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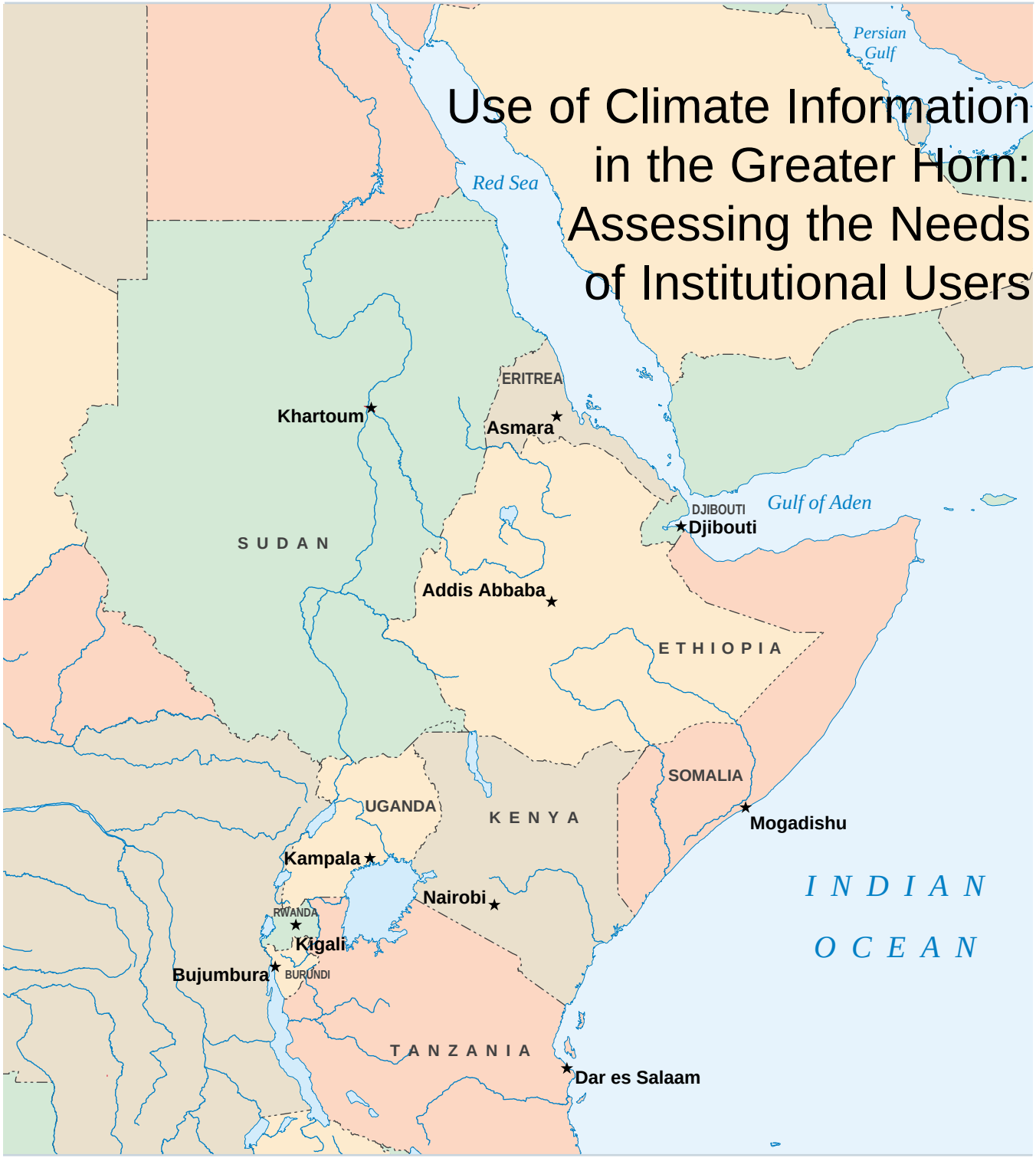

Use of Climate Information in the Greater Horn: Assessing the Needs of Institutional Users

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Use of Climate Information in the Greater Horn: Assessing the Needs of Institutional Users

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International Research Institute for Climate Prediction

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ABBREVIATIONS

ALRMP	-	Arid Lands Resource Management Project
ASARECA	-	Association for Strengthening Agricultural Research in Eastern and Central Africa
CIDA	-	Canadian International Development Agency
CBO	-	Community Based Organisation
COF	-	Climate Outlook Forum
CPPTRD	-	Crop Production, Protection, Technology, and Regulatory Department
CRS	-	Catholic Relief Services
DFID	-	Department for International Development
DMCN	-	Drought Monitoring Centre, Nairobi
DPM	-	Drought Preparedness and Mitigation
DPPC	-	Disaster Prevention and Preparedness Commission
EMA	-	Ethiopian Mapping Agency
EU-LFSU	-	European Union – Local Food Security Unit
FAO	-	Food and Agriculture Organisation
FEWS	-	Famine Early Warning System
FSWG	-	Food Security Working Group
GL-CRSP	-	Global Livestock Collaborative Research Support Program (USAID)
GoK	-	Government of Kenya
IGAD	-	Intergovernmental Authority in Development
ILRI	-	International Livestock Research Institute
IRI	-	International Research Institute for Climate Prediction (USA)
KARI	-	Kenya Agriculture Research Institute
KFSCS	-	Kenya Food Security Coordination System
KFSM	-	Kenya Food Security Meeting
KMD	-	Kenya Meteorological Department
KWS	-	Kenya Wildlife Service
LEWS	-	Livestock Early Warning System
MAM	-	March-April-May (rainfall)
MOA	-	Ministry of Agriculture
MOH	-	Ministry of Health
MTTC	-	Ministry of Transport and Telecommunications
NDVI	-	Normalized Difference Vegetation Index
NEWC	-	National Early Warning Committee (Ethiopia)
NMS	-	national meteorological service
NMSA	-	National Meteorological Services Agency (Ethiopia)
OAU-IBAR	-	Organisation of African Unity – Inter-African Bureau for Animal Resources
PRSP	-	Poverty Reduction Strategy Paper
RCMRD	-	Regional Center for Mapping and Resource Development
RVF	-	Rift Valley Fever
SNV	-	Netherlands Development Organisation
SOND	-	September-October-November-December (rainfall)
TMA	-	Tanzania Meteorological Agency
UN/EUE	-	United Nations Emergency Unit for Ethiopia
UNICEF	-	United Nations Educational, Scientific, and Cultural Organisation
UN OCHA	-	United Nations Office Humanitarian Assistance
USAID	-	United States Agency for International Development
WFP	-	World Food Programme
VAM	-	Vulnerability Assessment and Mapping Division (WFP)

1. OVERVIEW

As part of the USAID funded project, "Capacity Building in Regional Climate Prediction and Applications for the Greater Horn of Africa," an assessment of institutional users of climate information was undertaken to better understand the climate information needs of organizations working in the Greater Horn Region. The International Research Institute for Climate Prediction (IRI) conducted the research with the assistance of the Drought Monitoring Centre Nairobi (DMCN).

In the Greater Horn region, a critical number of institutions working in government, private industry, and the international and NGO community are affected by climatic variability. This research was conducted to assess their information needs and to provide feedback for improving regional and national-level climate information services for the Greater Horn. Forty-three institutions from Kenya, Tanzania, and Ethiopia responded to written surveys and/or participated in on-site interviews.

The assessment found that the majority of institutions participating recognize the role of climate information (both climate data and forecasts) in improving their planning and operational capacity. Furthermore, the institutions would like to strengthen their relationships with their climate information providers on the national and/or regional levels, and in many cases are proactive in seeking to build this relationship.

As many climate information providers in the region move into parastatal arrangements, institutional users may prove to be an increasingly relevant customer base. Many institutions interviewed expressed a willingness to pay for some services. However this research identifying user needs stressed the necessity for 1) improving the quality of forecast and climate data products, 2) assistance in interpretation and applications of seasonal forecasts, 3) increasing regularity in dissemination of reports, 4) establishing a standardized pricing system, and 5) enhancing accessibility to climate data.

2. METHODOLOGY

The assessment was conducted in two parts:

1) A written survey (Appendix II) mailed and e-mailed to users in all ten countries of the GHA region using a list provided by the DMCN. Internet searches also supplied names of regional and national organisations in natural resource management, food security, and agriculture. 120 surveys were mailed and 22 returned between January and March 2001.

2) On-site interviews with representatives from institutions were conducted in three cities: Nairobi (June 18-23), Addis Ababa (June 26-30), and Dar es Salaam (July 1-5). The interviews were conducted in an informal manner with one or more representatives from the institutions. The interviews covered questions from the written survey and tried to capture more casual responses and background information.

The assessment sought to measure the importance of climatic conditions in the selected institutions' activities and planning processes. For those currently receiving climate and weather information, the survey and the interview posed questions to:

- determine the sources of information
- time intervals when it is received
- communication channels through which the information is received
- reliability of receiving the information
- timeliness of the information
- presentation of probabilistic forecast information
- usefulness of forecast information in their activities
- required accuracy of the forecasts

For those not currently receiving any climate information, the survey and interview tried to assess:

- relative importance of climate/weather in the institution's activities
- familiarity with national and regional climate information providers
- knowledge of the types of forecasts and data products available
- if they might find the information useful in their activities.

In addition, for all surveyed and interviewed, the respondents were asked the lead time necessary for forecast information to be useful, the level of reliability required of forecasts, and their interest in participating in national and regional workshops.

2.1. Institutional Users

On the whole, the assessment involved a number organisations working in a variety of areas and with varying interests. The forty-three participating organisations categorized their activities in the following manner:

Economic areas the organisation is involved in:	**N=43**
Food Security	33%
Agriculture	28%
Natural resource management	23%
Energy	12%
Livestock	14%
Water	5%
Commerce and Industry	2%
Tourism	2%
Other	16%

Furthermore, the participating institutions come from a variety of sectors. They identified their primary sector as follows:

Sector	**N=43**	**No.**
Government	19%	8
Donor/Multi-lateral	16%	7
Intergovernmental Organisation	7%	3
Private	19%	8
NGO/Not-for-Profit	26%	11
Parastatal	14%	6

As the focus tended to be in climate sensitive sectors, the institutions were most often users of climate information, or in the least, affected by climate variability in their own activities. The written survey asked several questions to assess the importance of climate information to the users. Nearly all participants recognized climate information as important to their activities.

Total number of participating institutions	43
Currently receiving climate information from any source	33

Number saying climate information is:	**N=39**	
Very important to their activities	36	79%
Somewhat important to their activities	3	21%
Not at all	0	0%

3. CLIMATE INFORMATION PROVIDERS IN KENYA, ETHIOPIA, AND TANZANIA

3.1. Regional Services

3.1.1. Drought Monitoring Center Nairobi (DMCN)

The DMCN serves the ten countries of the Greater Horn of Africa as a regional climate information provider. The Drought Monitoring Centre was originally formed in 1989 with Nairobi as the head office for 24 countries in south and eastern Africa, with a sub-regional office in Harare. Since 1998, the Harare office has become a regional center for the SADC countries while DMCN has become the primary provider for the IGAD countries. In 2000, DMCN was officially named a specialized institution of IGAD.

The DMCN serves to minimize the impacts of extreme climate events by producing climate information and prediction products. The national meteorological services in the IGAD region send primary data to the DMCN where it is analyzed and used for regional statistical modeling for forecast purposes. The DMCN has recently received the technology and training to begin running regional dynamical climate models for prediction purposes.

The DMCN targets a variety of users in government, international organisations, early warning, food security, agriculture, research, livestock, water resources, health, and energy. The DMCN distributes its dekadal, monthly and seasonal bulletins through the post, e-mail, its web site (http://www.dmcn.org), and upon user request. The dekadal reports include a summary of rainfall and drought severity in the GHA, socio-economic conditions, and a weather outlook for the coming ten-day period. The monthly reports provide climate information for the past month, drought severity, socio-economic conditions/impacts, and precipitation outlooks for the next month. A regional seasonal forecast is issued twice a year, in February before the MAM rainfall and in August before the SOND rainfall. The DMCN hosts two Climate Outlook Fora (COF) in February and August to discuss and develop a final regional seasonal consensus forecast in conjunction with the meteorological services from all ten GHA countries. The consensus forecasts for the region are disseminated by the DMCN and the NMSs to users following the COF.

3.2. National Meteorological Services

3.2.1. Kenya Meteorological Department (KMD)

The KMD processes meteorological data from a network of national weather stations and produces daily weather reports; dekadal agro-met reports; and forecasts on daily, 4-day, weekly, dekadal, monthly and seasonal basis. The KMD had for years issued climate data and forecast products to the public and interested institutions free-of-charge. Cost sharing measured begun in 1996 have since restricted certain data and forecast reports to paying subscribers. KMD has become a semi-commercialized government agency.

