

**Final Report of the
Expert Meeting on Agrometeorology
in the Service of West African Agriculture**

AGRHYMET Centre, Niamey, Niger
23-24 April 2008

1.0 Opening Ceremony

1.1 The Expert Meeting on Agrometeorology in the Service of West African Agriculture was held at the AGRHYMET Centre in Niamey, Niger from 23 to 24 April 2008. Mr Papa Oumar Dieye of AGRHYMET Centre served as the master of ceremonies and introduced Mr Gnoumou Faustin from the AGRHYMET Centre. He mentioned the importance of weather and climate variability to food security, especially in West Africa. He thanked all the participants for coming to this meeting and he requested that the meeting be held in a participatory manner.

1.2 Dr M.V.K. Sivakumar, Chief of the Agrometeorological Division of WMO, then welcomed the participants on behalf of the Secretary-General of WMO, Mr Michel Jarraud. He thanked the AGRHYMET Centre for hosted this meeting and he also thanked the State Agency for Meteorology in Spain (AEMET) for providing the financial resources for the meeting and the projects to be discussed at this meeting.

1.3 Mr Francisco Perez Pascual from the International Relations from AEMET welcomed the participants to this meeting. He mentioned that due to unforeseen circumstances Dr Jose Luis Camacho could not attend this meeting. Dr Camacho is an agrometeorologist and was involved in the development of this project. Mr Pascual mentioned that the Spanish Government is interested in assisting the West African countries in developing their agriculture. He discussed the Las Palmas Action Plan which was developed during a meeting of the Permanent Representatives to WMO from West African countries in Nov 2007. He stated that the Marine Meteorology portion of project has been developed and that this meeting is to focus on agrometeorology.

1.4 Mr Labo Moussa, the Head of the National Meteorological Service of Niger and Permanent Representative to WMO, greeted the participants and mentioned that agriculture is an important aspect in West Africa. He also stated that vegetable truck farming has been a focus of the Niger Government in recent years.

1.5 Mr Mohamed Boulama, the WMO Representative of West and Central Africa, then addressed the participants.

2.0 Organization of the Session

2.1 Dr Sivakumar chaired the meeting and asked if the participants agreed with the proposed agenda (Annex I). The agenda was approved unanimously. It was decided that the meeting would be organized from 09h00 to 12h30 in the morning and from 15h30 to 18h30 in the afternoon. There would be one coffee break at 1030 hrs in the morning and at 1700 hrs in the afternoon.

3.0 Contacts with farming community – Current Status in West African Met Services

3.1 Dr Sivakumar mentioned that much has changed in disseminating agrometeorological information over the years. Twenty years ago one did not have the Internet. Today, there is more rapid dissemination of information. He asked the participants if they have changed their method of communication. He then opened the floor for discussion.

3.2 Mr Ndiaye from Senegal stated that the addition of RANET and rural radio has been helpful. Today there are many journalists interested in agricultural issues. Mr Diarra from Mali also stated that bulletins and local radio are playing an important role. Since 2001, every morning the local radio disseminates meteorological information and the forecasts are provided for the local area. There was some discussion as to whether villagers have mobile phones and Mr Diarra replied that villagers buy their own mobile phones. There were also some comments from participants on their experiences that farmers will request the information directly if for some reason it was delayed being disseminated through the official channels. Dr Sivakumar briefly discussed the current food crisis and mentioned the following factors that touch the rural community: increased speculation in the global commodity markets; weather problems in some food producing areas; increased use of food crops for biofuels; and record global oil prices.

Presentations on current status

3.3 Ms Judith Sanfo, agrometeorologist from Burkina Faso gave a presentation on the current status of collaboration with the Burkina Faso Meteorological Service and rural farmers. She first talked about several passed experiences with two pilot projects. The first was a pilot project with CILSS and the Meteorological Service of Burkina Faso from 1985 to 1992. The objective of this project was to show the advantages related to the use of agrometeorological information. The Meteorological Service along with the Ministry of Agriculture targeted three pilot villages with 72 rural farmers. The project targeted rural farmers at three levels of agricultural technology (traditional, intermediate, and modern) with an experimental and baseline plot of land. They gave decadal agro-meteorological advice and opinion and directly communicated with the peasants from April to December. The results showed that in a wet year, there was no significant difference in production between the experimental and baseline plots. In dry year, however, there was better production on the experimental plot from +7% (traditional agriculture) to +20% (modern agriculture).

3.4 She then described the CFAR project which involved Tufts University (USA), University of Georgia (USA), Meteorological Service of Burkina Faso, INERA, and Plan International from 1998-2005. There were two phases of this project. The first was a basic research phase (1998-2001) whose objective was to learn about traditional forecasts, adaptation strategies to climatic risks and the needs and priorities of producers with regard to climatic information. The second was an applied research Phase (2002-2005) which proposed a transmission method for probabilistic forecasts and identification of needs for supplementary information. Other actors in this project included technical agents of the agricultural services and from SOFITEX (facilitators) and producers (rural farmers and livestock herders) from 9 villages from the three climatic zones in the country, organized in GPC and cooperatives or not. The project organized workshops each June in two parts. The first workshop involved facilitators and the content of the one day workshop focused on the foundations of the seasonal forecasts, an explanation of probability with exercises, the forecast of the current season, and adaptation strategies. The other workshop involved peasants and content of the two day workshop focused on the traditional forecast data for the peasants along with the content of the facilitator workshop. The project also made investigations into the understanding, the use and the diffusion of the seasonal forecasts (August and October)

and the collection of weather data (rainfall and temperature) by trained peasants. The project showed that the traditional forecast was based on the observations of nature over time and there was a rather good comprehension of the seasonal forecast, the use of climatic information in strategic and tactical decisions and rainfall and temperature data collected for modeling. The farmers requested additional information such as the beginning and ending dates of the rainy season, the duration of the crop growing season, and forecasts of the dry periods and episodes of significant rainfall.

