather, Climate and Farmers and on the basis of the Mali experience on agrometeorology for farmers (AGROMET).

The objective of METAGRI OPS was to improve and scale up the METAGRI approach enriching it with new components as training, development of communication skills, feedback and evaluation tools and institutional strengthening. METAGRI OPS project was requested by the Conference of Directors of Western Africa National HydroMeteorological Services.

The objective of the project is in line with the MDG 1 “Eradicate extreme poverty and hunger” and its relevance is confirmed by scientific studies and technical reports.

The high relevance of the project is attested by the positive feedbacks obtained by METAGRI during its years of activity and the increasing interest in agrometeorological services for farmers coming from civil society, governments and development partners in all the involved countries.

Effectiveness

The project was built on the strong experience of METAGRI that in its last phase was operational in 14 Western Africa countries.

Compared to METAGRI, METAGRI OPS objectives were more ambitious and then the activities were articulated around five main components.

The project inherited from METAGRI an effective collaborative approach building on previous experiences and expertise of Countries that earlier have been involved. Effective south-south collaboration was established among NHMS of target countries, through Trainings of Trainers and Evaluation meetings. Even if not formalized, the project steering committee was ensured by the Conference of Directors of National Meteorological and Hydrological Services of West Africa, WMO and funding agencies. The number of beneficiary countries was impressive and with the involvement of Chad, Liberia and Sierra Leone covered the whole Western Africa and for some training expanded also to Eastern and Southern African Countries.

At national level, collaborations and partnership between NHMS and other national/local stakeholders were often developed, even if in some countries this win-win opportunity has not been fully developed.

Efficiency

Considering the large number of involved countries, the overall efficiency of project implementation was good. The final figures indicate that 12499 persons, representing 4652 villages, have been trained during 269 Roving Seminars in 17 different countries. Among participants, 11042 were farmers (13% women) and 1457 extension and other services' agents. The timing of Roving Seminars' delivery often was not the most preferable (during or after the rainy season) and this could have affected the capacity of farmers to practically use the rain gauges and valorize the weather and climate information they received. The efficiency of the project was hardly affected by security and epidemic crises in some countries. Indeed the Ebola hemorrhagic fever epidemic hampered Sierra Leone and Guinea in delivering roving seminars for two years and sociopolitical crisis in other countries evenly impeded the smooth implementation of the project.

Impacts

The project impact on the short term can be evaluated through an analysis of the farmers' performance and behavior during the growing seasons following the Roving Seminars. Impacts on the long term depend on the strength of the partnership created with the extension system and other partners well rooted at local level. Impacts are different country by country and depends not only by the level of implementation of METAGRI, but also by the context in which METAGRI operated.

Impacts on farmers' behavior and crop productivity have been quantitatively evaluated on 4 test countries in 2015. The results show that METGAGRI approach has stronger impacts where the extension system is stronger and where the relation among NHMS and farmers is closer.

Sustainability

The project sustainability lies principally in the scaling up by the beneficiaries of the activities launched by the project and on their optimization in terms of training, information production and support to farmers. The project valorized the METAGRI experience and went further paying particular attention in developing communication strategies, strengthening NHMSs capacities in delivering climate services for farmers as well as establishing partnerships with local and national stakeholders and raising public and political awareness.

Moreover, the project generated great interest in other development partners, international agencies and NGOs, ensuring long-term sustainability of the approach. Thus, conditions have been set for further expansion of investments by the National Governments and Donors, as shown by the number of requests that NHMS received for providing weather info, rain gauges and training.

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BACKGROUND

In 1982, WMO in collaboration with the Malian meteorological service and with the financial support from the Swiss Agency for Development and Cooperation (SDC), developed an innovative approach to bring agrometeorological information to rural communities and authorities, to help them in their decision making concerning farming activities and food security.

Starting in 1982 with a 5-year experimental phase, the project continued until 1995 with the support of SDC with a succession of evaluation, capacity building, and scaling-up phases. After 1995, the Malian government received contributions from different partners through the WMO for the scaling up of the approach.

The approach was built on:

1) Group de Travail Pluridisciplinaire: a multidisciplinary working group composed of members from the meteorological service, the Ministry of Agriculture, and other line ministries. One of the group's most important functions has been to act as a 'boundary institution' – bridging the gap between the climate and agricultural communities by 'translating' climate information into useful information and advice for farmers (IRI, 2007, Climate risk management in Africa: Learning from practice).

2) Paysans observateurs: Model Farmers which were given rain gauges to measure rainfall in their fields, and were trained in using them in conjunction with sowing calendars, which indicate suitable planting dates and appropriate crop varieties in the different locations, depending on rainfall as measured by the gauges.

3) Agrometeorological information adapted to the sowing calendars: throughout the May–October growing season farmers received 10-day bulletins, including agrometeorological and hydrological summary information as well as corresponding advices and recommendations; daily and 3-day weather forecasts.

As well as the project worked on fostering participation and building capacity among agricultural extension agents, establishing routes for information flow between stakeholders and developing methods for rapid processing of data and their conversion into appropriate and useful advice.

The results of this long-term project indicate that the regular provision of agrometeorological information helps farmers to manage the risks associated with increased climate variability.

In October 2007, WMO organized a Conference of Directors of National Meteorological and Hydrological Services of West Africa in Las Palmas, Spain. From this Las Palmas meeting, an action plan was developed with the objective to reinforce the NMHSs of the region. In April 2008, AEMET funded and WMO organized an Expert Meeting on Agrometeorology in the Service of West African Agriculture in Niamey, Niger.

The purpose of the meeting was to develop projects in agrometeorology for the West African countries of Burkina Faso, Mali, Mauritania, Niger, and Senegal based on funding from AEMET. The main project discussed were Roving Seminars for Weather, Climate, and Farmers, which aim to increase the interaction between the National Meteorological and Hydrological Services (NMHSs) and rural farmers.

In July 2008, National Focal Points from the five countries were selected in order to liaise with AEMET and WMO for organizing Roving Seminars in their respective countries.

The content of the Roving Seminars are adapted to the local conditions of the country and regions. The Roving Seminars are of one-day duration and bring together farmers from a group of villages to a centralized location in any given region (Roving Seminars Methodological document). Due to the success of a similar activity in Mali, that country has agreed to supply a total of 200 rain gauges to be distributed at each of the ten seminars (20 per seminar) that will be organized by each country. The focal point with assistance from Mali prepared agrometeorological advice that was used in conjunction with the rain gauge.

Building on the success obtained in the first 5 countries, during following years other countries joined the programme: Benin, Cape Verde, Gambia, Guinea, Guinea-Bissau and Togo in 2009 and Ghana, Nigeria and Côte d'Ivoire in 2011. Liberia also participated in trainings, but could not realize the seminars. Sierra Leone failed to participate at all.

The METAGRI Final Meeting, held in Bamako, Mali on 26-30 September 2011, brought together representatives from all the 15 participating countries plus AEMET and WMO to discuss the results of the 3 METAGRI phases, to analyze the gaps and to provide guidance for a new project called METAGRI OPERATIONAL (OPS).

METAGRI OPS has been conceived building on some METAGRI lessons learnt can be resumed in:

• Plastic rain gauge is a good tool but it needs improvements.

• Communications tools are improving quickly, so that special attention should be paid to new communication procedures, integrating existing and old practices.

• In some Countries, there is a need to develop or strength the Pluridisciplinary Working Groups in Agrometeorology, involving agricultural authorities, food security officers, plant and animal health experts, researchers and meteorologists.

• NMHS should be better integrated into the National Action Plans for Adaptation to Climate Change.

• More attention on the role of the media, the use of local languages for walking the last mile to reach the users.

The New project started in 2012 with the objective to improve the performance of the Roving Seminars, as requested by the Conference of Directors of Western Africa NMHS, and to

develop new components as training, development of communications skills, feedback and evaluation tools and institutional strengthening. That project is an evolution of METAGRI in order to provide weather and climate services to a wider public of rural sectors (including livestock management, forest, traditional fishermen) by the NHMS in close cooperation with other national institutions that have mandate on food production or food security.

METAGRI OPS has been implemented in 17 Countries: Burkina Faso, Mali, Mauritania, Niger, Senegal, Benin, Cape Verde, Gambia, Guinea, Guinea-Bissau, Togo, Ghana, Nigeria, Côte d'Ivoire, Liberia, Chad, and Sierra Leone. Chad and Sierra Leone who did not participate in METAGRI joined respectively in 2012 and 2014. Moreover the training component was opened also to other countries of Central (Cameroon) and East Africa (Ethiopia, Tanzania, Kenya, Uganda and others).

METAGRI OPS funds were provided by Ministry of Foreign Affairs of the Norwegian Government but also by the Government of Greece and minor contributions from AEMET (Spain), EUMETSAT and WMO regular budget.

An external project evaluation was undertaken by Dr Vieri Tarchiani (Institute of Biometeorology of the Italian National Research Council) from April to December 2015. The evaluation methodology assesses the five evaluation criteria endorsed by the OECD-DAC: Relevance, Effectiveness, Efficiency, Impacts and Sustainability of the project.

The evaluation report is organized in a general synthesis of METAGRI OPS, a factsheet per Country, a special evaluation report on METAGRI OPS in four pilot Countries (Niger, Mauritania, Côte d´Ivoire, Ghana).

METAGRI OPERATIONAL PROJECT

METAGRI OPERATIONAL objective is to improve the performance and operationalize the Roving Seminars approach of METAGRI in West Africa in order to strengthen decisions making at local level in relation with food production management, poverty reduction & food insecurity reduction.

The project is an evolution of METAGRI in order to provide weather and climate services to a wider public of rural sectors (including livestock management, forest, traditional fisheries and rangelands) by the NMHS in close cooperation with other national institutions that have mandate on food production or food security.

In order to reach the expected results, METAGRI OPS includes new components as training, development of communications skills, feedback and evaluation tools and institutional strengthening.

At institutional level, METAGRI OPS aims to increase of the interaction of NHMS with users at national level in order to:

- Mainstreaming food security and food production issues in relation with climate change and variability at the NMHS Strategic planning;
- Incorporate NMHS on Climate change adaptation activities at national, regional or international level;
- Strengthening the contribution of NHMS in the development and implementation of the Global Framework for Climate Services;
- Promote International cooperation among the NMHS, WMO, AGRHYMET and other partners as ECOWAS, ACMAD or other African institutions.

Project organization

The project, Coordinated by WMO was implemented in each country by the National HydroMeteorological Service (NHMS). The National Focal Points of METAGRI were confirmed where possible. The role of the National Focal points was to liaise with WMO in developing detailed action plans (including dates, identification of beneficiary localities, logistical organization, etc.) for organizing the roving seminars in their respective countries. Each country was provided with a yearly budget for organizing a defined number of Roving Seminars and other ancillary activities. The project steering committee was ensured by the Conference of Directors of National Meteorological and Hydrological Services of West Africa, WMO and funding agencies.

Table 1, METAGRI Partners and Focal Points

Country	NHMS	National Focal Point
Benin	Direction de la Météorologie Nationale	Mr NAPKON Kokou Marcelin/Mr. AGBADJAGAN Janvier *
Burkina Faso	Direction de la Météorologie Nationale	Mme SANFO B. Judith */Mr SIA Cyriaque
Cabo Verde	Instituto Nacional de Meteorologia e Geophísica	Mr SPENCER Joao
Chad	Direction Générale de la Météorologie Nationale	Mr DJERGO Gaya/Mr. MBAITOUBAM Elie
Côte d'Ivoire	Direction de la Météorologie Nationale	Mr MIAN Kodjenini Augustin
Gambia	Department of Water Resources	Mr GIBBA Peter/ Mr JALLOW Alpha
Ghana	Ghana Meteorological Agency	Mr POKPERLAAR Dominic Soami
Guinée	Direction Nationale de la Météorologie	Ms DIALLO Halimatou
Guiné Bissau	Direccao do Servicio Nacional da Meteorologia	Mr DIAS FONSECA Francisco
Liberia	Division of Meteorology	Mr SIMPSON Henry A.
Mali	Agence Nationale de la Météorologie	Mr DIARRA Z. Dauda
Mauritania	Office National de la Météorologie	Mr COULIBALY Hamidou
Niger	Direction de la Météorologie Nationale	Mme SITTA Aïssatou Adamou
Nigeria	Nigerian Meteorological Agency	Mr IJAMPY James Adamu
Senegal	Agence Nationale de l'Aviation Civile et de la Météorologie	Mr NDIAYE Mamadou
Sierra Leone	Meteorological Department	Mr MUSA Patrick/Mr. BOCKARI Alpha
Togo	Direction Générale de la Météorologie Nationale	Mr AFFO-DOGO Abalo/Mr. KPOGO Louis Yao Doh

**** Deceased while appointed as Focal Points***

Project implementation

The project was launched in 2012 and should last up to December 2015. The project is articulated around five main components that respond to specific needs for the improvement of decision making in agriculture by the use of climate and weather information.

1. First component aims to improve the Roving Seminars approach in terms of performance, reaching a bigger audience, broadening observed rainfall databases, standardization of simple plastic rain-gauges, development of basic manual to perform roving seminars, identification of climate related risk on agriculture and integration of traditional knowledge into the roving seminars.
2. Second component targets directly capacity-building needs inside NHMS to improve their skills in crop modeling, use of remote sensing and GIS tools.
3. Third component concerns communications aspects between NMHS, final users and institutional users/partners, mainly through the relations with the media at national, regional or local level.
4. Fourth component is related to feedback information process and evaluation of the overall scheme by assessment of impacts and user satisfaction survey.
5. Component five is institutional strengthening inside the country and development and/or improvements of partnerships between national institutions.

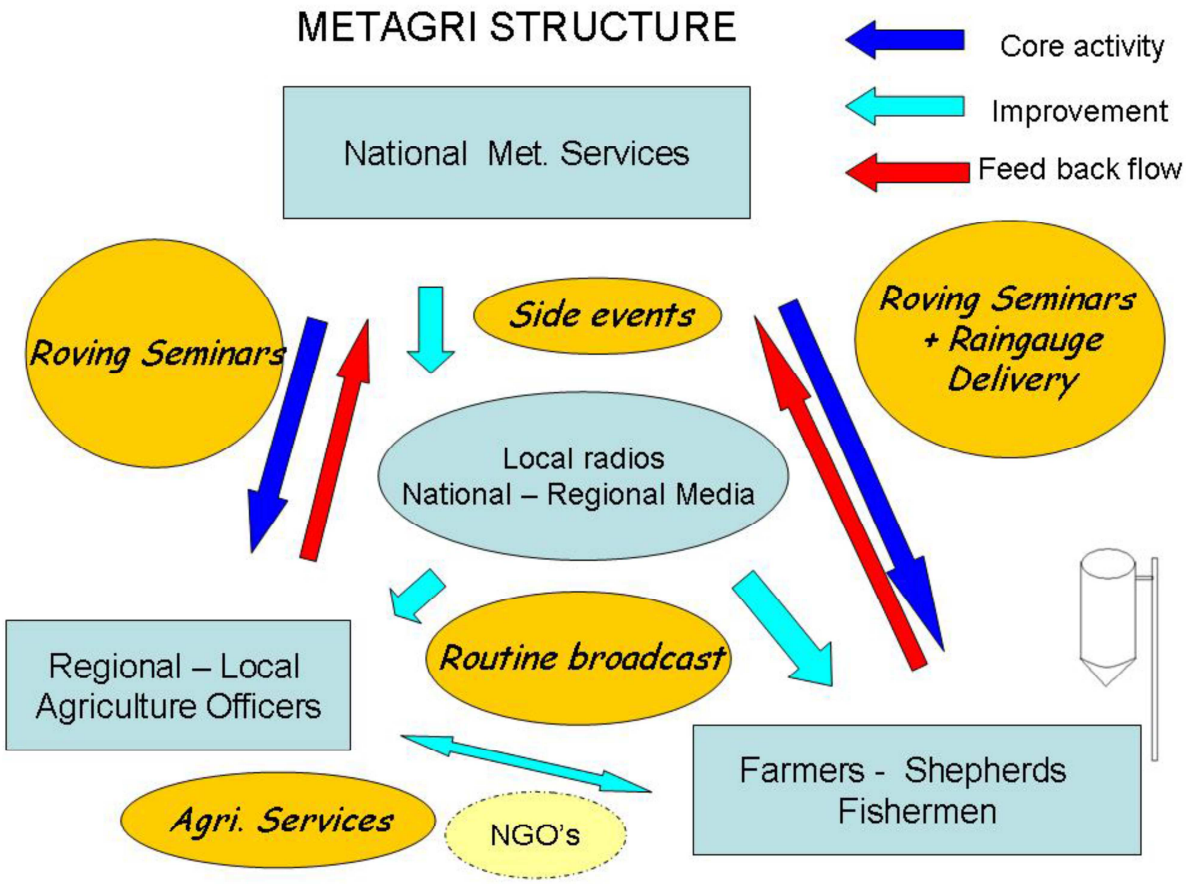

Figure 1, METAGRI OPS New Components

Table 2, METAGRI OPS implementation outcomes

Year	Countries	C.1 Roving Seminars	C.2 Capacity building	C.3 Communication	C.4 Evaluation	C.5 Institutional Strengthening
2012	16 (Burkina Faso, Mali, Mauritania, Niger, Senegal, Benin, Cape Verde, Gambia, Guinea, Guinea-Bissau, Togo, Ghana, Nigeria, Côte d'Ivoire, Liberia, Chad)	- 126 roving seminars and 2352 rain-gauges - Basic Manual to perform Roving Seminars - Training of Trainers Workshop, in Liberia (17-19 April)	- WMO - EUMETSAT Training in Niamey (19/23 November) -	METAGRI Media Workshop, in Dakar (13 December)	METAGRI Evaluation Workshop, in Dakar (14 December)	
2013	16 (Burkina Faso, Mali, Mauritania, Niger, Senegal, Benin, Cape Verde, Gambia, Guinea, Guinea-Bissau, Togo, Ghana, Nigeria, Côte d'Ivoire, Liberia, Chad)	- 77 roving seminars and 1411 rain gauges - report on the integration of traditional knowledge in Roving Seminars - Regional report on Climate and weather risks in agriculture - Analysis of rain gauge quality in Mali and Ghana	- Operational Test of SARRA-H in Niger Training Course on SARRA-H in Niamey (28 October to 1 November) - WMO - EUMETSAT Training in Accra (10-14 June)	- 4 Media-meteorologist workshops (Liberia, Guinea-Bissau, Togo, Guinea)	-	-
2014	17 (Burkina Faso, Mali, Mauritania, Niger, Senegal, Benin, Cape Verde, Chad, Gambia, Guinea, Guinea-Bissau, Togo, Ghana, Nigeria, Côte d'Ivoire, Liberia and Sierra Leone)	- 38 roving seminars and 623 rain gauges - Training the Trainers Workshop for Roving Seminars, in Sierra Leone (12-18 May)	- Training Course on SARRA-H in Banjul (24 - 28 February) - Training Course on SARRA-H in Abidjan (17 - 21 March) - WMO - EUMETSAT Training Course in Ouagadougou (5 to 9 May)	- 4 Media-meteorologist workshops (Gambia, Sierra Leone, Mauritania and Guinea Bissau)	-	-
2015	17 (Burkina Faso, Mali, Mauritania, Niger, Senegal, Benin, Cape Verde, Chad, Gambia, Guinea, Guinea-Bissau, Togo, Ghana, Nigeria, Côte d'Ivoire, Liberia and Sierra Leone)	- 28 roving seminars and 441 rain gauges - A comparison study of farmer rain gauge with other rain gauges by Italian NMS	- WMO - EUMETSAT Training Course in Addis Ababa (23-27 March)	- 9 Media-meteorologist workshops (Benin, Burkina Faso, Cabo Verde, Chad, Niger (2), Mali (3),)	- Methodology for Weather and Climate Services' impact assessment - Test of impacts assessment methodology in Ghana, Mauritania, Côte d´Ivoire and Niger - METAGRI OPS Evaluation report - Final METAGRI OPS Meeting in Abidjan (November 2015)	-

Component 1: Roving Seminars

The Roving Seminars on Weather, Climate and Farmers are one or two day seminars aiming to sensitize farmers about the weather and climate information and its applications in operational farm management. Farmers from a group of villages are gathered in a centralized location in any selected region. The objective of these seminars is to make farmers become more self-reliant in dealing with weather and climate issues that affect agricultural production on their farms and to increase the interaction between the local farming communities and the local staff of the National Meteorological and Hydrological Services (NMHSs). This feedback is crucial for the NMHSs in providing better services for the agricultural community.

Roving Seminars are organized in two parts. The first focus on five main topics: climate variability and climate change, specific climate risk for agriculture in the host region, agro meteorology (products and tools), agronomic research and adaptation to climate change and Farmer Perception of Weather and Climate Information Provision and Feedback. The second part is devoted to the so-called farmer's rain gauge, including rainfall observation techniques, data collection and transmission and rain gauge installation.

At every seminar, a limited number of simple plastic rain gauges built in Mali are provided to the most skillful farmers, allowing them to measure rainfall in their plots. These rainfall measurements provide them an estimation of the soil moisture and could be used to make decisions in critical crop timing regarding when to plant and which variety of seed to use according to date, received rainfall, and expected character of the rainfall season. Those selected farmers also act as leaders in their communities by conveying weather and climate information and providing useful information to the national meteorological services and agricultural authorities about rainfall, weather phenomena, status of crops, pest and plagues occurrences or other aspects of crop evolution.

Training teams were multidisciplinary with meteorologists, agricultural extension agents and experts in agriculture. They liaise previously with regional authorities and convoke the farmers to a convenient place in the agricultural area providing them transportation fees, coffee and tea, and lunch. Often, local NGOs, other development partners and research institutions in agriculture were associated to the Seminars. Media coverage was also encouraged to give more eco to the Seminars.

The choice of localities where to organize the Roving Seminars responded to the basic criteria of equal geographic distribution among country's regions and production systems. Taking into consideration the coverage of Seminars ensured by METAGRI (2008-11), NHMS in collaboration with Extension services and other partners define each year the regions/districts where to conduct the new seminars. Moreover, in some countries where the Roving Seminars have been supported and financed also by other partners/projects, it was

decided to avoid overlapping and cover the most of the geographic extension of the country. In some cases, security conditions prevent to conduct seminars in specific areas (e.g. Mali, Nigeria) or impeded at all the activities (e.g. in Guinea during the epidemic of Ebola hemorrhagic fever).