KMD receives data directly through links with the METEOSAT and the NOAA satellites.
The Climatological Section processes data from rainfall stations, temperature stations, synoptic stations, and upper air observing stations. The department operates a network of 32 Grade A weather stations throughout the country. The total number of Grade A and Grade B rainfall stations has declined from 2000 in 1977, to 1497 in 1990, and to 700 at present due to government financial constraints. Of the total number, 13 are agro-meteorological stations and track precipitation, air temperature, soil temperature, radiation, sunshine duration, wind speed, relative humidity, pan evaporation, and potential evapo-transpiration. The main crop parameters include: type of crop, growth status, and pest and disease damage.

A customer service office coordinates user subscriptions and request for specific data reports. Paid subscriptions are required for seasonal and monthly weather forecasts and agro-met reports. A 10-day Crop Weather Bulletin reports the national agro-met data to paying subscribers; crop weather reviews for coffee, maize, sugar, tea, horticulture, tobacco, wheat, and general agriculture; dairy and ranching; and forecasts for tourism. Government agencies in need of specific climate information and forecast reports are also required to pay the costs of the subscription.

Daily, four-day, weekly, dekadal, monthly, and seasonal reports are disseminated through the newspapers, radio, television and online at http://www.meteo.go.ke. The KMD depends on other ministries such as the MOA to distribute information to agents in the field who have contact with farmers and herders.

3.2.2. Ethiopian National Meteorological Services Agency (NMSA)

The National Meteorological Service Agency collects climate data from just over 600 weather stations throughout the country. The NMSA disseminates three different reports to users: a climate data report, climate forecast report, and an agro-meteorological report with assessments and forecasts. The NMSA produces dekadal, monthly and seasonal (3 times per year) climate data reports, separate from forecast reports. As for forecast products, the NMSA produces 24 hour, 3 day, dekadal, monthly, and seasonal forecasts (3 times a year) separate from the data reports. The seasonal forecasts are based on anomaly years.

The NMSA currently has approximately 400 subscribers include government ministries such as the Ministry of Agriculture, Ministry of Trade, Ministry of Telecommunications, the Prime Minister's Office, power suppliers, and water resource managers. NGOs, private agencies working in construction, tourism, and banks also receive information from the NMSA. The NMSA distributes the information by post and demands a small fee from the users to cover the postal expenses. It does have e-mail and Internet access but does not currently distribute climate information by e-mail nor does it operate a website. The NMSA also relies on the national television and radio to disseminate daily meteorological reports.

The NMSA is a semi-commercial agency of the government that still receives the bulk of its financing and operating budget from the government. A customer service office was established. However, institutional users generally contact the NMSA to request climate data and forecast reports. National forecast products are available to the government, private agencies, and the NGO communities free of charge. Specific regional (within Ethiopia) forecasts for regions are available at a fee established by a fixed price system. Specialized climate data on request is available for a service charge.

The NMSA currently hosts three national workshops in Addis Ababa per year for potential and current users. The forecasts are given and explained at the workshops and attended by 30-40 persons.

3.2.3. Tanzania Meteorological Agency (TMA)

The TMA issues climate information and forecasts on daily, dekadal, monthly, and seasonal bases. The reports include a review of past precipitation, temperature, impacts on energy and agriculture, and the precipitation outlook for the coming period. Reports are released in both Swahili and English. The TMA also employs and agro-meteorologist at the Food Security Department of the Ministry of Agriculture and Food Security who issues monthly agro-met and early warning reports for the government and food security community.

The TMA distributes its reports primarily by post and by direct request. The TMA does not operate a web site. For dissemination, the TMA largely depends on radio, television, and print media to distribute the message. The seasonal forecasts are translated into Kiswahili as well as English for dissemination. The TMA has a team of meteorologists who record presentations for daily weather

reports with Dar es Salaam Television (DTV) and Television ya Taifa (TVT). TMA is currently negotiating with Independent Television (ITV) and Zanzibar Television to broadcast the presentations. The seasonal forecasts are also presented on television in September and February following the press conference through the Prime Minister's Office.

3.3. Other Sources of Regional Climate Information and Early Warning Systems

3.3.1. Famine Early Warning System (FEWS)

FEWS is a USAID funded project providing food security early warning systems to all ten countries in the Greater Horn of Africa. The Nairobi office serves as the GHA regional headquarters and national office for Kenya. In addition, FEWS employs one analyst for each of the GHA countries including an office in Addis Ababa, Nairobi, and Dar es Salaam. FEWS develops monthly early warning reports focused on the food security situation on regional and national levels, periodic Vulnerability Assessment Reports, food security updates, and data dissemination and analysis.

The early warning reports include information on precipitation, vegetation density, market supply, food prices, crop growth, crop production, insect infestation, school attendance, household income, demographic, health and nutrition, population, employment, and malnutrition. FEWS also uses a number of contacts in the national government agencies for crop production statistics, prices of agricultural goods, farmer responses to weather, livestock assessments and impacts, and the climate data. FEWS specialists in the USA and analysts in the GHA countries supply ground-based and remote-sensing data for estimated precipitation and vegetation density.

The early warning reports target government policymakers, donors, the UN agencies, and the NGO community with whom they report close links. FEWS distributes reports to a long list of institutions in Kenya, Ethiopia, and regionally. FEWS is not directly involved with local communities but through institutions who may have contacts at grassroots levels. The newsletters are distributed by post, e-mail, and at their website (http://www.fews.net). An archive of FEWS reports is available through the US Geological Survey's Africa Data Dissemination Service.

FEWS participates in several fora in the food security and relief sectors, including the Kenya Food Security and Coordination System (KFSCS), the Food Security Working Group in Ethiopia, and a similar food security coordinating system in Tanzania. FEWS does play a role in disseminating the seasonal consensus climate forecasts at the KFSCS meetings and in its monthly bulletin. FEWS has presented the consensus forecasts at the KFSCS meetings and assisted KFSCS participants in understanding the probabilities as well as the process that produced the forecast. They reported having little direct contact with the agencies after the newsletter is disseminated.

4. MAIN FINDINGS

4.1. General Characteristics of Institutional Users

The assessment reveals that the participating institutions are active users of climate information. A majority of the institutions interviewed demonstrated a strong need for climate information and an interest in participating in the activities of the DMCN and/or the national meteorological services. 79% of the total respondents classified climate information as "very important" for their activities. Sources of climate information typically cited were television, radio, national meteorological services, Drought Monitoring Center, FEWS, and NOAA. 62% of respondents reported receiving information from two or more sources, and 40% of the users receiving from 3 or more sources. The majority of current users receive climate information from their national meteorological service (79%) and nearly as many from the DMCN (73%). Of the DMCN subscribers, 80% also reported receiving information from national meteorological services. In the interviews, a number of users noted using the different sources to confirm the reliability of forecasts and gain added perspective. Furthermore, a number of institutions have used climate data and seasonal forecasts in their own applications and would like to further this aspect of their research.

Number of participants receiving climate information	**N=33**	
Number of climate info sources cited by respondents	%	No.
1 source	18%	6
2 sources	30%	10
3 sources	18%	6
>3 sources	33%	11

Common sources of climate information cited by current users	**N=33**
National Meteorological Services	79%
DMCN	73%
Other Organisations[1]	73%
Meetings	24%
Television	12%
Internet	12%
Radio	9%
Personal contact	9%
Traditional Methods	3%
Newspaper	0%
Government Extension officers	0%
Private climate services providers	0%

[1] Most frequently noted were FEWS, NOAA, and the institution's own field monitors.

Current users also reported a receiving a variety of reports from their climate information providers. Monthly and seasonal reports were most often cited.

Types of Climate Information	**N=33**
Daily	15%
Weekly	3%
10-day	55%
Monthly	88%
Quarterly (seasonal)	82%

A closer look at the DMCN subscribers who participated demonstrates that they are active users with more than half receiving climate information from three or more sources, most commonly with one being the national meteorological service.

Total receiving climate information from DMCN:	**N=24**
Number of respondents citing other met info sources	
1 source	1
2 sources	8
3 sources	4
> 3 sources	11
Percentage also receiving information from national met service	80%
Percentage experiencing disruption in services	42%

Of current users, the majority reported receiving the information electronically, by e-mail (70%) and/or through web sites (58%). This figure contrasts with 93% of users who reported having access to e-mail. The remaining 7% of institutional users have plans to install e-mail within the next 1-3 years. It should be noted that the National Meteorological Services Agency (Ethiopia) and the Tanzania Meteorological Agency (TMA) do not currently disseminate by e-mail.

Communication channels used for receiving climate information	**N=33**
E-mail	70%
Web Site	58%
Post	30%
Meetings	24%
Fax	9%
Telephone	6%

Which of the following is applicable to your organisation? (Circle most applicable)	**N=43**
Has facilities to receive and send e-mail	93%
Plans to install e-mail in the next 1-3 years	7%
No plan to install e-mail facilities	0%
Has access to the World Wide Web	58%

4.2. Climate Information Needs

The results of the assessment indicated a number of areas where institutional users would like to see improvements in the service and climate information products that they are currently receiving from the DMCN and their national providers.

4.2.1. Strengthen the relationship between institutional users and providers

A majority of the institutions interviewed demonstrated a strong need for climate information and an interest in participating in forecast updates, workshops, and trainings by the DMCN and the national meteorological services. During the interviews, many had voluntarily mentioned that they had been largely responsible for initiating and sustaining relationships with the DMCN and/or their national meteorological service. They would like to see more outreach efforts by the providers.

4.2.2. Dissemination of the DMCN products

A number of organisations reported disruptions in the delivery of the newsletter and reports by e-mail and by post, leading to delays anywhere from a few days to weeks, and even being dropped from the distribution list. Among DMCN users, 42% reported disruptions in transmission of the newsletter. Moreover, many organisations have said the forecasts delivered by e-mail are often late, which can compromise the usefulness of the product. A number of respondents volunteered this information in the written surveys which prompted its inclusion in the interview discussions.

The preferred channel of dissemination varied. The majority of respondents, 36 of 43, have access to e-mail, and most currently receive climate information electronically rather than by the post. During the interviews, institutions with reliable e-mail and Internet access generally cited e-mail or the World Wide Web as the preferred method. Some reported that e-mail accounts were shared or access was generally unreliable. Therefore, some still had a preference for postal delivery. However, others noted delays with the postal service.

Some users said e-mail transmission could help to avoid complicated lines of communication within their own organisations. A number of respondents said that the climate information is often received at higher levels but does not always reach the proper person.

Discussions with institutional users and climate information providers demonstrates only limited contact outside the dissemination of newsletters and reports. A number of institutions have made it clear that the climate information providers rarely made an outward effort to contact them. The climate information providers are under pressure to increase outreach through COFs and national user workshops.

However, many users were unaware of the COF and the national workshops sometimes sponsored by the national meteorological services. Several also said national workshops might better suit their needs, explaining that the regional workshops such as the COFs were expensive to attend and required long stays away from work.

Discussions with non-user institutions show a potential for outreach efforts. Of all ten non-users, all would like to begin receiving reports from the DMCN. Discussions with some of these organisations demonstrated a lack of awareness of the products currently being offered.

4.2.3. Regional and National Information

The importance of regional and national information varied with the institution. Institutions with activities spread across different countries or along borders demonstrated a need for regional climate information. For example, nearly all food security organizations interviewed expressed a desire for regional climate information saying their activities are often affected by trans-boundary migration due to drought or other extreme climate events. In contrast, those in government and private industry involved in agriculture seemed more concerned with national information relevant to agricultural zones.

Number of Respondents showing preference for regional and/or national info	**N=31**
Greater Horn Region only	13%
National	52%
Both	35%

4.2.4. Use of Forecast Information

Discussions with the users revealed varying degrees of usage of the seasonal forecasts. While some believe that the probabilistic seasonal forecasts are particularly relevant to their work, others believe that they serve only as broad indicators of the coming season.

Nearly all expressed a desire for further interpretations and recommendations for specific sectors based on the seasonal and monthly forecasts. In addition, they would like to see applications of the seasonal forecasts to potential impacts. This included applying seasonal climate prediction to vegetation/biomass growth, agricultural production, animal/crop diseases, eco-systems, and water availability. Respondents indicated that forecasts applied to specific sectors could help them better use forecasting in their decision-making.

A number of institutional users are currently applying or researching ways to apply seasonal forecasts to their own activities. Several expressed a willingness to collaborate with the DMCN and the national meteorological services to develop new applications.

Several organizations underscored the importance of seasonal forecasts by hoping to use them in future proposals to donors.

A number of organisations expressed a willingness to pay for forecast information and climate data. However, it was unclear how much they would be willing to pay. Government agencies in each country explained that ongoing budget cuts could hamper their ability to pay. Others said that money would have to be formerly set aside ahead of time to pay the costs of the products.