3.5 Ms. Sanfo then described the current project which is to improve water management in the Comoé Basin. The objective of the project is to identify and test the constraints and opportunities at the institutional and community levels in using seasonal forecasts for the improvement of the surface water management for irrigation. The actors in this project involve Tufts University (USA), University of Georgia (USA), Meteorological Service of Burkina Faso, INERA, DGRE, ONEA, SN-SOSSUCO, and the Cooperative of the irrigators of the perimeter of Karfiguiela (Banfora). This project will make a census of the needs of irrigators and dam operators in forecasting water availability, to define with the major players the objectives of such a forecast, and to design a decision-making tool to aid in the management of the Karfiguiela dam.

3.6 She then discussed the current situation of contacts between the Meteorological Service of Burkina Faso and peasant community. There are direct email contacts with some peasant associations and contacts during the GTP training missions. There is the dissemination of products such as the 10-day agrometeorological bulletin and the seasonal forecasts (PRESAO) from the Meteorological Service by the Ministry of Agriculture, the SOFITEX and the rural radio. There is also participation of peasants and peasant organizations in the workshops and seminars organized by the Meteorological Service on the utilization of climate information. During the non-rainy season, the Meteorological service has continued to elaborate and disseminate the 10-day agrometeorological bulletin since the 2007-2008 agricultural season and has integrated in the bulletin the crop water needs during the off-season.

3.7 She concluded that the interaction between the Meteorological Service and rural community has not been optimal. There is still only indirect interactions with the majority of producers, despite the ambition of the Meteorological Service to fully play its role in supporting agricultural development. The experiences of direct collaboration were very successful, but it would be better if the direct interaction could be done across all of the country. Finally, the meteorological information available to the producers should be more precise, reliable and take into account the needs expressed by the producers.

3.8 Ms. Sanfo then described the needs of Burkina Faso in relation to this project in order to capitalize on current and previous experiences to benefit the producers. These needs include the following: training of the major agricultural actors to create networks of groups for improving the communication and use of weather information by the producers; to integrate participative communication and local knowledge; provide more reliable and precise seasonal forecasts; and to optimize the use of seasonal forecasts by the development and dissemination of tools to aid decision-making based on economics and to develop packages to consult and give advice on better use of the weather resources (exposure of the exploitation, effective use of water, etc).

3.9 After her presentation, Dr Sivakumar asked if she had reports from the previous projects. These are quite useful not only to the country but can also provide lessons for other countries and provide the WMO Secretariat with documentation of what concrete steps and successes that these project have produced along with which improvements are needed. He also mentioned that WMO would assist in scanning old reports if they did not exist in an electronic format. He also mentioned

that these projects reports and workshop presentations will be put on the WMO website as a resource for all. There was a question discussion on how successful were the farmers in collecting the weather data for the one project and Ms. Sanfo replied that it was a complete success. One discussion based on her presentation was to develop packages of agricultural practices as is done in English-speaking countries, and that these packages need to have meteorological information in them. Another discussion was on how to improve the work of the GTP and based it on a system. One participant mentioned the Internet does not function well in some countries and another stated that the interaction with peasants needs to be oral since many of them cannot read. There was also discussion of how to organize seminar based on the regional administrative units in each country.

3.10 Mr Daouda Diarra, agrometeorologist from Mali, gave a presentation on the current situation of meteorological assistance that the Meteorological Service of Mali has given to the farmers. He started by giving an introduction on how the agriculture in the semi-arid regions of West Africa has developed in the context of extreme variability of environmental factors. He then described the following concerns of the producers: What is the date of start of the rainy season at a certain locality?; What will be the amount of rainfall that occurs during the season?; How long will the season be?; Will there be dry periods during the season and how long will they be?; Can one forecast the weather and climate for each zone of the country (at even the village level)?; Can one frequently disseminate weather information in all of the national languages during the rainy season?; and Is traditional knowledge from the peasants used to weather or seasonal forecasting?

3.11 He then discussed that one can develop strategies in face of these challenges at the regional level with the assistance of institutions such as CILSS and the AGRHYMET and at the national level with the agrometeorological and hydrological services of the country. These institutions can implement meteorological assistance to reduce the risks and lessen the impacts related to climate variability and climate change. He then described the mission of the agrometeorological division of Mali as the following: to study in close collaboration with the national services concerned the relationships between meteorological factors and agricultural production and to identify the needs of agrometeorological assistance; to undertake agroclimatic studies in order to contribute to the promotion of sustainable agricultural and rural development; to develop and disseminate agrometeorological information, advice, and recommendations that allow monitoring of agricultural, forest, and rangeland conditions and rational decision-making in the carrying out agricultural activities.

3.12 Mr Diarra then discussed the necessary activities for successfully providing weather assistance to rural populations. This includes using training as a means of maintaining capability and assets. He stated that with the development of an estimated crop calendar, the planting decisions not only depend on the availability of rainfall but also on the aptitude of the peasant. He stated that during the process of interaction between the peasants and members of the team, each group learned from the other. Currently there are more than a thousand of peasants and more than 500 popularizers were formed in the methods of making rainfall and crop observations. He also mentioned that several "weather and media", "weather and Members of Parliament", and "communal weather and elected officials" days were organized. He stated that useful weather assistance rests on the exploitation of data in quasi real time. He also described the assistance included the provision of bicycles, raincoats, installation of radios, agrometeorological stations, computers for data processing, and vehicles to assist the team in coordinating the project. He stressed that exchanges with rural population improved the knowledge of project team on the peasant's needs and requirements in the field of meteorology and also their habits and customs. It also provided knowledge to the team on which decision-making tools the rural producer wanted

such as an estimated planting calendar of sowing and the identification of certain traditional references of the peasant.