Plastic Rain gauges

Plastic Rain gauges have been developed and used first in the Malian pilot project in order to respond to the increasing request of the populations in the meteorological assistance and to the lack and high cost of imported rain gauges. They were designed to measure liquid precipitation as representative as possible in various Sahelian countries. Indeed, the dimensions of rain gauges were specified according to the daily precipitations on the region. At Gulf of Guinea countries, several reports indicated that a bigger gauge would be needed there. They were locally manufactured from a mall by a private company. The farmer rain gauge is composed of:

1. a graduated plastic bucket with a receiving ring of 100 cm2 of surface; a plastic ribbon with a graduated scale is also attached.
2. a metal support provided with two smooth iron rings welded on to the higher edges to maintain the bucket vertical and stable. Supports are made at every country by local providers.

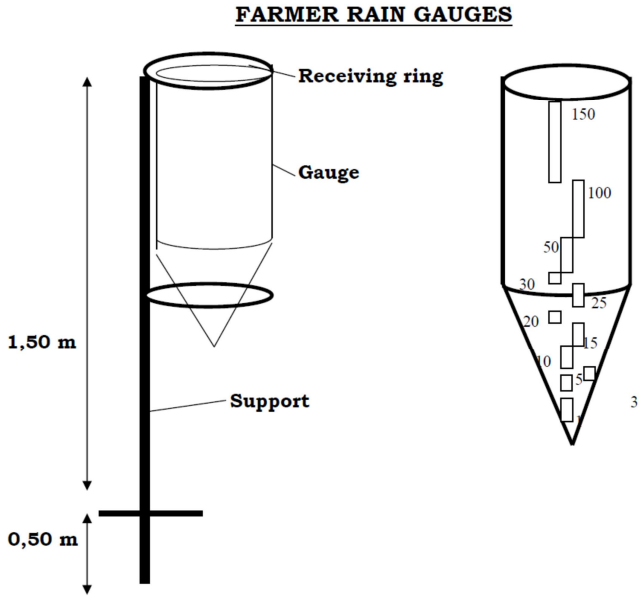

Figure 2, Farmer Rain Gauge (Source: DNM Mali, LOCAL MANUFACTURED FARMER RAIN GAUGES IN MALI)

In 2013, METAGRI OPS engaged in the improvement of rain-gauge quality with a test in Ghana for Guinea Gulf climatic conditions and in Mali.

METAGRI OPS approached the Commission for Instruments and Methods of Observation (CIMO) to perform the characterization of farmer rain gauges used in Africa and provide guidance on how to improve the plastic gauges. Development of Quality Control activities has been carried out at ResMA (Italian CIMO Centre) to check the current plastic rain gauge distributed by METAGRI in Western Africa and other models and to provide specifications to simple plastic rain gauges to be used in support of agriculture. This activity has been developed in 2015 jointly by CIMO-CHy-CCl-CAgM.

Main outcomes of component 1 are:

- 269 Roving Seminars were performed training approximately 11,042 farmers in a total of 12,499 persons trained. More than 4800 simple plastic rain gauges were distributed.
- Among roving seminars 19 were organized for fishermen, where 140 sets of flags have been distributes.
- a Basic Manual to perform Roving Seminars in French, English and Spanish versions,
- A regional report on Climate Relate risks in agriculture,
- a report on the integration of traditional knowledge in Roving Seminars based on the experience from Senegal (in French)
- a report on rainfall measurements comparisons between traditional and simple plastic rain gauges in Mali and Ghana.
- An analysis of plastic rain gauge performance compared to 3 other types of rain gauges performed by the Italian National Met Service in Vigna di Valle.
- WMO/FAO METAGRI-OPS Training of Trainers Workshop, in Monrovia (Liberia) 17-19 April 2012. At the end of the workshop a joint technical committee was establish composed of 2 FAO Staff, 1 MOA staff, 3 NMS staff and 2 Ministry of Lands, Mines and Energy staff. The joint technical committee was tasked with the responsibility to ensure the planning and full implementation of the METAGRI Roving Seminars.
- WMO/IFAD METAGRI-OPS Training the Trainers Workshop for Roving Seminars, in Freetown (Sierra Leone) 12-13 May 2014

Table 3, Roving Seminars statistics

Roving Seminars	269
Rain gauges	4827
Flags (sets)	200
Total trainees	12499
Trained Farmers	11162
Trained Women	1464 (13% of farmers)
Trained E. Agents	1457 (12% of trainees)
Villages	4652

Roving Seminars for fishermen

In Cape Verde, Ghana, Guinea Bissau, Côte d´Ivoire, Liberia, Mauritania, Nigeria, Senegal and Togo roving seminars for fishers were organized in 2014 and 2015.

Senegal is the champion of Seminars for fishermen, with 5 seminars organized in 2015 and 188 fishermen trained.

In Liberia, a roving seminar for fishermen was conducted on June 5, 2015 in the Port City of Buchannan, Grand Bassa County. It covered four coastal counties Namely: Grand Cape Mount County, Grand Bassa Margibi and Rive Cess. Twenty fishermen and fish mongers were trained. Alert flags and rain gauges were distributed to trainees. In Mauritania, the seminar was co-sponsorised by the German Cooperation and in Guinea Bissau INM received a contribution from the Institut Maritime et Portuaire (IMP).

In some countries, alert flags have been distributed to fishermen during seminars. The sets were composed by 3 flags: red, yellow (except in Guinea where it was pink) and green.

Table 4, Roving Seminars for fishermen

Country	RS for fishermen	Flags sets
Benin	0	
Burkina Faso	0	
Cape Verde	2	40
Chad	0	
Gambia	1	
Ghana	2	
Guinea	2	60
Guinea Bissau	2	
Côte d´Ivoire	1	
Liberia	1	20
Mali	0	
Mauritania	1	
Niger	0	
Nigeria	1	20
Sierra Leone	0	
Senegal	5	
Togo	1	
TOTAL	**19**	**140**

Component 2: Capacity building

Under Component 2, several capacity-building activities have been developed in order to improve NHMS skills in crop modeling, use of remote sensing and GIS tools.

SARRA-H

1. Operational Test of SARRA-H in Niger, two consultants of DMN Niger that have performed operational trials in Niger for the implementation of SARRA-H crop model

and they delivered a comprehensive report on troubles found and advised about the procedures to be used at the first training course on the operational use of this model.

2. Training Course on crop model SARRA-H, first edition in Niamey (Niger) at AGRHYMET Regional Center 28 October to 1 November 2013 : with the participation of two representatives, one expert in agrometeorology and other expert in ITDs from Mali, Niger, Chad, Mauritania, Togo and Benin. The trainers were from the AGRHYMET Centre with the collaboration of CIRAD and the DMN of Niger. Following the Course, AGHRYMET has been tasked to complete final adjustments on the operational software and to provide translations to English on the software interfaces and on the operational manuals. (Results from Report C. Baron)
3. Training Course on crop model SARRA-H Crop Model Operational Implementation, second edition in Banjul (Gambia) 24 - 28 February 2014 : with the participation of two representatives, one expert in agrometeorology and other expert in ITDs from Ghana, Nigeria, Sierra Leone, Gambia and Liberia. The trainers were from the AGRHYMET Centre and from CIRAD.
4. Training Course on crop model SARRA-H Crop Model Operational Implementation, third edition in Abidjan (Côte d´Ivoire) 17 - 21 March 2014 : with the participation of two representatives, one expert in agrometeorology and other expert in ITDs from Guinea, Burkina Faso, Senegal, Cabo Verde, Guinea Bissau, Côte d´Ivoire. The trainers were from the AGRHYMET Centre with the collaboration of CIRAD. Following the Course, some recommendation for the improvement of the SARRA-H usability and affordance have been proposed.

<u>Use of satellite products in agro- meteorology</u>

1. WMO - EUMETSAT Training Course on the Utilization of Satellite Products for Agrometeorological Applications, first edition in Niamey (Niger) 19-23 November 2012 : participants from Mali, Mauritania, Senegal, Guinea-Bissau, Guinea, Côte d' Ivoire, Chad and Togo.
2. WMO - EUMETSAT Training Course on the Utilization of Satellite Products for Agrometeorological Applications, second edition in Accra (Ghana) 10-14 June 2013: participants from Nigeria, Liberia, Guinea, Cape Vert, Ghana, Gambia, Kenya, Ethiopia, Uganda and Tanzania.
3. WMO - EUMETSAT Training Course on the Utilization of Satellite Products for Agrometeorological Applications, third edition in Ouagadougou (Burkina Faso) from 5 to 9 May 2014: in French, attended by representatives of meteorological services in Benin, Burkina Faso, Cameroon, Côte d´Ivoire, Chad, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Senegal and Togo. The course, aimed at the specific needs of the region, had teachers of institutions who are active in this field: WMO, EUMETSAT, Land SAF, TAMSAT, JRC, FAO, University of Lisbon. AEMET contributed with specific teachers to present the Barcelona Dust Forecast Centre and Nowcasting SAF products and some experiences in distance learning.
4. WMO - EUMETSAT Training Course on satellite products utilization in agro-meteorology, fourth edition in Addis Ababa (Ethiopia) 23-27 march 2015: with the participation of Gambia, Nigeria, Uganda, Kenya, Tanzania, Rwanda, Burundi, Sud Sudan, Malawi, Zambia, Zimbabwe. The course, aimed at the specific needs of the region, had teachers of institutions who are active in this field: WMO, EUMETSAT, Land SAF, JRC, FAO, AEMET.

GIS training course has not been done

Component 3 – Communication

Component 3 activities aim to improve NHMS relations with the media. Starting from the experience of METAGRI, activities have gone further on the development of a communication strategy for NMHS in Western Africa with special focus on the delivery of agricultural meteorology services and products and to develop feed back channels from the users by strengthening relations with the media. A consultant was hired by WMO to assist countries in the definition of communication strategies, developing a communication work plan and organizing Meteo-Media workshops. Main results achieved under this component are:

1. Brochure on Roving Seminars activities,
2. METAGRI Media Workshop, in Dakar (Senegal) 13 Dec 2012,
3. 18 Media-meteorologist workshops (on the basis of the one performed in Senegal in December 2012) in Benin, Burkina Faso, Cabo Verde, Chad, Gambia, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Senegal, Sierra Leone and Togo.
4. NMHS communications strategy and action plans have been developed for all the countries where the Media-meteorologist workshops have been carried out.
5. Implementation of action plans, including agreements with media, establishment of communication networks in some countries (Mauritania, Gambia)
6. Documentary videos produced in some countries (Côte d´Ivoire, Senegal).
7. A video about the Roving Seminars in Western Africa is under production.

Component 4 - Feed back and evaluation tools

In the framework of METAGRI OPS Component 4 - Feed back and evaluation tools, some activities of evaluation have been carried out since 2012:

1. METAGRI Evaluation Workshop, in Dakar (Senegal) 14 December 2012
2. Survey on Roving Seminars (2012): after the first year of METAGRI OPS, a survey on National Focal Points advices and recommendation has been conducted for the improvement of Roving Seminars in terms of logistics, communication, constraints and possible solutions.
3. Methodology for Weather and Climate Services' impact assessment (2015): a methodology for the assessment of climate services impacts at local level has been proposed. The Objective is the assessment of farmer use and impacts of Weather and Climate Services on smallholder farmer behavior and crop production. The assessment will be community based and context specific, indeed project impacts will be evaluated in relation to the national context for 4 selected countries. The methodology includes:
    a) Assessing the context of climate services in the country:
    b) Assessing use and impacts of Weather and Climate Services on farmers behavior
    c) Assessing impacts of Weather and Climate Services on crop production
4. Test of impacts assessment methodology in Ghana, Mauritania, Côte d´Ivoire and Niger developed in collaboration of the Focal Points of selected Countries for the application during the 2015 campaign.
5. METAGRI OPS Evaluation (2015)

Component 5. Institutional development

Institutional collaborations and projects have been developed in many countries with the aim to scale up the METAGRI Approach, particularly concerning Roving Seminars and distribution of Rain Gauges.

In all the countries thanks to METAGRI first and METAGRI OPS later, NHMSs could establish new and fruitful institutional collaborations with the Agricultural Extension Services, the Ministries of Agriculture and other line Ministries. In some countries such collaborations involved also Research Institutions (Benin, Cap Vert, Guinea, Côte d´Ivoire, Nigeria,…) and International Organizations (Liberia, Sierra Leone, Gambia,…)

Moreover, NHMSs could strengthen their role at national level, increasing their visibility allowing new partnership with other initiatives/donors. For example, in Mauritania, thanks to complementary funding from the Global Climate Change Alliance (EU-UNDP-GIZ) 10 Roving Seminars and 500 rain gauges have been provided for the Regions of Assaba and Guidimagha in 2014 and 2015.

In Niger, thanks to complementary funding to METAGRI ones, DMN could extend the METAGRI approach:

- 5 Roving Seminars in 3 Municipalities (40 villages) in the Tillabery Region and the production of special agrometeorological bulletins for the involved communities (ANADIA Niger – Italian Cooperation; 2014/15);
- 2 Roving Seminars involving globally 10 Municipalities along the Niger River and 26 villages (PROCAN project – GIZ; 2015);
- 1 Roving Seminar for 9 villages in 2 Municipalities (CARE Niger; 2014).

In Ghana, a collaboration with CARE International in the Adaptation and Learning Programme allowed to a wider dissemination of climatic services among farmers in some pilot areas.

In Mali, 3 Meteo-Media workshops have been organized thanks to the collaboration with a World Bank project and a USAID project.

Nevertheless, some activities foreseen under this component have not been finally realized, such as the Support to Interdisciplinary Working Groups on Food Security and Food production and the METEO-Decision Makers workshops.

METAGRI OPS EVALUATION

The external evaluation of the METAGRI OPS project (2012-2015) was carried out by Dr. Vieri Tarchiani (Institute of Biometeorology of the Italian National Research Council) upon demand of the World Meteorological Organization. The objective is to evaluate the project implementation in relation to project objectives using existing reporting. The Evaluation process, based on project documentation assesses the five evaluation criteria endorsed by the OECD-DAC:

- Relevance
  - Of the project objectives
  - Of the approach towards reaching objectives
- Effectiveness
  - Of the approach
- Efficiency
  - In the implementation of activities
- Impacts, in terms of:
  - Improving the capacities of NHMSs to produce and communicate of weather and climate information for farmers;
  - Farmers' behavior and productivity;
- Sustainability
  - In terms of scaling-up and institutionalization

Documentation about METAGRI OPS project, METAGRI OPS national reports of different phases were provided by WMO and by NHMSs (Annex 2, list of consulted documents).

For the purpose of the METAGRI OPS evaluation, a simplified evaluation model was adopted for the evaluation of the whole process together, using simplified indicators in order to assess the Relevance, Effectiveness, Efficiency, Impacts and Sustainability of the overall approach with focus on the different project components and improvements compared to METAGRI.

In terms of project conception and formulation, METAGRI OPS as well as METAGRI was a process rather than a project. Indeed, there is not a specific initial plan for METAGRI OPS but a growing experience starting from the recommendations of the METAGRI Final Meeting, held in Bamako, Mali on 26-30 September 2011. The process was annually renovated, without a project document, a Logical Framework or a M&E framework. The project objectives and action plan can be extrapolated only from the proceedings of the meetings where they have been defined. In this context, the project evaluation cannot refer to objective targets (Performance indicators) and thus the present evaluation is built on ex-post qualitative indicators, calculated on the basis of the data presented by each country in the annual reports or at the final METAGRI OPS conference.
Evaluation activities done under Component 4 provide some figures for the first year of METAGRI OPS (Evaluation report 2012 and National Focal Points Survey 2012). METAGRI OPS realized an Impacts Assessment in 2015 in 4 pilot countries (Niger, Mauritania, Côte d´Ivoire and Ghana) in order to evaluate the real impacts of Roving Seminars on productivity and farmers' behavior.

The impacts assessment methodology has been developed in collaboration with the Focal Points of selected Countries (Ghana, Mauritania, Côte d´Ivoire and Niger) for the application during the 2015 campaign.

This assessment activity has a double objective, firstly to have a semi-quantitative assessment of METAGRI OPS impacts on rural activities, second to test an evaluation methodology that could be extended to other Western Africa Countries and other regions. The test methodology includes:

a) Assessing the context of climate services in the country
b) Assessing use and impacts of Weather and Climate Services on farmers behavior
c) Assessing impacts of Weather and Climate Services on crop production

The impact assessment on crop productivity has been done through questionnaires, participatory evaluation tools (Participatory success indicators: what would indicate farmers that the climate services are a valuable investment) and in-situ measures on crop production (Objective indicators of success).

In each target country, the assessment has been carried out on 4 sites:

- 2 new sites
- 2 METAGRI-OPS sites

Four Roving Seminars in each country has been done. In the METAGRI OPS sites, the Roving Seminar focused on further training and information (seasonal forecasts for example) for observing farmers, collecting of feedbacks, and replacement of damaged rain gauges. Roving Seminars have been followed by mid season (post seeding) evaluation field missions and end of cropping season evaluation missions in each of the 4 sites per selected country. In each site 2 pilot and 2 control farmers has been selected. For each farmer 3 plots have been identified in the same field (parcel). Three questionnaires have been prepared, for the evaluation. Collected data are organized in a database for further analysis and scientific research.

The results of the assessment are provided by the Report on Weather and Climate Services' impact assessment (V. Tarchiani 2015).

The following table gives a general overview of the project evaluation.

Table 5, General evaluation of METAGRI approach implementation

Criteria	Score	Indicators
Relevance	High	Building on previous experiences Interest of NMHS, Agriculture Technical Services and Research, NGOs and civil society, farmers and farmers associations

Effectiveness	High	South-south collaboration Partnership between NHMS and other national/local stakeholders and improvements compared to METAGRI Collaborations with other initiatives
Efficiency	Medium	Component 1: RS implementation targets and timing Component 2: Capacity building activities targets and timing Component 3: Media involvement and Media-meteorologists workshops targets and timing Component 4: feedback and evaluation activities targets and timing Component 5: Institutional development activities targets and timing
Impact	Medium	On NHMS: capacities to provide weather and climate services, Improvements respect to METAGRI, communication and institutional development On farmers: behavior and crop production (Evaluation of impacts)
Sustainability	High	Stakeholders commitment Scaling up by farmers and civil society Synergies and new projects

Relevance

The project was formulated by WMO in collaboration with the Conference of Directors of National Meteorological and Hydrological Services of West Africa and based on the lessons learnt of METAGRI (2008-11). The relevance of METAGRI was well documented starting from the experience on agrometeorology for farmers since 1982 by the Malian Meteorological Service, assisted by AGRHYMET and with technical support from the WMO and financial support from the Swiss Agency for Development and Cooperation (SDC). The Mali experience evolved through different phases until 1995, after which the Malian government received contributions from different partners through the WMO for the scaling up of the approach. The results of this long-term experience indicate that the regular provision of agrometeorological information helps farmers to manage the risks associated with increased climate variability. Since the pilot phase, the results from the field showed increases in yields for the plots where the farmers had used agro-meteorological information, as compared to the traditionally managed plots. Testimonies from farmers indicated substantial production increases in maize, sorghum, pearl millet, groundnut, and cotton generating household increase in income and resilience to climatic risks.

On the bases of this positive experience, METAGRI was designed to increase awareness of farmers on weather and climate risk management, the use of weather and climate information and services to improve rural production and better prepare against the weather threats emerging from climate change.

The same assumptions on which METAGRI was formulated are on the basis of its scaling up and improvement targeted by METAGRI OPS: that targeted weather and climate information

and awareness can increase farmers' climatic resilience securing and improving rural productions and leading to sustainable economic and social development for rural communities. Effective approaches to reach this target need to be participatory, cross-disciplinary and to bring together research and development expertise with farmers as equal partners to reap the benefits from weather and climate knowledge.

Therefore, the relevance of project objective is undoubted, considering that scientific works and practice experience in the region indicate that weather and climate are still the most critical risk factors affecting farming performance and management. Extreme weather and climate events such as droughts and floods are increasing in frequency and intensity due to climate change and strongly affect sustainable farming development and food security. Climate variability and change also exacerbate the vulnerability of individual farmers and whole rural communities.

Compared to METAGRI, METAGRI OPS was designed to bridge some gaps arose at the METAGRI final conference in order to widen the beneficiaries of weather and climate services including non-agriculture sectors such as livestock management, forest, traditional fisheries and rangelands) and improve the services with an integrated and holistic approach. 4 new components have been added to the project design in order to reinforce NMHS capacities and cooperation with other national institutions that have mandate on food production or food security:

1. Roving Seminars and rain gauges improvement
2. NHMS capacity building in crop modeling, and use of satellite data
3. Communication of Agrometeorological information and media relationships
4. Feedbacks and evaluation
5. Institutional development

These new components respond to METAGRI recommendations underpinning the METAGRI OPS relevance.

Concerning the approach for Roving Seminars, as for METAGRI, it remained in most countries limited to one shot training and sensitizing activities with farmers, without strong follow-up that would be needed to ensure long-term sustainability and impacts. Some exceptions exist, for example in Mauritania, where thanks to the engagement of the NMS and the limited extension of cropping area, farmers could benefit of yearly monitoring and follow-up. Niger thanks to external funding and synergies developed with other projects, some follow-up actions have been also done.

The Communication component of METAGRI OPS has a particular relevance for NHMSs even independently from METAGRI. All NHMSs in the region show dramatic limits in communication to the public and METAGRI OPS could start the process to bridge this gap. Concerning the agrometeorological sector, METAGRI OPS engaged in exploring new communication strategies among farmers, NHMSs and extension services.

Last aspect to be underlined is the relevance of Roving seminars for fishers. Security for fishers and maritime transportation is very sensitive in coastal countries. The number of causalities during last years is increasing. The use of precarious boats and navigation materials coupled with increasing extreme weather events and the need to fish farer from coast because of captures reduction make very relevant to provide weather info for fisherman's communities.

Final score: High

Effectiveness

METAGRI OPS was developed as a consensual process among funding agencies, implementing agency and national counterparts. Annual implementation plans were developed by WMO in collaboration with NHMSs. The project was not formalized with a project document, including Logical Framework and Monitoring & Evaluation framework. Thus, it is not possible to evaluate the project effectiveness against Key performance and Delivery indicators. The effectiveness of the project approach is therefore evaluated on the basis of qualitative ex-post indicators. 17 countries have been actively involved in the project of which 14 had been already involved in METAGRI.

