RA I Expert Group Meeting on the Application of Climate Forecasts for Agriculture

Report of Working Group A

TOR 1. Identify observations and data limitations for producing and applying climate forecast and seasonal prediction in Africa with particular emphasis on agriculture. Propose how such limitations could be addressed.

The major recommendations regarding data and observations include:

1.1 There is need to identify and list out all climate and agroclimatological data that are relevant to seasonal forecasting. It was noted that some specific recommendations on climate data have been made in GCOS, WMO and NMHSs, and at several other forums. Relatively less has been done on agricultural data.

1.2 There is need to make full use of satellite data available through remotely sensed systems.

1.3 There is need to properly document and archive climatic data needed for seasonal forecasts. Most of the available climate data are often not in usable format and have a lot of gaps.

1.4 The number of climate observing stations have been reducing at an alarming rate for most countries in Africa, and this needs to be addressed. For example, raingauge network is not adequate in all African countries especially for agricultural applications. It was noted that there are countries in Africa with the ability to fabricate raingauges. Those who are disadvantaged could take the advantage of the situation.

1.5 There is need to strengthen NMHSs capacity to improve the measurement of the atmospheric parameters.

1.6 There is need to encourage exchange of experts in Africa, including giving technical support to countries with inadequate technical and human resources in order to enhance their capacity for climate forecasting.

1.7 There is need for close collaboration among the stakeholders such as climate, water resources, health, agriculture and others.

1.8 Schools could be used to take rainfall observations to improve the national rainfall observation.

1.9 There is need to ensure the availability of global and other data that are required by the regional and national centres for making seasonal forecasting.

1.10 There is a need to link agro and climatic databases.

1.11 There is need to enhance/improve agrometeorological data observations such as soil conditions, evapotranspiration, vegetation/ animal conditions, etc.

1.12 There is need to educate the public on the importance of data observations and get feedbacks using for example WMO Day, special agricultural shows, visiting schools, etc.

1.13 There is need to motivate data observers as necessary and accordingly ensure that regular and systematic data observations are taken.

TOR 2: **Identify the current developments in producing and applying climate forecast and seasonal prediction in Africa.**

2.1 Development of tools for producing Seasonal Forecasts

2.1.1 The current tools for Statistical/Empirical climate prediction using ENSO indices etc exist but some countries are known to be unable to apply these techniques for seasonal prediction partly due to lack of computers, Internet facilities and SST update among others. There is need therefore to assist such countries to be able to provide seasonal forecasts and national climate updates for their respective countries.

2.2 Application of Climate Prediction

2.2.1 The basic facilities such as equipment and human resources are essential in the application of climate prediction. The dissemination of the climate prediction products is also an essential component in the application of climate prediction. There is therefore a need to ensure the availability of these facilities at national and regional levels.

TOR 3: Identify climate forecasting and seasonal prediction tools that can be applied in Africa, with particular emphasis on agriculture taking into considerations the various limitations.

The climate forecasting tools include:

- Models for downscaling the climate forecasts at regional and national levels applicable to agriculture that includes dynamical, empirical/statistical models and down scaling techniques;
- Computing power and software;
- GIS techniques;
- Verification techniques;
- Integrated disaster management policy.

The limitations include among others:

- Human resource capacity;
- Ability and skill of the models;
- Hardware/software;
- Lack of verification methods;
- Lack of confidence in the forecast.

TOR 4: Identify the successes and failures in the implementation of climate forecasts and seasonal prediction in Africa for agriculture. Propose the way forward.

Success and Failure Stories

Some successes and failure stories regarding seasonal prediction have been recorded in several countries such as Nigeria, Mali, Senegal, Ethiopia, Kenya, Zambia, Malawi, South Africa among others. These include stories the:

- Onset of the rains and distribution of dry/wet spells;

- The use of satellite data to monitor biomass information on pasture and communicating these to the relevant authorities, like has been done in Senegal.
- Warning regarding El Niño related floods and droughts in Eastern, Western and southern Africa;
- Food security warning in GHA, especially Ethiopia. During the 1984 drought, Ethiopia lost a considerable number of people but the number recorded during the more severe drought of 2000/2001 was less than 100;
- In southern Africa, drought was forecasted in 1992/93 and 1997/98 in many areas. Firms refused to provide funds and insurance to farmers. The drought however turned to be mild in some areas, and farmers who planted crops in such areas received average crop yield;
- Food intended for drought season arrived late and in the middle of the following good rainfall season, flooding the market with imported food and lowering the prices of local farm products, thus reducing the farmers normal income.