3.13 He stated that currently in Mali, the Meteorological Service developed products in association with the following partners: Permanent Assembly of Chambres of Agriculture of Mali (APCAM); the Programme of Support to Agricultural Structures and Peasant Organisations (PASAOP); and certain local radio stations. The Multidisciplinary Working Group (GTP) in Mali is comprised of representatives from the following institutions: National Service of Meteorology; National Service of Hydrology; National Service of Support to the Rural World; National Service of Territorial Administration; Directorate-General of Reglementation and Control, the Institute of Rural Economy; the Directorate-General of Civil Protection; the Offices of OHVN and CMDT; the Famine Early Warning System (FEWS); ORTM; SAP; the Committee of the Coordination of the NGO Actions (CCA-ONG); the Secretariat of the of the Coordination of the NGO Actions (SECO-ONG).

3.14 He then described the methods used during the assistance to the peasants. The production and dissemination of agro-hydro-meteorological information involved the collection and transmission of meteorological, hydrological, agronomic, phytosanitary, and agricultural (pasture, ranching, fishing, market prices) data. These data were then analyzed and discussed during regular meeting of the GTP. A multidisciplinary approach was used with specialists from meteorology, agrometeorology, agronomy, extension agents, plant pathologists, and communications. He made an important point that these specialists belong to different administrative services and the collaboration between these services is crucial for the success of such projects. He added that this kind of project needs people who will volunteer and who believe in it.

3.15 He stated that the data were collected by literate peasants, extension agents, and weather technicians, transmitted by radio or telephone to the Weather Service, then processed and analyzed by the GTP which develops the advice. These opinions are then diffused to the rural areas by national radio broadcasting. With the estimated planting calendar, the decision of sowing depends on the availability of a rain gauge and the aptitude of the peasant to use them. He added that it will be necessary in the long run for the peasants to be independent in their decision-making in order not to await for the advice from central agencies. From this point of view the training of literate peasants and extension agents in making rainfall observations, using the GTP products and the transfer of competences are very important aspects of the project. He then discussed that communication with the peasants is very important and humility is required in interactions with them. It is necessary to explain to them that this project is like an experiment and which, if successful, will help them and to contribute to the well being of society. The advice must be simply formulated and translated into national languages so that the peasant can easily understand them. Also, the advice, opinion, and products of the GTP are time sensitive.

3.16 Mr Diarra listed the following meteorological products intended for the rural peasants as : the average start, duration and the end of the rainy season; estimated planting calendars; rainfall data collected by peasants; 10-day and monthly agrometeorological bulletins; and verbal communications to inform the Council of Ministers of the rainfall situation in Mali. In the scope of the weather assistance to peasants, he listed the following actions that were taken: development and dissemination of weather information and products; transfer of competence through the training of actors at all the levels; feedback of these actors in the process of design and operations of the assistance; and adaptation of the weather products to the user's needs. He then listed some of the accomplishments of the operational weather assistance which was carried in five areas out of eight in country: better knowledge of the weather needs of the rural population; the development decision-making tools such as the estimated planting calendar; identification of certain traditional knowledge of the peasant; training of more than 1700 peasants and 500 popularizers on the

elementary techniques of agrometeorologic observations; the low cost manufacture of raingauges for the rural producers; and the participation of the peasants in the collection and the transmission of rainfall data.

3.17 He then stated that the application of weather information in the zones led to yield increases of 30% for dry cereal crops and 23% for cotton on average. A socio-economic study based on a survey showed that 50% of the peasants growing sorghum realized a surplus of yield varying from 500 kg/ha to 1325 kg/ha and for the millet, yields varying between 350kg/ha and 800 kg/ha. An economic analysis based on the producer prices from January 2005, showed that in the area (CMDT of Koutiala), the profit for peasants having following the advice and opinions was USD 26,000 with a 143 ton increase in production and the loss of earnings for peasants who did not follow the advice was USD 49,2000.

3.18 Mr Diarra ended his presentation by listed the following difficulties encountered: insufficiencies in collecting and the recovery of data in real-time; inadequacies in the means of transmission of the data; inadequacies in the functioning means of the GLAM; insufficient number of literate peasants and trainers (extension agents?); the lack of training of GLAM members; the private radios and certain national languages are still not utilized for the dissemination of products; the reception of radio signals by the national radio network in certain localities is of very poor quality; and inadequacy of meteorological forecasts; inadequacy in the use of peasant knowledge. He listed the following perspectives: to sensitize the local elected officials on the role and importance of meteorological information in socio-economic development notably in the fight to combat poverty and the preservation of the environment; to equip, reinforce and modernize the means of collection, transmission, treatment and diffusion of data; extend the operational assistance to the northern zones of the country; to extend the GLAM to other zones; to improve especially seasonal and localized weather forecasting; and to continue researching peasant knowledge. He then listed the following conclusions: to improve meteorological presentations; to make available decision making tools to producers and other decision-makers; increase the yield and quality of production; limit the loss of seeds; reduce the costs of production; reinforce the capacity of different actors; preserve the environment; start to adaptation to climate change; collect indicators of peasant knowledge; and to increase the living standards of the rural populations.

3.19 After his presentation, the discussions were on whether the agromet stations were also synoptic stations, the concerns of politicians, the problem of having a constant and stable GTP, and how the regional centres interact with national governments. There were several questions about the planting calendar and Mr Diarra replied that each zone has a different calendar. One participant asked if one separate the calendar into wet, dry, and normal years and then have different packages for these. Mr Diarra replied that the calendar is only a statistic. Dr Sivakumar mentioned the International Workshop on Adaptation to Climate Change in West African Agriculture being sponsored by WMO/UNDP to be held from 15-19 September in Burkina Faso.