The project approach was effective in up scaling the METAGRI experience. Indeed, since the beginning, strong **south-south collaboration** was encouraged between first phases' participants and other countries. For example, the Training of Trainers workshop of 2014 in Sierra Leone was led by a resource person from the Republic of Liberia.

An Evaluation Meeting was held in Dakar, Senegal on 14 December 2012. This meeting brought together representatives from 15 Countries, WMO, and AEMET. The meeting aimed to analyze the first year of METAGRI OPS, to evaluate the outcomes and to ensure discussions about encountered difficulties and planning of following years. Moreover, during this meeting a METAGRI Media Workshop was organized.

Trainings of trainers for last embarked countries have been organized: 17-19 April 2013 in Monrovia (Sierra Leone) and on 12-13 May 2014 in Freetown (Liberia).

Technical trainings organized by METAGRI OPS also included south-south collaborations, particularly with the AGRHYMET Regional Center and participating in ECOWAS, CILSS or CCAFS meetings, but also involving NHMS experts as trainers for other participants. That was the case of the SARRA-H Training Courses.

Partnership between NHMS and other national and local stakeholders has been encouraged through Component 1, 3 and 5. METAGRI had already contributed to create fruitful and win-win partnership among NHMS and:

- Agricultural Extension Services,
- Agricultural and other Technical Services (national and decentralized),

- ONGs (National and International i.a. CARE),
- Peasants' organizations (i.a. CNCR-Senegal) and fishers' organization (Union des Coopératives de Pêche Maritime in Togo),
- Agronomic Research Institutions (i.a. INERA-Burkina, ISRA-Senegal, CNRA-Cote d'Ivoire),
- Harbors and navigation authorities,
- International Organizations (i.a. IFAD in Sierra Leone, FAO in Liberia).

Such collaborations evolved during the years and new ones arose, as showed by the following table.

Table 6, Collaborations established under METAGRI and METAGRI OPS

Country	Ag. Ext. Serv.	Tech. Serv.	ONG	PO	Research	International organizations
Benin	mO	O			mO	
Burkina Faso	mO	mO	mO	mO	m	
Cape Verde	mO	O	mO	O	O	
Chad	O	O	O			
Gambia	mO	O	O			O
Ghana	mO	mO	mO	O		
Guinea	mO	m	mO	m	O	
Guinea Bissau	mO	mO	mO			
Côte d´Ivoire	mO	m	mO	O	mO	
Liberia	O	O				O
Mali	mO	mO	mO	O		mO
Mauritania	mO	mO	mO	O		O
Niger	mO	mO	mO			
Nigeria	mO	mO	mO	mO	mO	
Sierra Leone	O					O
Senegal	mO	mO	mO	mO	m	O
Togo	mO	mO		O	O	

m METAGRI; O METAGRI OPS

Among the 17 countries, such win-win collaborations have not been developed homogenously. New countries such as Sierra Leone and Liberia relies mainly on collaboration with International Organizations such as FAO and IFAD, while more experienced countries have developed larger partnerships. The level of developed partnership depends also on the institutional framework and the presence of rooted civil society and farmers' organization on the field. If in the case of Mali, such partnership were already ongoing thank to the previous 20 years of experience, Niger is among the first phase countries the one that less exploited this win-win opportunity to strengthen the relations with actors that often are better rooted at local level then NHMS. In Senegal and Burkina, the partnership was wide and included many local and national institutions. In both countries, Research was no more involved during METAGRI OPS. Mauritania developed more collaborations during METAGRI OPS compared to METAGRI.

The participation of rural communities was always important, even if in some cases logistic problems made difficult for peasants to travel to the seminar venue. It should be noted that

during METAGRI OPS specific seminars have been organized for non-agriculturalists, such as for fishermen in coastal countries.

Another effectiveness indicator is the fact that METAGRI OPS could build **synergies with other initiatives and projects** that contributed with external funds to widespread the METAGRI approach. In many countries, NHMS could organize Roving Seminars and distribution of plastic rain gauges more than those funded by METAGRI OPS. Moreover, in some countries, the synergies with other initiatives could contribute to develop further the METAGRI approach, in Ghana for example the collaboration with Care International within the Adaptation and Learning Programme allowed to improve the dissemination of agrometeorological information. In Mauritania, the collaboration with the GIZ project « Adaptation des Villes Côtières au Changement Climatique » (ACCVC) allowed the organization of the Meteo-Media Seminar in November 2014 which main result was an Action Plan for boosting the broadcasting of ONM Services. Moreover, in December 2014 the same collaboration supported the organization of a Seminar for fishers. The seminar was very successful and led to agreements with fishers associations and a plan of services improvement. In Mali, the collaboration with the CCAFS initiative, with ICRISAT and other institution still contribute to scale-up the approach. In Niger, the collaboration with ANADIA project contributed to improve the follow-up with farmers, ensuring the delivery of site specific advises and agrometeorological bulletins during the cropping season.

Table 7, Synergies with other initiatives

Country	Initiative
Burkina Faso	PANA, ONG INADES-FORMATION, 2IE, Reseau MARP
Cape Verde	Project de Renforcement des Capacités d'Adaptation et Résilience aux Changements Climatiques pour le Secteur des Ressources Hydriques
Ghana	Adaptation Learning Programme (ALP) - CARE
Guinea Bissau	Projet de résilience et d'adaptation aux changements climatiques by Secrétariat d'Etat à l'Environnement
Liberia	GEF Project Climate Change Adaptation for Agriculture (FAO)
Mali	CCAFS, PAPAM/ASAP (WB), GCCA (USAID/ICRISAT)
Mauritania	AMCC (EU-UNDP-GIZ), ACCVC (German cooperation)
Niger	ANADIA (Italian Cooperation), PROCAN (GIZ), CARE Niger
Senegal	CCAFS
Sierra Leone	IFAD Programme

Finally, METAGRI OPS established strong collaboration with the CIRAD (Centre de Cooperation Internationale en Recherche Agronomique pour le Développement) supporting the operationalization of the SARRA-H model in West Africa. SARRA-H has been developed by CIRAD on the bases of the DHC (Diagnostique Hydrique des Cultures) model, largely used by the NHMSs of the Sahel.
The technical team of METAGRI project and the Conference of Directors of Western African NHMSs have been asking to substitute this software by the more advanced software

SARRA_H. Though the model was available for research and development activities in some countries in the region, it was not been operationally implemented. A training programme and implementation methods of the model have been developed by DMN of Niger in cooperation with AGRHYMET and CIRAD, and 3 Training sessions have been delivered.

Final score: High

Efficiency

The efficiency of the project implementation is evaluated based on indicative targets for each component. For example Component 1 is evaluated in terms of number of Roving Seminars, timing of delivery, trained Farmers and delivered plastic rain gauges, trained Agents of NHMSs, etc.

Component 1

In terms of **efficiency in the realization of Roving Seminars**, the project overcame the target that was defined: 253 RS on 238 planned (8 seminars in 2012, 4 in 2013, 2 in 2012 per each country). Even if in some countries (Sierra Leone, Mali, Guinea, Burkina Faso) Roving Seminars could not be realized during some years, at the end of the project the delay was overall recovered.

Table 8, Delivered Roving Seminars per Year

Phase	Countries	Expected RS	Realized RS
2012	16	136	126
2013	16	68	77
2014	17	34	38
2015	17	0	28
TOTAL	**17**	**238**	**253**

It should be noted also that in some countries, Roving Seminars have been organized in critical socio-political situations, for instance in Mali, Burkina Faso, Nigeria, Guinea posing serious problems not only in terms of logistics but also of security. Moreover, Sierra Leone, Liberia and Guinea experienced the Ebola fever epidemic in 2014. Nevertheless, METAGRI could ensure the organization of Roving Seminars even in remote areas, often without minimum requirements of services such as power and sanitation.

Concerning the **Timing of the Roving Seminars**, and considering that the uppermost benefits are gained if they are organized just before the start of the rainy season, the efficiency was not very good. In fact, only about 30% of RS have been organized in the appropriate period (before the rainy season), 49% have been organized during the rainy season and 21% after.

Table 9, Timing of Roving Seminars per Year

Year	In Time	Late	Very late	Total
2012	22	89	15	126
2013	32	33	14	79
2014	17	3	18	38
2015	11	8	7	26
Total	**82 (30%)**	**133 (49%)**	**54 (21%)**	**269**

During the first year, the Seminars have been realized mainly during the rainy season, only 22 before and 15 after. During the second year, the ratio was improved: 41 % of seminars organized before the rainy season and, during the 3rd year, more than 45% have been organized before the season. The same applies for 2015, showing an increase of the efficiency in delivering the RS from the first year.

The **delay in the delivery of Roving Seminars** is due to two different causes. The first is embedded in the overall management of the project from the donors to WMO and finally the NHMSs Budget was allocated year by year by donors, WMO signed with each NHMS a LoA for each year. In order to control funds spending, WMO finalized the yearly LoA only when the previous was closed. Some NHMSs were chronically late in proving proper accounting to WMO, so that WMO could conclude the new LoA also late and so on.

The other element was the critical situation some countries faced during the problem, hampering the smooth implementation of the project. Some countries were forced to postpone the activities of one year to the following (Guinea, Mali, Burkina Faso, and Sierra Leone).

The described problems suggest revising the project management process, in order to ensure in time financial reporting and funds delivery.

In terms of efficiency in training delivery, final METAGRI OPS statistics show that 12499 persons, representing 4652 villages, have been trained during 269 Roving Seminars in 17 different countries. These figures indicate a very good efficiency. Among participants, 11042 were farmers and 1457 extension and other services' agents. Among farmers, 1464 were women (13%). An average of 46 persons participated to each seminar, representing 17 villages. 4827 plastic rain gauges have been distributed, an average of 18 per seminar (considering that 19 RS were dedicated to fishermen 140 sets of flags have been distributed).

Table 10, Timing of Roving Seminars per phase and per Country

Country	Year	RS	Timing	Country	Year	RS	Timing
Benin	2012	8	January 2013	Guinea Bissau	2012	8	July/September
Benin	2013	5	February 2014	Guinea Bissau	2013	4	July/September

Benin	2014	4	November	Guinea Bissau	2014	2	December/January 2015
Burkina Faso	2012	8	August	Guinea Bissau	2015	3	December
Burkina Faso	2013	4	June	Liberia	2012	8	August/September
Burkina Faso	2014	1	November 2015	Liberia	2013	4	September
Cap Vert	2012	8	July/August + April 2013	Liberia	2014	2	June 2015
Cap Vert	2013	6	August - February 2014	Mali	2012	8	July/September
Cap Vert	2014	2	December	Mali	2013	3	June/August
Cap Vert	2015	2	?	Mali	2014	2	March 2015
Chad	2012	4	January/February 2013	Mauritania	2012	8	July/August
Chad	2013	2	July	Mauritania	2013	4	July
Chad	2014	2	December	Mauritania	2014	2	September/December
Chad	2015	3	December	Mauritania	2015	4	July
Cote d'Ivoire	2012	11	March/April	Niger	2012	8	September
Cote d'Ivoire	2013	17	February/March	Niger	2013	4	November - January 2014
Cote d'Ivoire	2014	2	November/December	Niger	2014	1	August
Cote d'Ivoire	2015	4	August	Niger	2015	4	July/August
Gambia	2012	8	July	Nigeria	2012	8	August/October
Gambia	2013	5	?	Nigeria	2013	4	July/September
Gambia	2014	2	January 2015	Nigeria	2014	2	November
Ghana	2012	8	August	Nigeria	2015	2	December
Ghana	2013	5	August	Senegal	2012	8	September/November
Ghana	2014	3	August/September	Senegal	2013	4	July/August
Ghana	2015	4	June	Senegal	2014	5	December/October 2015
Guinea	2012	7	August	Sierra Leone	2012		-
Guinea	2013	4	July	Sierra Leone	2013		-
Guinea	2014	2	November 2015	Sierra Leone	2014	2	May
				Togo	2012	8	August/September
				Togo	2013	4	November
				Togo	2014	2	December
				Togo	2015	2	October

In terms of rain gauges production and delivery to METAGRI partners, a total of 5265 rain gauges have been produced in Mali and delivered under the supervision of Mali NMS. METAGRI contributed to strengthen the role of plastic rain gauges as a real tool for climatic risks management.

Table 11, METAGRI Final Statistics

Countries	17	
Years	4	
RS	269	(19 for fishermen)
Rain gauges	4 827	
Flags (sets)	140	
Trained Farmers	11 042	
Trained Women	1 464	(13%)
Trained E. Agents	1 457	(12%)
Villages	4 652	
Total trainees	12 499	
Trainees/RS	46	
Villages/RS	17	
Rain gauges/RS	18	

Comparing METAGRI OPS with METAGRI (2008-2011), considering the same length of the project, METAGRI OPS ensured a greater number of Roving Seminars (+69%) and consequently of trainees (+60%). While the number of agents was proportionally higher, the number of female farmers decreased from 14 to 13%.

Table 12, METAGRI OPS vs. METAGRI

	METAGRI OPS	METAGRI	diff %
Countries	17	14	21%
Years	4	4	0%
RS	269	159	69%
Rain gauges	4 827	3325	45%
Flags (sets)	140		
Trained Farmers	11 042	7044	57%
Trained Women	1 464	1015	44%
Trained E. Agents	1 457	783	86%
Villages	4 652	2606	79%
Total trainees	12 499	7 827	60%
Trainees/RS	46	49	-6%
Villages/RS	17	16	6%
Rain gauges/RS	18	21	-14%

Concerning the timing of RS delivery, METAGRI OPS could not ensure an improvement in the efficiency, indeed the project management mechanism remained the same.

Component 2

In terms of **efficiency in the realization of Capacity building activities for NHMSs**, the project reached the target that was defined. Only one training activity could not be delivered (training course on GIS). 7 training Sessions have been delivered on 2 different topics: Utilization of Satellite Products for Agrometeorological Applications (4 editions) and SARRA-H Crop Model Operational Implementation (3 editions).

Table 13, Training sessions delivered

N	Type	Dates	Days	Place	Trainees	Trainers	Person/day	Report
1	SARRA-H	28/10-1/11/2013	5	Niamey	12	6	60	y
2	SARRA-H	24-28/2/2014	5	Banjul	15	5	75	y
3	SARRA-H	17-21/03/2014	5	Abidjan	19	6	95	y
4	WMO-EUMETSAT	19-23/11/2012	5	Niamey	13	8	65	y
5	WMO-EUMETSAT	10-14/06/2013	5	Accra	17	9	85	y
6	WMO-EUMETSAT	5-9/05/2014	5	Ouagadougou	37	10	185	y
7	WMO-EUMETSAT	23-27/03/2015	5	Addis Ababa	44	8	220	y
	TOTAL		**35**		**157**	**52**	**785**	

Totally, 35 days of training have been delivered for 157 participants, with the involvement of 52 trainers. Each training has a report including list of participants, outcomes and recommendations for further improvements.

Encountered problems were mainly logistic concerning internet connection, power supply and in some case the impossibility for some participants to attend for security (Ebola) or personal reasons. In the case of the SARA-H training, some problems aroused concerning input data (manage lacking data or datasets not homogenous or in different formats), some dysfunctioning of the model, etc.

For SARRA-H trainings main outcomes have been:

- SARRA-H model was appreciated by participants
- users' need identification for a further and improved version of SARRA-H:
  - simplifying the installation procedure
  - complementary tools for preparing the input dataset
  - request to simulate other crops
  - improving some indexes and calculation performance
  - cartographic outputs and some improvements in the products layout
  - Users' forum"

Concerning WMO-EUMETSAT training main outcomes have been:

- Summary of remote sensing products used by Country
- Identification of more training needs about basic products in some countries of Western and Eastern Africa
- Proposal to develop special plans for Guinea, Guinea-Bissau, Togo, Benin and Cameroon
- Proposal of further editions of the course enlarging the countries to East Africa
- Proposal for specific training on the use of advanced vegetation monitoring, rainfall estimation, soil moisture and their coupling with numerical weather models by GIS tools
- Requests for better access to Sand and Dust Storm Warning Advisory System
- Proposal to link better the different WMO projects in different regions in Africa and to consolidate the participation from FAO, JRC, University of Reading and EUMETSAT SAFs
- Proposal to develop links with EU-funded programmes and EUMETSAT MESA project
- Promote cooperation between African institutions and Climate centers as AGRHYMET, ICPAC or SADC Centers with EUMETSAT, Land SAF, JRC and FAO to propose a training programme on the use of satellite products on agricultural meteorology for ECOWAS, IGAD or SADC countries.

Component 3

The **communication strategy** has been probably the main improvement of METAGRI OPS compared to the previous phase. NHMSs recognized the tremendous importance of adopting communication strategies as wide as possible to reach the greater number of farmers but also aggressive on National and regional Media to get consensus and make larger partnerships with national and international stakeholders.

Since METAGRI, Senegal was the champion for communication activities. In Senegal, the first Meteo-Media workshop was organized and a Senegalese consultant was hired to support other countries in defining their communication strategy.

During METAGRI OPS Gambia deserves a special mention, thanks to the work done with medias, including training for journalists, creating working groups media-Meteo and MoU with the Ministry in charge of Communication and Information. Indeed while in most countries the collaboration with media remains ad hoc, in Gambia it is henceforth institutionalized.

Involvement of Media in project activities was always ensured and interesting experiences have been developed in Niger where DNM organized radio interviews to meteorologists. Moreover, Niger organized regional Meteo-Media workshops being able to involve a large number of local media (45).

Table 14, Media involved in RS

Country	Local radio	National radio	Television	Press Agency
Benin	Y			Y
Burkina Faso	Y	Y	Y	
Cape Verde		Y	Y	Y
Chad	Y	Y		
Gambia	Y	Y		Y (Min. of Comm.)
Ghana	Y	Y	Y	
Guinea	Y			Y
Guinea Bissau	Y	Y		
Côte d´Ivoire	Y	Y	Y	
Liberia	Y			
Mali	Y			
Mauritania	Y	Y	Y	Y
Niger	Y			
Nigeria	Y	Y	Y	Y
Senegal	Y	Y	Y	Y
Sierra Leone		Y		
Togo	Y	Y	Y	Y

In Mauritania, communication is the core ONM approach. ONM and Agriculture Department each year organize sensitization campaign in the agro-sylvo-pastoral band to diffuse seasonal forecasts and provisional seeding calendar /advices. Agrometeorological forecasts and advices are also broadcasted by National Radio television, by Rural Radios (actually 4 different radios), by SMS to local focal points (for some lettered) and through Griots in certain communities (Brakna, Gorgol, Guidimagha among Soninke ethnic group) which walks around the villages declaiming the forecasts/advices.

In terms of **efficiency in the realization of Media-Meteorologist workshops,** not all foreseen activities have been developed. Over 17 involved countries, in 3 countries (Ghana, Côte d´Ivoire and Nigeria) the National Seminars Media-meteorologist have not been yet realized. But some countries such as Mali, Niger and Guinea Bissau organized more than 1 seminar, sometimes thanks to collaborations developed with other partners (CCAFS and ICRISAT in Mali for example).

Table 15, Media-Meteorologists workshops

	Country	Year	Television Radio Stations	Rural Radio Station	News Papers	TOTAL Media	Land Line Ministries & Agency	Met Service	other	Total
1	Senegal	2012				0				
2	Gambia	2014	26	4	6	36	6	14	10	66
3	Guinea Bissau	2013				32				32
4	Guinea Bissau	2014	15	10		25	2	5		57
5	Guinea	2013	15	2	12	52	6	9	7	74
6	Liberia	2013	14	5	8	27	12	9		48
7	Sierra Leone	2014	16		15	31	4	4		39
8	Togo	2013	28		20	48				48
9	Mauritania	2014		0		10	1	4	25	40
10	Benin	2015	12	9	11	32	10	11		40
11	Cap Vert	2015				10	3	5	17	25
12	Chad	2015	8		9	17		12	6	35
13	Mali	2015	6	8		14				
14	Niger	2015	7	29		36	9	9	12	102
15	Niger	2015	14	16	1	31	9	14	2	87
16	Burkina Faso	2015	12			12				40
	TOTALS	**16**	**173**	**83**	**82**	**413**	**62**	**96**	**79**	**733**

A video about the Roving Seminars in Western Africa should be realized in 2016.

A video reportage on METAGRI activities realized in Cote d'Ivoire and in Senegal, a video on Services for fishing communities has been realized.

Compared to METAGRI, METAGRI OPS was generally more attentive to communication aspects. The involvement of media in the Roving Seminars was higher and a specific consultant was hired to help countries in defining their communication strategy.

Component 4

In terms of **efficiency in the realization of activities related to component 4 - Feed back and evaluation tools**, just in the first year of the project an Evaluation workshop was organized in order to make the point after the first year of the project and identify problems and solutions. Moreover, a survey on Roving Seminars after the first year was conducted in order to gather National Focal Points advices and recommendation for the improvement of Roving Seminars in terms of logistics, communication, constraints and possible solutions.

Since 2014, the METAGRI OPS final evaluation was launched as well as a test for the Weather and Climate Services' impact assessment on 4 pilot countries (Ghana, Mauritania, Côte d´Ivoire and Niger).

For this purpose a methodology for the assessment of climate services impacts at local level has been developed. The objective is the assessment of farmer use and impacts of Weather

and Climate Services on smallholder farmer behavior and crop production. The proposed methodology is community based and context specific, indeed project impacts are evaluated in relation to the national context. The methodology includes:

a) Assessing the context of climate services in the country
b) Assessing use and impacts of Weather and Climate Services on farmers behavior
c) Assessing impacts of Weather and Climate Services on crop production

Compared to METAGRI, METAGRI OPS approached the evaluation aspects in a very efficient manner, with the involvement of a specific consultant and an uppermost important impacts evaluation activity carried out in 2015 in 4 countries.

Component 5

In terms of **efficiency in the realization of Institutional development activities,** METAGRI OPS was less efficient compared with other components. Some tasks as the Support to the Interdisciplinary Working Groups on Food Security and Food production or the METEO-Decision Makers workshops have not been realized. Nevertheless, Institutional collaborations and projects have been developed in many countries with the aim to scale up the METAGRI Approach, particularly concerning Roving Seminars and distribution of Rain Gauges (see chapter sustainability for more details).

In almost all the countries, NHMSs developed or strengthened the collaboration with the Ministry of Agriculture and particularly with the Agriculture Extension Service.