It was agreed that the following issues need to be addressed:

- New products such as prediction of the onset, cessation, dry spells actual amount of rainfall etc.;
- Timeliness of the forecasts;
- Forecasts not reaching the end users in time;
- Research to improve forecasting methods.

TOR 5: Identify and propose ways for building sustainable regional capacity in climate forecast and seasonal prediction.

There is need for capacity building in the following areas:

- Data processing of climatic and agricultural data for various applications in agriculture;
- The use of remotely sensed data such as estimation of rainfall data from satellite records and their calibration;
- Training of the trainers in climatic data processing;
- There is need to build capacity in the use of Empirical/Statistical methods for countries that need to understand these methods;
- Advanced techniques that add value to the Statistical/Empirical methods which provide additional products such as the onset, cessation, duration and length of dry spells among others needs to be enhanced. Capacity building in the use of these techniques including the analogue methods needs to be improved;
- There is need for capacity building in the General Circulation Model including Regional Climate Models. Data for initial conditions are difficult to access;
- GIS techniques;
- Verification methods;
- Downscaling techniques;
- Intergrated disaster management;
- Research techniques related to failures on climate forecasts;
- Tercile transformation from probabilistic to user oriented products;
- Evaluating of failures and successes;
- Strengthen regional and International linkages and networks;
- Sustainability of capacity building training;
- Sustainability of COFs training activities to build capacity of effective focal points at country level, and to stengthen networks;
- Access of the availability of the training modules and materials, e.g. CLIPS have a Web site with modules that can be used for training;

- Training workshops;
- Secondment to national institutions/centres;
- Regional institutions needs to have GIS as a useful tool for mapping (Project proposals should be developed on the use of GIS);
- (Training of Users should be noted);
- Various countries should do an inventory to see what they have in terms of GIS capabilities;
- Pilot Projects looking to address successes and failures of climate prediction including traditional indicators.

TOR 6: Develop a guideline to establish pilot project(s) for assessing the accuracy and skill of seasonal forecasts and climate prediction for agriculture.

Areas for Pilot Projects included:

- Data quality control including archiving and processing project;

- Developing pilot projects on the use of ***new techniques*** such as start and end of the rains among others;

- Pilot project on downscaling techniques;

- Pilot project on factoring climate information on integrated disaster management relevant to agriculture;

- Basic assessment on the success and failures of climate forecasts in agricultural applications;

- Modelling and verification of climate forecasts;

- COF process is very useful in the region but various centres should try to reduce the cost as much as possible. PAP for sustaining Climate Outlook Forums (COFs) cost effectively;

- Capacity building through secondment to national, regional and international institutions.

ACTION: WMO, NMHSs, and the relevant national, regional, and international institutions to consider which of these recommendations could be under taken immediately, and within their short-, medium- and long-term plans.

Comments:

- Need to specify who should carry out the various actions - need to have guidance;

- Give examples specific of verification methods - no standard methods currently present;

- Integrated disaster management need to see the economical benefits of seasonal forecasts;

- Duplication is not a problem;

- Observations by schools may not be good because of school closures.

Report of Working Group B

TOR 1. To what extent are agrometeorological services, including forecasts and seasonal prediction, being implemented for agricultural operations in Africa and what are, or could be, the impacts of their application for agricultural production, forestry, rangelands and control of forest fires. Brain storming development of specific (tailored) forecast and agrometeorological services for particular user groups.

The group started with the brain storming indicating that seasonal forecasts were found to be in high demand even though their applications differ from country to country. It was noted that farmers are very conscious of their needs and always take advises to their advantages. However, they don't take advice or messages when the risks involved are high or the messages are in a form not acceptable to them. Farmers appear often to be more interested in the onset of rains, dry spells and quantities of rainfall and their distribution.

Since it is difficult to come up with tailored or specific forecast due to different needs of farmers, farmers recommended that existing projects such as the CLIMAG being implemented in West Africa should also be exploited.

During the discussion, it was among many other points noted that:

- We have to distinguish farmers and other categories of decision-makers. Pilot forecast is not for farmers while pilot advisories can go directly to farmers.
- Seasonal forecasting is not widely used by farmers and decision-makers use it only in some countries because such forecasting is at an experimental stage or there is no link with early warning system and farmers.
- There is a real limitation in the operation service in terms of mobility, training, financial and human resources.
- Training has been done for seasonal forecasters for all member countries in Africa through ACMAD and DMCs.
- Regional outlook fora were conducted to guide partners in the smooth implementation of seasonal forecasting but verifications remain rare.
- We have mixed successes in advising farmers at different levels on seasonal forecasting.