3.20 Mr Diarra then gave a brief presentation on the raingauge project developed in Mali which is proposed to be updated and expanded to the Sahelian countries of Burkina Faso, Mali, Mauritania, Niger, Senegal with AEMET funding. He stated that the goal of the project is improve incomes and food security of rural farmers by the using rainfall data collected by peasants in conjunction with an estimated crop calendar and advice of the GTP (guided by the Meteorological Service) in each country transmitted by radio. He already discussed following important results from the previous presentation that were obtained in the training of peasants and others in the practical use of agrometeorological information. However, he added that certain concerns of the rural peasants remained unresolved such as: meeting the requirements of agrometeorological information for the peasants, as well on disseminating it properly; the availability of raingauges;

capitalizing on the "rural knowledge" in regards to weather and agriculture; and the adequacy of the estimated planting calendar in certain agroclimatic situations.

3.21 He then mentioned the beneficiaries of this kind of operational weather assistance would be rural producers (peasants, livestock herders, and fishers) and food security decision-makers of the countries. The objectives of the project include: to develop and make available the estimated planting calendar to the popularizers and rural producer groups in each country; to produce and make available raingauges in order to collect the rainfall records for the application of the estimated planting calendar; to form a core group of trainers in each country on the development of the estimated planting calendar, recording rainfall and crop observations; and to make available at the peasants level easily understandable and integrable information in their traditional practices to assist them in better planning and management of their agricultural activities. Therefore the activities of the project would include: collecting and processing weather and agronomic data for the development of estimated planting calendar; the production and popularization of raingauges; the training of the peasant weather observing and popularizers on the elementary techniques of recording rainfall and crop data; preparation of the formats for the data collection and transmission; consolidation of the assets through the reinforcement of capacities of Meteorological Services by the establishment of partnerships with the rural populations and the various food security and rural support organizations; management training of the Meteorological Services on the new techniques in the fields of seasonal and climate and seasonal forecasts; providing training and public awareness; obtain feedback on the application of the advice; and identify press organization in particular radio stations and evaluate their capacities. He concluded his presentation by giving an overview of the proposed budget of the project.

3.22 After his presentation, there was a question from Mr Francisco Pasqual from AEMET on how many raingauges will you need and who will make them. Mr Diarra responded that each raingauge is 4.50 euros and he already has manufacturer who has made about 1000 raingauges. He also added that five years is the average life of a raingauge. Dr Sivakumar suggested that a piece of paper be attached to the raingauge on how record data and the advice (not sure??). Dr Sivakumar also asked if Mr Diarra had a report on the experience of the peasant observers. Mr Diarra replied that in 2007 they made a report.

3.23 Mr Hamidou Coulibaly, agrometeorological engineer from Mauritania, gave a presentation on the current situation of the meteorology assistance to the rural people of his country. He stated that there is a total absence of concrete activities on the ground and that there is a development of a project going in direction discussed so far in this meeting. He then briefly discussed the level of the agrometeorological service at the Meteorological Service in Mauritania. He stated that the only information available is relating to the data-gathering on phenology and the crop status during the season. There is an information bulletin for the decision makers and public authorities. He added that there is no agrometeorological advice given to rural farmers, although this can be easily done. He stressed the importance of this workshop for the Meteorological Service of Mauritania which has just been created and that they look at what other countries (Mali, Senegal, etc) are doing in order to improve the agricultural production of the rural farmers.

3.24 After his presentation, Mr Boulama, the WMO representative for northern, central, and western Africa, how are they involved with the AGRHYMET framework. Mr Coulibaly replied that they are involved in the AGRHYMET activities. There was a discussion on the relative importance of the various agricultural sectors in Mauritania. Mr Coulibaly replied that he would rank them as livestock herder, crop farmers, and fishers.

3.25 Ms. Adamou Aissattou Sitta, agrometeorological engineer from Niger, next gave her presentation on the current situation in Niger of agrometeorological assistance to the rural populations. She stated that in Niger, rainfed crops occupy 95% of the cultivated land and that issues of food security are due unfavourable environmental conditions, problems with soils, inadequate agricultural techniques, and socio-economic factors. She mentioned that since 1982 an operational alarm system was put in place to determine areas at the risks or likely to be prone to the food insecurity. She then described two types of agrometeorological assistance in the rural populations based on the dissemination of advice. The first one she discussed was agrometeorological assistance for agricultural production which consists of agrometeorological information intended for rural producers for practical decision-making in the control and the planning of their daily activities. The information currently provided by the Meteorological Service is related to the planning for the agricultural operations during the rainy season (suitable choice of the species, varieties, sites, dates of sowing or harvest, periods of spreading manure, treatment of plant diseases/pests, the fieldwork... etc). This information includes: rainfall; the start, end and length of the rainy season by region; seasonal forecasts (PRESAO) made in April and May and updated in June; and daily weather forecasting. She then stated that existing constraints for this type of assistance are difficulties related to the dissemination of this information in the rural areas where there is a need for collaborating with the community radios and other media in the rural areas and that the information not useful due to lack of training and public awareness of peasants in their manner of use. She added that the Meteorological Service is putting into place a mechanism to assist truck farmers.

3.26 She then discussed the agrometeorological assistance for early warning. This second type of assistance consists of agrometeorological information intended for decision-makers at the national and international level, for development projects, and for food security early warnings. This is an indirect form of assistance to the rural community. The Meteorological Service provides these actors decision-making tools so that they can better target their interventions in the rural community. She then briefly discussed these tools and products and how they are used. The seasonal climate forecasts (PRESAO) make it possible to anticipate the situation of a crop year with the cumulative July to September rainfall which represents a significant quantity of water available for the crops (60 to 75%). The Inter-tropical convergence Zone (ITCZ) is good indicator of monitoring locust movement and is used to indicate the theoretical limit of the rainfall zones. Risk zone models (ZAR) compares crop cycles and the duration of the given agricultural season from agrometeorological methods by use of phenology and soil moisture levels. The products are used by the national early warning systems for the determination of the risk zones and which actions to undertake. The vegetation wave or front products can be used to monitor the decadal evolution of the vegetation which is important for route of cattle in the Sahel. Crop water balance models are based on the determination of the real evapotranspiration in 5-day time steps following the Egleman algorithm. These models are used to make the following products: planting dates estimates (detects the zones of delay of planting compared to the average and the previous year); indices of crop water satisfaction requirements; soil moisture levels as well as the water requirements for the following decade; and potential yields. These products are used for operational monitoring of the crop year and estimating yields before the end of the season. Vegetation biomass models are based on dynamic models of water and nitrogen balance and are used to make estimates of vegetative biomass at the end of the growing season. These products can be used in a complementary way with the analyses of the vegetation front by the technical livestock service as well during the current season. The Meteorological Service also produces 10 day and monthly agrometeorological bulletins.