Where Interdisciplinary Working Groups exist partnership with other line Ministries was already strong, but where they did not exist, METAGRI OPS could support the establishment of partnerships with Ministries in Charge of Livestock, Environment, Fishing (particularly where Roving Seminars for Fishers has been organized), Research Institutions and Farmers Organizations.

Thanks to METAGRI OPS NMS could enhance their role at national and local levels, building new collaborations with other governmental and international institutions, and increased their visibility toward civil society, NGOs and farmers' organizations.

Final score: Medium

Impacts

METAGRI OPS impacts have been here evaluated based on data from National Annual Reports of the 17 countries involved in the project and on the data collected in 4 pilot countries that have been chosen for the test of the evaluation of use and impacts on weather and climate services on smallholder farmers' behavior and production.

Impacts on Farmers behavior and performance

The best way for evaluating an agrometeorological project is the use of productivity and farmers behavior indicators. This approach could be developed for four pilot countries: Ghana, Côte d´Ivoire, Mauritania and Niger.

Concerning the **use of weather and climate information** at local level, METAGRI provided awareness rising, sensitization and training to farmers, farmers organizations, NGOs and Extension agents. The hypothesis was that targeted weather and climate information and awareness could increase farmers' climatic resilience securing and improving rural productions and leading to sustainable economic and social development for rural communities. The availability of Seasonal forecasts coupled with rainfall observation and associated with a seeding calendar specific by region and crop, should support farmers to better choose varieties, planting dates and the timing for other cropping practices, leading to a change in behavior and to an increased productivity.

According to National Focal Points, the application of the seeding calendar with the rain gauge allows farmers to avoid false starts of the season, resulting in a dramatic decrease of reseeding. Major benefits are witnessed for drought prone areas and rainfall deficient areas, while in more humid areas climatic risks for the start of the season are lower.

Thanks to the Test of impacts assessment methodology in Ghana, Mauritania, Côte d´Ivoire and Niger some results are available for those countries where weather and climate services for farmers demonstrate to be useful at different levels:

- Making strategic choice on the seed variety that is more appropriate to the expected seasonal profile thanks to the seasonal forecasts and sowing calendar in different areas. A short-season variety can complete its cycle without water constraints in the case of deficit or shorter seasons, otherwise long cycle variety help to better exploit a surplus year;

- Making strategic choice on the geographical distribution of plots, thanks to seasonal forecasts to avoid, if possible, toposequences that don't concur well with the nature of the season, drought or water stagnation;

- Choosing the most appropriate planting date to avoid huge losses because of the false starts of the season, thanks to the integrated use of sowing calendar with the peasant rain gauge; losses due to reseeding are very important in the Sahelian zone in terms of seeds (8.5 kg seed per hectare in Mauritania) or in terms of working time (three days of work per hectare)

- Better tuning of crop development cycle with the rhythm of the rains: the use of the appropriate variety and choice of planting date can avoid the most sensitive phases of culture coincide with periods of water stress.

- Choosing favorable periods for different cultural operations, thanks to the weather forecast and the rain observation with the peasant rain gauge. Reducing the number of

weeding can save in terms of money or working time (in Mauritania economic losses for each additional weeding are estimated at $ 45 / ha)

However, different levels of adoption are observed in the region.

In Côte d´Ivoire the evaluation has been done for maize and rice producers. Due to the small number of respondents, the differences between pilot and control farmers are not statistically relevant. Anyway, for maize control farmers sowed on average 1.25 times and pilot just 1. Failure rates are quite different -52% and +29% respectively for mid-season and end of season evaluations, without any reasonable explication. Concerning crop development, considering that the sowing period was the same as well as the used variety, stems circumference, cobs/stem ratio and cobs length show better performances (+13%, +19% and +12%) for pilot parcels.

In the case of rice, pilot parcels show less sowing number, -18% of failures both after installation and at the end of the season. Soil cover rate is higher for pilot parcels. Concerning crop development, not all the variables show significant differences.

In Ghana, the assessment has been done on Maize producers. Pilot farmers use on average shorter varieties, generally a 90 days one. Main differences between control and pilot farmers are observed about the failure rate at the end of the season (10% for control and 7% for pilot farmers) and about some development indicators. Indeed, even if sowing period were almost the same, the stems circumference and the dimension of cobs for pilot farmers are on average +11% bigger and +18% longer.

In Mauritania, pilot farmers sowed just once at the end of July, while control started sowing at the beginning of July and experienced many sowing failures. Final crop installation was at the end of July/beginning of august, but control farmers were using a long cycle variety while pilot farmers a shorter cycle one. This means that development indicators cannot be very relevant because of different phenological stages of crops at field missions' time. What is relevant is the end of rainy season that occurred at the beginning of October founding pilot parcels in the heading phase while control ones were still on tillering. As observed also by farmers, coincidence of rainy season with crop phenological cycle is a good indicator of success.

Concerning failure rates, the differences are significant also from a statistical point of view. Indeed the t test provides a percentage <5% that the difference in averages is accidental. Concerning the observed general conditions of the parcels, it appears quite clear the best performance of pilot parcels compared to control ones.

In Niger, a fair reduction in the number of sowing is observed between control and pilot farmers. The failure rates both at mid and at the end of season decrease from control to pilot farmers, while the final yield (in Niger measured in most of sites) increases by about 20%. Even if the figures cannot be taken as statistically relevant (the Ps of t.test are always higher than 30%), generally, pilot farmers performed better than control ones. Analyzing these data

it should be reminded that new sites had the training and the delivery of rain gauges only after the crop installation, so that most of benefits of the METAGRI approach could not be really exploited.

Weather and Climate Services' for farmers are more effective where there is a better integration among NHMS, extension service and farmers. The extension is a valuable mean to formulate and disseminate agrometeorological advises, as well as local administrations, NGOs and other actors working at local level with farmers.

The evaluation results show that agrometeorological information has a stronger impact in drier areas where climate is the main limiting factors. Each case evidences different aspects of good practice, and exemplifies what it takes to reach remote and vulnerable farmers with salient, usable and timely climate information and advisory services. As an example, in Mauritania the strong relation among NMS, extension and farmers, in Niger the large diffusion of weather information by media so that also control farmers have access to climatic information, in Côte d´Ivoire the appropriateness of the seeding calendar, in Ghana the effectiveness of seasonal forecasts for crops variety selection.

Nevertheless, many challenges remain on the road to render climate services relevant for smallholder farmers and to render farmers open to adopt the advices. Proximity of farmers with NMS and extension is probably the main factor influencing the adoption, in the sense of trust, continuity and feedbacks. In the case of Niger, large distances, extension of the cropping area, weak extension service negatively affect the adoption of advises.

The scaling-up of these services to reach many more farmers struggling with the vagaries of a changing climate across Africa is certain desirable, but some weakness should be addressed before. There is a growing volume of agro-meteorological products and services that can help farmers improve upon their agricultural output. These information and services are however not disseminated in a timely and understandable manner to smallholder farmers. There is the need to enhance the role of information and communication technologies for accurate, reliable and timely climate information.

Other critical point is the dialogue between NMHSs and farmers. METAGRI struggled on empowering farmers with agrometeorological information to better manage meteorological and climate-related risks for sustainable agriculture production but the effort needs to be sustained in the long term strengthening the relation among farmers, extension and NMS. Indeed, one-time actions with farmers are not effective, the dialogue should be renewed year after year and enriched with specific and continuous information and advises as it can be seen from the research that farmers with agro-meteorological information does better in terms of production outputs than those who never had that information.

Concerning the evaluation methodology, METAGRI OPS allowed a test on 4 countries, 16 localities 64 farmers. As first test it was very consistent and provided much information for improvements and replication on larger scale. The improvement of the methodology as well as the enlargement of the sample are desirable, but the replication year by year on at least 3

or 4 years is needed in order to get relevant information and normalizing biases due to interannual climate variability.

In Chad, NMS conducted a survey with farmers involved in METAGRI OPS, according to farmers the impacts on crop productivity amount on 30% of additional productivity.

Impacts on NHMSs performance

METAGRI approach builds also on the assumption that NHMSs regularly provide weather and agrometeorological advises to farmers, including targeted information for local communities. METAGRI OPS engaged in the improvement of producing and communicating such advises, and in better targeting to communities involved in the project. In the 4 pilot countries the context of climate services for farmers was analyzed more in detail, while for other countries some information has been retrieved from national reports and communications at the final METAGRI OPS conference.

METAGRI OPS dedicated a component to the technical capacity building of NHMS and another to the improvement of NMS communication capacities. Such activities obviously had an impact on NMS performance, but it is not easy to quantify. Concerning Capacity building, the main impact has been the operationalization of the SARRA-H agrometeorological model. Moreover, thanks to METAGRI OPS NMS could implement new products, such as weather forecasting bulletins for fishermen in Nigeria.

Agrometeorological services

In Côte d´Ivoire, METAGRI OPS allowed SODEXAM Agrometeorological Service (AgMetS) to approach farmers and local extension agents even if the Pluridisciplinary Working Group (GTP) has not been implemented yet as well as a reliable and practical system for agrometeorological services transmission to farmers. Agrometeorological Services for farmers provided by SODEXAM (Côte d´Ivoire Meteorological Service) are very limited; indeed SODEXAM products are mainly addressed to National Agriculture extension service and other institutional partners, which should take care of the development of advices and their dissemination to farmers, but often they cannot reach final users in time.

In Côte d´Ivoire, SODEXAM agrometeorological service produces the decadal agrometeorological bulletins along the whole year. The bulletin is transmitted by email to the Ministry of Agriculture, ANADER (extension service), CNRA (Agricultural Research Center) and other stakeholders at National level.

Agrometeorological Services for farmers provided by Ghana Meteorological Agency (GMET) are limited but they are largely trusted by government Agencies and civil society. The main services that GMET actually provides are the daily weather forecast and the seasonal forecast. Indeed agrometeorological applications in Ghana are limited to Seasonal Forecasts, no agrometeorological monitoring or 10-days agrometeorological bulletins, no sowing calendar for Ghana, neither Pluridisciplinary Working Group exist. Nevertheless, GMet has a strong partnership with the Ministry of Food and Agriculture (MoFA) and the Agriculture Extension

Service, which ensure the dissemination of weather and seasonal forecasts to local communities. Advices on agricultural practices or management are provided by the Extension, using GMET forecasts. Agrometeorological monitoring of the growing season is not developed neither organized at GMET. Some competencies exist or have been recently created, also thanks to METAGRI, but they are not systematically valorized or used. Remote sensed products developed and broadcasted by ACMAD are used for visualization in weather forecasting activities, as well as the EUMETSAT products available with the AMESD station.

Agrometeorological Services for farmers provided by ONM (Mauritania Meteorological Service - Office National de la Météorologie) are quite diversified not in terms of information rather than in communication channels. ONM has a strong commitment in reaching rural populations directly or through the partnership with the Agriculture Department and the Extension Service. Agrometeorological bulletins are formally issued by the GTP (Interdisciplinary Working Group), but practically GTP meetings are not organized for lacking of funds and ONM gathers information from other partners and issues the bulletin. Agrometeorological analyses are performed using some tools of agrometeorological monitoring, even if many of the previously available tools are no more operational (Windisp, DHC). The training on SARRA-H had a very positive impact on ONM capacity to monitor the cropping season.

Agrometeorological Services for farmers provided by DMN (Direction de la Météorologie Nationale du Niger) are diversified in terms of information; indeed DMN, even if cannot ensure the operability of all the services, experimented different kind of products for specific users and large public. Products for farmers concerns both irrigated and rainfed crops and are disseminated both directly or through the extension service and other institutional partners. Niger was one of the first countries in the Sahel adopting the Interdisciplinary working group (GTP) as a working tool for monitoring the agro-sylvo-pastoral campaign and issue agro-hydro-meteorological bulletins. The GTP approach was supported during years by WMO and AGRHYMET both technically and financially. Actually, DMN does not receive specific support for the seasonal monitoring, but still coordinates the GTP that each 10 days produces the bulletin that is disseminated to prime Ministry, line Ministries and partners by email and through the DMN web site. During last years, DMN developed different kind of agrometeorological bulletins and advices for specific users however the production and dissemination of those kind of products is not continuous as it depends most of the time on funds provided by partners. As examples we have:

1) Bulletins for irrigated crops, for horticulturalists in the Niamey area. Such bulletins have been produced for a limited number of years, and then their production has stopped because of lack of resources. They contained useful information about plants water needs requirements during the dry season in order to plan the irrigation amounts.
2) Bulletins for rainfed crops have been produced for specific Municipalities:
    - DMP – Niger sites (in Mayahi, Baban rafi and Madarounfa), in 2005 and 2006, funded by that program, decadal assistance bulletins were produced and disseminated among farmers and pastoralists in those areas.

- ANADIA Municipalities (Imanan, Gotheye, Ourogueladjo), 2015. Bulletins produced valorising rainfall data observed by farmers. Bulletins are diffused to the concerned Municipality and its technical services directly. Moreover, bulletins are transmitted in local language to farmers through agreements with local radios.
- 6 Metagri Municipalities (CUN, Hamdallaye, Bonkoukou, Simiri, Harikanassou, Tanda), 2009, on DMN own funds. The bulletins were produced valorizing the rainfall observations done by model farmers using Metagri rain gauges.

METAGRI OPS had a very positive role in fostering the use and the dissemination of Seasonal forecasts in all the countries. Côte d´Ivoire is included in 2 different Climate Outlook Forums: for the southern part of the Country seasonal forecast are produced in March (PRESAGG Forum), for the north in May (PRESAO Forum). A special Seasonal Forecast Bulletin is produced after the COF. It contains the outlooks for Côte d´Ivoire, including Start of the season, End of the season, Length of the season and dry spells. Through the METAGRI Roving Seminars, seasonal forecasts are disseminated directly to farmers; so far, METAGRI is the first attempt of SODEXAM to approach farmers and local extension agents. Moreover, a seeding calendar per each agro ecological zone of the country (south, center, west and north) has been developed within METAGRI activities.

In Ghana GMET could build thanks to METAGRI OPS a great and diffused trust on Seasonal Forecasts that are largely used by MoFA and NGOs to advice farmers. GMET issues its own Seasonal forecast twice a year. The first issue is in March-April and the second in May-June. GMET uses the results of the models run by the international centers and the CPT statistical model (IRI) to calculate the SF for Ghana synoptic stations. Ghana participates to the PRESAC and PRESAO Climate Outlook Forums, where Seasonal forecasts are harmonized at regional scale. More than probabilistic forecasts on rainfall and temperature, GMET provides the estimated onset, cessation and length of rainy season. When SF are issued, a Press conference is organized to disseminate the forecast, which are also sent to the Agriculture extension service to be communicated to farmers and to adapt agricultural advices on sowing periods, varieties to be used, farming practices to the forecasted season.

In Mauritania, each year, after the PRESAO Outlook Forum, ONM organizes a National Information Workshop for technical and institutional partners. Campaigns for delivering the information in the country are also realized in collaboration with the Agriculture Department. A seeding calendar per each agro ecological zone of the country has been developed within METAGRI activities. The seeding calendar, calculated by ONM on the climatological start of the rainy season is updated yearly with the seasonal forecast in order to advise farmers on the optimal seeding period for the current year. ONM communicates the seeding calendar of each year to Agriculture Department Inspectors. Advices for farmers are disseminated through AVB. Moreover, ONM communicates the seeding calendar directly to farmers during roving seminars.

In Niger, Seasonal forecasts are issued in the framework of the PRESAO Climate Outlook Forum. DMN bulletin on seasonal forecasts contains the probabilistic forecasts issued by

PRESAO and also the forecasts on the beginning, end and length of the cropping season elaborated by DMN. Advices on seeding and varieties to be used accompany also the forecasts in the bulletin. Seasonal forecasts are disseminated through the DMN web site, and directly to prime and line Ministries. Moreover, DMN communicates seasonal forecasts directly to farmers during the Roving Seminars and other types of workshops involving farmers. A specific bulletin is also issued and published on the DMN web site.

In Nigeria NMS analyzed the users of weather and climate information: while before METAGRI main users where Universities and the Federal Ministry of Agriculture (together more than 87%), with METAGRI OPS NMS could find new users as State Agricultural Development Agencies, Extension workers and Farmers.

Communication

METAGRI OPS had a very positive impact on the communication aspects of all NMSs, significantly increasing the awareness of NMS of the importance of communication.

The **media coverage** on Roving Seminars was very impressive in some countries such as Senegal, Ghana and Togo. In Senegal METAGRI activities had a large echo on the media, also thanks to the involvement of media in the activities and the production of a film by professionals, used previously trained farmers as testimonials, boosting confidence in the audience. Togo and Ghana as well ensured an impressive Media participation involving National, Regional and local media (TV, Radio).

In Niger and Mauritania, agrometeorological information, as well as rainfall forecasts and seasonal forecasts are largely broadcasted by media. In Mauritania, NMS proposes a diversification of communication strategies that is particularly interesting. Agrometeorological bulletins are disseminated through:

1) in analogical format to Government and line ministries,
2) a mailing list to technical partners
3) "Radio Commandement" of the Agriculture Department to Mughaata Inspections of Agriculture and then through AVB to farmers
4) Radio communautaires, ONM has a contract since 2014 (thanks to Metagri) with the radio communautaires of Aioun and Nema for the dissemination over 2 years of the decadal bulletins in local languages and also advices and warnings. Dekadal bulletins are transmitted once each 10 days periods, but advices and warnings whenever they are issued. Provisional Seeding Calendars and advices to fishers are also broadcasted. The costs are about 1000 US$/year/radio. The Guidimagha local radio is also transmitting advises and agrometeorological information. Since this year, Kaedi radio communautaire should also participate in the dissemination activities.

In case of extreme weather, specific advises and warnings of extreme weather, dry spells, risk of floods are disseminated by Radiotelevision (National and some rural radios), by GFU and SMS to technical services of each Department and to some METAGRI local focal points. Actually, Chinguitel Company is providing the service.

METAGRI allowed also to experiment the use of traditional communicators (Griots) to disseminate among certain communities of Mauritania (Brakna, Gorgol, Guidimagha among Soninke ethnic group) the agrometeorological advises and warnings. Alerts disseminated through Griots are for example warnings of extreme weather demanding to retrieve herds from alluvial plains or in case of dry spells for recommending to perform or not specific practices. An inventory of Griots has been done for some localities; they are contacted by phone when an advice or information should be disseminated. The Griots, walking around the village after the evening pray, inform the people. The channel of Griots has the advantage that everybody in the village will be informed, directly or indirectly. Griots are also invited to RS as well as other Media. This action more than being a well performing communication mechanism has also contributed to refresh and update the role of Griots.

In Côte d´Ivoire and Ghana, METAGRI OPS led to a strengthened relation between NMS and extension, which uses and disseminates the agrometeorological information and forecasts, but METAGRI OPS could not ensure the constitution of the MWG in those countries. In Ghana local FM Radio stations are actively involved in the dissemination of seasonal forecasts and related agronomic advices and it is interesting to note that this applies also to Radios not invited to seminars but that proactively seek for such information and broadcast it. Nevertheless, some problems arise when journalists don't have the skill to properly interpret and translate the forecasts.

The implementation of Action Plans is already going on in some countries:

- In Cape Vert the development of the NMS's web site has started.
- In Guinea Bissau a Meteo-journalist ad-hoc group has been created and a glossary of technical terminology for harmonizing the information provided by media has been developed.
- In Gambia, a MoU with the Ministry of Information has been finalized and further training of journalists has been delivered thanks to complementary funds from an EW project. Moreover, climate and weather glossary has been translated in 4 national languages.
- In Guinea Bissau the NMS web site is being finalized.
- In Liberia, a Media-Meteo network has been set-up for producing better-packaged information products. Furthermore, a specific training for Met officers has been organized.
- In Mali, a glossary of technical terminology for harmonizing the information provided by media has been developed in Bambara language.
- In Mauritania, agreements with local radios for disseminating agrometeorological advises have been finalized.
- In Niger, the DMN web site has been developed thanks to the external funding of the ANADIA project.
- In Senegal, a free service for fishermen has been developed for communicating by mobile phone weather warnings.

- In some countries such as Niger, Mauritania, Guinea Bissau, Mali, Gambia the Meteo-media workshops have been repeated responding to further training needs.

The adoption of new tools for information delivery (SMS, smartphones applications...) was also a positive impact of METAGRI OPS. In Nigeria development of the e-SRP platform for disseminating seasonal forecasts directly to farmers: an automatic system that send to users seasonal forecasts and estimated parameters by SMS.

Rainfall data collection

Farmer observed data are collected and centralized at NHMS feeding the agrometeorological databases, which are a separate database from the climatic one. Agrometeorological databases are used for the monitoring of the cropping season and the preparation of bulletins (daily, ten-days). Unfortunately, data are often not regularly transmitted and as consequence NHMSs tend to under-exploit such valuable source of climatic data. Usually observed data are used only for the weather bulletins on radio or TV diffusion as a sort of kind acknowledgement for farmers who sent their data.

The amount and the duration of received observed rainfall data from farmers by NHMSs is a good impact indicator. Unfortunately, METAGRI didn't collect from all NHMSs quantitative estimations about how many trained farmer sent regularly rainfall data and for how long they are available. Figures are available only for some countries about digitized records in databases, number of pluviometers providing regularly data, etc.

In Côte d´Ivoire, farmers usually send data for the first year, sometimes the second, but generally they stop at the third (only 2 villages over about 600 sent data the third year). The problem concerns data collection but also data transmission.

Farmers expert something back from SODEXAM, not necessarily money even information, advises. However, SODEXAM actually is not providing directly any feedback (even agrometeorological information or weather forecasts to farmers). ANADER should provide advice to farmers, using the agrometeorological information of SODEXAM, but it is not evident that information reaches the farmers.

The data transmission chain is very poor and not affordable. ANADER asks for payments for the service, SODEXAM had a contract for the Seminar with ANADER but not for data transmission. Moreover, data pass through the SODEXAM station chief to be transmitted à Abidjan. In case the station is not operational or the chief not affected, data are not transmitted. Actually, it is not possible to assess if not received data have been not collected or not transmitted to Abidjan.

In Ghana, GMET adopted a close farmer-extension approach based on small groups of farmers (generally 5) and a reference extension agent in order to improve the exchange of data and information with farmers in both directions:

1. Downward, so that all weather and climate information from the Ghana Meteorological Agency are channeled to these Extension Agents who then advice farmers accordingly.
2. Upward, the agent is responsible for monitoring the compilation of rainfall data by the farmers and for collecting and sending the cards to his Region or District Office.