Do you think your organisation would be willing to pay for some of the services you have outlined in question number 23?	**N=31**
Yes	61%
No	39%

4.2.5. Feedback on the Forecast Presentation

Among those currently receiving seasonal forecasts, users were generally satisfied with the presentation and said they understood the probabilistic nature of the forecasts. However, several said they would like to see less technical wording with an added section for recommendations on how to use the forecasts. Some respondents also said they would like explanations for the periodic revisions/updates of seasonal forecasts. Most respondents said they would also like to see more information on the reliability/accuracy of forecast information, especially if they are to use the information in their own activities.

When dealing with climate forecasts, how important is it to your organisation to have information on accuracy?	**N=32**
Extremely	50%
Very	47%
Moderately	3%
Somewhat	0%
Not at all	0%

How would you like the level of accuracy of the climate forecast to be presented to your organisation? (Circle all that apply)	**N=29**
Explanation in words	65%
Probabilities of possible outcomes	62%
Do not know	4%
Other (please specify)	12%

How useful to your organisation would information on past droughts, floods, and other climate variables be as a reference for forecast interpretation?	**N=25**
Extremely	32%
Very	60%
Moderately	4%
Somewhat	0%
Not at all	4%

4.2.6. Climate Data

Institutions have a strong need for climate data for their own activities. They use the data for their own research, modeling, and monitoring purposes. Many organisations have expressed the willingness to pay for climate data, particularly information on precipitation and temperature. However, several indicated that the lack of a standardized pricing system (or enforcement of the pricing system) prevents them from approaching providers. They also said that they are often stymied by a lengthy bureaucratic process and differing data formats. Several said they would like to see data formatted for use with GIS and other computer applications.

Users noted that the limited national networks of rain stations, especially in the arid regions, leaves them wanting for more information. Several noted their efforts in maintaining their own weather stations and trying to install new ones. However, in cases in each of the three countries, the institutions and the national meteorological services failed to make contact to share information.

4.3. Opportunities for Collaboration

During the course of the interviews, a number of institutions expressed an interest in working with the DMCN on possible projects:

- The WFP Kenya brought to our attention a preliminary proposal for a regional Humanitarian Assistance Information Centre to serve as a regional database for organisations in Kenya and the GHA.

- RCMRD discussed potential applications of the FAO funded AFRICOVER project being conducted on its premises. The AFRICOVER project is currently working to map all land-use and agricultural production areas for the African continent using satellite data. Once the project is completed, they proposed applying seasonal and monthly forecasts to model vegetation and agricultural production in the region.

- The Global Livestock-CRSP LEWS project coordinated by several U.S. research university and partner organizations in the region has done extensive research and modeling of livestock early warning systems, water availability, and vegetation/biomass production in the pastoralist areas of Ethiopia, Kenya, Tanzania, and Uganda. The regional representative housed at ILRI-Kenya expressed an interest in using such research for livestock applications of seasonal forecasts.

- KARI – Katumani has developed crop models, for which it would like to use forecast applications.

- The Kenya Wildlife Service (KWS) installed a number of advanced rain gauges in its wildlife reserves.

- Arid Lands Resource Management Project is planning to install 20 manual rain gauges in each of the ten arid districts of Kenya. It would like to share the maintenance responsibilities and costs with the KMD.

- The Tea Board of Tanzania regularly collects meteorological data from its affiliated tea estates. They suggested that the commercial tea estates could be used as weather stations.

5. CONCLUSIONS AND RECOMMENDATIONS

A total of forty-three institutions from three countries responded to written surveys and/or participated in on-site interviews. Twenty-two completed the written survey and twenty-nine participated in the interviews. The overall assessment finds that the majority of institutions who took part have expressed a strong need for climate information (both climate data and forecasts) in an effort to improve their planning and operational capacity. A majority of the organisations who participated are quite active in their search for reliable climate data and information with most current users receiving information from three or more sources and through a variety of channels. Furthermore, the institutional users would like to strengthen their relationships with their climate information providers on the national and/or regional levels. Some recommendations for the regional and national climate information providers:

Pursue collaborative activities for more specialized forecast products. During discussions with current users of forecast information, many said they currently use the precipitation forecasts as broad indicators of the coming season. Many said they needed more information about the potential impacts

of the predicted rainfall before using forecast information in their planning decisions. Among the applications that institutions said would be helpful:

- vegetation/biomass
- agricultural production
- livestock
- insect infestation
- Rift Valley Fever/animal diseases
- water availability
- flooding

A number of institutions mentioned that they have applied or are currently researching ways to apply forecast information into their own models. Several expressed a willingness to collaborate with the DMCN to integrate forecast information with their current models.

Conduct research into pricing arrangements for forecast and climate data products. Discussions with institutional users revealed that many institutions are willing to pay for forecast and data products. Climate data is in particular demand as many institutions and researchers try to track climate statistics and use mathematical modeling in their activities. A number of organisations also mentioned that forecast use could be a selling point to donors in future proposals. However, discussions with the users demonstrated a possible disparity between different sectors. Government agencies in particular seemed unsure of their ability to pay for climate data or forecasts. The research in the three countries also showed differing pricing schemes for some products already sold with varying enforcement of payments. Users will remain hesitant of paying for services if the pricing system is unclear and/or un-enforced. Standardizing the pricing systems between national and regional climate service providers may be a way to legitimize the notion of cost-recovery in previously public institutions. A pricing system should also be flexible to address the needs of certain sectors such as government agencies who need the information but may not have the budget to purchase the products.

Improve accessibility to forecasts and climate data. If institutions are to be asked to pay for services, the providers will have to enhance the accessibility to forecasts and climate data. This includes disseminating reports through channels deemed friendly by the users such as by e-mail and the Internet without disruptions. The timeliness is also of considerable importance as many reported that forecast information was often late. The value of climate data may be enhanced if data formats correspond to the computer applications in use by institutional users, such as GIS.

Plan regular activities with the users. Many institutional users would like to see increased efforts by the DMCN and the national meteorological services. Many of those interviewed were unaware of current user workshops at the COF and the national level but expressed a desire to participate in future activities. A number of users also showed a preference for workshops, trainings, and updates at the national level citing the high cost and time constraints of attending regional meetings.

Questions remain as to whether the current institutional user base is extensive enough and wealthy enough to support the activities of the meteorological services. As national meteorological services become semi-commercialized, the pressure is growing to develop new sources of income to supplant decreasing budgets. The DMCN and the national meteorological services will have to expand their user base and improve the services offered to paying users. A number of users said that they had been proactive in maintaining communication with the DMCN and/or the national meteorological services. Outreach efforts to current and potential users could help to expand the list of users by raising awareness about meteorological products and their usefulness.

6. INTERVIEW SUMMARIES AND USER PROFILES

6.1 KENYA

6.1.1. World Food Programme – Vulnerability and Mapping Division (VAM)

The Vulnerability Assessment and Mapping Division (VAM) is an administrative unit of the WFP performing various duties in monitoring, population targeting, and coordination. The regional unit based in Nairobi, soon to be in Kampala, oversees WFP efforts in 13 countries in Southern and Eastern Africa, with the exception of Ethiopia and Southern Sudan.

The WFP Kenya is a key member and original organizer of the Kenya Food Security Coordination System (KFSCS), composed of fifty governmental, UN, donor, and non-governmental organisations involved in all aspects of food security. The WFP is also a member of the Steering Committee for the system and participates actively in monthly meetings among the members. The Steering Committee includes the Ministry of Agriculture, the Office of the President, CARE, Ox-Fam, and FEWS. The system was formed in 1998 at the behest of donors and the Government of Kenya to prevent duplication of activities and to coordinate activities in food security according to each organisation's specialty.

The system has four major technical sub-groups for 1) Food Aid Estimate 2) Agriculture and Livestock 3) Education 4) Health and Nutrition and 5) Water and Sanitation. In addition the coordination system has five Geographic Review Teams (GRT) provide technical analyses in five different administrative-livelihood zones – northwestern pastoral, northeastern pastoral, agro-pastoral, marginal agricultural, and high-potential/dairy districts across the country. The groups of organisations produce livelihood assessments that prove useful tools for building a consensus on the regional and national needs of the food situation.

The members of the KFSCS meet on a monthly basis at which the sub-groups and GRTs discuss the present food security situation along with the meteorological forecasts. Currently, representatives from FEWS and WFP-VAM make the presentation of the monthly and seasonal forecasts. The member organisations produce best and worst case scenarios based on the various analyses and climate data.

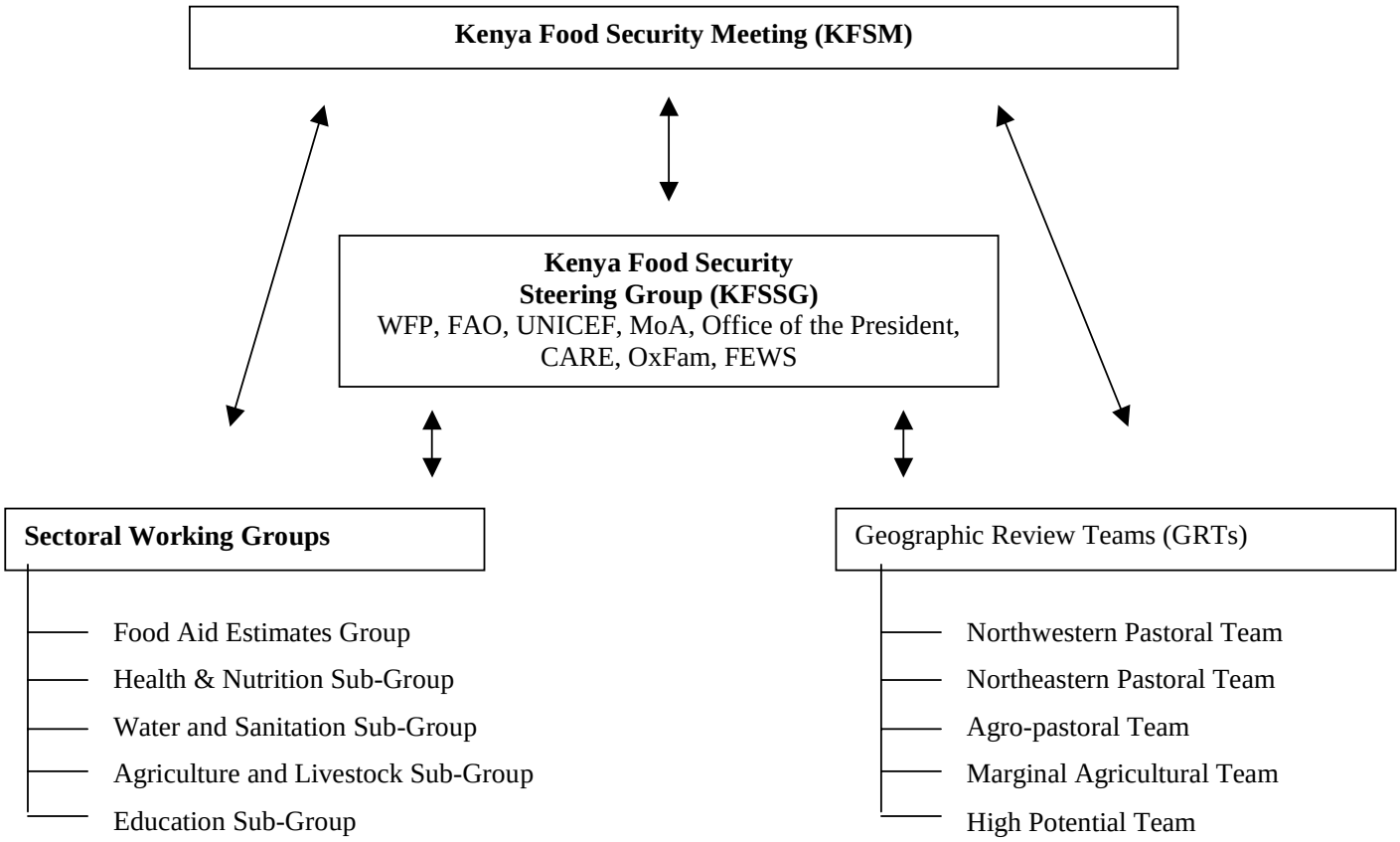
The WFP-VAM expressed a strong desire to see greater participation of the DMCN and the KMD at the monthly meetings. The meetings would be particularly useful for disseminating the forecast to the food security community and allowing the food security community to assess the strength of the forecast for planning purposes. In addition, explanations by the DMCN for revised updates of forecasts are of particular of interest to the community. The meetings provide a well-attended and regular forum for well-informed climate data users in the food security sector.

For timeliness of the forecasts for planning purposes, the WFP informed us that the one month lead time is sufficient to prepare estimates of assistance for the upcoming systems. Assessments are first done at the end of the harvest in June and December. The first process of documentation of the aid estimates requires approximately two months of preparation. The transport of commodities requires one month (two months from the USA). A seasonal forecast provided one month prior to the onset of the rains can therefore help the KFSCS prepare contingency plans before seasonal assessments at harvest time, thus giving added time for preparations, especially in extreme situations.