Case studies

1. **Mali:** In 1998, the rains were late although totals were expected to be normal but farmers were so discouraged, because they received information late, that they wanted to migrate to the urban centers. However, the Director of the Meteorological Service spoke to the nation predicting a normal to above normal season despite the late rains. The actual rainfall was in agreement with the forecast and the harvest was very good that year. It is therefore important for forecasters to be equipped with tools and models to give adequate and reliable information to farmers through intermediaries.

In 1998, PRESAO predicted normal to above normal for Senegal, but at certain levels there was lack of action. In 2002 PRESAO predicted drought in Senegal and it actually occurred but authorities were criticized for not anticipating on the drought. In Chad there was a lot of success in the forecast. In 2000, Burkina Faso sent 2 persons to collect seasonal forecast from ACMAD. There is frequent exchange of e-mail on statistics on rainfall probability.

In Ethiopia, in 2002**,** both rainy seasons were expected to be late so forecasts were sent to extension officers. In Northern Ethiopia, farmers were advised to plant short maturity and drought tolerant maize and Sorghum and they implemented the advice. Though there was

an end of season drought, they got reasonable products. In eastern Ethiopia, the advice was not taken leading to a crop failure. The advice was not used in eastern part because of the socio-economic importance of the Sorghum usually grown there. Farmers use it for heating, construction and feeding animals. It is therefore important for intermediaries to understand the farming practice and traditions to give the right advice based on their forecast.

In The Gambia, farmers were not informed of the seasonal forecast because it was at an experiment stage. This is not always a justifiable reason because farmers need to be sensitized on the risks involved when they get the results. For example, a farmer's representative in Niger was invited to ACMAD and told that the rainfall may be good in that particular year. They appreciated the effort but didn't take the advice because it was their first experience and the risks were high. The forecast turned out to be as predicted and they came to ACMAD on their own the following year requesting to be invited every year.

Success stories from other agrometeorological services came from improved underground grain storage in Sudan and some wind and sand protection advisories there.

With regard to TOR1, the group retained the following recommendations:

- Best practices and methodologies currently available and applied in different countries should be merged into new projects on the basis of the needs of decision makers, already listed several times for different farming systems. These improved methodologies should be adapted and promoted for application using data and products easily available through the Internet and Web sites (CAgM software & Agmet Bulletin, links on INSAM), and validated in CAgM OPAG context other methods of climate forecasting and related response farming should also be tested.

- We cannot develop agrometeorological services or assist in their development without setting the needs for such services in the context of the farming system concerned. Sharing of experience here also may be crucial not to waste human resources and to learn from successes and failures.

- It has also been recommended that in order to be able to assist farming systems better with yield improvements, more yield data should be taken under various climatic conditions. This will also make it possible to use crop growth models and other tools for management purposes in agro meteorological services.

TOR 2. What are notable success stories and what have been clear failures in the implementation of climate forecasts and agrometeorological services and how can they be extended to other countries in the region.

Successes in Africa:

Mali was a success story because all stakeholders of the process of deriving and using the agrometeorological information/services were involved at all stages of the project. It also enjoyed continued donor support. However, one must emphasize that the rural population was very organized and the coordination of the process was not interrupted. Exchange visits between experts in Mali and Chad were also made to learn from the experiences of each country.

Since Mali was a success story, the group is recommending that a post-evaluation of the Mali experience be made to:

- Identify key areas of success in terms of structural, organizational, economical and societal aspects;
- Identify difficulties encountered during different stages of the project;
- Build data base designed for capitalizing on the experience.

The outcome of the post-evaluation will serve as inputs for the development of scenarios for projects similar to that of Mali to be implemented in other African countries. The post evaluation will not re-evaluate the direct outcome but rather derive lessons and capitalize on the experience. An agrometeorologist, an economist and a sociologist could constitute the post-evaluation team.

Explicit failures in Africa:

Regarding the failures in the implementation of climate forecast, the group noted the following*:*

- The cotton belt in Burkina Faso. The cotton season failed because the rains stopped at the end of the season despite a good seasonal forecast;
- Shelter belt project in Nigeria: this was designed without the consultation of farmers or scientists;
- The Gambia Agromet pilot project: lack of appropriate field staff, inadequate orientation of field staff, no incorporation of farmers' reactions and project design errors made the experimental phase a failure.

Of course the general lessons learned from the case study of failures in northern Brazil to have climate forecasting applied in drought mitigating by small-scale maize/manioc farmers, do apply to African conditions as well.