3.27 Ms Sitta concluded her presentation by stating that this information if well utilized allows the following: to increase the agricultural production of the country; to satisfy the information needs of

the national early warning system; to produce information to the political decision-makers and to other food security actors to better coordinate their activities and to ensure the food security of the rural populations in a context of sustainable agriculture. She that to better disseminate agrometeorological information across the rural population, the Meteorological Service do the following: to establish a partnership with the community radios, the rural community and extension services; to have the necessary equipment to conduct these activities; and to have more suitable tools for the monitoring of truck farming.

3.28 After her presentation, there was a discussion about RANET. Ms Sitta responded that there a problem with the internet in Niger. They seem to have a problem with putting things on the web. There was also a discussion of how many peasant used the products.

3.29 Mr Mamadou Ndiaye from Senegal gave his presentation on the experience of Senegal on agrometeorological assistance to agricultural producers. He first discussed the passed experience of Senegal with the Meteorological Assistance to Agricultural Project (AMAS-French acronym) which took place from 1986 to 1995 in West-central Senegal (Ndiéfoune Parba). The objective of the project was to help the peasants integrate weather information during of course of the crop season and the project use experimental design. The main advice to farmers that was given on the choice of crop varieties, planting date, planting method, when to use fertilizer and control for plant diseases and pests, and relay culture of fodder (**Culture fourragère de relais**).. The results of the project showed a substantial increase in crop yields and increased interest of and interaction with the peasants who were involved in the project.

3.30 He discussed the current activities of agrometeorological assistance to agricultural producers in Senegal. He stated that this involved the application of seasonal forecasts to farmers as a research project within the framework of the AMMA project. The objective of this work is to direct the strategic choices of farmers towards the output of the West African seasonal forecast meetings (Presao) and to give advice on agricultural activities according to the short and medium-term weather forecasts. He added that the project can give specific recommendations depending on the time of the year. This activity is financed by the EU and will last for three years which started in June 2007. This activity focuses on the giving advice on the strategic options of seed quality, varieties, and fertilizer and the tactical options of optimal dates for planting, weeding, spreading of fertilizer, and field operations. The project occurred in three rural communities in the groundnut basin (Diaoulé and Ngayohème in the Fatick region and Niakhar in the Diourbel region). The method of work is similiar to that of the AMAS project. He gave an example that if a wet season is forecasted to occur, there is often an early start to the rainy season, a low frequency of the dry periods, rains arrive in the form of short but intense downpours, and annual rainfall totals are generally normal to above normal. With this forecast, recommendations to the farmers for a possible wet season include an option to plant higher quality seeds to maximize yields, a choice of high yielding varieties of groundnut, millet or sorghum with a 90 to 120 days growing period, an investment in the level of agricultural inputs such as fertilizer, pesticides and other factors of production, and relay culture of fodder (**Culture fourragère de relais**).

3.31 He mentioned the weather advice given to cotton producers which involved initiatives from the ACMAD RANET project. This involved radio stations in rural areas with weather information weather sent by fax and available on the website of the Meteorological Service. There was a very strong demand for the seasonal forecast and a request for a second radio station in the region. He discussed collaboration with the press for the dissemination weather advice and information. A seminar in February 2008 had participation of press organizations (newspapers, radio, and TV and this seminar will be held every year. From this seminar, there were requests for a weather training course for journalists. He also mentioned that there are plans to improve the website of the

Meteorological Service for providing constant updates of information. He gave an overview of the activities of the GTP which is oriented towards early warning. Other activities include: a working session with the peasants; bulletins are directly given to the agriculture authorities; GTP participation of radio stations; GTP participation of the National Council of Rural Consultation; bulletins are e-mailed to more than 100 recipients, and bulletins are available on the website of the Meteorological Service and on WAMIS. He then listed the following major constraints of these activities: the PRESAO seasonal forecasts are provided in a probabilistic form; the weather information is too general and must be more precise, timely, targeted, reliable, and adapted to the rural needs; the lack of forecasts at the beginning and end of season: RANET radio is too weak; and there are very few early crop varieties especially for millet. He gave his concluding perspectives on these activities that there needs to be a search for financing new activities, future actions need to be in close collaboration with rural organizations, there needs to be advice for rainfed crops and truck farming, and to work more closely with the rural radio stations.

3.32 After his presentation, there was a discussion on the need for WMO and other Meteorological Services to obtain project summaries and reports in order to learn from and promote these activities. There was also a discussion on the various aspects of the PRESAO seasonal forecasts and RANET.