The reliability of the forecasts is important for the usefulness and credibility of the forecasts. They would like more information about the limitations of forecasting and the associated accuracy before identifying acceptable levels for planning purposes. WFP-VAM reported that decisionmakers in Kenyan food security would generally need tercile forecasts of at least 45% before forecasts could be applied to activity planning.

UNEP, UNDP, WFP, USAID, and the US State Department are currently putting together a proposal for the Humanitarian Assistance Information Centre. The proposal for the Centre aims to provide a single data exchange platform to supply the data needs of the food security community, UN agencies in Kenya, and major NGO's in the region. The Center would seek to assemble data from reliable sources for population, geography, economy, agriculture, vegetation, and climate from relevant actors in the country. The data would be put into a standardized format for use only among member organisations and the Government of Kenya. WFP-VAM expressed a strong interest in participation from the DMCN. The database would offer the possibility of cost recovery after the first three-year implementation phase.

The WFP stressed the importance of a consensus building system such as the KFSCS in the use of climate information by users. The monthly fora provided by the system are an important source for peer review and discussion.



6.1.2. Kenya Wildlife Service (KWS)

KWS was formed in 1990 with the purpose of managing Kenya's national parks and wildlife. Meteorological data is of considerable importance to the management of the parks and has prompted the KWS to begin collecting its own information. The Senior Resource Technologist of the KMD is charged with the collection of data including vegetation analysis, precipitation, and animal counts. The vegetation analyses are done with NDVI and verification by aerial and ground observations. Animal counts are conducted during dry and wet periods throughout the year and then inputted into GIS maps to measure the movements of the herds.

The KWS currently receives monthly climate data (The Weatherman) and forecasts from the KMD and the DMCN. However, the forecast newsletters are not disseminated well within the KWS and are not received by all those in need of the information. The Senior Resource Technologist had noted a strong need for seasonal prediction but was unaware of the KWS's current reception of the forecast newsletters. He would prefer to receive the information directly by e-mail as well as invitations to users workshops.

Applications of the information include the management of wildlife numbers. Potentially, forecasts for dry periods and poor vegetation could allow the KWS to cull its wildlife herds before drought and low forage levels take a toll on animal populations. The managed culling of herds before the onset of drought could prevent the loss of animals and provide income for the KWS from game meat sold in the market. In addition, climate forecasts could help provide prediction of animal movements based on forage availability. Another aspect cited was the factoring of climate forecasting into the hydrology of the parks and the availability of water for the wildlife.

Applications of climate forecasts for animal management will require further research into the 1) the relationship between biomass/vegetation and precipitation, 2) the movement of animals in relation to forage and water, 3) sustainable numbers of animals in parks during times of drought, and 4) water/hydrology of the parks.

For timeliness, the KWS would require three months lead time to use climate forecasts in their management of animal stocks.

In 1994-95, the KWS installed 66 high precision automatic rain gauges to record temperature, precipitation, time, and date. The gauges are currently not counted among the network of weather stations of the Kenya Meteorological Department. It expressed an interest in sharing the climate data and maintenance responsibilities with the KMD.

6.1.3. Famine Early Warning System Network (FEWS)

FEWS reports that the timeliness of the forecasts is adequate for their use in decisionmaking and planning by the food security and relief sectors. In terms of accuracy (or reliability), a level of 70% would be necessary for forecasts to be useful in the long run.

The food security community has a strong interest in scenario probabilities. FEWS reports that the food security community would be very interested in probabilities of extreme events such as drought and flooding for use in their contingency planning.

FEWS reports that its bulletins have been very useful to large institutions and government. However, they have had less success in linking forecasts to actual decisionmaking. While users may have an adequate understanding of the probabilities, it is less clear if the users are finding the information worth integrating into their planning. FEWS suggested developing more practical applications of forecast information including vegetation and agricultural production requirements. More advanced applications of seasonal forecasts could be used in the modeling of hydrological systems and public health such as malaria.

6.1.4. Organisation of African Unity – Intergovernmental Bureau of Animal Resources

The Nairobi regional office of OAU-IBAR serves the Greater Horn of Africa as well as the Gulf States. OAU-IBAR serves as a political forum for regional policies pertaining to livestock. It is particularly involved in strengthening international networks to build trust and prevent the

proliferation of transnational livestock diseases. OAU-IBAR works directly with the ministries of agriculture and directors of livestock services in each of the participating countries.

In recent years, Rift Valley Fever (RVF) has proven to be a major concern of OAU-IBAR. They recognizes the potential of seasonal forecasts to predict RVF and would like to increase its involvement with the DMCN. In 1998, RVF struck the region after severe flooding and provoked official cattle trade bans by several countries in the Persian Gulf and the GHA causing considerable economic disruption among pastoralists.

IBAR has also acted as a regional development organisation operating projects funded by various donor agencies. It oversees an extensive network of community based livestock agents for animal surveillance in several countries including Kenya, Sudan, and Uganda. The community based agents work outside the national livestock extension system to help to implement a programme of animal vaccination and identification of livestock diseases. Over 1,000 operate in Southern Sudan, approximately 400 in Uganda, and 400 in Kenya. The community based agents generally contact OAU-IBAR field agents or affiliated NGOs about once a month to restock materials. The OAU-IBAR representative expressed a willingness to use the network to potentially train agents in climate forecasts and to disseminate climate forecasts.

OAU-IBAR does use seasonal forecasts in its planning of Livestock Drought Response along with the Arid Lands Resource Management Project (ALRMP) and the FAO, a food relief effort focused on the pastoral community. In the future, the forecasts offer the potential for organisations to manage selling/culling of herds prior to the onset of water and forage shortages during droughts. For example, during the drought of 1998, the selling/culling of animals in August rather than October could have saved thousands of animals. The OAU-IBAR representative also said that predictive capabilities could also enhance their organisation's reputation with donors and could enable them to use forecasting in future proposals. However, it would like more information on the reliability/accuracy of forecasts before making proposals to donors.

OAU-IBAR also expressed a strong interest in seeing the applicability of climate forecasts to vegetation/biomass and water availability. Forecast estimates of potential flooding could also alert livestock organisations to dangers of disease.

OAU-IBAR acknowledges receiving the DMCN newsletters in the past by e-mail but has recently had a disruption in its reception. They reported not receiving the newsletter between mid-January and June. They also reported that newsletters sometimes arrive a few days late, making the short-term dekadal forecasts somewhat irrelevant. They expressed a strong interest in being placed back on the list for the newsletters and invitations to user workshops. OAU-IBAR hosts regional forums for livestock policy and management, attended by national directors of livestock policy, at which DMCN could provide information on the use of climate forecasts.

6.1.5. CARE

CARE is active in the food security areas both regionally and in Kenya. CARE is a member of the KFSCS and a lead NGO on the Steering Committee. CARE receives information from the KMD and the UNDP directly, and from the DMCN at the monthly food security meetings. As part of the KFSCS, CARE uses climate information to determine the extent drought, the impact on rain-fed agriculture, and regional impacts. It uses the information in the planning of food relief requests within the framework of the KFSCS.

The organisation has a network of food monitors in drought prone areas, particularly Turkana, Marsabit, and Northeast Kenya. The food monitors collect information at the district level and relay it to the Nairobi office.

CARE has found that the use of climate information is of considerable interest to its donors (WFP, EU, CARE Canada, and the Gates Foundation). CARE reports the national climate situation on a monthly basis to donors. The use and application of forecast information in food security could be used in its future proposals with donors.

CARE made some suggestions about the forecast presentation to users. They would like to see less probabilities of extreme scenarios.

6.1.6. Arid Lands Resource Management Project (ALRMP)

Arid Lands operates under the Office of the President to provide relief to ten arid and primarily pastoral districts in the north and northeast of Kenya (Garissa, Mandera, Wajir, Ijara, Samburu, Baringo, Tana River, Isiolo, Moyale, Turkana). Arid Lands objectives include assisting pastoralists to retain their livelihoods. The office receives operational funding from the World Bank via the national treasury for a mandate ending in 2002. It also administers several projects with grant funding from donor agencies. The projects include food aid, community development, income generating activities, and monitoring of the food security situation. It makes and receives food aid requests through the KFSCS.

Rainfall is of considerable importance to all of the organisation's activities. Interventions depend on knowing the outcomes of the rainy seasons. Arid Lands operates from Nairobi but maintains between 20-30 monitors in each of the ten arid districts of Kenya. The monitors are usually crop/agricultural officers based at the household levels who were initially trained through an SNV project. The monitors report to a steering group in each region that includes members from the Ministry of Agriculture, Ministry of Health, and the Ministry of Water. The steering group also assists in distributing food relief.

Arid Lands is an active member of the KFSCS and attends the monthly meetings. It issues Early Warning reports for each of its districts on a monthly basis using information from monitors in the field. The reports collect information on pastoralist livelihoods, the nutrition of children, animal prices, and locations of livestock sales. The monitors contact and receive feedback from communities through quarterly meetings with communities and households. The early warning reports are targeted to donor agencies and government ministries who receive by e-mail.

Arid Lands also expressed an interest in working with the KMD to install and maintain 20 manual rain gauges in each of the ten districts. Currently, the lack of precipitation data hampers their monitoring capabilities. Arid Lands has requested that it pay for the cost of the gauges and that the KMD pay for the maintenance.

Arid Lands also expressed a strong willingness to pay for climate information from the KMD and the DMCN including precipitation data and forecasts. Arid Lands currently receives 10 day reports and three month forecasts from the DMCN on request. Arid Lands is on the mailing list but they noted disruptions in the dissemination of information from the DMCN. The DMCN often mails/e-mails information head of the Office of the President. However, the information does not always reach appropriate officer of the Arid Lands office and rarely in a timely manner. They are able to receive information from FEWS and OCHA regularly by e-mail. They would like to see greater involvement by the DMC in reaching out to institutions, particularly at the monthly KFSCS.

They expressed a strong need for regional information since many of their districts lie along borders with northern countries. Their activities are often affected by the movements of pastoralists across borders which often rely on the climate situation in their respective countries.

For levels of forecast accuracy Arid Lands said fifty percent would be sufficient to use in its planning activities. However, they would like more information on the reliability of the information.

They also expressed an interest in forecast maps predicting vegetation/biomass cover and also river flow forecasts which could assist in predicting pastoralist movements. They are particularly affected by the Dawa River that divides Kenya from Ethiopia and Somalia. Floods in recent years have caused disaster situations and livestock diseases. In addition, they emphasized that more research should be done in connecting scientific forecast information to traditional knowledge. Their monitors often report on traditional forecasting methods and local predictions for the coming season. If seasonal forecasts are to be used at the pastoralist level, they stressed that it would need to be translated into indigenous languages and incorporate traditional forecasting.

They also emphasized the need for increased coordination within the meteorological services (DMC and KMD) especially in creating a standardized pricing system and data platform for climate information. They would pay for the information if there were a set pricing system and better availability, preferably through e-mail. They noted that the GoK currently has policies encouraging co-sharing agreements that promote the selling of information between government departments and ministries.

6.1.7. Regional Center for Mapping and Resource Development (RCMRD)

The RCMRD is a regional organisation with 15 member countries in Eastern and Southern Africa (Kenya, Tanzania, Ethiopia, Sudan, Uganda, Zimbabwe, Botswana, Somalia, Rwanda, Burundi, Comoros, Burundi, Mauriius, Seychelles, Malawi, Zambia, Namibia, Swaziland, and Lesotho). The organisation was originally begun by UNECA and the OAU for natural resources mapping in development activities. It currently operates with the donations of the 15 member states and project grants from donor agencies. The center serves to train officers from member states in mapping and surveying; to prepare maps at the request of member states; and to execute mapping/surveying projects funded by donors. The center creates maps using satellite imagery with GPS for ground data collection. The center is GIS equipped and requires that all mapping data be formatted for GIS.

An FAO project currently underway at the center is AFRICOVER. The project seeks to create detailed resource mapping of land degradation, soil erosion, land cover, and land use for the continent and to put data in a standardized format for use throughout the continent. The information gathered will be of particular interest to the center for future mapping.

Since 1990, the center has been developing maps used for prediction of agricultural production in a Dutch funded project that recently ended in 2000. The maps are based on a “linear exponential growth modeling” that take maximum production potential in each country and district, estimate the vegetation coverage at the beginning of the rainy period from satellite imagery (METEOSAT), incorporate predicted rainfall, and then estimate the potential production sixty days after the planting day. The center is currently proposing that member states fund the estimated $200,000 yearly budget to continue the project. The shortcomings of the project were noted that the maps are not geographically specific to productive/semi-productive/non-productive areas, do not incorporate soil fertility, and do not take into account gaps in rainfall during the season. Nevertheless, the product has proven to be well received by its target group – the meteorological departments, the planning ministries, and the agricultural ministries in each of the member states. Once the AFRICOVER project is completed, the center hopes to include the detailed information on land use, agricultural production, and soil fertility into a more detailed prediction model, possibly using seasonal and/or monthly forecasts.