The group regarding TOR 2 retained the following recommendations:

- Lessons learned from all the methodologies already existing in pilot projects should be verified in a programme internationally funded and nationally executed by the NMHSs. Positive and negative effects should be analyzed and documented and accuracies of methodologies should be tested, and the evaluation and appropriate feedback mechanisms should be used on a pilot project scale regarding the implementation before the results of methodologies could be centrally organized for NMHSs to be made generally available;

- Most of the existing extension systems and proposed intervention systems as well as most of the weather/climate/agrometeorological forecasting in agriculture appear to be inappropriate support systems with limited success due to insufficient considerations of the actual conditions of the livelihood of farmers. Such system/interventions/forecasting should therefore be reconsidered;

- Case studies show that as a consequence of the insufficient knowledge of the conditions that actually shape the livelihood of farmers we have too often:
  - Insufficiently taken into account local adaptive strategies or;
  - Not made the right choices in the use of contemporary science;
  - Not understood the overwhelming effect of inappropriate policy environment.

TOR 3. What are the training needs for ensuring effective implementation of climate forecasts and agrometeorological services? Is there a need to train intermediaries between generators of the agrometeorological information/services and the users of such information/ services?

The group noted that in many countries, there exists an appropriate structure with intermediaries in place. Very often this is a dual carriage. One is the multi-disciplinary working group in charge of making forecast messages and other agrometeorological information available in forms suitable for extension, the other is the extension system in place.

Extension workers need to be trained to be able to deliver agrometeorological services in the right way. They will have to understand that delivery of agrometeorological information/services is also part of their duty and not the role of meteorologists.

There is need to introduce agrometeorological information in the school system or regional colleges to contribute to solving the problem of continuity. Focal points trained at ACMAD should form national networks to pass on their knowledge to others in the form of:

- Rapid training to extension workers and representatives of NGO and farmers before the rains;
- Discussions of the tendency of the next rainy season at the end of the rains.

The following recommendations were retained with respect to the "end-to-end" system for build up and transfer of agrometeorological information:

- As to the production of weather forecast and other agro meteorological services, constraints should be identified, new products developed, capacities of NMHSs should be reinforced, and training programmes should already start in meteorological and hydrological schools to sustain the competence in the meteorological services when graduates will be recruited. Training activities under RMTCs on best utilization of methodologies and related data should be improved;

- Multi-disciplinary Working Groups for specific applications in well-defined farming systems should be created in each country to analyze meteorological information before its distribution. Pilot projects should then be fed with the use of such information for applications. There are requirements for such pilot projects at the side of agrometeorological services offered and at the side of the extension services needed;

- Only very specific forecasts geared to the actual conditions and the most serious problems of the farmers, of the different categories of vulnerability distinguished, have a chance to be absorbed and used. Of utmost importance are the actual needs of end users of agrometeorological services. Only well trained intermediaries can give the necessary appropriate user training that will present the untampered use of raw forecasts and of proposed interventions as agrometeorological services and that will use products and adapted strategies approved by Multi-disciplinary Working Groups. It will help to invite rural journalists, extension workers and representatives of farmer associations to meetings of these Multi-disciplinary Working Groups of experts.

RA I EXPERT GROUP MEETING
ON THE APPLICATION OF CLIMATE FORECAST FOR AGRICULTURE

WORKING GROUP C
REPORT

1- Users who need weather/climate and agrometeorological information and services.

Every sector of society uses weather/climate and agrometeorological services in one way or the other but for the purpose of this workshop, the list below only include agricultural sectors.

- Agricultural planners
- Extension officers
- Farmers
- Government policy makers
- Transport and communication
- Hydrologists
- Research communities
- Seed companies
- Agricultural chemical companies
- Agro industries
- NGOs
- Health

2- Means of disseminating information to users

- Radio where they exist
- Meetings
- Personal contact
- Interest/target groups
- News papers
- Television
- Telephone
- Fax
- Internet
- RANET
- Bulletins
- Schools
- NGOs
- Intra groups
- Traditional communicators

Ranking:
Only the first five were ranked in the order of importance

3- Capacities to disseminate climate forecast and agrometeorological information

Most of the countries of Africa have the capacity to use any of the means of communication in disseminating the climate forecast and agrometeorological information.

- Radio if available has the best capacity to disseminate the agrometeorological information;

- Meetings are a very good medium of communication but they can be slow since they need time to be organized. The meeting place can be a long distance from some of the target audience;
- Personal contact may be very good but information can be distorted;
- Newspapers are only useful if the target group is literate;
- Interest/target groups are very effective but slow and may result in low coverage.

4- Means of achieving better recognition of the value and economic benefice of climate forecast and agrometeorological services.