3.33 Ms. Mariane Diop Kane, Head of the World Weather and Prediction Department of ACMAD, gave her presentation on the contribution of ACMAD to agriculture in regards to weather and climate information at all time scales. She stated that the long-term objective of ACMAD is to increase the capacity of National Meteorological Services of Africa for sustainable development and to develop appropriate applications and technique. She added that the medium-term objective is to assist the National Meteorological Services in developing and reinforcing their collaboration with the users and to provide the products that meet the needs of the Member States. She then gave an overview of the products and bulletins at all time scales. The seasonal forecast for the rainy season in West Africa (PRESAO) is developed using statistical models from the countries and international weather centres (Météo-France, UKMO, ECMWF, IRI). A PRESAO meeting is held every May and the seasonal forecast is then updated every month. The seasonal forecasts are a decision-making to agriculture, the water resources and food security and it is more useful if combined with the statistical data and the medium and short-term weather forecasts. She then discussed some of the applications of seasonal forecasts for agriculture as the determination of the optimal planting date, choice of crop varieties, yield forecasts for food security and contributing to the forecast of locusts. For hydrology the applications are forecasting river flows, dam management, forecasting river crests and floods, forecasting of inland pond filling, retaining tanks, and ground water levels, and the availability of drinking water. She added that the seasonal forecast applications for health are the forecasts of the diseases related with weather and climate like malaria and certain animal diseases (rift valley fever) and the determination of precautionary measures to be taken.

3.34 She discussed the various bulletins that ACMAD produces and how their usefulness to agriculture. The Monthly Continental Climate Bulletin provides information on the synoptic and current rainfall situation and their impacts and gives perspectives for the next month. The 10-day Continental Bulletin provides similar information but also added information on soil moisture and impacts on health, agriculture, and food security. ADMAD also produces a daily weather forecast bulletin and a short-term and medium scale forecast bulletins. She stated that all of these bulletins are tools for monitoring and early warning for agriculture, food security, water resources, and civil protection. She also briefly mentioned other special bulletins such as: the End of Rainy Season Bulletin; Start of Rains Bulletin; Extended Dry Period/Heavy Rain Bulletin; and the Weekly Bulletin on Food Security for Niger in 2005. She added that ADMAD also participates in the 10-day and

monthly meetings of AGRHYMET. She noted ACMAD's expertise and service to populations in information and communication with such systems as RANET which permits the dissemination of agricultural, hydrological, meteorological, plant health, social, and economic information to users in rural communities. ACMAD also collaborates with the media to facilitate the popularization of climate information and was involved in a AMMA training workshop for radio, newspaper, and TV journalists. She gave an overview of the various projects whose aim is to improve ACMAD products for the needs of National Meteorological Services and other users for early warning and food security. The aim of the APAO Project is to reinforce the capacities of the Meteorological Services so that they can develop useful products for agricultural users. The Network project will define an optimum network of observation stations for the climate monitoring. The Project ABN will develop of seasonal, medium, and short-term forecasts for the hydrological forecasts of Niger River Basin. The DevCoCAST project will disseminate of climate and environmental information through the MeteoSat Second Generation (MSG) Satellite System. The FFEM African warning and Advisory Climate Services (AWACS) Project will work on the vigilance of the African countries in regards to climate variability and climate change and the development of early warning services. Another FFEM project involves Support to climate change adaptation in the agricultural and water sectors in West Africa. The 'McKnight Foundation Collaborative Crop Research Research CCRP, West African Community of Practice' Project will focus on climatic data. The MAARS Project will install 5 radios rurales in Burkina Faso and Mali with the help of ICRISAT and Belgium Cooperation.

3.35 After her presentation, a few participants commented that they were not aware of several ACMAD forecasts or bulletins, especially with one on the forecast of the start of the rainy season. There was much discussion on the dissemination of ACMAD products. Also, there was a comment that RANET still needs more support in some countries.

3.36 Mr Seydou Traore, agrometeorologist and Head of the Scientific Coordination Unit of AGRHYMET, gave a presentation on the activities of the AGRHYMET Regional Centre in relation to rural communities. He stated that the AGRHYMET Regional Centre was created in 1974 following catastrophic droughts in West Africa in the early 1970s. It's mission is to contribute to sustainable food security and management of natural resources by developing monitoring tools and methods, analyses, and reinforcing the capacities of member countries (training, equipment and financial support). It also produces and disseminates information to many different users. He gave an overview of the some AGRHYMET activities that involve rural communities. The Centre was involved pilot project on adaptation to climate change in the Province of Zondoma in Burkina Faso and in the Fakara Zone and Keïta Departement in Niger. These projects made investigations into the peasant farmer perceptions of climate variability and change and made a census of adaptation strategies. Some of these strategies included: the traditional methods of seasonal forecast and interpretation; choice of crop varieties; fertilizer decisions and labor mobilization. The projects tested adaptations to climatic variability such as techniques of soil and water recovery, organic and mineral fertilization, and the use of short season crop varieties. AGRHYMET also gave support to livestock herders in the Tahoua Region of Niger for the identification of the best pasture.

3.37 He stated that the Centre was involved in the interpretation and utilization of weather forecasts in agriculture by combining the seasonal forecast from PRESAO and weekly forecasts from NOAA (NCEP) to guide strategic and tactical choices during the course of the growing season. He gave an example of strategic choices during a normal to wet year as planting after sufficient rainfall when the risk of planting failure is small, use of improved and treated seeds, planting with optimal densities, and fertilization. Examples of tactical choices were undertaking plant thinning and weeding operations according to crop stage, soil moisture and weather forecasts and applying fertilizer and plant pest/disease treatments adapted to the weather forecast (i.e. risk of heavy rain).

He then discussed several studies of the AMMA project such as to validate the model crop yield forecasts and to evaluate the potential usefulness of season forecasts for rural farmers. These studies focused on small regions in Senegal, Mali, Niger, and Burkina Faso which grew millet, corn, and sorghum. He concluded by mentioning projects giving support to irrigators and truck farmers in the Tillabéry Region of Niger and collaboration with the International Federation of Red Cross and Red Crescent Societies in supporting dry season activities in Sénégal, Mauritania, and Burkina Faso.