The center’s mandate is currently changing. While it is an intergovernmental organisation, it is decreasing its reliance on member government financing and will soon seek to develop products at a cost to consumers. At the same time, it may soon be included under IGAD. The center seeks to standardize its data, present the data in usable formats, and ultimately become a point of reference for

member governments, intergovernmental organisations, non-governmental organisations, and researchers.

The center currently receives climate information from the DMCN including the forecasts. It receives the information regularly. It expressed a wish to collaborate more with the DMCN, especially in developing new forecasts and products that incorporate agricultural production and vegetation into the seasonal forecasts.

6.1.8. Barclays Bank of Kenya, Agricultural Services

Barclays Bank allocates a substantial percentage of its lending for agricultural producers, mostly large scale commercial farmers and others in agriculture related sectors. Its clients include farmers in wheat, maize, tea, coffee, dairy, and seed production. Barclays Agricultural Services Division currently receives monthly reports and seasonal forecasts from the DMCN.

Barclays uses the climate forecasts solely for internal planning purposes within its Agricultural Services department. Planning usually begins in January at the start of the fiscal year, at which time the forecasts are particularly helpful for the MAM rainfall. The forecasts help the lender to determine how much money should be allocated for agricultural purposes. They wished that forecasts could be available up to six months in advance even despite lower levels of reliability. The bank uses the forecasts to help estimate how much to lend farmers depending on predicted dry, normal, or wet conditions. Barclays does not use the information to advise farmers on how to use the seasonal forecasts and strongly emphasized that it does not want to involve itself directly in the borrower's activities. Rather it relies on the farmers to collect their own information. The manager informed us that a number of his clients have detailed climate data sets extending nearly a hundred years for some, from which many make their own forecasts.

Barclays has had repeated difficulty in obtaining agricultural production information from the Ministry of Agriculture. They have a great need for agricultural data as well as seasonal forecasts and would be willing to pay for the forecast product. They would also like to see further applications of the forecasts to agricultural production, frost, temperature, and insect infestation. They would also like a more simplified product without technical language and more specific to Kenya rather than the region. Forecasts specific to the agriculturally productive areas of Kenya would be very helpful.

6.1.9. International Livestock Research Institute (ILRI)

The ILRI is headquartered in Nairobi and operates under the Consultative Group for International Agricultural Research (CGIAR) for Eastern and Central Africa. ILRI is mainly a research organisation focusing in livestock and pastoralism and does not directly implement development programmes. They operate in numerous livestock research areas including dairy, animal nutrition, disease, animal parasites, and forage.

Seasonal forecasts were identified as a tool for managing the effects of crisis during drought, epidemic diseases, and degradation of the environment. ILRI has found that FEWS, FAO, and the UN early warning system have generally neglected livestock and instead focused on agriculture. ILRI is a partner in the regional research programs led through Global Livestock CRSP, including the Livestock Early Warning System.

ILRI Kenya is housing the ASARECA project “Crisis Mitigation in Livestock Systems: From Relief to Development” and Global Livestock-CRSP LEWS research project. The projects were developed out of a regional workshop in 1997 that cited livestock management as a major component in regional and national development.

ILRI currently receives its climate data from NOAA rainfall estimates and from EROS satellite imagery. It said that it is often difficult to collect information from the various meteorological agencies in the region, thus prompting them to collect their own data from satellite estimates.

6.1.10 Global Livestock CRSP - Livestock Early Warning System (LEWS)

The USAID funded Global Livestock-CRSP program, involving several American research universities, has played a leading role in developing early warning models and vulnerability assessments specifically for the livestock, with extensive research conducted in East Africa. Global Livestock CRSP operates with a network of government agencies and national research organisations in implementing the research program. The ASARECA Crisis Mitigation Office, funded by USAID/OFDA, supports a regional coordinator, an information office, and a data analyst for LEWS research. ILRI Kenya also provides logistical support and publication assistance.

National and regional representatives, through ASARECA, devised a research strategy with the Global Livestock-CRSP program. The Global Livestock-CRSP studies in the region identify resources used in pastoral activities, migration routes, livestock diseases, traditional climate indicators, water holes, forage sources, and community management techniques.

LEWS has a regional coordinator housed at ILRI; a technical scientist (shared with ILRI); an information/communications specialist; a national coordinator in each of the participating countries; and zonal coordinators for each of the ten zones under the current LEWS project. Coordinators are responsible for the site monitors (often government extension agents or literate herders) in the districts. The monitors perform interviews and assess the local livestock situation for ten days a month for which they are paid a per diem for their services. LEWS has monitoring zones located in the following places, each comprising 30,000 to 50,000 square kilometers:

Central Tanzania	- Ministry of Livestock and Water Development
Western Tanzania	- Ministry of Livestock and Water Development/Funded by ASARECA Crisis Mitigation Office
Northern Tanzania	- Ministry of Livestock and Water Development
Southern Kenya	- KARI
Central Kenya	- Mpala Research Center/Laikipia Wildlife Forum
Northern Kenya	- KARI
Southwestern/Southern Central Uganda	- National Agricultural Research Organisation
Southern Ethiopia	- EARO
Northereastern Ethiopia - Afar region	- FarmAFRICA
South Central Eritrea (new)	

As a lead institution on the LEWS project, Texas A & M maintains computer facilities and staffing to manage a pastoral livestock early warning analytical system on the web. The pastoral livestock early warning analytical system is fully automated with data transferred to collaborating institutions. Full weather data is made available for each 8x8 km grid for all of Africa at http://cnrit.tamu.edu/rsg/rainfall/rainfall.cgi. Weather data is acquired automatically on a daily basis from NOAA via the METEOSAT satellite using NOAA's RFE data. The data is then stored and analyzed every ten days for 30 points per zone representing key households in the region. There are currently 130 points with 270 points expected to be fully functional by December. Data is uploaded continuously on the web to http://cnrit.tamu.edu/aflews, updated every ten days, and then sent to the African Learning Channel for downloading to remote regions in Africa. The data is then transferred to users in Africa using laptops and WorldSpace radios.

The project currently has two NIRS (Near Infrared Reflectance Spectroscopy) labs capable of scanning feces of free ranging livestock and providing information on diet protein and digestibility within 48 hours. Information on protein and digestibility is collected and used to ascertain how much weight the animal is gaining or losing. This enables researchers to predict when significant weight loss will occur and when nutritional health risks will occur. LEWS plans to integrate the NIRS with para-veterinary networks as a tool to diagnose emerging nutritional problems. Para-veterinarians would be trained to either gather samples working inside pastoral communities or the through systematic collection of feces of cattle for lab analysis. The ground information would be coupled with the satellite weather data acquisition system which provides temperature, wind and relative humidity estimates. The output would then be used with regional NDVI data to build livestock performance maps for major classes of livestock.

LEWS currently has forage availability models that can produce regional outputs using NDVI data. LEWS plans to couple the forage availability models with the livestock performance maps to give assessments of livestock during drought conditions. Using ground monitors, LEWS then intends to integrate indigenous knowledge about drought and diseases associated with loss in forage and animal body condition.

LEWS plans to widen the research project to link the livestock data to marketing decisions. Texas A & M, Utah State, Cornell and the University of Kentucky are beginning a joint research project studying the livestock marketing behavior of the corridor from southern Ethiopia to Nairobi. Researchers will collect and analyze information regarding the social issues of movement and sale decisions, marketing and movement decision process, bio-economic modeling of pastoral decision behavior, and exploration of policies that would help protect pastoral assets and lead to improved ecological condition of pastoral rangelands.

Seasonal forecasts were identified as a potential tool for managing the effects of crisis during drought, epidemic diseases, and degradation of the environment in relation to livestock management. The regional representative expressed an interest in integrating models developed during the project for livestock vulnerability and forage growth with climate forecasts. The LEWS project ultimately hopes to transfer technical capacity to other regional organizations to operate the early warning models. However, their models currently use data formatted for GIS that does not correspond to DMCN formats.

The research project does intend to install a number of manual rain gauges in the arid districts in the near future and wishes to share the information with the KMD. It said that it is often difficult to collect information from the various meteorological agencies in the region, thus prompting them to collect their own data from satellite estimates. The project is very interested in fostering a stronger relationship with the DMCN, particularly for data sharing relationships and the development of new forecast products. They have already approached the DMCN about using climate forecasting in their Forage Growth Models to assess the pastoral situation.

6.1.11. Kenya Agricultural Research Institute (KARI), Katumani - National Center for Dryland Farming Research

KARI performs agricultural research at its station in Katumani in the Machakos district. It also operates eight agro-meteorological stations in Kenya for the KMD and the DMCN, including one at the site in Katumani. KARI currently receives dekadal, monthly, and seasonal forecast information by e-mail on a regular basis.

KARI reported that it is an active user of the climate information and integrates it into its agricultural research. They have begun a programme of "response farming" using a combination of dekadal, monthly, and seasonal forecasts to minimize risks and maximize yields. Seasonal forecasts are used

to gauge the long-term productive outlook and choose varieties for planting. Dekadal forecasts are used for adjusting crop density and fertilizer amounts. If dry weather is expected, some seedlings are removed to improve soil moisture. They have noted success in the response farming using the combination of forecasts.

KARI is not directly involved in agricultural extension. However KARI works with CBOs in five districts including Machakos, Kitui, Mwenge, Kajiado, and Makwene and could be willing to use those stations to distribute information to local organisations. They have found that local churches are also an effective way of reaching farmers.

KARI would like to see newer applications of the forecasts for agriculture and vegetation. KARI has done considerable research and modeling of maize and sorghum varieties for Kenya according to climatic region, rainfall, and soil. They believe that integrating the climate prediction models with crop models could be of considerable use to national planners and decisionmakers who have shown a preference for non-technical and sector specific information. They are very comfortable with the presentation of the probabilistic forecasts but suggested that the reports should simplify its technical language for other institutions.

KARI expressed satisfaction with the information from the DMCN and the KMD and would like to strengthen the relationship. They indicated that KARI had maintained most contacts with the DMCN, including being added to the mailing list. KARI recommended that the DMCN create an outreach office for the users of the information. To expand their list of users, they suggested that the DMCN and KMD begin participating in agriculture trade fairs throughout the country. KARI said they would be willing to represent the KMD and DMC at the trade fairs. They would also like to see the users conferences address the agricultural applications of seasonal forecasting.

KARI has a strong preference for e-mail dissemination to ensure its timeliness and its arrival. It would even like to see the DMCN use a subscription based online system for institutional users.

For timeliness in reaching the farmers, they suggested that one month would be required in semi-arid places and up to two months in high potential areas. KARI recommended that dissemination to farmers be done outside the national extension system. The extension system has suffered considerably from budget cuts and retrenchment over the past few years bringing into question the reliability and the means of extension agents to perform various duties. KARI suggested using CBOs that are already in place throughout the country. The CBO's are often initiated by locals themselves in activities such as seed production, farmers groups, women's groups, and brick makers.

6.1.12. Faida Seed

Faida Seed is a private seed producer and seller specializing in maize. The company operates from Nakuru and is primarily focused on the agricultural regions of western and eastern Kenya. Faida uses a network of distributors, sales agents, and contract farmers. They instruct farmers on which varieties to plant and then advise on harvest dates and drying techniques. The seed is primarily distributed through local shops where they post circulars promoting their seed varieties. They recently began including the regional DMCN forecasts in their circular with specific recommendations for farmers buying seed. The forecasts were translated into Swahili and included maps and explanations of the seasonal forecasts.

Faida currently receives seasonal forecast and climate information from the DMCN. Initially they had difficulty contacting the DMCN and were unable to receive the forecast products while the DMCN server was malfunctioning. They ultimately contacted a DMCN representative for a company workshop on DMCN forecast products. They also reported following the daily and weekly weather through television and radio.

The seasonal forecasts allow Faida Seed to plan its activities according to predicted rainfall in each of its districts. They would like to know where to encourage production, where to sell certain varieties, and where to process the seed.

They are aware of the probabilistic nature of the forecast information. For the presentation of the forecast information, they would like the probabilities explained in words as well as percentages. For further applications of the forecasts, they specifically asked whether the forecast maps could include altitude level and soil type. Their contract farmers and seed customers are often located in the Highlands and are affected by altitude differences. Faida distributes hybrid seed varieties that are sensitive to altitude.

Despite their enthusiastic use of the forecast products, Faida said they would not be willing to pay since they are taxpayers and the meteorological services are part public institutions. They also feel that the forecasts are too technical for others to understand and therefore difficult to sell.

