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Access and application of climate instruments in the Nigerian South West Zonal Research Extension Farmers Input Linkage System (Refils)

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Abstract

The study assessed the access and use of climate recording facilities by the stake holders in the Research Extension Farmers Input Linkage System (REFILS) in South West agro-ecological zone of Nigeria. Respondents for the study comprised participants in the REFILS workshop (from research institutes, colleges and faculties of griculture, Agricultural Development Programmes (ADPs), National Food Reserve Agency/Federal Ministry of Agriculture and Water Resources (NFRA/FMAWR), input agencies, NGOs and farmers). A structured questionnaire was used to collect data from 74 randomly selected participants out of about 250 participants present in the workshop. All the respondents (100%) believed climate change was real and not a myth and that climate records were relevant to their respective functions. Most of the research institutes and the ADPs had access to some weather/climate recording facilities. Some of the challenges to access and effective usage of instrument/facilities included poor funding, use of obsolete equipment and poor application. ANOVA test showed significant difference in respondents' of institution categories (research, extension and others) with respect to access ($F=8.611$; $p=0.000$) and usage ($F=19.048$, $p=0.000$) of climate instruments. The study recommends that all REFILS stakeholders should acquire relevant climate instrument/facilities for their use or source data where available as safeguard against adverse effect of weather or climate change situations.

Key words: Climate change, REFILS, stakeholders

Introduction

Weather is the state of the atmosphere at a place and time as regards heat, cloudiness, dryness, sunshine, wind and rain. Climate is the prevailing weather conditions of an area while climate change is the alteration or modification in the prevailing weather conditions. Climatic factors have not been adequately managed over the years and the effects manifest in various forms such as soil degradation, flooding, reduced rainfall, erosion, global warning/excessive heat, wind and rain storm, cyclones, delayed/short rains etc. Evidences of adverse situations now manifest around the globe to show that climate is changing Atungwu and Odedina, 2010; Nasiru, 2009).

Anuforom (2009) states that climate and agricultural resources are very closely related and as such any crisis situation in the agricultural sector notably food crisis, stands a great risk of becoming escalated by vagaries and extreme weather events like heat wave, drought and flood. Temperature aids biochemical processes and determine crop growth and development and air and soil temperature affect all the

growth and development. Solar radiation/cloud cover and sunshine duration, solar radiation, wind/air motion, soil moisture content and humidity affect crop and animals as well (Wheeler *et al.*, 2000; Deweerdt, 2007)

The instruments used to record weather data include;

- Hydrometer is a special type of instrument that measures the humidity by calculating the water vapour in the air.
- Rain Gauge - This is a container that collects precipitation and measured it in millimeters (mm).
- Barometer - These instruments measures the air pressure.
- Sunshine Recorder - The recorder is a chart which has the sun's rays focused onto it using a magnifying glass so it *burns* a record of the hours the sun shone.
- Maximum and minimum thermometers measure the highest and lowest temperature in degrees Celsius.
- Wind vanes show the direction of the wind.
- Anemometers are used to measure wind speeds, usually in km/h. The wind is caught in small cups and the speed is calculated by measuring how fast the cups rotate.
- Recording cloud type and cloud-cover is done manually, using the naked eye. Meteorologists measure cloud-cover in oktas.

Nigerian Meteorological Agency (NIMET) has the mission to observe Nigerian weather and climate and provide meteorological, hydrological and oceanographic services in support of national needs and international obligations (Anuforum, 2009). NIMET provides various agro-climate information services/products for managing hazards/food crisis which could not be said to be accessible to research and extension institutions let alone farmers. This is partly due to problems associated with ICTs usage as identified by Adebayo and Adedoyin, 2005; Arokoyo, 2005)

The observed variability in weather situation and associated hazards observed in Nigeria include drought, desertification, floods, declining rainfall, increasing frequency of heavy rainfall, and reduction in length of rainy season (Anuforum, 2009). The direct effects on agriculture have been loss of livestock, devastation of farmlands/infrastructures increasing food prices, rotting of food items, poor yields, emergence of new pests and disease vectors.

The basic challenge of climate change to agricultural extension practice is that relevant institutions in the Research Extension Farmers Input Linkage System (REFILS) set up could not be said to possess the relevant climate/weather recording facilities to enhance access and application of climate data/information which will subsequently be disseminated to farmers. If farmers possess the instrument/equipment/facilities they could be used to record weather parameters to guide them in making informed decisions and even give feedback directly to research or through the extension service. The REFILS stakeholders include practitioners in the Agricultural Research Council of Nigeria and the research institutes (ARCN/RIs) under their coordination as well as Agricultural training institutions, National Food Reserve Agency/Federal Ministry of Agriculture and Water Resources and Agricultural Development Programmes (NFRA/FMAWR/ADPs) including other programmes under their coordination, farmers, inputs agencies, non governmental organizations (NGOs), private sector, The research institutes (RIs) and the Monitoring and Evaluation sub programme of the ADPs are expected to have climate/weather recording facilities/instruments, take data and interpret for

subsequent use on the field for researchers and farmers. The information generated could be circulated in the system via various REFILS activities which include annual zonal workshops, zonal steering committee meetings, in-house review meetings, technology review meetings, staff trainings and REFILS stakeholders' meeting. These activities are for interactions of two or more stakeholders.