The Meteorological Agency's Regional Office nearest to the Agricultural Office collects the cards and sends them to GMET HQ. Cards are collected from farmers at the end of each months and one or two months later arrive in Accra where data are digitized in an Excel spreadsheet. Such data are not yet used by GMET because of their nature and quality. As in Côte d´Ivoire, data are send during the first two years, rarely a third.

In Mauritania, the ascending communication flow starts from farmers that observations are gathered by local focal points, and then is organized in three parallel channels:

1. Local focal points have been included in GFU (Groupe Fermé d'Utilisateurs – Closed Users Groups) of mobiles phones. GFUs are used as a communicating network from observation stations and ONM, and in each site has been enlarged to local focal points which have been furnished with a prepaid telephone credit for communicating rainfall and phenological observations directly to ONM;
2. Local focal points gather data from observers and bring it to the Agricultural Department Inspector (Moughaata). Concerning rainfall data, Agriculture Inspectors average the received daily data for each locality (if more than 1 rain gauge per each locality) and transmit to the chief of ONM station who send to ONM in Nouakchott using the GFU communicate the data to ONM.

ONM stores rainfall observed data in Excel spreadsheets, while phenological and phytosanitary data are just used for the assessment of the dekad and then transmitted to the Department of Agriculture for analysis. Actually, rainfall observed data for about 106 localities is updated regularly (about 75-80% of covered localities) (Table 18).

In Niger, the ascending communication flow starting from farmers has not a structured path. After each rain, farmers' observations are shared with the local community at public places (mosque, house of village chief,…). Sometimes farmers send them directly by telephone to DMN or to the Municipality or the Extension service, which send it to the Department and to the "Radio Présidence" that broadcasts it. Data are also gathered in the monthly forms and sent by mail once or twice per year to DMN through Municipalities, Departments or DMN stations' chiefs. However, the monthly forms are provided to farmers just once during the seminar, so that for the following years, often farmers don't have the forms, but simply register the rain on a notebook. Therefore, data transmission is quite uncertain and usually farmers send data regularly for the first 1 or 2 years, and later gradually abandon. Observed data are partially digitized, but not organized nor stored in a database. It has not possible to assess how many data have been received by DMN during the years. Indeed data are used by DMN just to produce the agrometeorological decadal bulletins. By the other hand, farmers are not sensitized and supported to send regularly observed data, they are trained once and then often they don't receive any further feedback or support.

In some countries, new experiences for data collection are being tested: for example in Mali a green line with telecom operators has been established, ensuring that farmers can communicate observed rains without charge. Again, in Mali, thanks to the collaboration of AGRHYMET, smartphones are being used to collect data on the field. The AGROMET toolbox developed for collecting phenological data could be experimented also for transmission of rainfall data from farmers to NMS.

Table 16, Consistency of Farmers' rainfall database table in Ghana

Region/Department	Number of trained villages	Number of villages in the DB	Date of the roving seminaries	Last date of digitized data	Number of digitized years	Observations on the consistency of the data set
Upper East/Bolga	70	20	20/07/2011	2012	2	No single farmer has brought up all the rainfall data for each year
Upper West / Wa	20	20	22/08/2011	2012	2	,,
Upper West / Lawra	20	20	23/08/2011	2012	2	,,
Upper West / Tumu	20	20	24/08/2011	2012	2	,,
Northern / Bole	20	20	25/08/2011	2012	2	,,
Brong Ahafo / Kintanpo	20	20	26/08/2011	2012	2	,,
Brond Ahafo / Sunyani	20	20	12/09/2011	2011	1	,,
Northern / Tamale	20	20	13/09/2011	2014	3	,,
Northern / Yendi	20	20	14/09/2011	0	0	,,
Brond Ahafo / Kete-Krachi	20	20	15/09/2011	0	0	,,
Northern / Walewale	20	20	13/08/2012	2013	2	,,
Northern / Karaga	20	20	14/08/2012	2013	2	,,
Northern / Damongo	20	20	15/08/2012	2013	2	,,
Northern / Salaga	20	20	16/08/2012	2013	2	,,
Northern / Bimbilla	20	20	17/08/2012	2013	2	,,
Ashanti / Ejura	20	20	28/08/2012	2014	3	,,
Brong Ahafo / Techiman	20	20	29/08/2012	2012	2	,,
Brong Ahafo / Wenchi	20	20	31/08/2012	2012	2	,,
Central / Gomoa Afransie	20	20	12/08/2013	0	0	Not a single data has been received from the farmers
Central / Mankessim	20	20	13/08/2013	0	0	,,
Central / Assin Fosu	20	20	14/08/2013	0	0	,,
Ashanti / Foase	20	20	15/08/2013	0	0	,,
Ashanti / Nsuta	20	20	16/08/2013	2014	2	Some data received from some farmers
Brong Ahafo / Sunyani West	40	20	22/08/2014	0	0	No data received
Northern / Tamale	20	20	8 /06/2015	2015	1	Almost all data received for this year
Northern / Karaga	20	20	9 /06/2015	2015	1	Almost all data received for this year
Upper East / Garu	20	20	10/06/2015	2015	1	All data received but not all yet digitized
Upper West / Nadowli	20	20	12/06/2015	2015	1	All data received but not all yet digitized

Table 17, Consistency of Farmers' rainfall database table in Cote d'Ivoire

Site	Number of trained villages	Number of villages sending data	RS Date	Date of last registered data	Years of data	Observations
Abidjan	10	0	March 2012	-	-	
Bondoukou	40	26	March 2013	February 2015	2013, 2014, 2015	For most of villages only some months of data after the RS are available. For 2 villages data are available also for 2014 and 2015 (not continuous)
Bouake	63	0	April 2012	-	-	
Dabakala	30	0	January 2013	-	-	
Danane	50		August 2015	-	-	
Daloa	63	41	August 2013	June 2014	2013, 2014	
Dimbokro	61	25	February 2013	December 2013	2013	For most of villages data are complete from March to December 2013
Gagnoa	62	0	March 2012	-	-	
Grand Bassam	60	0	December 2014	-	-	
Grand Lahou	60	27	November 2014	November 2015	2015	
Korhogo	63	63	April 2012	December 2012	2012	For most of villages data are complete from March to December 2012. The Korhogo station had no chief during 2013 and 2014 so data were not sent to Abidjan
Odienne	45	5	January 2013	October 2013	2013	Very few data available
Sassandra	40	13	September 2013	December 2014	2013, 2014	That is the best series of data
Seguela	50		August 2015			
TOTAL	**697**	**174**				

Table 18, Consistency of Farmers' rainfall database table in Mauritania

LOCALITY	N. of trained villages	N. of villages included in DB	Last digitized data	N. of years of digitized data	Obs.
GUIDIMAKHA	35	30	2014	6 years	90%
GORGOL	34	34	2014	6 years	90%
ASSABA	17	13	2014	3 years	70%
BRAKNA/ALEG	15	5	2014	5 years	70%
TRARZA	10	08	2014	3 years	95%
HOD-ECHARGHI/NEMA	30	7	2014	2 years	Regional Capital
HOD-EL GHARBI/AIOUN	30	9	2014	2 years	Regional Capital
TAGANT	05	0	2014	0	0%
TOTAL OF VILLAGES	**176**	**106**			

Concerning component 5, Institutional development, main impacts concerns the improved visibility of NHMSs and consequently a better public awareness of the importance of their role. In many countries, METAGRI OPS allowed NMS to have agreements with other institutions (Benin with ONASA and INRA, Liberia and Sierra Leone MoU with Agriculture District Offices for collecting data from farmers, etc.)

Final score: Medium

Sustainability

The sustainability of the METAGRI approach consist mainly in mainly in the roving seminars simplicity and low cost, allowing NMHS of West Africa to replicate it despite limited resources. Even the regionally produced plastic rain gauge contributes to the sustainability of the action thanks to its very competitive price compared to imported ones.

In all the involved countries, Roving Seminars had large audience and they awaken farmers, civil society, local administration and technical services on the role of weather and climatic information in agriculture. Almost in all the countries, NHMSs received each year many requests for installing rain gauges and training farmers by civil society, farmers, local administrations and traditional chiefs. The number of requests per year is another good indicator of sustainability. Figures are available for the 4 pilot countries only.

Table 19, Requests for rain gauges by country

Country	Requests	Satisfied requests
Côte d´Ivoire	In 2014 10 by Research and in 2015 50 by Extension	0 because out of stock
Ghana	30 per year by NGOs, individuals, projects	0
Niger	120 local authorities, technical services, ONGs and projects	
Mauritania	785 by local authorities, technical services, ONGs and projects	540

In some cases (Nigeria i.a.) farmers and stakeholders, on learning of the importance and likely problems of weather and climate to their sector, even expressed their willingness to bear the cost of procurement and installation of additional rain gauges. In other cases, the National Meteorological Service bought on its own funds complementary rain gauges for distributing to demanding farmers and stakeholders (in Mauritania ONM bought 500 rain gauges in 2012).

In some countries, the partnership created between NHMS and other organization involved in Roving Seminars led to long term agreements and partnerships valorizing the role of NHMS and ensuring further scaling-up of the approach. That's the case for example of Côte d´Ivoire where the NHMS could concretize long term agreements with the Agence Nationale d'Appui au Développement Rural (ANADER), in Benin with ONASA and INRA, in Liberia and Sierra Leone MoU with Agriculture District Offices, etc.

In many cases, METAGRI raised the interest of development partners who funded the inclusion of METAGRI approach in their projects. Globally, more than 2500 farmers have been trained on external funds and 1682 rain gauges have been provided.

Table 20, Funding of complementary activities by other agencies

Country	Project	Institutional collaboration	RS	RG	Villages	Farmers	Meteo-Media workshops
Burkina Faso	Réseau MARP		1	17		34	
Burkina Faso	2IE		2			120	
Burkina Faso	ONG INADES FORMATION		1			27	
Burkina Faso	ONG ARF		1			20	
Burkina Faso	Projets du Plan National d'Adaptation aux changements climatiques (PANA) , 2IE, ONG INADES-FORMATION, RESEAU MARP	yes	13	6		590	
Cap Vert	Project de Renforcement des Capacités d'Adaptation et Résilience aux Changements Climatiques pour le Secteur des Ressources Hydriques	yes					
Ghana	CARE Int. ALP	yes					
Guinea	PANA, RAZC						
Guinea Bissau	Projet de résilience et d'adaptation aux changements climatiques du Secrétariat d'Etat à l'Environnement	yes	2	14	14	39	
Guinea Bissau	Institut Maritime et Portuaire (IMP)	yes	1				
Liberia	GEF Project Climate Change Adaptation for Agriculture (Ministry of Agriculture/FAO)	yes					
Mali	PAPAM/ASAP (WB)		2	750		750	2
Mali	CCAFS	yes	1	20		20	
Mali	GCCA ICRISAT (USAID)	yes	4	300		300	1
Mauritania	ACCVC (German cooperation)	yes	1			40	1
Mauritania	AMCC (EU-UNDP-GIZ)	yes	10	500		500	
Niger	CARE Niger		2	9	9	9	
Niger	ANADIA (Italian Cooperation)	yes	5	40	45	80	
Niger	PROCAN (GIZ)		2	26	26	26	
Sierra Leone	FAO	yes					
	TOTAL		**48**	**1682**	**94**	**2555**	**4**

In Burkina Faso, 791 farmers have been trained during 18 roving seminars delivered on the demand of NGOs and projects. In Mali, trained farmers were 1070 with distribution of so

many rain gauges. In Mauritania, farmers have been 540 and distributed rain gauges were 500.

These figures shows that, METAGRI could start a process that in some countries is self-feeding, mainly in the countries involved from the first phase. That is a major outcome of the project, reached through the increased visibility of NMSs and the interest of stakeholders at different level in the approach.

This outcome could be considered as a cumulative indicator of project relevance (the interest of national and international stakeholders in the approach), effectiveness (the capacity of establishing collaborations and rising complementary funding), efficiency (the capacity of delivering training and rain gauges), impacts (on the behavioral changes of stakeholders toward agrometeorological services for farmers) and sustainability (in terms of scaling-up and internalization of the approach).

A very interesting education activity is being carried out in Mauritania with the support of GIZ: ONM is involved in managing a training module on agrometeorology at the Ecole Nationale de Vulgarisation Agricole of Kaedi that trains the extension agents.

Around METAGRI OPS, local initiatives were growing in some countries, for example in Mauritania 4 peasant associations organized themselves in order to better exploit agrometeorological information and support actions. In Senegal, NMS finalized MoU with peasant organizations to disseminate agrometeorological advises to their members. Always in Mauritania, as a complementary METAGRI OPS activity, ONM is working on local dialogue among farmers and herders in order to avoid bloody conflicts. Such activities are carried out during RS or other awareness rising actions (Caravane de la champagne, awareness rising days). Direct reconciliation activities are carried out through the establishment of local committees fostering amiable solutions in case of damages caused by herds to crop fields.

Final score: High

FINAL REMARKS

Strengths

The strength of the roving seminar concept is without doubt its simplicity and the possibility for NMHS in West Africa to replicate it despite limited resources. At the end of METAGRI OPS, we can synthesize the strengths as follows:

Concerning NHMSs:

- The willingness of NHMSs to implement the project even in very difficult security and sanitary situations
- The good level of preparedness of the NMHS teams to respond to the demand for roving seminars,
- The increased collaboration among NHMSs of the region,
- The increased interaction of NHMSs with the local farming communities,
- Better understanding of the needs (in terms of information) and perception (on climate and changes) of the rural farmers,
- Increased awareness of the potential to valorize local knowledge and practices about climate change and adaptation measures.
- Public awareness raised on NHMSs role not only in agriculture development but also in other sectors such as fishing, maritime transportation, disaster risk reduction (floods),
- Sensitization of national and decentralized decision makers and stakeholders of climatic risks and possible solutions in agriculture,
- Good partnerships with local agricultural extension services, civil society, Peasant Organizations, NGOs, Municipalities and decentralized Governments,
- Strategic alliances with other technical services and agricultural research institutions,
- Involvement in new projects integrating the METAGRI approach,
- Improved role of NHMSs as climate services providers
- A good visibility at all levels.
- Better identification of constraints in forecasts and advises production and broadcasting
- Awareness of NHMS of the importance of communication, and engagement in improving their communication skill
- Test of use of new ICT technologies for sending information to users (i.a. SMS in Mauritania, Nigeria, Ghana) and receiving data from the field (green line in Mali, etc.)
- Improvement of rain gauges density for season agrometeorological monitoring,

Concerning farmers:

- A better understanding of climate variability and change.
- Increased awareness of communities about climate change and adaptation measures.
- Better information on climate, whether and agrometeorological services and advises produced by NHMSs,
- Increased self-resilience in dealing with weather and climate issues that affect agricultural production (impacts on farmers behavior and productivity) and other sectors (fishing, breeding),

- Increased interaction with NHMSs and other involved institution (extension services, NGOs, research, etc.).
- Improvement of farmers practices (mainly for sowing dates) using rain gauges,
- Interest of local authorities for integrating the METAGRI approach in local development plans and other rural development activities.

Gaps

Some of the gaps arose from the countries are hereafter listed:

Effectiveness:

- Weak relation kept with farmers (in many countries) and few feedbacks from the field
- Inadequate engagement and funds for NMSs to keep relation with farmers
- Rain gauge design has to be improved in the attached plastic scale and developing a bigger version for Gulf of Guinea precipitations.
- Rain gauges transport from Mali often difficult and damaging the RG

Efficiency:

- Security and sanitary problems in some countries: Mali coup d'état in 2012, Guinea Bissau coup d'état 2012, Burkina Faso coup d'état in 2014 and in 2015, Nigeria presence of terrorists since 2012 in the North (Boko Haram) and in the Niger Delta, Guinea and Sierra Leone Ebola hemorrhagic fever since 2014
- Organizational: Delay in reporting by some countries, Delay in funds mobilization from WMO, Delay in RS delivery
- Logistics: Choice of participants done in collaboration with the ministry of agriculture (Guinea Bissau), problems for farmers to timely reach the villages where the training takes place,
- The timing of the seminars: the best period is just before the cropping season, when the content of the training « rings a bell », when the messages and lessons are likely to be readily usable,
- Low participation of women (only 13%): conditions for higher attendance number of female farmers should be identified,

Impacts:

- Low, or missing at all, support to farmers after the delivery of seminars and rain gauges,
- Inadequate structuring of the data transmission process from farmers to NMSs and use of smart IC Technologies.
- Inadequate agrometeorological information dissemination mechanism in some countries (Ghana, Côte d´Ivoire, …)
- Language of forecasts not easy to be understood by farmers but also by radio agents
- Poor valorization at NMSs of rainfall data observed by farmers (anyway no quantitative figures of stored data are available for most of the countries),
- Un-sustainability of data collection: for example in Niger, Ghana, Côte d´Ivoire after 1 or 2 years farmers abandon if not supported or monitored (need of specific bidirectional flow of information, farmers needs to be gratified receiving feedbacks, specific agrometeorological advises, etc.),

- Low or underexploited feedbacks from users of weather and climate information, even if they are crucial for the NMHSs in improving their services for the agricultural community both in the design of improved products and in the improvement of communication channels (METAGRI OPS working on it).
- Low capitalization of farmers perception and knowledge of weather and climate
- Communication of weather and climate information to be further improved using all the available channels to get in touch with farmers, particularly during the critical phase of agricultural production.

Recommendations

The following recommendations arose from national reports and the METAGRI OPS final conference:

To WMO

1. Project management:
    a. The described problems in project efficiency in delivering reports, funds and roving seminars suggest revising the project management process, in order to ensure in time financial reporting by countries and funds delivery to countries.
    b. Improve the project implementation monitoring framework with reporting guidelines for countries.
    c. Improve the impacts evaluation on farmers' behavior and productivity, increasing the sample, repeating it each year and improving the protocol.
2. Improvement of the METAGRI approach:
    a. Support countries in the institutionalization of the METAGRI approach: Roving Seminars should be endorsed by Governments as tools for rural development. WMO funding should be limited to the improvement and the enrichment of the approach, not for scaling-up.
    b. Propose common mechanism for ensuring strong farmers follow-up, feeding back and continuously renovate the relation between NHMSs and farmers through recalling seminars, field visits and communication activities.
    c. Propose the adoption of ICT for rainfall and phenological data collection in the field (ex. Apps on smartphones).
    d. Identify mechanisms for the valorization of good experiences of communication from best performing countries (mobile phones, local radios, funding of communication activities, use of local languages, glossaries).
    e. Encourage south-south collaborations among NHMSs of different countries particularly among those already having strong skills in farmers' agrometeorology and those with fewer competencies.
    f. Introduce practical types of training activities (on-the-job training, stages).
3. Follow-up of METAGRI-OPS:
    a. Further strengthen NHMSs technical capacities in Agrometeorology through specific training and provision of analysis tools (remote sensing, crop modelling and GIS).
    b. Adaptation and validation of SARRA-H to humid areas.

c. Diffusion of and training on the last SARRA-H version issued by CIRAD.
d. Improve the quality of the plastic rain gauges because after some time (2-3 years) of exposure to atmospheric agents they tend to crack and the graduation progressively disappears.

<u>To NHMSs</u>

1. Project management:
    a. Respect financial and technical reporting instructions in order to speed up the administrative procedures for funds delivery
    b. Respect the appropriate times (before the cropping season) for delivering roving seminars.
2. Collaborations:
    a. Further engagement in the collaboration with local and central authorities, particularly Ministry of Agriculture and agronomic research.
    b. Strengthening the collaboration between DMN and extension service in order to better support model farmers in the use of agrometeorological information (school fields in the villages for demonstration) and to scale-up the training to other farmers
3. Farmers loyalty:
    a. Ensure a regular monitoring to trained farmers in order to make them feel the proximity of DMN and encourage them to communicate observed data.
    b. Production of agrometeorological bulletins specifically for METAGRI Municipalities and communicate them to involved communities,
    c. Integrate traditional knowledge and weather and seasonal forecasts in the farmers' decision making process
4. Institutionalizing the METAGRI approach:
    a. Further engagement in finding complementary funding other than WMO for delivering roving seminars.
    b. Organize in each country an event promoting the METAGRI approach targeted to decision makers and development partners, for the generalization of the approach in other rural development activities.
5. METAGRI OPS follow-up:
    a. Prepare seeding calendars where not yet available.
    b. Prepare a calendar on the appropriate periods to disseminate the different climatic information in the different regions of the country (considering also that the southern countries have 2 rainy seasons).
    c. Track the flow of weather data from farmers to NHMSs, manage data in a specific database, and valorize collected data.
    d. Improve the participation of women where relevant and representative of the gender involvement in rural activities
6. Communication aspects:
    a. Training for NHMSs agents in communication
    b. Training of media journalists in the comprehension of weather and climate lexicon, in the interpretation of forecasts and in the translation in local languages using appropriate vocabulary.
    c. Produce weather and climate glossary in local languages
    d. Develop MoU with local Media for advises dissemination
    e. Test and exploit appropriate smart IC Technologies for communicating with extension agents, local radios and model farmers

f. Fully implement the communication action plans
g. Develop and regularly update NHMSs web sites for the dissemination of agrometeorological information and advises

To local radio agents

1. Diffusion of agrometeorological bulletins/advices in local languages and at appropriate periods.
2. Choice appropriate timing for radio transmission, when farmers can better exploit them
3. Establish MoU with NHMSs

To decision makers

1. Integration of agroclimatic services and Roving Seminars into Communities' Development Programs (PDC) and Climate Change Adaptation as well as Climatic risk reduction programmes.
2. Redynamisation of MWG (GTP) where existent and establish them where not yet existent,
3. Include agrometeorological services in the curricula of extension agents and involve NHMSs in the education programmes.