3.38 After his presentation, there was a discussion on the Climate Prediction and Agriculture (CLIMAG) project.

3.39 Mr Francisco Pascual Perez from the Spanish State Agency for Meteorology (AEMET) gave a presentation on the proposed agricultural meteorology project for West Africa. He stated that unfortunately, Dr Camacho of AEMET who was involved in the development of project, could not attend this meeting due to unforeseen circumstances and that he was here in his place. He mentioned that he will do his best to present the proposals and answer any questions. He stated that the objectives of this meeting were to consolidate the current activities in the region, to establish relationships between various actors and NMHSs, to reinforce the capacity of NMHS personnel and collaborating institutions, and to assure food security and to improve the economic activity of the region. He then provided some background information on the project. From the WMO International Conference on Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services that was held in Madrid, Spain in March 2007 the Madrid Action Plan was created. One aspect of the Plan was to increase the marine early warning system for Western African countries". At a subsequent meeting with AEMET and the WMO Permanent Representatives (PRs) of the North and West African National Meteorological and Hydrological Services held 15 October 2007, the Las Palmas Declaration was created to foster closed cooperation between AEMET and the African NMHS in marine and agricultural meteorology. Mr Pascual mentioned that the AEMET wanted to foster cooperation such the Met Service of Mali and AGRHYMET. He stated that there have already been meetings on the topic of marine meteorology between Spanish and African Met Services and that this meeting was sponsored to focus on agrometeorology. He noted that there were already preliminary contacts on the technical needs and the possible contribution of Spain through Dr Sivakumar of WMO and Mr Camacho of AEMET.

3.40 He gave an overview of recent meteorological applications and tools from Spanish institutions that could help to develop the agrometeorology project in West Africa. These tools included the management of climate data and organizing climate databases, techniques for climate data rescue through automated scanning of paper data records, techniques for the homogenization of climatic series and for created gridded databases, development of operational satellite products from EUMETSAT for Nowcasting, the development of fire danger products and monitoring. He also mentioned drought indices (SPI), water balance models, the development and application of seasonal forecasts and statistical downscaling techniques, and applied research from the AMMA project. He described the climate data processing software CLESCOM developed at AEMET and mentioned the WMO Mediterranean Data Rescue Initiative (MEDARE).

3.41 After his presentation, there was a discussion on the interest of ACMAD to validate Meteo-France and AEMET nowcasting products and the potential collaboration with ACMAD and AEMET on data rescue issues (scanning equipment and software).

4.0 Presentation of the Concept Note on Roving Seminars on Weather, Climate, and Farmers by WMO

4.1 Dr Sivakumar, Chief of the Agricultural Meteorology Division of WMO, have a presentation on the current status and future plans of the Roving Seminars on Weather, Climate, and Farmers. He first gave a brief introduction on the importance of weather and climate in West African Agriculture. He stated that against the very unfavorable economic scenarios of the last decades, farmers have been struggling to maintain their income by continuously trying to increase yields in their production systems. He then gave an overview of current trends and future projections of crop yields which showed stagnant crop production for sorghum and variable production for sorghum and groundnuts. He stated that for all crops the all production was not increasing to keep up the population growth and demand. He added that the projected outlook for crop production for the next 10 years was for only a very slight increase. Also, there will be Increased economic and environmental risk as the farming systems becomes more vulnerable to climate variability and climate change and these existing pressures demand the development and implementation of appropriate methods to address issues of vulnerability to weather and climate. He stressed therefore, that there a need for more effective approaches to deliver weather and climate information. More effective approaches to the delivery of climate and weather information to farmers may need the incorporation of a more participatory, cross-disciplinary approach that brings together research and development institutions, relevant disciplines, and farmers as equal partners to reap the benefits from weather and climate knowledge. He noted some examples of more general decisions that can be aided by targeted weather and climate information which include strategic and tactical crop management options, agricultural commodity marketing, and policy decisions about future agricultural land use.

4.2 He stated that the objective of the Roving Seminars on Weather, Climate and Farmers is t make farmers become more self-reliant in dealing with weather and climate issues that affect agricultural production on their farms. He added that the goal of the seminars is to secure farmer self reliance, through helping them better informed about effective weather and climate risk management by sustainable use of natural resources for agricultural production. He then gave an outline of the planned activities of the seminars which have already taken place in Colombia, Ethiopia, and India and could be used as reference for the proposed seminars in West Africa. He stressed that the content of the seminar should be adapted to the local conditions of the country and regions. Typically 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 and consist of two parts. The first part of day is devoted to providing information in local language on the aspects weather and climate in the region such as weather (i.e. short-term weather forecasts, clouds), climate (seasonal climate patterns, forecasting, using rainfall records), future climate change and their implications, climatic risk in production of different crops in their region and better risk management. The second half of the day, is devoted to obtaining feedback from the farmers on the weather and climate issues in their farming operations and the nature of assistance they need. He stressed that this part of the seminar will be designed in such a way as to engage all the participants in discussions and obtain full information from the farmers on their needs for weather and climate information and the ways to improve future communication of weather and climate information from the Meteorological Services and the Agricultural Extension Agencies to them to facilitate effective operational decision making.

4.3 He stated that the Roving Seminars will be organized in full cooperation with the local agricultural extension services, and active involvement of the agricultural research institutions (i.e. universities) in the region. He added that the expected outcomes of the roving seminars is to raise the awareness of the farming community in West Africa of the current advances in the provision of

weather and climate information for facilitating operational decisions on farm. He mentioned the feedback from farmers and rural communities is very important and that summary reports will be produced at the end of the first phase of the project that will aid in assessing the current status of weather and climate information dissemination and methods of farm-level weather and climate risk management and help introduce improved risk management tools for the farming. Finally, he discussed the cost of organizing previous seminars was about \$2,000 in a given location. This amount covers the cost of organizing the meeting place; production of suitable training material in local language; local organizational costs including transport, tea and lunch for all the participants; and travel and honorarium for the lecturers. In Phase I of the project (2008-2009), 10 seminars are planned in each of the following five countries: Burkina Faso, Mali, Mauritania, Niger and Senegal. WMO will act as the Coordinating Agency and the total cost of the seminars, including coordination, is \$125,000.