6.2. ETHIOPIA

6.2.1. United Nations Emergencies Unit for Ethiopia (UN-EUE)

The UN-EUE receives dekadal reports regularly from the DMCN along with information from the Ethiopian Meteorological Service, the WFP, FEWS, and the DPPC. The climate data and forecasts are used to prepare for emergency operations in food relief, food for work programmes, and cash for work programmes. Reports are compiled by the WFP and the DPPC at regular meetings of the Food Security Coordination System. A consensus is developed over conflicting aspects of the early warning reports issued. Seasonal forecasts are presented at the meetings and discussed by the participants. UN-EUE is a member of the Food Security Working Group that makes the final assessments with the DPPC. They would need the forecasts one month prior to make it of use. The forecasts serve as an indicator of what to expect for the coming rainy season and is factored into the contingency planning.

For the presentation of the forecast maps, the colors can be confusing at first glance. Similar colors may mean the same probabilities appear, but may be misinterpreted that the rainfall will be the same for different areas. They would also like to see a clarification of what above, below, and normal means in actual precipitation for certain parts of the country. They would like to see periodic evaluations of accuracy to estimate its effectiveness as a planning tool.

UN-EUE believes that the use of seasonal forecasts in the humanitarian and food security community can make a very good selling point to donors.

They believe the challenge lies in presenting the climate information to local users, and not just institutions at the national level. Regional information is useful to the organisation since many areas lie along borders with Kenya and Somalia. Low rainfall in border areas can lead to population movements.

6.2.2. Catholic Relief Services (CRS)

CRS is a member of the Food Security Working Group with other food security and emergency relief organisations in Ethiopia. CRS receives climate information from the NMSA, the DMCN, FEWS, and the DPPC. The NMSA is the major supplier of the climate information for CRS. However, they have noted difficulty in dealing with the NMSA. They have approached the NMSA several times for historical climate data requests. However, their requests have generally not been met and reported a lengthy bureaucratic process. It has also found the reception of the NMSA reports to be somewhat

unreliable. However, the exact reason for the irregularities is not known whether the delays are attributable to the post or the NMSA.

CRS is a subscriber to the DMCN for dekadal and monthly reports but has noted disruptions in the reception of the reports. It finds that the regional DMCN reports are too general for its activities. While they note that it is important to have regional forecasts, they prefer country and province specific information. They would like forecasts at the national and provincial level.

CRS currently operates in health, agricultural, and emergency relief activities. CRS does not directly implement programming activities. Rather it has relationships with local NGOs to implement at the regional and local levels. It finances projects, provides technical support, training, and technology to its partner organisations. Its activities are primarily located in five regions of Ethiopia: Tigray, Harambee, Shoa, Southern Ethiopia, and the Amhara region.

CRS does not directly use climate information in its planning activities nor do its affiliated organisations. They receive the information but do not analyze the data or the forecasts for its activities. For its food security activities, all assessments are done through the DPPC and the Food Security Working Group. Assessments, targets, and food requests are all done through the working group and the DPPC.

CRS is trying to sponsor an initiative to install more rain gauges in certain regions. It has found that weather stations are often located up to 100km apart leading to questions about the reliability of the information. It has approached the NMSA several times about cooperating to install the gauges, but the importation of rain gauges is restricted by the Government of Ethiopia.

It did note that the use of forecasts could be a selling point for donor organisations and foresees the possibility of integrating forecast information into future project proposals.

6.2.3. Ministry of Agriculture - Crop Production, Protection, Technology, and Regulatory Department (CPPTRD)

The agro-meteorological department operates and is funded under the Crop Production Department. The agro-met department currently receives several types of climate data and forecast information from various sources. The NMSA is the main source of forecasts, data, and agro-met information. They receive 3 day, 10 day, monthly, and seasonal reports from the NMSA. They receive satellite information on NDVI from FEWS and the WFP. They are a subscriber to the DMCN Nairobi but report that the reception of the reports is erratic and unreliable. They are on the DMCN e-mail distribution list. They are a member of the Food Security Working Group and attend the monthly meetings. They were also receiving the agricultural production forecasts from the RCMRD until the project ended in 1999.

Based on the climate information, the CPPTRD issues monthly reports and advisories that are sent to the MOA departments, the regional offices, the zonal offices, the woredas, and the development agents located in the villages (see diagram). The bulletins are done in the national language Amharic. The first section of the bulletins present the agricultural impact assessments of the last month rainfall. The second section reports on the monthly forecasts and issues advisories for the farmers including how much rainfall to expect and how to act on the information. The advisories also include information on pest control provided by experts in the MOA. Dry spells are generally associated with armyworms and desert locusts while heavy rains usually diminish the occurrence of pests.

The reports are disseminated in several ways. The 11 regional offices receive the information primarily by fax and telephone. The reports are also faxed or telephoned to the approximately forty-six zonal bureaus in agricultural and agro-pastoral zones in the country (total nation-wide number of zones is approximately 50 – current structure is being reformulated). The information is passed down

to the development agents from the zonal offices. The advisories are also broadcast on the national radio programmes on a monthly basis to reach farmers and pastoralists. However, assessments have not been conducted in the past to evaluate the penetration of the forecasts to the development agents or the farmer level. Nor has there been an evaluation of the content of the advisories and the use of the forecast advisories in farm or pastoralist activities. They are currently working with the FAO to start Rapid Response Assessments to evaluate the reception of the information as well as agricultural production information.

The CPPTRD reports that the Minister of Agriculture has been especially keen on using the forecasts for farmer and herder use. The CPPTRD has been working in agro-meteorology for six years and has noted a marked improvement in the accuracy of the NMSA forecasts. A few years ago, the agro-met department was initially issuing bulletins based on dekadal reports. However, the dekadal reports were not being issued on a timely basis and there was an absence of sufficient staff for analyzing the information, developing agro-met bulletins, and disseminating the information.

The department is concerned about the level of accuracy of the seasonal forecasts issued by the NMSA and the DMCN. It believes that the seasonal forecasts do not contain a level of accuracy satisfactory for use by farmers. They believe that 90% accuracy or greater is necessary before subsistence farmers can use the information. It is also concerned that crop production could be negatively affected as a whole if below normal probabilities are dominant. Moreover, the regional DMCN forecasts do not provide specific information to the regions of Ethiopia, nor is it pertinent to the seasonal cycles of Ethiopia. Seasonal forecasts do provide assistance in planning purposes for their department. They were very interested in applying forecast probabilities to agricultural production in the regions of Ethiopia.

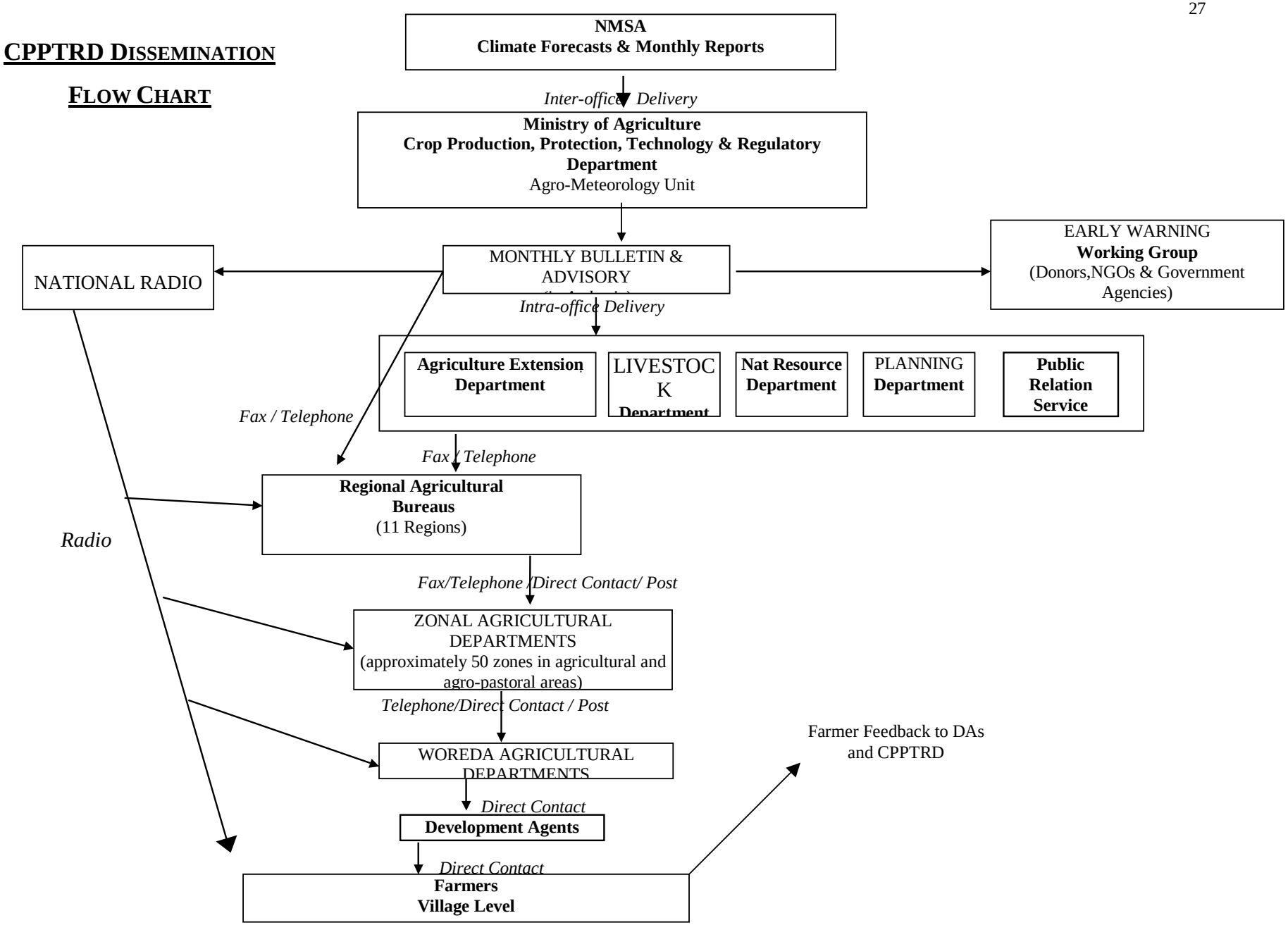
The NMSA also forecast start and cessation dates of rainy seasons for the different regions of Ethiopia. However, the Crops Production department believes that the prediction of start dates could have risks for planting while prediction of cessation dates could have effects on fertilizer use. Early cessation dates could cause farmers to regard the costs of fertilizer as an added risk with little relative value. They believe that farmers will generally start planting according to their traditional calendars.

The CPPTRD stressed that it is the only government department in Ethiopia using the forecasts data for agricultural applications purposes. It would appreciate a strengthening of the relationship with the DMCN. It would very much like to participate in the COF and the regional users workshops but noted budget limitations in sponsoring a representative.

The CPPTRD also submitted a pilot project to the DMCN entitled “Enhancing of Meteorological Information Applications in Crop Production.” However after a positive response six months ago, the department has yet to hear any specifics about funding. They would very much like to apply data on soil quality, water retention, planting dates, rates of evapo-transpiration, and crop production for forecasting probabilities of agricultural production.

The CPPTRD did explain that it has made every contact with the NMSA and the DMCN to receive the information. While it is the only agro-meteorology department in the Ministry of Agriculture, the information is not always forthcoming. Delays in the postal system and irregularities in the dissemination process from the NMSA have made receiving reports somewhat unreliable.

CPPTRD DISSEMINATION FLOW CHART



6.2.4. International Livestock Research Institute (ILRI)

ILRI Ethiopia is currently engaged in the implementation of the Mountain Regions Project in the Ethiopian Highlands. The Mountain Regions Project is a global initiative to improve the livelihoods of mountain peoples. The ILRI in Ethiopia uses livestock as the entry point to help improve the production systems of the local people. As an institution involved in livestock, the ILRI depends heavily on climate data. They have been collecting climate data in Ethiopia for over 20 years at six weather stations on wind speed, sun, temperature, soil temperature, evapo-transpiration, and precipitation. They share the data directly with the NMSA. Based on the data, they have tried to make their own predictions based on past weather patterns and natural cycles.

The ILRI currently relies primarily on the NMSA, FAO, UNDP, and WMO for early warning and climate data. They also collect information on soil, biomass production using NDVI. They would like more information on month-to-month and year-to-year variations. They do not currently receive DMCN information but would like to be put on their e-mail distribution list. They report a need for regional climate information since their work is often affected by trans-boundary movements and regional climate patterns.

For further applications, they would like to see seasonal predictions used for biomass and vegetation forecasts. The ILRI office in Nairobi has done considerable research in southern Ethiopia modeling vegetation growth important for livestock. They would also like more information forecasting gaps within seasons and shortfalls in rain. They would also like to see research into collecting traditional knowledge of climate and forecasting and connecting that knowledge to scientific forecasts.

