The Need for an Integrated Weather Information Dissemination System for Uganda

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Abstract

Weather is one of the key factors that affect the livelihood of people in Uganda, especially in the sectors of agriculture, aviation, construction, health, defense, disaster management and resource management. Accessibility to reliable weather information is therefore vital for decision making. In this paper, we present the findings from a survey carried out to establish the status of the weather information dissemination system in Uganda. The survey sought to generate and report on the current usage of weather information; inform on the current and future weather information needs for the different sectors and users, and guide appropriate modes for packaging weather information for different purposes so as to forge a strategy that can improve the quality, access and impact of weather information.

Results from the analysis indicated a great interest in weather information and an expression by respondents for varying detail of weather information and creation of more products that can serve their interests. This provides the need for an effective weather dissemination system in order to provide more timely, accurate and accessible weather information.

1 Introduction

Most farmers in Africa including Uganda largely rely on the natural weather cycle for their crop and animal production. Indeed, many essential economic activities could also be better planned, and food security improved, if people were well informed of seasonal climate predications and could take appropriate actions (WMO, 2012). Beyond the sparse meteorological network (Sansa, 2012), Uganda faces a challenge of effective weather information dissemination to its diverse audience.

Weather specifically refers to conditions over a short period of time, the way the atmosphere is behaving, mainly with respect to its effects upon life and human activities. Weather consists of the short-term (minutes to months) changes in the atmosphere. Weather can change from minute-to-minute, hour-to-hour, day-to-day, and season-to-season (Dunbar, 2014). Accessibility to reliable weather information is therefore vital for informed decision making. It leads to increased productivity (in the agricultural, energy, water resources and construction sectors) and safety (in the aviation, disaster management, fishing, health, mining, and defense sectors) (Reuder, 2013).

In Uganda, effects of weather are pronounced in the socio- economic sectors of agriculture, aviation, construction, health, defense, disaster management and resource management. Considering the main livelihood of many people in Uganda arises from agriculture, which encompasses fishing, crop production and animal husbandry, weather information is more critical in the agriculture sector. However, different stakeholders in agriculture will need weather information for different purposes. For example, a fisherman for one will be interested in the daily weather conditions that allow him to go out and catch fish, yet a crop farmer will be interested in seasonal weather information to know when they can plant, weed, harvest their crops while an animal keeper is interested in when they can spray their animals.

In construction sector, individuals or companies target to sign a contract for a period of time of work when the weather is most favourable, and will least affect their activities, allowing for predictable delivery times. In health, availability of weather information is a central factor in planning for, mitigating or preventing outbreaks of diseases, while for disaster management will lead to reduction on the number deaths due to weather related conditions such as floods.

The Uganda National Meteorological Authority (UNMA) is mandated with promoting, monitoring weather and climate; providing weather forecasts and advisories to the government of Uganda and other stakeholders for use in sustainable development of the country.

In order to improve the quality, access and impact of weather information, the WIMEA-ICT (Improving Weather Information Management in East Africa for effective service provision through the application of suitable Information & Communication Technologies) project partnered with UNMA, as a key stakeholder of the research project to conduct a nation-wide survey on Weather Information Dissemination (WID). The survey was carried out to establish the status of the weather information dissemination system in Uganda. The purpose of the survey was to generate and report on the current usage of weather information; inform on the current and future weather information needs for the different sectors and users; and guide appropriate modes for packaging weather information for different purposes. This was done to complement the efforts of the UNMA and related institutions towards meteorological data collection, management and dissemination.

Section 2 presents related work, section 3, the summary of the results of the survey and section 4 provides a motivation and rationale for the envisaged weather dissemination system. Section 5 presents the conclusion.

2 Related Work

In order for UNMA to achieve the mandate of providing weather information for all, one of the five factors that must be considered is an effective dissemination system for impact. According to UNMA, there are two main types of weather information that is currently disseminated. These are the short-range information, which spans from one hour to5 (five) days, and the medium range information that spans up to 90 (ninety) days. This information is disseminated using different strategies. The short-range information is mainly disseminated by FM radio, email, television, and also displayed on the UNMA website. There are also tailored mobile weather alerts provided to fishermen (piloting in Kalangala district) and for farmers in Kasese district. The information is also provided on the MTN

website (www.mtn.co.ug), which is a partner with UNMA in implementing the project. The principal language for the information is English. The same information is then translated in other local languages including Luganda, Lukonjo and Rutooro.

The medium range dissemination is for 10 (decadal) day, monthly and seasonal forecasts and is achieved through stake-holder workshops, where the stakeholders are selected from all the major socio-economic sectors; the National Media Centre, where a high profile person such as the minister of water and environment reads the weather statement before the media; local FM radios; and NGOs whose mandate is to facilitate the access of weather informationby relevant stakeholder groups; on the UNMA website; through the Ministry of Agriculture early warning unit, and recently through the social media arena (via Facebook[1], Twitter[2], and U-tube[3]).