4.4 After his presentation, Mr Pascual stated that AEMET would sponsor these seminars. There was a discussion on the issues of preparing material in the local languages and if there was a restriction on who can attend and what topics the seminars can address. Dr Sivakumar replied to the last pointing stating that the specific topics are up to each country.

5.0 Agrometeorology in the Service of West African Agriculture – Open Discussion and Development of Priorities

5.1 Dr Sivakumar then opened the floor for a discussion of the proposed project and the development of priorities. Mr Pascual asked Mr Diarra how many raingauges would be needed and how many have already been manufactured. Mr Diarra stated that about 1000 raingauges have been made, therefore there would be about 200 raingauges available for each country and 20 to 30 raingauges per seminar (10 seminars per country). He also stated that with his previous seminars in Mali, each village would get one raingauge, therefore the number of raingauges distributed sometimes depends on how many villages are represented at each seminar not necessarily how many villagers.

5.2 There was much discussion if the seminars could be organized before the current rainy season. Dr Sivakumar mentioned that since it was already the end of April and the rainy season starts in May or June, it might be difficult to organize the seminars in time. However, other participants mentioned that there were still many matters to organize such as transport, availability of staff and resources persons, preparation of training material, and distribution of raingauges. Dr Sivakumar stated WMO would need to send an official letter to the five WMO PRs of the NMHS involved in the project. Mr Sivakumar and Mr Pascual discussed the administrative matters of transferring the money from AEMET to WMO and then to the various countries. Mr Pascaul stated that the money has already been transferred to WMO.

5.3 A participant asked Mr Diarra how did the farmers record and transmit the data. He replied that they recorded it on a sheet of paper and mailed it to the NMHS. He agreed with the suggestion to have the instructions and recording sheet in French.

5.4 Dr Sivakumar proposed that each country nominate a project focal point and that the raingauges could be sent to the focal point for distribution for the seminars. There was then some discussion on what method to use for sending the raingauges. A participant commented that this could take some time. There was also a suggestion that each project focal point will attend the project coordination meeting. Mr Diarra stated that Mali could host this meeting in Bamako. Dr Sivakumar mentioned that it would also be useful to have a 2 day evaluation meeting in February or March 2009 to assess the project. After some discussion it was proposed to have the

training workshop from 9-13 June 2008 in Bamako. Mr Pascual stated that Dr Camacho would be able to attend this workshop.

5.5 Other comments included the installation of more rural radio stations. Representatives from ACMAD and AGRHYMET stated that both of their institutions will actively participate in the organizations of the seminar. Ms Dufresne from ACMAD stated that her organization will prepare background material on climate change for the seminars. There was detailed discussion between Mr Diarra and Mr Pascual about the proposed budget from Mr Diarra.

5.6 In summarizing the discussion, Dr Sivakumar recommended that an action plan be developed among the countries and partners to guide the project.

6.0 Discussion on Materials and Resources Required for Implementation of Priority Activities

6.1 Dr Sivakumar reiterated that a focal point be selected from each country and the partnering institutions of ACMAD and AGRHYMET. He added that a coordination committee be created with a Terms of Reference. There was also a suggestion that the project country focal point contact their respective UNFCCC Focal Point to inform the UNFCCC COP about the project and to arrange Climate Change experts for the seminars if needed.

6.2 There was a discussion of what materials are needed for the project and whether renting or buying equipment (loudspeakers, microphones, etc) would be more cost effective. It was agreed that the focal points would make a list of needed material and then the coordination committee could help in making purchasing decisions.

6.3 The PR from Niger, Mr Labo Moussa, mentioned that this project is very important to the farmers of Niger and he hopes that it could also aid truck farming which is a new and important activity in the country.

6.4 Mr Boulama mentioned that there will be a lot of activities and that the focal points need to pick the easy targets first in order to provide successes for the project to build upon.

6.5 A participant asked how WFP activities relate to this project. Mr Stefanski added that WMO already has had preliminary discussions with WFP about participating in these seminars. It was suggested that a list of WFP activities be obtained to determine possible collaboration with them.

7.0 Preparation of the Schedule for Implementation of Activities

7.1 Ms Sanfo presented the proposed schedule of activities of the project in Burkina Faso which would take place from November to December 2008.

7.2 Mr Diarra from Mali stated that he would like to have seminars in 5 regions of Mali but he will have to work on it and send it to WMO and AEMET. Mr Coulibaly from Mauritania also stated that he will send his schedule later.

7.3 Ms Sitta from Niger stated that they plan to have 5 seminars over 17 days in November and December 2008.

7.4 Mr Ndiaye from Sénégal stated that they will have seminars in the center and south regions of the country from June to December 2008.

7.5 Mr Diarra mentioned that he would prepare a small note on the seminars by the end of May.

7.6 Dr Sivakumar asked the participants which country would want to host the project evaluation workshop in 2009. Dr Diarra stated that Mali could host the workshop.

7.7 Dr Sivakumar suggested that the links to the West African NMHS and other institutions be made available on the WMO project website.

8.0 Any Other Issues

8.0 Dr Sivakumar suggested that a publication of this meeting be done. He asked the participants if they would be able to do this. They all agreed. He then stated that WMO and AGRHYMET could jointly publish the proceedings and that each participants should prepared a draft paper of 5 to 10 pages with references by the end of May 2008.

9.0 Closure of Meeting

9.1 Dr Sivakumar thanked all the participants for attending this meeting and he wanted to thank AGRHYMET for being the generous hosts of the meeting. He also thanked AEMET for their funding of the project. Mr Pascual also thanked all of the participants and AGRHYMET. He stated that he hoped that the project will be a success. Mr Labo Moussa, the Head of the National Meteorological Service of Niger and Permanent Representative to WMO, thanked the participants, ACMAD and AGRHYMET. Mr Gnoumou Faustin thanked all the participants for attending this meeting and he wanted to thank WMO and AEMET for their support of the project. And then he officially closed the meeting.

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