6.2.5. Disaster Prevention and Preparedness Commission (DPPC)

The DPPC is charged with the day-to-day activities for collecting information and implementing all emergency programmes and activities in Ethiopia. They are a lead member of the National Early Warning Committee (NEWC) consisting of officials from the Ministry of Agriculture, the NMSA, the Statistics Office, the Ministry of Health, and the Ethiopian Mapping Agency. They perform multi-disciplinary activities to make the final assessment in disasters, drought, and food security. The Ministry of Agriculture collects agriculture related information such as past and current production, market prices, and reports from the districts and regions. The NMSA collects meteorological information from its stations throughout the country and prepares forecasts. The Statistics Office is charged with following socio-economic information. Data is collected on a monthly basis. Rainfall, crop performance, pasture area, livestock, market information, and food stress indicators such as migration and nutrition.

The DPPC prepares two seasonal field assessments per year: one at the end of the belg harvest in June and another in February to confirm the results of the monthly assessments and overall agricultural production. The seasonal assessments involve other ministries and donor organisations working in appointed regions and using agreed upon methods. The research done by the various organisations is accumulated, discussed by the Food Security Working Group, and then assessed by the DPPC and the National Early Warning Committee. The final official assessment is released by the DPPC.

The DPPC and the NEWC issue early warning reports issued on a monthly basis. They distribute the newsletter to 300 user organisations in Ethiopia that include government agencies, policymakers, regional offices, NGOs, educational institutions, research organisations, and individuals. The reports are disseminated by post.

DPPC is a major user of climate information and forecasts and uses products from multiple sources including the NMSA, the DMCN, FEWS, and reports from the field. They receive dekadal, monthly, and seasonal forecasts from the NMSA and the DMCN. Seasonal forecasts are used to give the

general impression of the coming season and may prove useful for contingency planning. The NMSA forecasts are preferred because they give more specifics at the national and district levels.

The DPPC has some problems with the DMCN forecasts. The main Ethiopian season falls from June to September while the DMCN forecasts are for MAM and SOND. The February forecasts have been helpful for predicting the belg rains. The DPPC would need the forecasts at least one month prior to the season to incorporate them into their activities.

The NEWC assesses the possible impacts on agriculture, livestock, and food security after the forecast is released. After discussion of the possible impacts, they discuss possible measures and solutions for possible situations. The early warnings are communicated to the regional offices of each member ministry of the NEWC. The DPPC anticipates that the information reaches the woreda level and the Development Agents. However, it is not known how well the early warnings are communicated within each of the ministries or through the administrative levels.

The DPPC says that seasonal and monthly precipitation forecasts are not always helpful since gaps in rainfall can prove harmful to agricultural production while excessive rainfall in short periods can be equally destructive.

Regarding the accuracy of the forecasts, the DPPC has noticed an improvement in the quality of the forecasts over the past few years. The DPPC reported that it needed an accuracy rate of 75% for forecasts in order to find them useful. However, the DPPC reports that the low number of weather stations in the country (approximately 600) makes it difficult to trust the forecasts. Moreover, the weather stations are reported to be mostly located in the well-populated and accessible areas of the Highlands while lowland and arid regions have fewer stations. For this reason, they use satellite information to gather data for the lowland and arid areas. Furthermore the topography of the highlands can make the forecasts somewhat unreliable.

The DPPC would like to see further applications of the seasonal forecasts for predicting agricultural production.

6.2.6. Canadian International Development Agency (CIDA)

The Canadian International Development Agency is a donor agency and member of the Food Security Working Group in Ethiopia. CIDA has been a major donor in Ethiopia's food crises and food shortages. It takes part in the food assessments conducted in coordination with the DPPC and the working group during which they discuss forecasts from the NMSA and the DMCN. They report that the group's use of climate information and forecasts is very good and useful for their contingency planning. CIDA would like to see applications of forecast information to agricultural production and livestock.

CIDA is a member of the Food Security Working Group that receives early warning information from the Disaster Prevention and Preparedness Committees at the district level. The DPPC in Addis Ababa collects the information and verifies it during two nation-wide assessments in July and February. The DPPC puts together the final assessments based on the reports of its own field operations, local DPPC committees, and NGO work. CIDA noted that early warning information is collected by government agencies and NGO's but is not given back to the communities.

CIDA recommended dissemination of the climate information to farmers and herders who may need it most. However, they recognized that Ethiopia's poor communication infrastructure could be problematic. The road system is in poor condition preventing timely communication with rural areas. They did report that the regional capitals are well connected to the national capital through phone and fax. Radio reception can vary by region and also by topography as some areas in the Highlands do

not receive radio national radio signals. E-mail and internet access is limited to the national capital and some NGO's in the regions.

6.2.7. World Food Programme – Vulnerability Assessment and Mapping Division (VAM)

WFP is a lead member in the Ethiopia Food Security Working Group with the DPPC, the Ministry of Agriculture, and other NGOs. The WFP issues monthly reports with climate data primarily from remote sensing. The DMCN and NMSA forecasts and climate data are also presented in the reports.

The WFP Ethiopia receives dekadal, monthly, and seasonal reports from both the NMSA and the DMCN. The information is delivered by e-mail or fax automatically rather than by request. However, they reported that the DMCN reports are usually not on time. WFP-VAM reproduces the regional consensus forecasts in its monthly reports that target the food security community. Following the Climate Outlook Fora in February and August, the NMSA convenes a users meeting with government ministries, international organisations and major NGOs to explain the forecast and potential impacts. WFP reports that the seasonal forecasts are particularly helpful in contingency planning. Contingency plans can generally be made without input from the seasonal forecasts using just the results from remote sensing of the rainfall amounts.

WFP-VAM has been receiving the forecasts since the first COF in 1997. The WFP uses the February forecast for contingency planning for its JJAS rainfall (belg season) for preparing against extreme scenarios. They report that the SOND forecasts by the COF in August are not relevant for Ethiopia. They use the information as a factor in the "trigger" modeling of where and when food shortages will occur. The contingency plan is made by region and includes qualitative data such as the quality of the roads, infrastructure, markets, etc) and temporal data (weather, precipitation). It also includes the network of NGO partners in the region who can facilitate assistance in the time of need.

6.3. TANZANIA

6.3.1. Caritas

Caritas is a Catholic NGO performing three major functions in Tanzania: 1) emergency section involved in food security, disaster management and social services 2) Development projects 3) women and development. The emergency section's operations are mainly in drought-affected areas. Caritas runs programmes in food for work, free food programmes, and seed programmes. Caritas coordinates activities and funding for affiliate organisations operating in the regions, districts, and the 29 Catholic dioceses. To their knowledge, their affiliate organisations in the dioceses do not receive climate information. Their food security activities are funded by the Prime Minister's Office and the World Food Programme.

Caritas does not systematically receive information from the TMA, DMC, FEWS, or other sources. The representative did not recognize the seasonal forecasts but said they could be useful. It receives weather and climate information mainly from radio and televsion broadcasts. It has limited contact with the Food Security Department in the Ministry of Agriculture and Food Security. They would like to start receiving more climate and weather information from the TMA and the DMC, although it had a greater need for national information. They said that they could alert their affiliate organisations of forecast and weather information. They would prefer forecast information that presents the chance extreme scenarios such as flooding and drought.

6.3.2. Food Security Department - Ministry of Agriculture and Food Security

The FSD/MOA houses an agro-meteorologist funded by the TMA to operate and advise on its early warning activities. The FSD originated in the 1970's following the Sahelian droughts. The FAO and the Netherlands originally financed the agro-meteorology office to monitor crop harvesting and the TMA eventually replaced the FAO person with its own agro-meteorologist. The FSD is the representative for the MOA for the Disaster Management Committee of the Prime Minister's Office.

The primary activities of the FSD focus on food assessments. The FSD conducts two field assessments in July and January following the harvests. The field assessments are done in conjunction with the WFP, the FAO, FEWS, Disaster Management Office, the Prime Minister's Office, the Statistics Office, and an economist of the MOA. Monthly early warning reports are also issued. The monthly reports are founded on information reported by a network of 400 voluntary field monitors. The field monitors report on a ten-day basis giving information on the type of crop and its status. The postcard postage is paid through funding by DANIDA. The early warning reports are issued in English and targeted to the government agencies, international organisations, donors, and NGOs.

The FSD has worked to improve the dissemination of the early warning reports and the monthly and seasonal forecasts. The forecasts issued by the TMA are translated into Swahili. The FSD received funding from DANIDA to conduct two regional trainings with the TMA for its field monitors to improve the collection of weather data and to inform them about forecast information. It held trainings in southern Tanzania in October 2000 and in Tabora in January 2001 each with 50 monitors. They developed training materials in Swahili for filling out the agro-met cards. They also gave explanations of the seasonal forecasts. They found that the field monitors are an excellent target group since many are important members of their own communities, with many having positions on the village development committees. The FSD reported that the field monitors were very receptive to the seasonal forecast information and glad to learn about the final product resulting from the collected data.

In presenting the seasonal forecasts, the training used an analogy of past seasons to explain the probabilities. They found that the farmers had difficulty understanding the probabilities alone. The trainings were conducted for between three to four thousand dollars.

The FSD relies heavily on regional and national climate information but would not be in the position to pay for the forecast products. They receive their operational funding from the national treasury.

The FSD, in conjunction with the FAO, used to issue reports of prospective yields based on field reports, drought indexes, and water satisfaction. The models gave a rough estimate of expected harvests. They would like to see further applications of the forecasts probabilities on harvest production, vegetation, and extreme events such as flooding.

The FSD currently use seasonal forecasts as an indicator and starting point for what to expect in the coming season. The department receives reports from both the TMA and the DMCN.

6.3.3. School of Journalism

The School of Journalism is a government organisation with the Ministry of Information. The school currently has 100 students enrolled in a two-year programme. The school has strong relationships with the newspaper, radio, and television media in Tanzania. The school was a participant in the media workshop held in Dar es Salaam funded through a pilot project with the DMCN.

The school does not currently receive information from the TMA or the DMCN. However it is somewhat familiar with the climate data and forecasts products available from the TMA. The school

says that it does not have a strong need for regional climate information, aside from reporting extreme climate events in the region and foreign countries.

The school has had directors from the TMA lecture on the technical aspects of meteorology and how to correctly report weather and climate events. However, a shortage of funding hampers the costs related to inviting a TMA official to the school.

6.3.4. National Environmental Management Council (NEMC)

The NEMC is a government funded agency also receiving project assistance from donors. The NEMC currently receives Tanzania specific climate reports from the TMA and satellite data from the DMC Harare. They report that forecast information is not of particular use to their activities. Rather, the NEMC tries to use long-term data to establish the causes of environmental degradation. They are most interested in the climate/meteorological data to use for their own research and project purposes. They compare the ground-based meteorological data collected with the NDVI to link the source of degradation to natural causes or human activities. They do not consider themselves major users of forecast information.

For environmental monitoring, they need long-term data to analyze long-term changes. They have a need for regional information for Eastern and Southern Africa only in special cases such as the Lake Victoria project being conducted with UNEP and neighboring countries. The NEMC is interested in networking and exchanging climate information with the TMA and the DMCN and would be willing to pay for data if a clear pricing system is established.

6.3.5. Tanzania Tea Board

The Tea Board is charged with regulating the commercial tea growing industry in Tanzania. The Tanzania Tea Board was established by the Government of Tanzania in 1999 with a board of directors constituted by members of government and using government reporting systems. The Board replaced the Tanzania Tea Authority two years ago which had formerly controlled all trade and production at the tea estates. The Board's formation followed the privatization of the tea estates during the 1990s. The Board imposes a 1% levy on all tea sold by producers to finance its activities in licensing and monitoring tea estates.

The Tea Board collects its meteorological data from the tea companies including information on rainfall and temperature. It reported that the prices for data from the TMA are too expensive for its activities. Nevertheless, they would like to use their own data collection for predictive purposes in the future. It was explained that the TMA would be in a better position to make meteorological forecasts since longer sets of data are required for predictive capabilities. They reported that the farmers themselves make predictions on their own production and report these estimates to the Tea Board.

The tea industry is concentrated in the southern regions and northern regions of the country. Tea production is usually heaviest during the warm periods from October to April. Cold weather from June to July in the tea growing regions slows the growth of the bushes. During this period, farmers generally prune. They reported that their heaviest production of tea came during the El Nino year of 1997-98 but were unaware of the forecasts released predicting high probabilities of above normal rainfall.

The Tea Board does not currently receive climate data or forecast information from the TMA or the DMCN. They would very much like to be put on the mailing lists for the reports and for user workshops. They have e-mail capability and would like to start receiving the information

electronically. It was also suggested that the tea estates could be used as weather stations for the TMA.

The Tea Board would like the forecasts as far in advance as possible. It believes that it could distribute the information to commercial growers as a way of providing services to the people who finance their activities. The Tea Board suggested contacting the Tanzania Tea Development Agency who promote and monitor tea production by small growers.

APPENDIX I - Contacts

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APPENDIX II -Survey Instrument

QUESTIONNAIRE TO ASSESS THE CLIMATE INFORMATION NEEDS OF ORGANISATIONS IN THE GREATER HORN OF AFRICA

This questionnaire is intended to gather information to better understand the climate information needs of the region. By "climate", we refer to the average rainfall and temperature conditions over a period of about 1-6 months, and not "weather", which refers to a period of about 1-10 days. This information will be used to help design more effective climate services programmes to serve your needs. Please answer the questions frankly and feel free to elaborate at length. We ask that a representative of the organisation who is familiar with the current or potential use of climate information for the organisation's decision making fill out this questionnaire.