COUNTRIES' FACT SHEETS

Country	**Benin**
NHMS	Direction de la Météorologie Nationale
National Focal Point	Mr. AGBADJAGAN Janvier/Mr NAPKON Kokou Marcelin

Year	**2012**	**2013**	**2014**
Roving Seminars	8	5	4
Timing	January 2013	February 2014	November
Represented Villages	80	50	40
Total attendants	424	216	149
Food producers	424	216	149
Trained Women	69		
Other attendants			
Rain gauges	80	50	40
Flags (sets)			
Meteo trainers	5	5	5
Other trainers	2	2	2
Other institutions participating			
Collaborations	INRAB (Institut National des Recherches Agricoles du Benin) and ONASA (Office National d'appui à la Sécurité Alimentaire)		
Media coverage	Local Media, Agence de Presse du Benin		
Building on previous experiences			
Scaling-up with complementary funding	MoU NMS with INRA and ONASA		
Impacts	Improved role of NMS		
Needs			
Recommendations	Regular training of extension agents on the use of agrometeorological information, develop a training manual, radio broadcasting in local languages		
Notes			

Country	**Burkina Faso**
NHMS	Direction de la Météorologie Nationale
National Focal Point	Mme SANFO B. Judith/Mr. SIA Cyriaque

Year	**2012**	**2013**	**2014**
Roving Seminars	8	4	1
Timing	August	June	November 2015
Represented Villages	223	74	75
Total attendants	580	316	86
Food producers	503	272	75
Trained Women	103	119	14
Other attendants	77	44	11
Rain gauges	135	55	72
Flags (sets)			
Meteo trainers	3	3	
Other trainers	2	1	
Other institutions participating	ONG ARFA, ONG CIDI, SOFITEX, Farmers Organization (CPF)		
Collaborations	DR/DPAH, DR/DPEDD, DPASA, DG Agriculture		
Media coverage	Local radio, RTB2		
Building on previous experiences			
Scaling-up with complementary funding	Projects of Plan National d'Adaptation aux Changements Climatiques (PANA) funded other 13 seminars, 590 farmers, 6 rain gauges + 6 AWS, ONG ARF funded 1 RS (20 participants) 1 by ONG INADES-FORMATION, 2 by 2ie, 1 by Reseau MARP Total about 200 part and 42 rain gauges		
Impacts			
Needs	Improvement of the diffusion of advises to farmers, Organization of Roving Seminars for women		

Country	**Cabo Verde**
NHMS	Instituto Nacional de Meteorologia e Geophísica
National Focal Point	Mr. SPENCER Joao

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	8	4	2	2
Timing	Jul.-Aug. + April 2013	Aug. 2013- Febr. 2014	December	
Represented Villages	80	80	40	
Total attendants	289	179	95	60
Food producers	281	175	92	60
Trained Women	110	52	28	8
Other attendants	5	?	?	
Rain gauges	80	80	40	40
Flags (sets)			20	20
Meteo trainers	1	3	3	
Other trainers	3	4	4	
Other institutions participating	3	4	3	

Collaborations	Multidisciplinary Working Group: National Institut of Agricultural Research and Development (INIDA), Général Direction of Agriculture, Sylviculture and Breeding (DGASP), Ministry of Rural Development (MDR), Ministry of Education (ME) and 3 NGOs National Institut of Fishing Développent (INDP), Institut Maritime et des Ports (IMP), National Civil Protection Services (SNPC), and 20 Associations Communautaires des Pécheurs.
Media coverage	National Radio (RCV), National Television (RTC), Press officies of Ministries, National Press Agency, Newspapers
Building on previous experiences	
Scaling-up with complementary funding	Collaboration with the Project « Renforcement des Capacités d'Adaptation et Résilience aux Changements Climatiques pour le Secteur des Ressources Hydriques » that provided a communication expert for the seminars, a journalist and a vulagarisator. collaboration with 20 Fishers associations
Strenghts	To have created a mechanism of dialogue and exchange between the INMG, Extension services and farmers.
Needs	

Country	**Chad**
NHMS	Direction Générale de la Météorologie Nationale
National Focal Point	Mr DJERGO Gaya/Mr. MBAITOUBAM Elie

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	4	2	2	3
Timing	January-February 2013	July	December	December
Represented Villages	90	53	3	
Total attendants	189	98	92	135
Food producers	163	85	73	135
Trained Women	21	11		
Other attendants	24	11	17	
Rain gauges	120	70	80	120
Flags (sets)				
Meteo trainers	2	3	2	
Other trainers	2	2	2	
Other institutions participating	2	2	2	

Collaborations	Office National de Développement Rural (ONDR), Direction de la Production et des Statistiques Animales (DPSA), SODELAC (Société de Développement du Lac)
Media coverage	National and local Radios
Building on previous experiences	
Scaling-up with complementary funding	NGOs participation
Strenghts	Collaboration with Agriculture and Breeding experts on the use of weather forecasts by farmers and herders exchanges between farmers and NMS on the use of traditional knowledge of farmers and herders on season forecasting Strengthening relation between farmers and extension service
Needs	
Recommendations	Make regular weather forecasts on the radio and TéléTchad and in national newspapers; taking geographic coordinates of the rain gauges so that their data can be entered in the country's climate data base
Notes	

Country	**Côte d'Ivoire**
NHMS	Direction de la Météorologie Nationale
National Focal Point	Mr. MIAN Kodjenini Augustin

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	11	17	2	4
Timing	March-April	Jan-Mar/ Aug-Sep	Nov-Dec	August
Represented Villages	196	235	120	100
Total attendants	450	581	260	220
Food producers	394	538	260	220
Trained Women	21	35	8	4
Other attendants	38	43		
Rain gauges	200	262	120	100
Flags (sets)				
Meteo trainers				
Other trainers				
Other institutions participating	18			
Collaborations	ANADER (extension), Ministry of Agriculture, CNRA, ONGs, Fishing Direction, Peasants' Organizations			
Media coverage	local media, RTI, newspapers, rural radios			
Building on previous experiences				
Scaling-up with complementary funding				
Strengths				
Needs				
Recommendations	Transmission of observed data and advices by SMS Implementation of GTP			

Country	**Gambia**
NHMS	Department of Water Resources
National Focal Point	Mr. GIBBA Peter/ Mr. JALLOW Alpha

Year	**2012**	**2013**	**2014**
Roving Seminars	8	5	2
Timing	July	?	Jan. 2015
Represented Villages	149	80	20
Total attendants	376	317	57
Food producers	301	317	57
Trained Women	89		11
Other attendants	75		
Rain gauges	160	80	20
Flags (sets)			
Meteo trainers			5
Other trainers			2
Other institutions participating			

Collaborations	Dep. Agriculture, Disaster Agen., Red cross Soc., Environment, NGOs, Regional Agricultural Offices, Department of Water Resources, Fisheries Department,
Media coverage	
Building on previous experiences	
Scaling-up with complementary funding	
Strengths	Both gauge readers and communities they served are highly appreciative of the rain gauges, Farmers are more interested in weather and climate issues now more than ever.
Needs	Increase awareness, understanding and interest of the user community on weather and climate information through conducting further roving seminars, increase the time to two roving seminars par region to allow enough time for all the topics to be dealt with, establishing further links and feedbacks with the user communities.
Recommendations	Daily forecasts broadcast daily over the community radios Use of traditional musicians, local theatre groups and advocacy groups in the sensitization of local communities
Notes	

Country	**Ghana**
NHMS	Ghana Meteorological Agency
National Focal Point	Mr. POKPERLAAR Dominic Soami

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	8	5	3	4
Timing	Aug	Aug	Aug-Sep	June
Represented Villages	160	100	99	80
Total attendants	200	130	138	116
Food producers	160	100	114	80
Trained Women	10	16	3	7
Other attendants	40	30	24	36
Rain gauges	160	100	40	40
Flags (sets)			0	
Meteo trainers	2	3	2	1
Other trainers	16	9	13	9

Other institutions participating	Ashari Ecological Farms Project (NGO) local farmers association (FAKA, COFAG)
Collaborations	Ministry of Food and Agriculture (MOFA) , Agricultural extension agents (AEA) Fishers cluster communities
Media coverage	GBC, Local FM Radio, Television stations
Building on previous experiences	
Scaling-up with complementary funding	CARE Int. ALP Collaboration with the PANA RAZC for the organization of Seminars
Strengths	
Needs	
Recommendations	Enhance the role of information and communication technologies for accurate, reliable and timely climate information to farmers. Combine traditional and scientific knowledge for improved local weather forecasting to farmers
Notes	In 2014 2 RS for fishers and 1 RS for farmers

Country	**Guinée**
NHMS	Direction Nationale de la Météorologie
National Focal Point	Ms. DIALLO Halimatou

Year	**2012**	**2013**	**2014**
Roving Seminars	7	4	2
Timing	Aug	July	October 2015
Represented Villages	170	100	60
Total attendants	236	216	120
Food producers	170	150	120
Trained Women	8	16	0
Other attendants	66	63	?
Rain gauges	170	100	
Flags (sets)			60
Meteo trainers	7		
Other trainers			
Other institutions participating	3		

Collaborations	Extension service, ONGs, Universities, projects, Agence navigation maritime
Media coverage	AGP (Agence Guinéenne de Presse), Rural Radio, RTI, private Radios
Building on previous experiences	
Scaling-up with complementary funding	Collaboration with projects such as PANA and RAZC for the organisation of seminars
Strengths	For the National Directorate of Meteorology, improved visibility and collaboration with technical services of rural development and with farmers through the advice and guidance provided. Awareness of the technical departments of agriculture to plan agricultural activities based on information from the seasonal forecast. Good partnerships have been established with some organizations including local NGOs operating in certain prefectures.
Needs	
Recommendations	Peasants and extension, in view of the importance of lessons received, requested the organization of other seminars and this before the start of the rainy season, the extension of rainfall network in rural communities; Finally ensure the best routing and timing for diffusing weather and climate information to farmers.
Notes	

Country	**Guinea Bissau**
NHMS	Direccao do Servicio Nacional da Meteorologia
National Focal Point	Mr. DIAS FONSECA Francisco

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	8	4	2	3
Timing	Jul_Sep	Jul-Sep	Dec. - Jan 2015	?
Represented Villages	160	100	40	56
Total attendants	256	112	72	81
Food producers	250	104	72	81
Trained Women	51	14	13	5
Other attendants	6	8		
Rain gauges	160	100	40	56
Flags (sets)			0	
Meteo trainers	4	4	4	
Other trainers	2	2	2	
Other institutions participating				

Collaborations	Extension service, NGOs, Institut Maritime et Portuaire
Media coverage	Radio (private and community), Regional media
Building on previous experiences	
Scaling-up with complementary funding	Project Résilience et d'adaptation aux changements climatiques of Secrétariat d'Etat à l'Environnement (28 agr. Trained, 11 NGOs' agents, 14 raingages in 14 villages Contributions from Institut Maritime et Portuaire (IMP) 2 roving seminars organised in the framework of the partnership with the Project Resilience et Adaptation au Changement Climatique in the Region of Gabu
Strengths	Weather forecasts used by marine police
Needs	
Recommendations	
Notes	In 2013 Seminars for farmers, breeders, horticulturalists, fruit farmers and extension and NGOs agents, In 2014 1 Seminar for farmers, 1 seminar for fishermen and delegates maritime In 2015 fishermen, maritime delegates and marine transportation

Country	**Liberia**
NHMS	Division of Meteorology
National Focal Point	Mr. SIMPSON Henry A.

Year	**2012**	**2013**	**2014**
Roving Seminars	8	4	2
Timing	Aug-Sep	Sep	June 2015
Represented Villages	160	80	40
Total attendants	240	80	40
Food producers	185	56	31
Trained Women			6
Other attendants	55	24	9
Rain gauges	160	80	40
Flags (sets)			20
Meteo trainers	2		
Other trainers	4		
Other institutions participating			

Collaborations	Ministry of Agriculture and Extension service, FAO Counties Agriculture Coordinators (CAC), District Agriculture Officer (DAO), Land Line Ministries
Media coverage	Community Radio, Local radio, Media workshop
Building on previous experiences	
Scaling-up with complementary funding	Synergy with the GEF Project Climate Change Adaptation for Agriculture (Ministry of Agriculture/FAO)
Strengths	MoU with Agriculture Offices for collecting data from farmers
Needs	Speed the availability of funds, enlarge the size of rain gauge, better involvement of local authorities, community radio stations in the sensitization and supporting the division's initiative in getting the daily forecast broadcast on the local radios; Strengthening the capacities of regional officers of the Ministry of Agriculture and MeteoLiberia staff in the collection of rain fall data.
Recommendations	Getting the coordinates (longitude, latitude and elevation) of the rain gauges planted during Roving Seminar. Provide training for Met Service on the use of GPS; Involvement of local authorities, community radio stations in the sensitization and supporting the division's initiative in getting the daily forecast broadcast on the local radios; Strengthening the capacities of regional officers of the Ministry of Agriculture and MeteoLiberia staff in the collection of rain fall data, Organize evaluation & monitoring missions - frequent field visits, Strengthening partnership with GSM operators, community radios to improve communications with the farming community.
Notes	In 2014 1 RS for fishermen and 1 RS for farmers

Country	**Mali**
NHMS	Agence Nationale de la Météorologie
National Focal Point	Mr. DIARRA Z. Dauda

Year	**2012**	**2013**	**2014**
Roving Seminars	8	3	2
Timing	July-September	June-August	March 2015
Represented Villages	160	80	?
Total attendants	154	219	134
Food producers	154	154	67
Trained Women			14
Other attendants	65		67
Rain gauges	160	80	
Flags (sets)			
Meteo trainers			
Other trainers			
Other institutions participating			

Collaborations	Technical services, NGOs, Agriculture Department
Media coverage	Local radios, 25 media agents
Building on previous experiences	
Scaling-up with complementary funding	CCAFS, 1 RS Cinzana 20 rain gauges, ICRISAT/Prog GCCA of USAID bought 300 rain gauges, 4 roving seminars, 1 Meteo-media seminar
Strengths	
Needs	
Recommendations	
Notes	

Country	**Mauritania**
NHMS	Office National de la Météorologie
National Focal Point	Mr. COULIBALY Hamidou

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	8	4	2	4
Timing	Jul-Aug	Jul	Sep-Dec	July
Represented Villages	26	18	5	
Total attendants	834	219	85	
Food producers	805	200	65	
Trained Women	61	20	6	
Other attendants	25	10	20	
Rain gauges	160	55		
Flags (sets)				
Meteo trainers				
Other trainers				
Other institutions participating	4	9		

Collaborations	Agriculture Department, Extension Agents (AVBs), ONG World Vision, GRDR, ACCORD, AMAD, fédération de pêche artisanale, UNDP, GIZ, FAO, WFP, UNICEF
Media coverage	AMI (Agence Mauritanienne d'Information), TVM, Radio, Online Press, Press Agency, Newspapers, rural radio (agreement for info dissemination)
Building on previous experiences	Previous project (MarinMet) Meteo-Pecheurs having already implemented the system of alerting flags.
Scaling-up with complementary funding	ONM bought 500 rain gauges on its budget, AMCC (EU-UNDP-GIZ) funded 10 RS, collaboration with ACCVC (German cooperation) for organizing Fishers Seminars and Meteo-Media seminar, MoU with fishers associations
Strengths	Promoting services and products within the rural world provided and the visibility of the service, Strengthening collaboration between meteorology, other structures of development and rural producers; identification of constraints to regular production of reliable forecasts for rural producers, the identification of the conditions for the establishment of trust to climate information
Needs	
Recommendations	Valorization of farmers rain gauge network, data evaluation, improve collection by smartphones, strengthening the collaboration between Fédération Nationale de Pêcheurs Artisanaux and the Office National de la Météorologie, repeat the experience of flags
Notes	In 2014 1 RS for farmers and 1 for fishers (MoU for weather info dissemination for fishers)

Country	**Niger**
NHMS	Direction de la Météorologie Nationale
National Focal Point	Mme SITTA Aïssatou Adamou

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	8	4	1	4
Timing	Sept.	Nov 2013- Jan 2014	August	August
Represented Villages	145	77	20	72
Total attendants	337	195	42	150
Food producers	313	174	40	150
Trained Women	21	17		9
Other attendants	24	21	2	
Rain gauges	145	77	20	
Flags (sets)				
Meteo trainers	2	2	2	
Other trainers				
Other institutions participating				

Collaborations	Extension service, Livestock service, Environment service, Gendarmerie Nationale, ONGs
Media coverage	Local radio
Building on previous experiences	
Scaling-up with complementary funding	ANADIA 2 RS and 2 recalling seminars, 45 villages, 60 farmers, 40 rain gauges CARE Niger funded in 2014 the training and distribution of rain gauges in 9 villages (Makalondi and Doutchi) PROCAN (GIZ) 2 seminars, 26 villages , FAO-Resilience
Strengths	Interviews of Meteo agents with local radio
Needs	Improve the quality of rain gauges, valorize data observed by farmers
Recommendations	Continuation of roving seminars, implementation of action plans resulting from weather seminars and media, development of meteorological services and tools for more reliable information to farmers, encourage farmers to use climate information through demonstrations such as schools fields, maintain contact between meteorological services and farmers even outside seminars
Notes	

Country	**Nigeria**
NHMS	Nigerian Meteorological Agency
National Focal Point	Mr. IJAMPY James Adamu

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	8	4	2	2
Timing	Aug - October	July-September	November	December
Represented Villages	160	89	28	
Total attendants	574	296	90	0
Food producers	396	185	88	
Trained Women	69	14	19	
Other attendants	178	100	2	
Rain gauges	160	100	20	
Flags (sets)			20	
Meteo trainers	2	2	2	2
Other trainers	5	3		
Other institutions participating		11		

Collaborations	Ministry of Agriculture, State Agric Development Authority (ADP). All Farmers Association of Nigeria (AFAN), State Agricultural development Projects, National Agricultural Extension Research & Liaison Services, Institute of Agricultural Research, Nigerian Hydrological Services Agency, University of Agriculture Makurdi, EEC, FRCN,
Media coverage	Local, State and Federal FM radios, TVs, newspapers, States' Media Services, print media, Federal Radio Corporation of Nigeria (FRCN), States Media Services
Building on previous experiences	
Scaling-up with complementary funding	Collaboration with States Agricultural and Rural Development Programmes (ADP)
Strengths	Change in the users, before mainly research and Ministry of agriculture, now also farmers and extension Increase of the number of weather info users
Needs	
Recommendations	
Notes	In 2014 1 RS for farmers + 1 RS for fishermen/farmers

Country	**Senegal**
NHMS	Agence Nationale de l'Aviation Civile et de la Météorologie du Sénégal
National Focal Point	Mr. NDIAYE Mamadou

Year	**2012**	**2013**	**2014**
Roving Seminars	8	4	5
Timing	Sept-Nov.	Jul.-Aug.	Dec.-October 2015
Represented Villages	95	46	
Total attendants	727	274	188
Food producers	649	235	188
Trained Women	169	49	
Other attendants	78	39	
Rain gauges	168	60	
Flags (sets)			
Meteo trainers	4	4	4
Other trainers	7	7	

Other institutions participating	Association pour le Développement Agricole de la Communauté rurale de Fimela (ADAF), Projet d'Appui aux Filières Agricoles (PAFA), Conseil National de Concertation des Ruraux (CNCR), Centre d'Appui au développement Local (CADL)
Collaborations	Ministry of Agriculture, Ministry of breeding, Agricultural Extension (ANCAR), Ministry of Environment, Regional Development Agencies, NGOs, CDAF, CADL, CDEPS, Farmers Organizations, WFP, Direction de la Protection et de la Surveillance des Pêches (DPSP), Direction de la Pêche
Media coverage	National media (RTS, Zik-FM, newspapers), APS, Walf, RFM, TFM and local radios
Building on previous experiences	AMMA (EC FP7)
Scaling-up with complementary funding	Agreements with local farmers organizations for climatic information dissemination
Strengths	Farmers, breeders and poultry farmers involved Peasant organizations always present at RS Media always present at RS Seminars becoming popular at Peasant Organizations, creation of a free service for fishermen for getting warnings on strong winds/thunderstorms (Agreement with Sonatel company)
Needs	Peasant Organizations ask for an improvement of quality of delivered services, particularly i) better training of farmers on variety choice and sowing date, 2) advices broadcasted with weather forecast during the whole season
Recommendations	To establish demonstration fields for the use of agrometeorological information To improve the dissemination of short and medium term forecasts To improve the communication among technicians and farmers To provide short and long range forecasts for farmers
Notes	2014 5 RS for fishermen

Country	**Sierra Leone**
NHMS	Meteorological Department
National Focal Point	Mr MUSA Patrick/Mr. BOCKARI Alpha

Year	**2012**	**2013**	**2014**
Roving Seminars	Nil nil		2
Timing			May
Represented Villages			45
Total attendants			49
Food producers			45
Trained Women			
Other attendants			4
Rain gauges			45
Flags (sets)			
Meteo trainers			
Other trainers			
Other institutions participating			
Collaborations	Agricultural Extension, IFAD		
Media coverage			
Building on previous experiences			
Scaling-up with complementary funding	MoU with District Agriculture Officers for rainfall data collection from farmers		
Strengths	Interest and enthusiasm shown by the participants during the seminar Increased resilience to weather and climate variability and change through sensitization and improved interaction among MET Department, user communities and Agriculture extension and other development partners such as FAO and IFAD.		
Needs			
Recommendations	Better communication method established to disseminate agricultural meteorological information and agricultural advisories in conjunction with weather information to end users. Strengthened capacity of the MET Department to produce and disseminate enhanced agricultural meteorology products and end-user services. Observation gaps to be identify in order to improve the quality of agricultural meteorology in pilot areas. Memorandum of understanding (MOU) developed between the MET department and the District Agriculture Officers in monitoring and collection of data from farmers.		
Notes			

Country	**Togo**
NHMS	Direction Générale de la Météorologie Nationale
National Focal Point	Mr AFFO-DOGO Abalo/Mr. KPOGO Louis Yao Doh

Year	**2012**	**2013**	**2014**	**2015**
Roving Seminars	8	4	2	2
Timing	August-Sept	November	December	October 2015
Represented Villages	202	73	46	72
Total attendants	389	184	101	113
Food producers	315	156	101	99
Trained Women	102	22	7	13
Other attendants	74	28		14
Rain gauges	134	62	46	85
Flags (sets)			0	
Meteo trainers				
Other trainers				
Other institutions participating				

Collaborations	Agriculture Department, Livestock and fishing Department, Institut Togolais de Recherche Agronomique (ITRA), Extension service (Institut de Conseil et d'Appui du Togo ICAT), Union des Coopératives de Pêche Maritime,
Media coverage	Radio Lomé et Radio Kara (National Radios), National Television (TVT), Quotidien National d'Information (TOGO-PRESSE), Agence Togolaise de Presse (ATOP) and many local radios
Building on previous experiences	
Scaling-up with complementary funding	
Strengths	Improved collaboration with media (Many media where present at RS at list 9 different National/regional/local) Farmers are aware of agrometeorological information use and importance
Needs	Regularly visit farmers and rain gauges sites for controlling and continuous training of farmers; take GPS coordinates of rain gauges; get funds on time
Recommendations	Monitoring and evaluation of rain gauges, geolocalize rain gauges, improvement of data collection
Notes	In 2014 1 RS for fishermen and 1 for farmers

ANNEXES

Annex 1, Terms of Reference

Annex: TERMS OF REFERENCE / DESCRIPTION OF DUTIES

Terms of Reference:

The specific objective of the contract is to evaluate the METAGRI OPERATIONAL project (2012-15) and to develop and apply in four pilot countries an impact assessment methodology for the Roving Seminars and the Weather and Climate Services for Agrometeorology at smallholder farmer level.

