CRM in Agriculture an Water Sectors in West Africa, through rainy season monitoring and Early Warning at AGRHYMET Regional Center

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Outline

• Introduction on AGRHYMET Regional Centre

• What are main Climate Risks in West-Africa

• Regional rainy season monitoring and early warning as CRM activities in West-Africa
Some elements on AGRHYMET Regional Center
AGRHYMET = AGRrometeorology, HYdrology, METeorology

- AGRHYMET was created in 1974, following the catastrophic droughts of the early 1970’s, for integrated climate risks management.
  At its creation, 9 member states: Burkina, Cape Verde, Chad, The Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal.

- AGRHYMET is becoming a technical arm for The Economic Community Of West African States (ECOWAS) thus is extending its activities to the cover all the 17 CILSS/ECOWAS countries
The AGRHYMET Regional Centre’s mandate

Three main areas

• To collect and process data and disseminate information on:
  – food security,
  – water resource management
  – desertification control
  – and climate change impacts;

• To build technical capacities through training and transfer of tools, methods adapted to the Sahelian countries in
  – climatology,
  – Agrometeorology
  – hydrology
  – information technology
  – crop protection,
  – Geomatics

• To strengthen interstate co-operation by sharing methodologies and technologies between member states
The AGRHYMET Regional Centre

- **AGRHYMET is 71-hectare estate**
- **Six laboratories**: (agricultural zoology, plant pathology, hydrology, phytopharmacy, instrumentation and micro-computing, and Geographical Information System)
- **Two main departments**: research and information department and training and research department
- **Control and Evaluation Bodies**
  - The head of the member States Summit (each 2 years)
  - The minister of the member states council (twice a year)
  - Technical and Management Committee (CTP)
  - CAMES (African and Malagasy Council for Higher Education)
- **An international Scientific and Academic Advisory Board**
  composed of 8 well renowned scientists from West Africa, Europe, USA and Canada
- **AGRHYMET is a WMO certified training center**
- **AGRHYMET is in the process to become the WMO West-African Regional Climate Center**
**AGRHYMET regional/ national system and organization**

**PARTNERS**

- Data and Information
- Financial and Technical assistance

**Analysis**

- Hydrology
- Meteorology
- Agriculture
- Crop protection

**Diffusion**

- Training

**Satellite Data Reception and Storage**

- Agriculture
- Hydrology
- Meteorology
- Animal husbandry

**Countries**

- GTP

**Ground Observations and Surveys Data, meteo, hydro, Agricult.**

**www.agrhyemet.net**
What are the main climate risks in the West-Africa Sahelian region?
Sahelian rainy season

• The West-African Monson System
• Only one rainy season per year from June to October (but more 85% of the total rainfall falls between in July, August and September)
• More than 90% of Sahelian agriculture are rainfed
• Less than 5% of surface water resources are controlled
• In general, below the average rainfall is damageable for agriculture and the water resource availability
Main climate Risk

• Low rainfall
• Bad rainfall distribution (let onset, early cessation, high dry spell, Extreme rain event or successive rainy days.)

• The impacts are: famine, animal and people death, lack of water, etc.
The observed situation

- Persistence of dry years
- Abrupt change from very wet to very dry years
- Persistence of wet years

Another mode of inter-annual variability seems to be established in the Sahel
Impact on the Niger River

In 1985, for the first time, in living memory, the Niger River flow stopped.
Rainy Season monitoring and Early Warning as a powerful tool in CRM in West-Africa!
Objective

Monitor the rainy season conditions, the crop status, water resource availability in order to issue periodical information and alert in case of severe drought or flood for decision making.
Monitoring and Early Warning by GTP and AGRHYMET

- The active period of the monitoring activities extends from May to October
- The monitoring and early warning activities are based on the use of field data, satellite products and hydrological and agrometeorological models
- The first step is the Seasonal rainfall and hydrological forecasts in May

Policy from Seasonal forecasts

- Hydro-agrometeorological advice (Mali experience is the well known most successful case in West-Africa)
- Early or late onset, length of the rainy season: specification and advice the choice of seed variety
- Potential wet rainy: promote the use of plateau area for agricultural activities instead of shallow area and recommendation to the necessary fertilizers
- Potential dry year: recommend shallow area, practice of soil and water conservation techniques (Half-moon and Zaï in particulary)
Monitoring and Early Warning by GTP and AGRHYMET

Then from June to October

- 10-day monitoring of the rainfall situation (field data and satellite products)
- 10-day monitoring the progress of sowing and the crop water satisfaction (field data and agrometeorological models)
- 10-day monitoring of the pastures situation (Vegetation Indices)
- Monitoring the locust situation (Rainfall maps + Vegetation Indices)
- In September crop and biomass yield forecasting
- Joint pre-harvest assessment missions in the field (FAO, WFP, FEWSNET)
- In September Identification of risk zones (Synthesis of all the products)
- The process includes methodological and financial support to national agricultural statistics collection and analysis
Data and database, use of both ground measurements and satellite images
Field measurements (rainfall and river discharge, From GTP)

Around 700 raingauges

Around 250 hydrometric stations
Remote sensing data & products reception

PUMA reception station

EUMETCAST:
- MSG data every ¼ hour
- 10-days VGT4AFRICA products
- Others..