Name of enumerator ..... **Date**.....

A. Respondent's information

i) Name: (optional) .....
ii) Age: .....
iii) Gender: (tick one) Male [ ] Female [ ]
iv) Educational level: (tick one) Primary [ ] Secondary [ ] University [ ]
v) Area of expertise.....
vi) Position in the organisation .....
vii) Number of years with organisation.....
viii) Main duties of the respondent within organisation: (please list them below)
   a. .....
   b. .....
   c. .....

B. Information about the organisation

i) Postal address.....
ii) Telephone / Fax.....
iii) Email .....
iv) Website .....
v) Type of organisation [tick the most applicable]:
   a. Governmental [ ]
   b. Private [ ]
   c. Parastatal [ ]
   d. Multinational [ ]
   e. Not-for-profit [ ]
   f. Other (please specify) [ ]

vi) Economic sectors the organisation is involved in: [tick all that apply]
   a. Agriculture [ ]
   b. Energy [ ]
   c. Water [ ]
   d. Transport [ ]
   e. Commerce and industry [ ]
   f. Tourism [ ]
   g. Natural resource management [ ]
   h. Other (please specify) .....

C. Climate information

1. Does your organisation receive climate information at present?

   (a) Yes **[if "YES", please answer Questions 2-13 and 22-29]**
   (b) No **[if, "NO", please answer Questions 14-29]**

COMMON TYPES OF INFORMATION	COMMON SOURCES OF CLIMATE INFORMATION
a. Daily forecast b. Weekly forecast c. 10-Day forecast d. Monthly forecast e. Quarterly (Seasonal) forecasts	a. National meteorological station b. Television c. Newspaper d. Radio e. Traditional methods f. Other organisations g. Drought Monitoring Center (DMC) h. Government extension officers i. Private climate services providers j. Internet k. Personal contact

2. In the table below, fill in the different type(s) of climate information your organisation receives. For each type of information, indicate the primary (main), secondary and tertiary source, and how often (hourly, daily, weekly, monthly quarterly, yearly) it is received? A list of possible sources and common types of climate information is provided in the table above to assist you.

Type of information	1. Primary source	How often received	2. Secondary source	How often received	3. Tertiary source	How often received

3. Does your organisation receive any climate information through any of the methods listed below? [Tick all that are applicable]

Method	Yes	No	If yes, which type of information?	must your organisation:	
Fax	[ ]	[ ]	[ ]request info	[ ]info delivered automatically	
E-mail	[ ]	[ ]	[ ]request info	[ ]info delivered automatically	
Telephone	[ ]	[ ]	[ ]request info	[ ]info delivered automatically	
Meetings	[ ]	[ ]			
Website	[ ]	[ ]	[ ]request info	[ ]info delivered automatically	

4. How long in advance of the period being forecasted, does your organisation receive **CLIMATE (not weather)** information?
   Minimum .....[days, weeks, months]
   Ideal ..... [days, weeks, months]

5. How useful is this **CLIMATE (not weather)** information to your organisation? [Circle the most applicable]
   a. Very
   b. Somewhat
   c. Not at all

6. How do year-to-year and season-to-season climate variations affect your organisation's activities? (Impacts) [Explain]

.....
.....

7. What additional information could help your organisation minimize the negative effects, and take advantage of the positive effects of climate variability? [List]

a. .....
b. .....

8. WHAT LIMITATIONS OR PROBLEMS HAVE YOU NOTED IN THE CLIMATE INFORMATION YOUR ORGANISATION RECEIVES? [LIST]

a. .....
b. .....
c. .....

If you answered "No" to Question (1), please answer the remaining questions that address how your organisation could possibly make use of different types of climate information, even though it is not currently being used.

9. Would your organisation like to start receiving climate information?

Yes [ ] **[go to question 15]**
No [ ] **[skip to question 19]**

10. If 'YES', list the types of climate information that would be most useful to your organisation & how long in advance of the period to be forecasted would your organisation like to receive this information? [Please specify]

a. Type of information.....
How long in advance .....
b. Type of information.....
How long in advance .....
c. Type of information.....
How long in advance .....

11. How would your organisation make use of the **<u>above</u>** types of information? [i.e. in making what kind of decisions?] [Please specify]

Type A.....
Type B.....
Type C. .....

12. When would your organisation require this information (**from above types of information**)? [Circle all those that apply]

<u>Type A</u>	<u>Type B</u>	<u>Type C</u>
A. Throughout the year	A. Throughout the year	A. Throughout the year
B. During the rainy season	B. During the rainy season	B. During the rainy season
C. During the dry season	C. During the dry season	C. During the dry season
D. Other [please specify]	D. Other [please specify]	D. Other [please specify]

13. How useful do you think this information would be to your organisation (**from above types of information**)? [Circle the most applicable]

<u>Type A</u>	<u>Type B</u>	<u>Type C</u>
a. Very	a. very	a. very
b. somewhat	b. somewhat	b. somewhat
c. not at all	c. not at all	c. not at all

14. If your organisation is not ready to start receiving climate information, why not?
    .....
    .....

15. How do year-to-year and season-to-season climate variations affect your organisation's activities? [Explain]
    ……. .....
    .....

16. What problems or challenges does your organisation face related to seasonal climate variability?
    a. .....
    b. .....
    c. .....

ACCURACY OF FORECAST: There are many ways of defining the accuracy of a forecast and we are trying to determine which way would be most useful to your organisation in assessing the value of this information for your activities.

17. For example, consider a forecast of whether the coming season rains will be above or below normal (the long-term average). What level of skill do you think your organisation would need the forecasts to have in order to:

a) be of some use?

i. 60% level of accuracy (e.g., good forecast 6 years out of 10)
ii. 70% level of accuracy (e.g., good forecast 7 years out of 10)
iii. 80% level of accuracy (e.g., good forecast 8 years out of 10)
iv. 90% level of accuracy (e.g., good forecast 9 years out of 10)
v. 100% level of accuracy (e.g., good forecast 10 years out of 10)

b) be very useful?

i. 60% level of accuracy (e.g., good forecast 6 years out of 10)
ii. 70% level of accuracy (e.g., good forecast 7 years out of 10)
iii. 80% level of accuracy (e.g., good forecast 8 years out of 10)
iv. 90% level of accuracy (e.g., good forecast 9 years out of 10)
v. 100% level of accuracy (e.g., good forecast 10 years out of 10)

18. When dealing with climate forecasts, how important is it to your organisation to have information on accuracy? [Circle the most appropriate]
    a. Extremely
    b. Very
    c. Moderately
    d. Somewhat
    e. Not at all

19. How would you like the level of accuracy of the climate forecast to be presented to your organisation? [Circle all that apply]
    a. Explanation in words
    b. Probabilities of possible outcomes
    c. Do not know
    d. Other (please specify).....

20. How useful to your organisation would information on past droughts, floods, and other climate variables be as a reference for forecast interpretation? [Circle the most applicable]
    a. Extremely
    b. Very
    c. Moderately
    d. Somewhat
    e. Not at all

21. Which of the following is applicable to your organisation? [Circle the most applicable]
    a. Has facilities to receive and send email
    b. Plans to install email in the next 1-3 years
    c. No plan to install email facilities
    d. Has access to the World Wide Web

22. Do you think your organisation would be willing to pay for some of the services you have outlined.
    a. Yes b. No

23. Would you be willing to participate in a discussion group on this topic?

    a. Yes b. No.

24. Please write down any comments you might have on any aspect of this survey [Please feel free to elaborate at length]

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APPENDIX III - Compiled Survey Results

A. Respondent Information

i.) Name		*varied*
ii.) Age		*varied*
iii.) Gender		**N=42**
	Male	93%
	Female	7%
iv.) Educational Level		**N=42**
	Primary	0%
	Secondary	0%
	University	100%
v.) Area of Expertise		*varied*
vi.) Position in Organisation		*varied*
vii.) Number of Years in Organisation		*varied*
viii.) Main duties of the resondent within organisation		*varied*

B.) Information about the Organisation

i.) Postal Address		*varied*
ii.) Telephone/Fax		*varied*
iii.) E-mail		*varied*
iv.) Website		*varied*
v.) Type of Organisation		**N=43**
	Governmental	19%
	Private	17%
	Parastatal	14%
	Multinational	0%
	Not-for-Profit (NGO)	26%
	Multilateral/Donor	19%
	Other	0%

vi.) Economic Sectors the organisation is involved in:	N=43
Agriculture	28%
Energy	12%
Water	5%
Transport	0%
Commerce and Industry	2%
Tourism	2%
Natural resource management	23%
Food Security	33%
Livestock	14%
Other	16%

C. Climate Information

1) Does your organisation receive climate information at present?	N=43
Yes	77%
No	23%

If you answered 'Yes', please answer questions 2-8 and 17-24
If you answered 'No', please answer questions 9-24

2) Types of Climate Information	N=33
Daily	15%
Weekly	3%
10-day	55%
Monthly	88%
Quarterly (seasonal)	82%

Sources of Climate Information	N=33
National Meteorological Services	79%
Television	12%
Newspaper	0%
Radio	9%
Traditional Methods	3%
Other Organisation	73%
DMC	73%
Government Extension officers	0%
Private climate services providers	0%
Internet	12%
Meetings	24%
Personal contact	9%

3) Communication channels used for receiving climate information	N=33
Post	30%
Fax	9%
E-mail	70%
Telephone	6%
Meetings	24%
Website	58%

4) How long in advance of the period being forecasted does your organisation receive climate (not weather) information?

a)	**minimum**	**N=23**
	1 month	78%
	2 months	4%
	3 months	17%
	>3 months	0%

b)	**ideal**	**N=14**
	1 month	50%
	2 months	7%
	3 months	14%
	>3 months	29%

5) How useful is this climate (not weather) information to your organisation?	**N=39**
Very	79%
Somewhat	21%
Not at all	0%

6) How do year-to-year and season-to-season climate variation affect your organisation's activities? **N=40**

Answers varied

7) What additional information could help your organisation minimize the negative effects? **N=28**

Answers varied

8) What limitations or problems have you noted in the climate information your organisation receives? **N=29**

Answers varied

9) Would your organisation like to start receiving climate information?	**N=10**
Yes	100%
No	0%

10) If 'YES', list the types of climate information that would be most useful to your organisation & how long in advance of the period to be forecasted would your organisation like to receive this information? (Please specify) **N=9**

Answers varied

11) How would your organisation make use of the above types of information? **N=10**

Answers varied

12) When would your organisation require this information (from above) **N=10**

Answers varied

13) How useful do you think this information would be to your organisation (from above)? **N=10**

Answers varied

14) If your organisation is not ready to start receiving climate information, why not? **N=9**

Answers varied

15) How do year-to-year and season to season climate variations affect your organisation's activities (Explain) **N=5**

Answers varied

16) What problems or challenges does your organisation face, which you think, would be eased through availability of climate information. (List) **N=10**

Answers varied

Accuracy

17) For example, consider a forecast of whether the coming season rains will be above or below normal (the long-term average). What level of skill do you think your organisation would need the forecasts to have in order to:

a) be of some use **N=22**

Not Sure	0%
60% accuracy	18%
70% accuracy	32%
80% accuracy	32%
90% accuracy	9%
100% accuracy	9%

b) be very useful **N=29**

Not Sure	17%
60% accuracy	7%
70% accuracy	0%
80% accuracy	7%
90% accuracy	48%
100% accuracy	21%

18) When dealing with climate forecasts, how important is it to your organisation to have information on accuracy? **N=32**

Extremely	50%
Very	47%
Moderately	3%
Somewhat	0%
Not at all	0%

19) How would you like the level of accuracy of the climate forecast to be presented to your organisation? (Circle all that apply) **N=29**

Explanation in words	65%
Probabilities of possible outcomes	62%
Do not know	4%
Other (please specify)	12%

20) How useful to your organisation would information on past droughts, floods, and other climate variables be as a reference for forecast interpretation? **N=25**

Extremely	32%
Very	60%
Moderately	4%
Somewhat	0%
Not at all	4%

21) Which of the following is applicable to your organisation? (Circle most applicable) **N=43**

Has facilities to receive and send e-mail	93%
Plans to install e-mail in the next 1-3 years	7%
No plan to install e-mail facilities	0%
Has access to the World Wide Web	58%

22) Do you think your organisation would be willing to pay for some of the services you have outlined in Question number 23? **N=31**

Yes	61%
No	39%

23) Would you be willing to participate in a discussion group on this topic? **N=22**

Yes	95%
No	5%

24) Please write down any comments you might have on any aspect of this survey (Please feel free to elaborate at length) *written survey only* **N=16**

Answers varied