There are four main deliverables that the consultant will produce. The first is an Evaluation Report of METAGRI-OPS activities from 2012-2014. This is similar the report that Dr Tarchiani develop for the METAGRI project from 2008-2011. This deliverable will involve no travel.

The second deliverable is to develop and test an impact assessment methodology on 4 pilot countries. This will involve a trip to each of the countries.

The third deliverable involves preparing a report assessing the use and impacts of Roving Seminars on farmer's behaviour and on crop production. The original METAGRI-OPS project did not explicitly involve an assessment of crop yields based on information from the Roving Seminars. The consultant will assess if farmers behaviour has changed based on the Roving Seminars and try to determine if there was any crop yield impact.

The fourth deliverable is an update on the second deliverable after consultations with country focal points and discussions at the Final METAGRI-OPS Workshop in October 2015.

The fifth deliverable is the Final METAGRI OPS Evaluation Report which will be a revised and updated version of the four other deliverables that will be synthesized into an overall summary METAGRI OPS project. This last deliverable will also provide an overall evaluation of the METAGRI OPS project.

The International Consultant will coordinate the following tasks with National Focal Points under the guidance of C/AgM.

1) Evaluation of METAGRI OPERATIONAL 2012-2014

The METAGRI **OPERATIONAL** implementation will be evaluated in relation to project objectives considering the five evaluation criteria endorsed by the OECD-DAC:

- Relevance
  - Of the project objectives
  - Of the approach towards reaching objectives
- Effectiveness
  - Of the approach
- Efficiency
  - In the implementation of activities for the 5 project components
- Impacts, in terms of:
  - Improvement of classical activities (Roving Seminars –Rain gauges)
  - Strengthening NMHS skills;
  - Communication of weather information;
  - Feedbacks from local level;
  - Institutional framework and partnership;
- Sustainability

2) Test of Weather and Climate Services' impact assessment methodology on pilot countries (Ghana, Mauritania, Côte d´Ivoire and Niger)

2.1) Methodology elaboration in collaboration of the Focal Points of selected Countries for the application during the 2015 campaign.
2.2) Assessing the context of climate services in the country on the basis of the data collected through the questionnaire for National Focal Points prepared by the C/AgM.
2.3) Support the National Focal Points in the preparation of the impact assessment in 4 sites per each country
2.4) Support the National Focal Points in the Mid-season evaluation (2 countries visited x 1 week each)
2.5) Support the National Focal Points in the end of season evaluation (2 countries visited x 1 week each)
2.6) Draft a first document about conclusions and coordinate the final writing with National Focal Points and WMO

3) Final reports

3.1) Final methodology proposal (to be reviewed by country focal points and at Final METAGRI-OPS Workshop)
3.2) METAGRI OPS final Evaluation Report 2012-2015

Input (to be provided by WMO and/or National Focal Points):

- METAGRI OPS project document,
- METAGRI OPS yearly and final project reports,
- METAGRI OPS yearly and final national reports,
- METAGRI OPS events (training, conferences) reports.
- Filled questionnaires for the Assessment of climate services in the country (for pilot countries)
- 2015 Roving seminars reports (for pilot countries)
- 2015 Mid-season evaluation reports (for pilot countries)
- 2015 End of season evaluation reports (for pilot countries)

Deliverables	**Month**
D1 METAGRI OPERATIONAL 2012-14 Evaluation Report	April 2015
D2 Impact assessment methodology to be tested	April 2015
D3 Report assessing the use and impacts of Weather and Climate Services on farmers behaviour and on crop production	October 2015
D4 Proposal of an impact assessment methodology for the Roving Seminars and the Weather and Climate Services for Agrometeorology in Western Africa and other regions at smallholder farmer level.	November 2015
D5 Final METAGRI OPERATIONAL Evaluation Report	December 2015

Annex 2, List of consulted documents

N.	Author	Year	Report
1	Benin	2012	METAGRI OPS National Report
2	Benin	2013	METAGRI OPS National Report
3	Benin	2014	METAGRI OPS National Report
4	Burkina Faso	2012	METAGRI OPS National Report
5	Burkina Faso	2013	METAGRI OPS National Report
6	Cap Vert	2012	METAGRI OPS National Report
7	Cap Vert	2013	METAGRI OPS National Report
8	Cap Vert	2014	METAGRI OPS National Report
9	Chad	2012	METAGRI OPS National Report
10	Chad	2013	METAGRI OPS National Report
11	Chad	2014	METAGRI OPS National Report
12	Cote d'Ivoire	2012	METAGRI OPS National Report
13	Cote d'Ivoire	2013	METAGRI OPS National Report
14	Cote d'Ivoire	2014	METAGRI OPS National Report
15	Gambia	2014	METAGRI OPS National Report
16	Ghana	2012	METAGRI OPS National Report
17	Ghana	2013	METAGRI OPS National Report
18	Ghana	2014	METAGRI OPS National Report
19	Ghana	2015	METAGRI OPS National Report
20	Guinea Bissau	2012	METAGRI OPS National Report
21	Guinea Bissau	2013	METAGRI OPS National Report
22	Guinea Bissau	2014	METAGRI OPS National Report
23	Liberia	2012	METAGRI OPS National Report
24	Liberia	2013	METAGRI OPS National Report
25	Liberia	2014	METAGRI OPS National Report
26	Mali	2012	METAGRI OPS National Report
27	Mali	2013	METAGRI OPS National Report
28	Mauritania	2012	METAGRI OPS National Report
29	Mauritania	2013	METAGRI OPS National Report
30	Niger	2012	METAGRI OPS National Report
31	Niger	2013	METAGRI OPS National Report
32	Niger	2014	METAGRI OPS National Report
33	Nigeria	2012	METAGRI OPS National Report
34	Nigeria	2013	METAGRI OPS National Report
35	Nigeria	2014	METAGRI OPS National Report
36	Senegal	2012	METAGRI OPS National Report
37	Senegal	2013	METAGRI OPS National Report
38	Senegal	2014	METAGRI OPS National Report
39	Sierra Leone	2014	METAGRI OPS National Report
40	Togo	2012	METAGRI OPS National Report
41	Togo	2013	METAGRI OPS National Report
42	Togo	2014	METAGRI OPS National Report
43	Senegal	2012	Meteo Media Workshop Report

44	Gambia	2014	Meteo Media Workshop Report
45	Guiné Bissau	2013	Meteo Media Workshop Report
46	Guiné Bissau	2014	Meteo Media Workshop Report
47	Guinea	2013	Meteo Media Workshop Report
48	Liberia	2013	Meteo Media Workshop Report
49	Sierra Leone	2014	Meteo Media Workshop Report
50	Togo	2013	Meteo Media Workshop Report
51	Mauritania	2014	Meteo Media Workshop Report
52	Benin	2015	Meteo Media Workshop Report
53	Cap Vert	2015	Meteo Media Workshop Report
54	Chad	2015	Meteo Media Workshop Report
55	Niger	2015	Meteo Media Workshop Report
56	Niger	2015	Meteo Media Workshop Report
57	CIRAD	2014	Training Workshop on SARRA-H Banjul 24-28/2/2014 and Abidjan 17-21/3/2014
58	CIRAD	2013	Training Workshop SARRA-H Niamey 28/10-1/11/2013
59	WMO-EUMETSAT	2012	Training Workshop Use of Satellite Products on Agrometerology 19-23/11/2012 Niamey
60	WMO-EUMETSAT	2013	Training Workshop Use of Satellite Products on Agrometerology 10-14/06/2013 Accra
61	WMO-EUMETSAT	2014	Training Workshop Use of Satellite Products on Agrometerology 5-9/05/2014 Ouagadougou
62	WMO-EUMETSAT	2015	Training Workshop Use of Satellite Products on Agrometerology 23-27/03/2015 Addis Ababa
63	Liberia	2012	Training of Trainers Workshop 17th -19th April 2012 Monrovia
64	WMO	2013	METAGRI OPERATIONAL. Background, Review 2012-2013, Project plan for 2014 and perspectives 2015

Annex 4, Survey on METAGRI OPS implementation in Cote d'Ivoire, Ghana, Mauritania and Niger

COTE D'IVOIRE

IC formally embarked in the last year of METAGRI (2011), but operationally activities could start only in 2012 (METAGRI OPS).

Roving Seminars

RS have been held in collaboration with ANADER and CNRA (only in 2012). 11 RS have been organized in 2012, 17 in 2013, 2 in 2014 and 4 in 2015 for a total of 34 Seminars covering 651 villages.

METAGRI allowed SODEXAM Agrometeorological Service (AgMetS) to approach farmers and local extension agents. Indeed the RS have been used to train both and SODEXAM AgMetS could strengthen its relations with ANADER (Agence Nationale du Développement Rural). Moreover, the rain gauge network in the North of Côte d'Ivoire was completely destroyed during the war, and METAGRI contributed to rebuild the network, even if data are not reliable for climatology, just for local monitoring of rainy season.

The choice of METAGRI sites was driven by the presence of a SODEXAM synoptic station. Villages and farmers in each region are chosen by ANADER following the criterion of 10 km distance between villages in order to have an optimal observation network.

Rainfall data collection and management

Farmers collect data using the sheets provided by SODEXAM AgMetS. The sheets are gathered by ANADER, and then transmitted to the SODEXAM station chief, who should sent it to Abidjan. This transfer process is very long and sometimes data delay 6 moth or more to reach Abidjan. At AgMetS, data are entered in excel spreadsheets. The consistency of digital data is synthesized by table 1.

Farmers send data for the first year, sometimes the second, but generally they stop at the third (only 2 villages over about 600 sent data the third year). The problem concerns data collection but also data transmission.

Farmers expert something back from SODEXAM, not necessarily money but also information, advises. But SODEXAM actually is not providing any feedback (even agromet information or weather forecasts to farmers). ANADER should provide advice to farmers, using the agromet information of SODEXAM AgMetS, but it is not evident that information reaches the farmers.

The data transmission chain is very poor and not affordable. ANADER asks for payments for the service, SODEXAM had a contract for the Seminar with ANADER but not for data transmission. Moreover data pass through the SODEXAM station chief to be transmitted à Abidjan. In case the station is not operational or the chief not affected, data are not transmitted. Actually it is not possible to assess if not received data have been not collected or not transmitted to Abidjan.

Table 1, METAGRI database consistency

Site	**Number of trained villages**	**Number of villages sending data**	**RS Date**	**Date of last registered data**	**Years of data**	**Observations**
Abidjan	10	0	March 2012	-	-	
Bondoukou	40	26	March 2013	February 2015	2013, 2014, 2015	For most of villages only some months of data after the RS are available. For 2 villages data are available also for 2014 and 2015 (not continuous)
Bouake	63	0	April 2012	-	-	
Dabakala	30	0	January 2013	-	-	
Danane	50		August 2015	-	-	
Daloa	63	41	August 2013	June 2014	2013, 2014	
Dimbokro	61	25	February 2013	December 2013	2013	For most of villages data are complete from March to December 2013
Gagnoa	62	0	March 2012	-	-	
Grand Bassam	60	0	December 2014	-	-	
Grand Lahou	60	27	November 2014	November 2015	2015	
Korhogo	63	63	April 2012	December 2012	2012	For most of villages data are complete from March to December 2012. The Korhogo station had no chief during 2013 and 2014 so data were not sent to Abidjan
Odienne	45	5	January 2013	October 2013	2013	Very few data available
Sassandra	40	13	September 2013	December 2014	2013, 2014	That is the best series of data
Seguela	50		August 2015			
TOTAL	**697**	**174**				

Seeding calendar

A seeding calendar per each agro ecological zone of the country (south, center, ouest and north) has been developed within METAGRI activities. The reference seeding periods are identified for each synoptic station for the 30 years of the climatology using the criterion of 20 mm in 10 days followed by less then 10 dry days over 30. Then the date corresponding to 20% of frequency is chosen. Since that date, seeding is recommended when 20 mm of rain are observed.

LOCALITES	DATES DE REFERENCE
ABIDJAN, ADIAKE	11 MARS
YAMOUSSOUKRO, BOUAKE, BONDOUKOU	21 MARS
KORHOGO, ODIENNE,	15 AVRIL
SASSANDRA, SAN PEDRO	11 AVRIL

Requests for plastic rain gauges

In 2014 CNRA requested around 10 plastic rain gauges, in 2015 ANADER requested about 50 plastic rain gauges and a private farming company other 10. SODEXAM couldn't provide any one of them because out of stock.

Media and agromet-info dissemination

SODEXAM has no direct relation with media, just for the transmission of the weather forecasts by RTI (TV)

Needs

Needs of training and tools for calculating water balance, water needs satisfaction and simulating crop growth. Sarra-h not operational and not validated for sudano guinean climate.

Needs to strengthen :

- specific agromet servcies for different agroecological zones
- the communication of the services
- modeling and analysis tools adapted to IC conditions

GHANA

Ghana embarked the METAGRI experience in 2011. During METARI OPS Ghana organized 8 RS in august 2012 for a total of 160 farmers; in 2013 GMet organized 5 Roving Seminars in August for a total of 100 farmers; in 2014 3 RS has been organized (2 for fishers in September and 1 for farmers in August).

According to GMET, the recommendations of the Bamako Meeting at the end of METAGRI have been fully taken into consideration by METAGRI OPS. In Ghana, METAGRI allowed a better and wider dissemination of Seasonal Forecasts issued by GMET involving farmers in the process. Indeed, Roving Seminars were conducted involving farmers in the prediction of the seasonal climate harmonizing the scientific and traditional knowledge. Discussion about appropriate strategies to overcome predicted or probable hazards were also developed with the support of the Agriculture Extension Service. The main difference between METAGRI and METAGRI OPS approaches was the involvement of Media. Indeed, during the seminars of the last 4 years the media coverage was wider, particularly concerning local and regional Radios.

Local Radios were always associated in Roving Seminars, building a strong partnership for disseminating climate and weather information. Radios' journalists are invited to the seminars both to be trained and to get the information to broadcast, such as seasonal forecasts. Seminars are given in English, as well as weather and seasonal forecasts. Indeed the level of English comprehension, even in rural areas is very high. Nevertheless, journalists from local FM Radio stations translate the results of the workshops into the local languages and broadcast them in their own areas.

Local media are very interested in weather and climatic information to broadcast. A part for those that are invited at the seminars, generally Radio stations, even if never involved in METAGRI seminars, pick up the seasonal forecasts and related agricultural advices at the Regional offices of Agriculture or of GMET. Sometimes, the constraint is that not trained journalists have problems to properly translate and explain the forecasts as they are formulated and thus the message they broadcast could be not exact or not comprehensible by farmers (because journalists themselves didn't understand).

Ghana Meteorological Agency developed a strong partnership with the Agriculture Department and the Extension Service of the Ministry of Food and Agriculture (MOFA). GMET relies on the Extension Service for the organization of the Roving Seminars (logistics, informing and inviting farmers and media, etc.). Moreover, Agriculture Extension Agents who advice farmers on their farming activities were invited to be part of the roving seminars in order to be trained and better support farmers in the use of climate and weather information. Agriculture Extension Agents uses themselves Seasonal Forecasts to adapt agronomic advices to the characteristics of the forecasted season.

GMET adopted a close farmer-extension approach based on small groups of farmers (generally 5) and a reference extension agent in order to improve the exchange of data and information with farmers in both directions:

- Downward, so that all weather and climate information from the Ghana Meteorological Agency are channeled to these Extension Agents who then advice farmers accordingly.
- Upward, the agent is responsible for monitoring the compilation of rainfall data by the farmers and for collecting and sending the cards to his Region or District Office.

The Meteorological Agency's Regional Office nearest to the Agricultural Office collects the cards and sends them to GMET HQ. Cards are collected from farmers at the end of each months and one or two months later arrive in Accra where data are digitized in an Excel spreadsheet. Such data are not yet used by GMET because of their nature and quality.

Table 2, Consistency of Farmers' rainfall database table

Region/Department	Number of trained villages	Number of villages in the DB	Date of the roving seminaries	Last date of digitized data	Number of digitized years	Observations on the consistency of the data set
Upper East/Bolga	70	20	20/07/2011	2012	2	No single farmer has brought up all the rainfall data for each year
Upper West / Wa	20	20	22/08/2011	2012	2	,,
Upper West / Lawra	20	20	23/08/2011	2012	2	,,
Upper West / Tumu	20	20	24/08/2011	2012	2	,,
Northern / Bole	20	20	25/08/2011	2012	2	,,
Brong Ahafo / Kintanpo	20	20	26/08/2011	2012	2	,,
Brond Ahafo / Sunyani	20	20	12/09/2011	2011	1	,,
Northern / Tamale	20	20	13/09/2011	2014	3	,,
Northern / Yendi	20	20	14/09/2011	0	0	,,
Brond Ahafo / Kete-Krachi	20	20	15/09/2011	0	0	,,
Northern / Walewale	20	20	13/08/2012	2013	2	,,
Northern / Karaga	20	20	14/08/2012	2013	2	,,
Northern / Damongo	20	20	15/08/2012	2013	2	,,
Northern / Salaga	20	20	16/08/2012	2013	2	,,
Northern / Bimbilla	20	20	17/08/2012	2013	2	,,
Ashanti / Ejura	20	20	28/08/2012	2014	3	,,
Brong Ahafo / Techiman	20	20	29/08/2012	2012	2	,,
Brong Ahafo / Wenchi	20	20	31/08/2012	2012	2	,,
Central / Gomoa Afransie	20	20	12/08/2013	0	0	Not a single data has been received from the farmers
Central / Mankessim	20	20	13/08/2013	0	0	,,
Central / Assin Fosu	20	20	14/08/2013	0	0	,,
Ashanti / Foase	20	20	15/08/2013	0	0	,,
Ashanti / Nsuta	20	20	16/08/2013	2014	2	Some data received from some farmers
Brong Ahafo / Sunyani West	40	20	22/08/2014	0	0	No data received
Northern / Tamale	20	20	8 /06/2015	2015	1	Almost all data received for this year
Northern / Karaga	20	20	9 /06/2015	2015	1	Almost all data received for this year
Upper East / Garu	20	20	10/06/2015	2015	1	All data received but not all yet digitized
Upper West / Nadowli	20	20	12/06/2015	2015	1	All data received but not all yet digitized

Local farmers associations have been involved in Roving Seminars (FAKA, COFAG have been involved in 2013 RS). But the outcomes of that experience have shown that it was not so effective and that such associations could not diffuse the climatic information among their associated farmers mainly because of organizational problems. Concerning fisherman's associations (clusters), GMET already was in contact with them providing weather forecasts on demand. RS for fishermen have been organized in collaboration with such associations and the MoFA, which is charged also for fishing activities.

GMET developed collaborations with NGOs, such as Care International in the framework of the Adaptation Learning Project, started by Care in 2010 in Ghana, Kenya, Niger and Mozambique with the support of the United Kingdom's Department for International Development (DfID), the Ministry of Foreign Affairs of Denmark, the Ministry of Foreign Affairs of Finland and the Austrian Development Cooperation.

GMET and CARE have an agreement that GMET provides seasonal forecasts for Ghana and participates in the Seminars that ALP organizes every year before the onset of the growing season. GMET share the probabilistic season forecast, also giving the expected dates for the start of the rains and possible dry spells between May and August. Forecasts are interpreted and discussed with the support of the district officers from MoFA. Based on Seasonal forecasts, Participatory Scenarios are developed using the Participatory Scenario Planning (PSP) mechanism for collective sharing and interpretation of climate forecasts. This is achieved by participants considering climatic probabilities, assessing their likely hazards, risks, opportunities and impacts, and developing scenarios based on the assessment. Discussion of the potential implications of these scenarios on livelihoods leads to agreement on plans and contingencies that respond to the levels of risk and uncertainty.

Often GMET invites to Roving Seminars organized in the framework of METAGRI, farmers involved also in ALP activities, strengthening the relationship and collaboration among the two projects.

In 2012 GMET involved the local NGO Ashari Ecological Farms Project which was working in the Walewale district. No further collaboration born from that experience.

During last 4 years GMET received some requests for Rain gauges and training. The main demander is CARE international for the ALP programme. GMET could not provide the Rain gauges but could include ALP farmers in the Seminars organized in the ALP districts and provide them the rain gauges.

Unfortunately GMET didn't record all the requests for rain gages, roughly they are 20-30 per year from NGOs, individuals, projects.

GMET doesn't provide directly agrometeorological advises to farmers or monitoring bulletins to stakeholders. GMET provides the forecasts, the rain gauges and training how to use. GMET didn't developed a sowing calendar for Ghana, just the rules on how to use the rain gauge to determine the sowing date. Advices on agricultural practices or management are provided by the Extension, using GMET forecasts.

Concerning the Capacity building component of METAGRI OPS, it responded to a real need of GMET in terms of improving technical competencies of its staff especially in technical applications such as agrometeorology, hydrology and marine meteorology. Concerning the efficacy of the training provided by METAGRI OPS, SARRA-H training was not so effective because the software version used for the training in Banjul was not really operational because of technical problems not allowing a practical and proper use. Probably the new

version issued after the trainings could better satisfy GMET needs, but unfortunately, no training and no delivery of the software have been foreseen by METAGRI. The Training on the use of satellite products for agriculture organized in Accra was attended by several GMET agents, but no real impacts on the operations of the Agrometeorological Division are observed.

Concerning communication, as already said, there has been a great improvement since 2011, and Ghana appears as one of the leader countries in communicating climatic information through media, even if GMET didn't organized any meteo-media workshop.

Concerning feedbacks from farmers, GMET indicates that it would be useful to come back on farmers after the Seminars in order to learn about farmers problems and requests. The 2 recalling seminars of 2015 allowed understanding that farmers have a sometime a problem getting at the good time seasonal forecasts from radios or extension services. Often they don't know when radio broadcast the information and often the information is given too late. It is recommended to prepare a calendar for the Media on the appropriate periods to disseminate the different climatic information in the different regions of the country (considering also that the southern regions have 2 rainy seasons).