The information disseminated over the radio is simplified and translated into 20 languages/dialects to make it more understandable. The seasonal forecast information is further accompanied by advisories on what actions the stakeholders can undertake, for instance what types of crops farmers can plant, relocating people from landslide prone areas to safer ones, installation of lightning arrestors on public buildings, strengthening general hygiene and sanitation among others (Kamuntu, 2014). However, the dissemination done by UNMA is not without challenges, some of which are:

- Despite the fact that many of the messages have been simplified and translated, some stakeholder groups maintain that the messages received are still complex, as translation is done to the nearest approximate language
- A long standing attitude and bias by the general public that hinders acceptance of information relayed,
- Limited funding that only allows a few communication and dissemination channels to be explored.

As a preliminary to the survey, the research team interviewed officials from UNMA to discuss their stake in the project. As a result of this, it was established that UNMA envisions an interactive web portal where stakeholders can request for and obtain weather information in real time. They would also like to harness the social media capabilities to capture the interest, and encourage the participation of the youthful people. Furthermore, an SMS platform that allows individual inquiries to be made would be ideal.

In view of this need, the WIMEA-ICT project seeks to complement the efforts of UNMA by creating an integrated weather information dissemination system.

3 Results

The survey was achieved by structuring a questionnaire that was administered to respondents who either completed the questionnaire with researcher(s) present, had an oral interview where the researcher(s) completed the questionnaire with the respondent's answers, or the respondents' filled out the questionnaire as a google form. Data from the questionnaires was analyzed using a spreadsheet program.

Table 1: Overview of Survey Results

Socioeconomic characteristics		
Age	Frequency	%
18-25	6	6
26-36	54	49

[1] www.facebook.com
[2] www.twitter.com
[3] www.youtube.com

37-47	33	30
>48	16	15
Sector coverage		
Resource Management	24	22
Agriculture	21	19
Aviation	2	2
Construction	26	24
Disaster Management	16	14
Health	11	10
Defense	10	10
Gender		
Male	26	76
Female	83	24
Currently receiving forecasts		
Yes	75	67
No	34	30
Not Aware	3	3
Channels of Delivery		
Television	64	36
Radio	41	23
Newspapers	20	11
Physically from Meteorology Service	6	3
Email from Meteorology service	14	8
Meteorology Service website	3	2
Other websites	10	6
Mobile Phone	13	7
Other sources	7	4
Efficiency of Weather Dissemination		
Accuracy		
Very Bad	8	7
Bad	18	17
Fair	6	6
Good	64	61
Very Good	9	9
Timeliness		
Very Bad	8	8
Bad	27	27
Fair	7	7
Good	49	49
Very Good	9	9
Accessibility		
Very Bad	9	8
Bad	26	26
Fair	8	10
Good	46	46
Very Good	10	10

The survey was structured in 5 sub-sections. First, namely one, the general information that captured general aspects of the respondents who participated in the survey, including their district of location; the sector or their major economic activity; age; and gender; two, the channels of delivery that aimed at investigating how respondents get access to weather information; three, usage and accessibility of information, which sought the frequency of receiving; uses; usefulness of; impact; and interest in weather information by respondents; four, packaging of information which focused on presentation of weather information; and finally, five, issues and recommendations that encompassed suggestions of the respondents for effective dissemination. Table 1 presents an overview of the results of the survey.

3.1 General Information

The key sectors that consume weather information that were visited included Agriculture, Aviation, Construction, Defense, Health, Disaster and Resource management. The focus and purpose of the survey was to visit the selected sectors, and a total of twenty-one districts were visited all being representative of the sectors. The choice of district was taken from the existence of the sector in the district. It was also found that access to weather information generally reduces as the age increases. In terms of the gender, most of the respondents were male (76%), although the health sector had more female respondents than male.

3.2 Channels of Delivery

It was found that 30% of the respondents do not receive weather forecast information, 67% receive, and 3% were oblivious.Of the 67% who receive the information, most claimed to receive the weather forecast information at the end of a news bulletin either on TV or radio, as shown in Table 1. Some respondents received weather forecast information through newspapers, and others through various applications on mobile

telephones. Table 2 shows a summary of the popular and easiest ways of access to weather information for the different sectors.