Stakeholders require climate recording facilities/equipment to provide data for analysis in order to forecast adverse conditions. This will ensure that mitigation and adaptation measures that are best suited for the different agro-ecological zones/local conditions in the country are sought. This is important because varying climatic conditions have implications for agricultural practices and potentials. It is against this background that the study assessed access and application of climate recording instruments among research and extension personnel in the set up of REFILS in south western Nigeria. The specific objectives included to:

- i) identify the climate instruments that are accessed by respondents;
- ii) examine the constraints to access and usage of the climate recording facilities

Study hypotheses

Ho (1): There is no significant relationship between respondents' personal characteristics and access to climate instrument.

Ho (2): there is no significant difference between respondents' institution types (research, extension, others) with respect to instruments access

Ho (3): There is no significant difference between respondents' institution types with respect to climate instrument usage/application.

Methodology

South-west agro-ecological zone of Nigeria is made up of eight (8) States- Delta, Edo, Ekiti, Lagos, Ogun, Ondo, Osun and Oyo. All the technical staff of agricultural research and extension institutions, agricultural input agencies, NGOs and about two farmers selected per state who featured in the 2010 Annual Zonal REFILS workshop constituted the population for the study. Sample was drawn through random selection of eighty participants who filled the structured questionnaire. Seventy four (74) copies of the questionnaire were retrieved. The questionnaire addressed personal characteristics access, usage/application and constraints to application of climate recording facilities among the respondents.

Access to nine (9nos) climate recording/measuring instruments was measured on a 3-point Likert type scale. No access (1), occasionally accessed (2), regularly accessed (3). Minimum score= 9, maximum=27 and mean score ≥ 2.00 = accessed.

Application/usage of nine (9nos) climate recording/measuring instruments was measured on a 3-point Likert type scale. Not used (1), occasionally used (2), regularly used (3). Minimum score= 9, maximum=27 and mean score ≥ 2.00 = used/applied.

Result and Discussion

Personal characteristics of respondents

Majority of the respondents were from extension institutions (70.3%). This is an indication that other stakeholders based in south western Nigeria, do not participate enough in REFILS workshop as much as the extension institutions. Majority were males (73.0%), had HND/B.Sc and higher educational qualifications (94.6%), with work experience of 11-30 years (56.7%). All the respondents (100%) believed climate change was real and climate records were relevant to their functions as agricultural research, extension, farmers, input marketers, NGOs. This is an indication that access and application of the instrument/facilities would be necessary.

Table 1: Personal characteristics

Characteristics	Frequency	Percentage	Mean
Institution type			
Research (RIs, Univ. etc)	12	16.3	
Extension	52	70.3	
Others (farmers=5, input dealers=3, NGO=2)	10	100.0	
Sex			
Male	54	73.0	
Female	20	27.0	
Marital Status			
Single	10	13.5	
Married	58	78.4	
Qualification			
SSCE/OND	4	5.4	
HND/B.Sc.	32	43.2	
M.Sc	30	40.5	
Ph.D	8	10.8	
Working Experience			
<10	20	26.3	
11-20	22	29.7	19.19yrs
21-30	20	27.0	
>30	12	16.2	
Experience with REFILS			
<5	6	8.1	
6-10	30	40.5	
11-15	16	18.9	
16-20	12	16.2	11.70yrs
21-25	6	8.1	
No response	4	5.4	
Climate change real			
Yes	74	100.0	
Relevance of climate records job/business			
Yes	74	100.0	

Respondents' access to and application of climate recording facilities

Table 2 shows that the respondents had little access to most of the climate recording instruments. Only cloud cover which was physically observed (mean=2.869) and thermometer or temperature-related data (mean=2.211) were regularly accessed by the respondents. The mean for recording cloud cover could have been high due to little or no cost involvement. Other parameters could have also been accessed by non cost involving methods where applicable hence the low mean score.

The overall mean application (1.521) of the instruments (Table 2) was lower than that of access (1.601). Only Temperature (mean=2.198) and cloud (mean=2.976) recording facilities were regularly applied.