Concerning institutional development, METAGRI allowed strengthening the collaboration with MoFA at a moment MoFA could not provide funds to maintain the same level of collaboration that the two institutions had before. Thus METAGRI came at the good time to continue this fruitful collaboration. In Ghana the Multidisciplinary Working Group doesn't exist and METAGRI didn't invest in it.

Recommendations/improvements

The following recommendations are expressed by GMET:

1) Extend Roving Seminars and distribution of rain gauges in all the regions of the country,

2) Ensure a mechanism for feeding back and continuously update farmers through recalling seminars, field visits or media,

3) Prepare a calendar on the appropriate periods to disseminate the different climatic information in the different regions of the country (considering also that the southern part has 2 rainy seasons).

4) Further strengthening communication of climatic information through:

    a. Training of forecasters on how to break down the forecast in information that farmers (and journalists) can understand, and possibly translating them in local languages;

    b. Training of journalists on the interpretation of forecasts and in translation in local languages using appropriate vocabulary.

5) Strengthen GMET activities in Agrometeorology through specific training and provision of analysis tools (i.a. for analyzing Soil moisture content)

6) Delivery of last version of SARRA-H issued by CIRAD after the trainings to METAGRI Countries and provide training.

7) Improve the quality of the plastic rain gauges because after some time of exposure to atmospheric agents they tend to crack and the graduation progressively disappears.

MAURITANIA

Mauritania is among the 5 Countries that participated in METAGRI since the first phase (2008).

In 2012 8 Roving Seminars have been organized in July-August with the participation of more then 800 farmers and the distribution of 160 rain gauges. In 2013 4 RS have been organized in July for 200 framers among which 55 received a rain gauge. In 2014, one RS for farmers and one for fishers have been organized in September and December, but no rain gauges were distributed to farmers because of the end of the season.

At the beginning of METAGRI (2008), ONM (Office National de la Météorologie) was in a critical situation, with few relations with the public and weak relations with Agriculture Department and other technical services. Moreover, ONM didn't have any relation with the rural world. A rural world that because of global changes was losing traditional references and then in need of support for adapting agriculture and other rural activities to the new evolving context.

METAGRI first and METAGRI OPS later allowed the generalization of ONM activities toward the civil society and rural producers. Before ONM activities were limited to the production of information without many regards to communication and dissemination, now communication is at the center of ONM approach. This is an aspect to capitalize and valorize in the framework of METAGRI.

Up to now the whole agro-sylvo-pastoral zone has been covered by Roving Seminars with associated rain gauges distribution and training. METAGRI activities in Mauritania have been particularly diversified, including also awareness rising about climatic risks to fishers, developing information exchange networks and communication activities.

Communication and information exchange are at the core of the Mauritania approach. The information exchange network has its core in local focal points: in each METAGRI site 10 local focal points are participatory identified among farmers and herders involved in the seminars. They are chosen representing local traditional social groups and authorities thus local focal points have public and acknowledged social role and responsibility. Technically, they have responsibility in gathering rainfall observation from other observes in their area and they are relays for the dissemination of agrometeorological information and advises coming from ONM.

Moreover, local focal points collect phenological and phytosanitary observations (on the basis of the AGRHYMET technical card N. 1) and send this information to ONM through the same communication flow that rainfall observation.

The ascending communication flow starts from farmers, which observations are gathered by local focal points, then is organized in three parallel channels:

3. Local focal points have been included in GFU (Groupes Fermé d'Utilisateurs – Closed Users Groups) of mobiles phones. GFUs are used as a communicating network from

observation stations and ONM, and in each site has been enlarged to local focal points which have been furnished with a prepaid telephone credit for communicating rainfall and phenological observations directly to ONM;

4. Local focal points gather data from observers and bring it to the Agricultural Department Inspector (Moughaata). Concerning rainfall data, Agriculture Inspectors average the received daily data for each locality (if more that 1 rain gauge per each locality) and transmit to the chief of ONM station who send to ONM in Nouakchott using the GFU communicate the data to ONM.
3.
4. Official station data are moreover transmitted through:
5. "Radio a Commandement" of the Agriculture Department to Mughaata Inspections of Agriculture send each day the situation to the Agriculture Department in Nouakchott, and then to ONM.
6. Moreover, another channel of data communication exist, through Wilayas (Regions) and Ministry of Interior who send rainfall data to ONM by fax, but this is not so rapid as the other. Rainfall data are sent each 10 days and phenological and physanitary data are transmitted to ONM monthly: at the end of July, August and September.
7. Dispatch of observation sheets by meteorological station chief once per year.

ONM stores rainfall observed data in Excel spreadsheets, while phenological and phytosanitary data are just used for the assessment of the dekad and then transmitted to the Department of Agriculture for analysis. Actually rainfall observed data for about 106 localities is updated regularly (about 75-80% of covered localities) (Table 1).

Table 3, Consistency of METAGRI rainfall database

LOCALITY	**N. of trained villages**	**N. of villages included in DB**	**Last digitised data**	**N. of years of digitised data**	**Obs.**
GUIDIMAKHA	35	30	2014	6 ans	90%
GORGOL	34	34	2014	6 ans	90%
ASSABA	17	13	2014	3 ans	70%
BRAKNA/ALEG	15	5	2014	5 ans	70%
TRARZA	10	08	2014	3 ans	95%
HOD-ECHARGHI/NEMA	30	7	2014	2 ans	Capitale régionale
HOD-EL GHARBI/AIOUN	30	9	2014	2 ans	Capitale régionale
TAGANT	05	0	2014	0	0%
TOTAL OF VILLAGES	**176**	**106**			

ONM wish to evaluate observed data by comparing it with the official network data.

This result is impressive compared to other countries. It is possible thanks to a strong proximity relation with observers. ONM and Agriculture Department work together and each year organize sensitization campaign in the agro-sylvo-pastoral band of Mauritania. Moreover each year all localities receive seasonal forecasts and provisional seeding calendar /advices. This information is diffused directly at the time of Roving Seminars or sensitization

campaigns held by ONM or through the Agriculture Department and the extension service (Agents Vulgarisateurs de Base - AVB).

Other agrometeorological and weather information provided to farmers are the advices contained in the agrometeorological decadal bulletin and special advises and warnings.

This information is broadcasted and communicated to rural population in many different ways:

1) through Agriculture Department and Extension service

2) broadcasted by National Radio television

3) directly by Radio Comunautaires (actually 4 different radios)

4) directly by SMS to local focal points (for some lettered)

5) directly by GFU to local focal points

6) through Griots in certain communities (Brakna, Gorgol, Guidimagha among Soninke ethnic group)

ONM and Agriculture Department have actually a very strong partnership. Since the beginning of METAGRI, ONM involved the Agriculture Department with which, before, relations were not very smooth. Thanks to METAGRI a deep integration and cooperation of Agriculture and Meteorological Departments, formalized by an institutional Agreement was possible. Agriculture national experts are always involved in METAGRI activities. Moreover Department Inspectors and AVB participate actively in the transmission of Agrometeorological information to farmers and of rainfall and phenological data from farmers. These exchanges and collaborations are ruled by institutional agreements and being a public service don't require transfer of funds or compensations. The extension service in the agrosylvo pastoral belt is very strong and well organized: in each locality there are 2 AVBs. AVB are trained at the Ecole Nationale de Vulgarisation Agricole of Kaedi. ONM is involved in managing a training module on agriculture (GIZ support).

Around local focal points, peasant associations are growing up in order to better exploit agrometeorological information and support actions (Table 2).

Table 4, list of initiatives born from or supported by METAGRI-OPS

Village	Name of the association	Observation
Diadijibiné	DJIKE (Espoir)	In this locality, the rainfed rice cultivation practiced by women was completely abandoned, thanks to the collaboration with ONM under METAGR-OPS program, we are now witnessing a return to this cropping system in the zone.
Sélibabi	Association des Maires du Guidimakha	The Association was not created by METAGRI-OPS but it is working in full cooperation with ONM on whatever is related with the development of rainfed agriculture in the region.

Djoubayé	Groupement des agriculteurs de l'Oued Garfa et de Boudami	This group was born with the trainings provided by METAGRI-OPS program. Sometimes the local Mayor supports some training and peasants rain gauges.
Guidimakha	Revalorisation des communicateurs traditionnels en milieu soninké	The profession of traditional communicator had almost disappeared in that area, but with the METAGRI-OPS program now much of information is disseminated by them.
Au niveau Central	Groupe du suivi de la campagne agrosylvopastoral	With METAGRI-OPS program, there are now a perfect collaboration between weather and agriculture around the training of farmers, dissemination of climate information and monitoring of the cropping season. From this collaboration a real distribution network of climate information was born from technical services to users and back from users to the technical services.

Generally, in Mauritania there is a strong interest by civil society and general public on Agrometeorological information for rural producers, including farmers, herders and fishers. Mayors and privates are continuously demanding for rain gauges, seminars and agrometeorological information. In 2014, about 40 rain gauges have been provided to farmers who went to demand directly to ONM in Nouakchott. In 2012 ONM had to buy 500 rain gauges on its institutional funds in order to satisfy the demand of the public (Table 3).

Table 5, demands for rain gauges from 2012 to 2015

Requests for rain gauges	**2012**	**2013**	**2014**	**2015**	**TOTAL**
Mayors of Municipalities	20	32	28	35	115
Regional delegations of Agriculture and Breeding	35	35	45	50	165
Cooperatives/Village Associations	15	10	25	32	82
Regional Governements	40	40	40	40	160
Other Technical Services	15	12	20	21	68
Village Chiefs	12	10	11	9	42
NGOs	13	20	18	18	69
Other recipients	17	20	15	32	84
TOTAL GENERAL	**167**	**179**	**202**	**237**	**785**

Moreover, groups and associations asks also for agrometeorological advises and warnings. For example, in some sites women groups demand to receive ONM advises and warnings to disseminate them among participants.

This public interest, coupled with other technical and financial partners interest, allows ONM to improve METAGRI activities, thanks to complementary funding to METAGRI ones. For example the Global Climate Change Alliance (EU-UNDP-GIZ) funded the realization of further RS and rain gauges distribution. GCCA for the 2014 and 2015 campaigns funded around 10 RS and 500 rain gauges for the Regions of Assaba and Guidimagha. Moreover GCCA funded an exchange stage of 4 Mauritanian farmers to Kaffrine, Senegal (CGIAR-CCAFS site).

The collaboration with GIZ project « Adaptation des Villes Côtières au Changement climatique » (ACCVC) allowed the organization of the Meteo-Media Seminar in November 2014 which main result was an Action Plan for boosting the broadcasting of ONM Services. Moreover, in December 2014 the same collaboration supported the organization of a Seminar for fishers. The seminar was very successful and led to agreements with fishers associations and a plan of services improvement.

Two students of the Master in Geography of the Faculty of letters and human science, University of Nouakchott are preparing their dissertations on the perception of METAGRI project in two Regions among those involved in the project.

As a complementary activity, METAGRI in Mauritania is working on local dialogue among farmers and herders in order to avoid bloody conflict during RS or other awareness rising actions (Caravane de la champagne, awareness rising days). Direct reconciliation activities are carried out through the establishment of local committees fostering amiable solutions in case of damages caused by herds to crop fields.

Improvements of METAGRI OPS compared to METAGRI

METAGRI OPS have brought an improved exchange among farmers (and fishers) and ONM. The immediate impacts are that i) ONM is very well known and considered in the rural areas (agro-sylvo-pastoral belt); ii) ONM strengthen its knowledge about rural farmers, their needs and their behavior allowing to improve climate services. This favorable environment has been created thanks to a constant presence of ONM in rural areas, organizing each year, in collaboration with Agriculture Department and raising complementary funds, awareness raising and sensitization campaigns. That is what farmer expects and needs a reference in which trust.

METAGRI OPS boosted a great improvement of ONM communication capacities that further contributed to build trust among farmers.

Moreover, increased visibility made ONM a leading actor in Mauritania, allowing further collaborations and complementary funding.

Finally, METAGRI OPS contributed to strengthen technical capacities of ONM through its programme of trainings, which have been perceived as very useful. Remote sensing trainings allowed a better exploitation of rainfall estimates, and SARRA-H training allowed to fill the gap caused by the dismissing of DHC. Nevertheless it should be noted that training on the last improved 3.2 version of SARRA-H should be very useful. Moreover 1 week trainings are seen as too short for a good appropriation of technical tools.

Recommandations from 2014 Seminars

1. Provide to ONM the means necessary to carry out its mission become more important given the relentless nature of climate change
2. Advocacy to bring policy makers to valorize the agrometeorological products;
3. To formalize the collaboration between the different actors and the ONM;
4. Creation of a communication cell at the ONM to develop communication strategies and to interface with the users;

5. The training of journalists in the field of meteorology to be focal points for better use of climate information;
6. To establish functional partnerships between the national federation of artisanal fishers and the ONM for better collaboration;
7. To provide artisanal fishermen green number easy to remember to ask for help in case of distress at sea;
8. The renewal of the experience of flags (green, yellow and red) that proved to be useful and it is a comprehensible language for users on the sea;
9. The requirement by the state of a minimum safety equipment onboard of canoes or boats.

NIGER

Niger is among the 5 Countries that participated in METAGRI since the first phase (2008).

The first phase of METAGRI (2008-11) was very successful in Niger, allowing DMN to improve its interaction with farmers and enhancing the interest of civil society, rural producers and local administrations to the role of DMN. DMN experimented specific agroclimatic services for rural producers valorizing the rainfall observations done by model farmers using METAGRI rain gauges. A very large interest grown around the METAGRI approach: programmes (such as PANA Resilience, PROCAN) and ONGs (such as CARE) established collaborations with DMN in order to integrate the approach in their programmes. Moreover, DMN receives each year many requests for installing rain gauges and training model farmers by civil society, farmers, local administrations and traditional chiefs.

Such a positive picture showed anyway some critical points, mainly in the capacity to ensure continuous support to farmers (including the production of locally specific bulletins) and to valorize the METAGRI rainfall observation network (rain gauges and trained farmers). Indeed because of the extension of the country and the limited funds available at DMN, activities focus mainly in extending the number of rain gauges and observing farmers rather than strengthening the relations among DMN, Extension Service and already trained farmers.

With the beginning of METAGRI OPS, in 2012 8 Roving Seminars have been organized during September in 6 different regions with the participation of 313 farmers and the distribution of 145 rain gauges. In 2013 4 RS have been organized from November 2013 to January 2014 for 174 framers among which 77 received a rain gauge. In 2014, one RS for farmers has been organized in August 2014, for 40 farmers among which 20 received a rain gauge.

Up to now the whole agro-sylvo-pastoral zone of Niger has been covered by Roving Seminars with associated rain gauges distribution and training. The following table synthesizes the number of involved localities per Region.

Number of localities	
REGIONS	Total
Diffa	19
Dosso	70
Maradi	90
Tahoua	69
Tillabéry	132
Zinder	59
Total	439

METAGRI before and METAGRI OPS later allowed DMN to enlarge its activities toward rural producers and civil society. METAGRI activities in Niger had great echo and DMN is solicited by local authorities, technical services, ONGs and projects to replicate METAGRI approach, train farmers and distribute rain gauges. The following table shows the number of demands for rain gauges during last 2 years:

Region	2013	2014
Agadez	7	
Diffa	1	
Dosso	25	3
Maradi		1
Niamey	1	
Tahoua	35	
Tillabéry	22	7
Zinder	3	15
TOTAL	**94**	**26**

This public interest, coupled with other technical and financial partners interest, allows DMN to improve METAGRI activities, thanks to complementary funding to METAGRI ones. For example, the ANADIA Project funded by the Italian Cooperation and realized in collaboration among DMN, IBIMET-CNR and DIST of Italy. ANADIA supported the extension of the METAGRI approach to 3 Municipalities in the Tillabery Region (2RS for 60 farmers, 30 villages 30 raimn gauges, 3 recalling seminars, 45 villages, 80 farmers, 10 rain gauges) and the production of special agrometeorological bulletins for the involved communities; PROCAN project (GIZ) that in 2015 supported the realization of 2 Roving Seminars involving globally 10 Municipalities along the Niger River and 26 villages (26 farmers and 26 rain gauges); CARE Niger that funded in 2014 the training and distribution of rain gauges in 9 villages (Makalondi and Doutchi).

Communication and information exchange between DMN and farmers follows conventional channels such as radio, telephone, bulletins.

The ascending communication flow starting from farmers has not a structured path. After each rain, farmers' observations are shared with the local community at public places (mosque, house of village chief,…). Sometimes farmers send them directly by telephone to DMN or to the Municipality or the Extension service which send it to the Department and to the "Radio Présidence" that broadcasts it. Data are also gathered in the monthly forms and send by mail once or twice per year to DMN through Municipalities, Departments or DMN stations' chiefs. But the monthly forms are provided to farmers just once during the seminar, so that for the following years, often farmers don't have the forms, but simply register the rain on a notebook.

So, data transmission is quite uncertain and usually farmers send data regularly for the first 1 or 2 years, and later gradually abandon.

Observed data are partially digitized, but not organized nor stored in a database. It has not possible to assess how many data have been received by DMN during the years. Indeed data are used by DMN just to produce the agrometeorological decadal bulletins.

By the other hand, farmers are not sensitized and supported to regularly send observed data, they are trained once and then often they don't receive any further feedback or support. Farmers appreciate the use of rain gauge particularly for the choice of the seeding time, and

like to hear from Radio Presidence the rainfall amount observed in their village, but they are also asking for improvements. The main requests are:

- To improve the systems of data sending, using mobile or smart phones, with prepaid traffic.
- To receive specific agrometeorological information and advises in order to improve their production. To receive forecasts on rainfall, on growing season, such as the start and the length.
- To receive such information directly by mobile phone or by local radios.

DMN regularly diffuses the hydro-agro-météorological bulletins of the Interdisciplinary Working Group, that contain generic advises for farmers. The problem is that the extension system in Niger is not enough efficient and staffed to really support all the model farmers not even to diffuse the information bulletins of the GTP to all the villages because of the limited resources.

DMN experimented specific bulletins for METAGRI Municipalities, but they have been done just for limited periods, or if a project/program supports the activity.

Specific agrometeorological bulletins for rural producers are actually produced for 3 Municipalities thanks to the support of the ANADIA Project (Italian Cooperation). ANADIA endorsed the METAGRI OPS approach and funded its extension to the Municipalities of Gotheye, Imanan and Ourogueladjo where Roving seminars have been held in June 2014, a monitoring phase has been held in November 2014, a recalling seminar with replacement of rain gauges and dissemination of Seasonal Forecasts has been organized in June 2015 and decadal bulletins are produced for each Municipality since the 2nd dekad of June 2015, and disseminated in local language thanks to agreements with local radios.

Improvements of METAGRI OPS compared to METAGRI

METAGRI OPS boosted a great improvement of DMN relations with other national stakeholders and Technical and Financial Partners operating in the adaptation to climate change. Moreover, communication capacities have been improved that further contributed to build trust among partners. Local radios have been more frequently involved, they received sessions of sensitization and provided resonance to the seminars. Interviews to trainers have been registered and broadcasted to a large public in order to disseminate key concept on climate and weather to a larger public.

Even the DMN improved its communication skill toward farmers, adopting a language more adapted and comprehensible.

Finally, METAGRI OPS contributed to strengthen technical capacities of DMN through its programme of trainings, which have been perceived as very useful. Nevertheless it should be noted that DMN still has a lack of agrometeorological tools for seasonal monitoring and early warning at large scale. SARRA-H cannot provide easy to use and real time monitoring of the whole country, as other tools such as ZAR (developed in collaboration with AGRHYMET-WMO) and DHC did.

Moreover, the rain gauges distributed during Metagri OPS have a better graduation than before.

Recommendations

To DMN :

- Redynamisation of GTP,
- Production of agrometeorological bulletins specifically for METAGRI Municipalities and communicate them to involved communities,
- Training of local radios' agents in the communication of agrometeorological information,
- Strengthening the collaboration between DMN and extension service in order to better support model farmers in the use of agrometeorological information,
- Strengthening the communication system with extension agents, local radios and model farmers through the use of smartphones,
- Improve the quality of rain-gauges, because it has been observed a large number of damaged gauges after 2-3 years,
- Ensure a regular monitoring to trained farmers in order to make them feel the proximity of DMN and encourage them to communicate observed data.

To local radio agents

- Diffusion of agrometeorological bulletins in local languages

To decision makers

- Integration of agroclimatic services into Communities' Development Programs (PDC).

Results

- Awareness of communities about climate change and adaptation measures (need to valorize local knowledge and practices),
- Improvement of farmers practices (mainly for sowing dates) using rain gauges,
- Improvement of rain gauges density for season agrometeorological monitoring,
- Interest of local authorities for integrating the METAGRI approach in local development plans.

Annexes

Other villages covered by METAGRI-OPS in Mauritania

1) Lenoir
2) Galb Elhkheir
3) Gogui
4) Vokess
5) Oumoul Khoura
6) Batha
7) Doueirare
8) Magta sfeire
9) Legrane
10) Bouderaa
11) Bir El Barka
12) Aghorat
13) Ghabra
14) Gueler
15) Rag
16) Tenaha
17) Hamod
18) Ganki
19) Bidizguen
20) Niabina
21) M'bottou
22) Chegar
23) Dar Salam
24) Woloum Néré
25) Kamour
26) J'reikaye
27) Moundi
28) Bagodine
29) Garlol
30) Lexeiba1
31) El Maaden
32) Legatt
33) Elb Ejmel
34) Teikane
35) Tachott
36) Ould Birem
37) Aéré Golere
38) Aéré M'bare
39) Tiguent
40) Ouad naga
41) Tezékré
42) Khalwa maure
43) Khalwa peulh
44) Bothiek El Yemani
45) Bothiek El Ali
46) Boudamé Samengué
47) Boudama Demba Boffo
48) N'djewo
49) Chelkh Tiyab
50) Djogountouro
51) Djeybaba
52) Bounayé
53) Lahrache
54) Bagodine
55) Nieleba
56) M'beydiya sakha
57) Gori lakhé
58) Garfa
59) Boudamy
60) Gnerdé
61) Tistayé
62) Moussalah
63) Debaye El Guelay
64) Ouad Amour
65) Djinkkaré
66) El Yetama
67) Hel Aly
68) Wouro Moulo
69) Diaguily
70) Hayré La