Table 2: Ways of Access for Sectors

Sector	Popular ways of access (most to least)
Agriculture	Radio, TV, email from meteorological service, experience
Aviation	Physically from meteorological service
Construction	TV, newspaper, radio, physically and email from meteorological service
Defense	TV, radio, newspaper, other websites
Disaster Management	Radio, Email from meteorological service, TV
Health	TV, mobile phones, radio
Resource Management	TV, newspaper, radio, mobile telephones

Figure 1 presents the level of ease of understandability of the format and language used in the forecasts and severe weather warnings by the respondents.

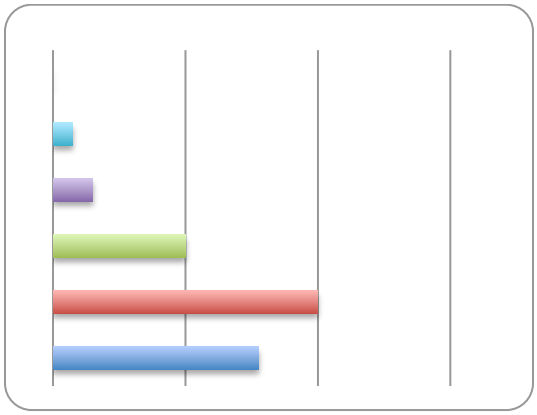

Figure 1: Understanding format and language of forecasts and severe weather warnings

3.3 Usage and accessibility

It was found that 86% of the respondents are affected by weather in their day-to-day activities,while 10% of the respondents think that they are not affected by the weather forecast information and 4% of the respondents did not respond to the question. The respondents who are affected use weather information for their plans and decisions, all sector-dependent. Respondents from construction were most affected, followed by those in resource management, agriculture, disaster management, with an equal number in defense and health. The respondents who claimed noeffect were generally nearly equally spread across the sectors, with the health sector having the largest number. Figure 2 shows the frequency with which the respondents who receive weather information use it.

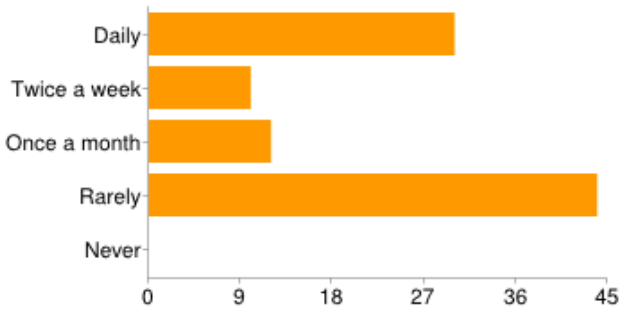

Figure 2: Frequency of use of weather forecast

The survey further sought the respondents' interest in weather forecast information. Most interest was expressed by the respondents from the sector of agriculture, followed by those in resource management, disaster management, and construction. Most respondents from the sector of health were somewhat interested in weather information. Several reasons were given for the levels of interest expressed, all related to sector driven activities. The respondents rated the usefulness of the weather forecasts and warnings of severe weather received, with most (48%) of them finding the information very useful as Figure 3 illustrates. Respondents mainly from resource management, construction, agriculture and disaster management rated them as very useful.

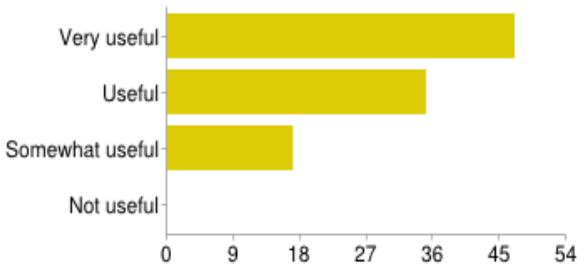

Figure 3: Usefulness of weather information

17% of respondents found the weather information somewhat useful and pointed out that often times the information provided is irregular, inaccurate and unreliable. These respondents were mainly from the health sector. Some of these therefore preferred to rely on the experience and knowledge of past seasons as passed on from their ancestors and ob- serving the skies for changes so as to determine the upcoming seasons, especially for the sector of agriculture.

The survey also investigated aspects of weather concerning its accuracy, timeliness and access. By ranking of sectors, respondents from construction, resource management, disaster management, agriculture, defense and health generally found accuracy of the weather information good. In terms of timeliness, respondents from resource management and construction generally found the information timely, and the same sector respondents ranked access of weather information as generally being good. Even though about the same percentage of respondents found these aspects very good, and generally thought the information is timely, respondents from the sectors of agriculture and health generally found these aspects of weather information to be fair and bad respectively. Table 1 shows a summary of these aspects for the sectors.

Figure 4 shows the frequency with which respondents would like to receive daily weather updates. 43% prefer to receive updates on a need to know basis (on demand), especially for the sectors of agriculture, resource management, and disaster management. 13% prefer to receive hourly updates, 10% after three hours, and 34% after six hours.