- FLOW EUMETSAT (MSG full resolution)
- DDS: Data Dissemination System of ESA within the GMFS (ENVISAT MERIS, AATSR and ASAR products)
- AMESD
- GEONETCAST
Produits VGT4AFRICA : ce sont les indices calculés à partir des composites décadires des images SPOT-VEGETATION. Ces indices sont NDVI, NDWI, Small Water Body, Leaf Area Index, Phenology ...

ENVISAT est le (gros) satellite d'observation de la terre de l'Agence Spatiale Européenne (ESA). Nous recevons les produits (niveaux 1 et 2) basse résolution des instruments MERIS (hyperspectral ds le domaine du Visible), AATSR (Multispectral dans le domaine de l'IR thermique), et ASAR (Radar imageur).

AGRHYMET, 19/09/2008
Field experimentations for climate change adaptations
Monitoring: the starting point is the seasonal forecasts
SST main areas to predict the West-African seasonal rainfall

The SST of April and May are used to predict JAS rainfall and discharges
2010 rainfall seasonal forecast in West-Africa made, in May 2010
2010 hydrological seasonal forecast in West-Africa made by AGRHYMET in May 2010
Training and dissemination, Target Audiences
Rainfall, discharge, vegetation and crop monitoring
Rainfall products from satellite estimation (MSG)

- 10-day basis
Natural vegetation monitoring and early Warning

31st July 2010

31st August 2010
Water availability monitoring from hydrometric stations

2010 Niger River discharge level

Comparative hydrographs of River Niger in Niamey.
Hydrographes comparés annuel du fleuve Niger à Niamey (Niger)
Use of Crop model for crop monitoring (Crop water balance DHC, the French acronym)

2010 sowing dates, compared to 1971 – 200 normal

2010 rate of water requirement satisfaction, between May 1th to Sept 10th

Yield forecasts
10-day briefing, analysis of the convergence of different indices
Precipitation Forecast

Mean Surface Temperature (°C) during the period:

Sun, 23 MAY 2010 at 00Z
---to---
Sun, 30 MAY 2010 at 12Z

Temperature Anomaly during the first 7.5-day period from:

Mon, 31 MAY 2010 at 00Z
---to---
Tue, 08 JUN 2010 at 00Z

Temperature forecasts from the National Centers for Environmental Prediction.

Normal Temperature derived from CRU monthly climatology for 1901–2000
Forecast Initialization Time: 00Z23MAY2010
Identification of areas with potential risk of deficit
Food security early warning: potential deficit areas

2009

2010
Field Evaluation
Millet field in Niger

11th August 2009
Failed millet crop in Niger

27th September 2009
Rice field lacking water in Chad

22nd October 2009
Final step
Technical meeting with GTP; services in charge of agricultural statistics collection and analysis; FAO; FEWS-NET; etc.

Regional Cereal / Food balance, in October
Meeting of decision makers and other stakeholders

- Regional meeting of decision makers meeting and other stakeholders (in general ministers of Agriculture of countries) to see which actions should be undertaken.

But the mitigation decisions are implemented at the national level.
Crop yield deficit management
Dissemination of the Information

- The AGRHYMET monthly bulletin
- The Decision makers’ special bulletin
- Radio
- Public conferences
- E-mail
- Web site
Some ongoing Initiatives

AMESD/ECOWAS : AGRHYMET is the Regional Implementation Center (RIC) :
• use of earth observation data for better management of water resources in agriculture and livestock breeding

CLIMDEV Africa : AfriClimServ project funded by AfDB:
• capacity building of regional climate institutions:
• contribute to make AGRHYMET a center of reference on CC in West Africa

AMMA (African Monsoon Multidisciplinary Analyses project)
• Management of the project mirror database
• Drafting of follow-up projects

CODEWA (COmmunity management of crop Diversity to Enhance resilience, yield stability and income generation in changing West African climates)
• Analysis and prediction of onset and cessation dates of the rainy season
Somme ongoing Initiatives

• Global Climate Change Alliance (GCCA, EU).
  • Mainstream climate change into development policies in Sahel and West African countries
  • Support countries in agro-hydro-meteorological data collection, adaptation/mitigation project design and implementation
  • Promote AGRHYMET to become a Designated Operational Entity (DOE) for the certification of CDM projects in WA

• Regional Program for the Sustainable Land Management and Adaptation to Climate Change in the Sahel and West Africa (PRGDT, EU)
Some Future Prospects

Continued ground-based Data Collection and satellite data Management

- Sustain field collection
- Sustain remote sensing data acquisition and processing,
- Update and secure the Regional Database

Extension of activities to cover all ECOWAS countries

- Adapt/harmonize existing tools and methods,
- Improve existing models (rainfall estimation and yield forecasting)
- Increase the capacity of AGRHYMET (staff, infrastructure and equipment) and of national technical services in all countries (data collection and processing)

Further tailoring of products to users’ needs

- Interpret and publish advisories to end-users with regard to the results of Rainfall and Hydrological Seasonal Forecasts
- Organize Food security and hydroclimatic risk outlook forums (with forecasts of river discharges, onset and cessation dates of the rainy season, rainfall distribution and crop yield potentials)
- Organize short training courses on various aspects of climate change adaptation
Some Future Prospects

• Established optimal raingauge and hydrometric network with real-time automatic remote sensing data transmission;
• Improved daily rainfall estimation by assimilating operational ground-based data collection and satellite estimations;
• Develop reliable daily evaporation and soil moisture regional products;
• Adapt one or two regional models in West-Africa;
• Develop multi-model approach in the use of crop and hydrological models.
Thank you for your Attention!