- The users should be informed on the importance of agrometeorological information and services that are available;
- The information should be in the local languages where possible and in a format that the users understand;
- There is a need for dialogue between climate scientists, agrometeorologists and users. This will help to establish trust among the stakeholders;
- The users should be educated/trained on the uses of the available agrometeorological information and services;
- There is a need for a more participatory approach by involving all the stakeholders;
- There should be credibility of the producers and disseminators of the information;
- Scientists should demonstrate and evaluate the effectiveness of the use of agrometeorological information and services;
- Build the capacity of the agrometeorologists on how to package and market the information;
- National Climate Forums where experts share information.

5- Ways of assessing the economic values of seasonal forecasts agrometeorological services

This includes all the economic calculations.

- Carry out on-station and on-farm trials of application of seasonal forecasts and agrometeorological information;
- Compare production of farmers who have used agrometeorological information with those who have not.

6- Creation of a track record for using climate/weather and agrometeorological services

- World meteorological;
- Open days;
- Regular meetings between NMS and target groups.(e.g. NGOs, communities, journalists, industries);
- Surveys/questionnaires, to inquire users' needs;
- Train media/journalists to better understand meteorological terminologies;
- Accuracy and quality of forecast products by meteorologists should be stated;
- Example of success stories/good practices printed/distributed/analyzed after events.

7- Case studies

- Meteorological assistance to agriculture in Senegal (success);
- Agrometeorological information dissemination in Mali (success);
- Improving climate forecast communication for farm management in Uganda (success);
- Use of RANET for disseminating agrometeorological, climate and environmental information to rural people in Niger (success);
- Use of RANET for disseminating agrometeorological, climate and environmental information to rural people in Kenya (ongoing);

- Use of RANET for disseminating agrometeorological, climate and environmental information to rural people in Uganda (ongoing);
- Use of RANET for disseminating agrometeorological, climate and environmental information to rural people in Zambia (ongoing);
- Envirovision; prediction of maize use yields using various scenarios in the Free State, South Africa (success);
- Vegetable farming at Mingondi, Limpopo province, South Africa (success);
- Agrometeorological assistance to rural folk in Mali (ongoing);
- Agrometeorological weekly bulletin in Zimbabwe (ongoing);
- Testing of the application of agrometeorological data and information to continue to enhance food production in the Gambia;
- Other studies supported by national and regional institutions.

8- Pilot projects

8-1 Independent evaluation of the Malian project;
8-2 Agrometeorological information dissemination to users in Africa;
8-3 Evaluation of the seasonal outlooks disseminated to users in Africa during the last five years;
8-4 Evaluation of agrometeorological advisories issued in selected countries of Africa;
8-5 Capacity building of the media practitioners in Africa to improve the dissemination of climate forecast and agrometeorological advisories;
8-6 Capacity building of agrometeorologists in conducting the needs assessment and packaging of agrometeorological products;
8-7 Development of methodologies to predict onset, distribution and cessation of rainfall in different parts of Africa;
8-8 Cost-benefit analyses of the use of seasonal forecast and agrometeorological advisories in Africa;
8-9 Implementation of the RANET project in other countries of Africa;
8-10 Development of new and innovative agrometeorological products and services.

9- The way forward/recommendations

9.1. There should be an increased participation of users in meetings to discuss the use of climate forecasts and agrometeorological services;
9.2. The National Meteorological and Hydrological Services (NMHS) must conduct a needs assessment of climate forecasts and agrometeorological services among users;
9.3 The NMHSs must evaluate existing climate forecasts and agrometeorological services disseminated to users;
9.4 The media practitioners should be educated on the meanings of agrometeorological terms, concepts, informed on the agrometeorological services available and trained on ways of disseminating agrometeorological information;
9.5 Climate scientists and agrometeorologists should be trained on how to package and marketing agrometeorological information;
9.6 There should be training of intermediaries including extension workers;
9.7 There is need to raise a awareness of policy makers on the importance of climate forecast and agrometeorological information and services;
9.8 The school curriculum or other means should include agrometerological starting from the lower/primary levels.

There should be a follow up of the above recommendations.

All the above is dependent on the availability of adequate funds. Therefore, there is a need to sensitize funding agencies, national governments and NGOs to provide enough funds to enable the recommendations to be implemented.

Comments:

Climate forums are not the best means to get the users, but for active participation need in forums you need more funds.

There many other case studies hence need to put those in a Web-site for example on www.agromet.org

Define a combined pilot project- not individual

Need to sensitise the policy makers

Need to develop a philosophy of marketing our product.