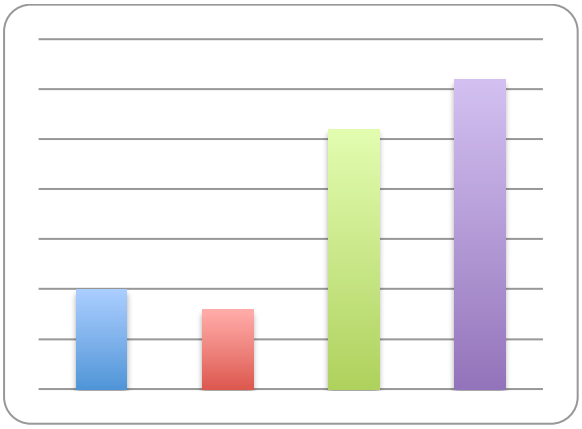

Figure 4: Frequency of daily Updates

On comparing the forecasts and warnings of severe weather provided today to two years ago, respondents stated that they are generally more useful and the information about forecasts themselves more available, in comparison to 5 years ago.

3.3 Packaging of Information

The respondents from the sectors of agriculture and health were interested in weather information for a season, while those from aviation for a day, specifically three hourly. The respondents from the sector of disaster management were equally interested in weather information of a day; three days in advance; and a month. In terms of location, these respondents from all the sectors were mostly interested in weather information for their regions, basing on the activities they undertake. They ranked the regions in terms of the country, district, village, county and parish. Table 3 shows the elements of interest to the respondentsranging from rainfall, temperature, wind, sunshine, hail and cloud cover.

Table 3: Elements of interest in weather forecast

	Agriculture, Construction	Aviation	Defense, Disaster management	Health, Resource management
Rain fall	✔	✔	✔	✔
Wind	✔			
Temperature	✔		✔	
Cloud cover	✔	✔		
Sunshine	✔			
Humidity	✔			
Hail	✔			

The research team found that 49% of the respondents preferred to receive a detailed, but not technical weather forecast. They preferred a summary with the following aspects:

- Critical parameters highlighted, such as amount of rainfall received and expected;speed of wind and the direction; temperature of the day; among others
- Precise and short graphics,
- Tabular formats used to present the weather information
- Sent via SMS or other various phone applications
- Presented with captivating programs on TV, and well explained
- Packaged by regions or based on the users, e.g., for researchers and users from aviation sector, provide detailed information, whereas a summary may suffice for those from the agriculture sector
- Dedicated sections in the print media such as newspapers and magazines
- Be accompanied by advisories for the consumers to be able to take immediate or required action

3.4 Issues and Recommendations

Respondents advocated for assistance/training in the interpretation of the weather forecast. This was particularly for the sectors of disaster management, agriculture and health. More respondents in the sectors of aviation, construction, and resource management purported not to need as much training in the interpretation of the weather information. Respondents suggested several ways to enable effective weather information dissemination including:

- Disseminating the weather updates directly to people's phones as requested since majority of the people have mobile phones.
- Weather magazines specifying information of the previous month and projections in the new month to provide details of all weather parameters. These magazines could be delivered monthly
- Provide via Internet, or create an online all-time access MIS capturing all regions of the country and the world available all the time.

- Simplifying terms used in the forecast dissemination presentations such as normal/below normal and others
- Create a data bank that can easily be accessed and that is regularly updated
- Use social media other than the traditional TV, Radio, Newspaperschannels.

4 Pull-push technology

Effective information dissemination requires a combination of pull and push technologies. Under the push technology, the user has no control on when the information is received. Examples of push technologies include the TV, Radio, newspapers and bulletins among others. On the other hand, pull technologies allow the user to decide on when to get the information. The information is obtained on demand whenever there is need. From the results of efficient information dissemination, accuracy, timeliness and accessibility can be achieved through an integrated weather disseminations system that integrates both push and pull technologies.

5 Conclusion

Access to timely and accurate weather information has continued to be a challenge for people whose livelihood is dependent on such information. However, this will remain a challenge unless an integrated weather information system is designed to address the diversity in information detail, timing, accuracy and accessibility of weather information by different stakeholders. The weather dissemination system needs to be robust, efficient and dynamic in the way it handles and manages weather information.

A multi-channel weather dissemination system is needed to deal with different audiences while disseminating the weather information system. The desired system must be accessible, anytime, anywhere. The possible system is an online, mobile platform for weather dissemination. The platform requires voice, textual, graphical and analytical weather information. The information provided by the system can also be used to create advisories for the different sectors.

6 Acknowledgement

We would like to acknowledge the WIMEA Research team for their contribution during different meetings and data collection.

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