Table 2
Mean scores of respondents' access to and application of climate recording facilities

Parameter/Instrument	ACCESS		USAGE	
	Mean score	SD	Mean	SD
Thermometer –temperature	2.211	.320	2.198	.524
Rain gauge-rainfall/precipitation	1.434	.476	1.303	.476
Hygrometer –humidity	1.275	.273	1.217	.271
Global Positioning System-various including soil properties	1.346	.203	1.249	.288
Anaemometer-wind speed	1.387	.169	1.263	.627
Cloud cover-physical observation	2.869	.204	2.976	.603
Sunshine- recorder	1.235	.391	1.192	.322
Wind vane-wind/air motion-direction	1.591	.378	1.259	.153
Solar radiation-recorder	1.064	.339	1.038	.492
Overall mean	1.601		1.521	

Mean score ≥ 2.00 =regularly accessed/applied

Constraints to effective application of climate instrument

Table 3 shows some of the constraints to effective application of climate instruments. The strongly indicated ones include cannot afford the facilities or cost to access (91.8%), no knowledge of NIMET services and products (89.8%), Inadequate funding by government/organization (77.0%), lack of technical know-how in operating equipment (66.2%) and respondent did not have time to access climate information (51.3%) which were indicated by more than 50% of the respondents. Inability to adequately apply the instruments/facilities was due to unavailability of most of them as a result of lack of funds to acquire them. The respondents had poor knowledge of NIMET climate information services which could partly address the data to generate from the instruments. This is an indication that stake holders might not have optimized their potentials at obtaining weather/climate data. This implies that early warning, mitigation and adaptation information/measures might not be readily available to the client system. This could adversely affect agricultural activities in the zone.

Table 7
Constraints to effective application of climate information and instrument

Constraints	Frequency	(%)
Inadequate fund to access facilities by	57	77.0
Irregular electric power supply	36	48.1
Obsolete weather recording facilities	4	59.4
Poor network/reception for electronic media	12	16.3
Cannot afford the facilities or cost to access	68	91.9
Wrong timing in climate information	6	8.1
Facilities were not available in my establishment	32	43.2
Do not have time to access climate information	38	51.4
Lack of technical know-how in operating equipment	49	66.2
No knowledge of NIMET climate services and products	65	89.8
Not readily available	34	45.9
No interest	18	24.3

*Multiple responses

Relationship between respondents' characteristics with access and application of climate instruments

Table 3 shows that only working experience was significant at 5% level to respondents' access ($r=0.362$) and application ($r=0.283$) of climate instrument with positive correlation. This implies that the more experienced the respondents were on their jobs/enterprise the more they accessed and applied climate instruments to obtain climate data/information. Educational qualification showed a negative but very weak and insignificant value with both access ($r=-0.006$) and application ($r=-0.013$). This is an indication that the less educated had more access to climate instruments which could be as a result of their roles as field workers. Experience in REFILS set up were strong values but not significant probably because access and application scores were generally low among the respondents.

Table 4
Correlation between personal characteristics and application climate instruments

Characteristics	ACCESS		APPLICATION	
	Correlation (r)	p-value	Correlation (r)	p-value
Qualification	-0.006	0.973	-0.013	.825
Working experience	0.362*	0.030	0.283	.046
Experience in REFIL	0.312	0.062	0.291	.066

* Significant at 5%level

Difference in respondents' access and usage/application of climate instrument to job by institution types

Table 5 shows that the analysis of variance (ANOVA) was significant for access ($F=8.611$; $p=0.000$) and application ($F=19.048$; $p=0.000$) of instruments in the institution types. This shows that there were significant differences in the means for the access and application of instruments to respondents' job among the institution

types. This was highest for research, followed by extension and then others. This could be due to the fact that climate parameters are crucial to agricultural research and extension while other stakeholders depend on the outcome of research and information from extension service.

Table 6
Differences in respondents' equipment access and usage by institution type

Institution type	No of cases	ACCESS			APPLICATION		
		Mean Score	F-value	Prob.	Mean Score	F-value	Prob.
Research	12	21.18	8.611*	0.000	20.96	19.048	0.000
Extension	52	16.36			11.31		
Others	10	10.67			9.67		

* Significant at 5%level

Conclusion and Recommendations

The study concludes the following;

- Climate instruments/recording facilities are relevant to stakeholders in south west Research Extension Farmers Input Linkage System (REFILS);
- Access to and application of climate recording instruments/facilities are poor among REFILS stakeholders however the experienced stakeholders access and applied the instruments more;
- Respondents' constraints to access and apply climate facilities include funding, knowledge and time related factors;
- Respondents from research institutions use climate recording instruments more than other stakeholders;

Based on the findings the following are recommended;

- Research Extension Farmers Input Linkage System (REFILS) activities in south west such as fortnightly trainings, monthly technology reviews and zonal workshops should report on weather/climate situation from as capture at different locations for the review period and relate such information to production/value Chain activities for the area covered;
- Adequate funding support should be given to institutions to acquire relevant facilities and NIMET agro-climatic information services should be widely publicized;
- Capacity building should be carried out to enhance ability of REFILS stakeholders to access and utilize relevant climate facilities and information.

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