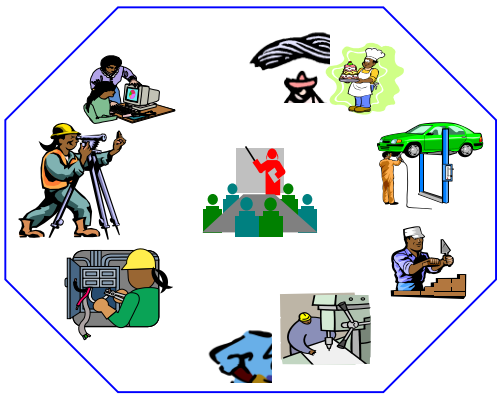

Crop Production

Level –III

Based on March 2018, Version 3

Occupational Standard

Module Title: - Observing and interpreting weather

LG Code: AGR CRP3 M04 LO (1-4) LG (16-19)

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East Africa Skills for Transformation and Regional Integration Project (EASTRIP

Contents

LG # 16	LO # 1- Check weather and climate information

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Checking weather and climate information
- Recognizing changed weather and climate situations.
- Anticipating impact of changes
- Making report of anticipated impact

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Check weather and climate information
- Recognize changed weather and climate situations.
- Anticipate impact of changes
- Make report of anticipated impact

Learning Instructions:

1.Read the specific objectives of this learning guide

2. Read the information written in the “information sheets 1 - 3 “. Try to understand what are being discussed. Ask your teacher for assistance if you have hard time understanding them.

3.Accomplish the” self- check” in Page 20

4. If you earned a satisfactory evaluation proceed to “information sheet 2”. However, If your rating is unsatisfactory, see your teacher for further instruction or go back to learning activity #2.

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Information Sheet -1 Checking weather and climate information

1.1. Definitions of terminologies

1) Climatology

It is a science that seeks to describe and explain the nature of climate, how it differs from place to place and how it is related to human activities. It deals with mean (average) conditions representative of long-term state of the atmosphere and its variability.

2) **Metrology**

Literally, it means a "discourse (study) on things above". It deals with day-to-day atmospheric conditions and their causes.

3) **Agro-climatology**

Abbreviated from agricultural climatology, can be defined as the science that deals with the aspects of climatology (*wind, rain, clouds and temperatures, etc.)* having a direct relevance to agriculture. Agro climatology is the study of climate and its effect on agriculture.

4) **Agro-meteorology**

It is abbreviated from 'agricultural meteorology'. Agro meteorology is defined as a science investigating the Metrologic, climatologic, and hydrologic conditions that are significant for agriculture owing to their interaction with the object and processes of

agricultural production. It is a branch of metrology, which investigates the relationship of plants and animals to the physical environment.

5) Climate

The process of exchange of heat and moisture between earth and atmosphere over a long period of time (month, season, and year) related to large areas (zone, state, and country, continent) results in conditions what we call **climate.** It is aggregate of atmospheric conditions involving heat, moisture and air movement. In other words, the totality of weather over a large area is known as climate. It is expressed as marine, continental, arid, semi-arid, humid or desert climate.

6) Weather

It is the day-to-day state of atmosphere and pertains to short term changes in conditions of heat, moisture and air movement. In other words, the instantaneous state of atmosphere can be called as weather. It is usually expressed as: fine, fair, foggy, cloudy, rainy, sunny or windy weather.

Table1.***difference between climate and weather are:***

WEATHER	CLIMATE
• Pertains to the day-to-day state of the atmosphere at a particular place. • Refers to specific instant of time and places • It is always changing and differs from time.	• Pertains to the atmosphere over a given region. • Large region and for a long period of time. • It is more or less stable and differs from region to region.

7) Macroclimate

Macroclimate is the climate of an extensive geographic region, such as part or all of a continent, hundreds to thousands of kilometers across. *Compare with* mesoclimate; microclimate.

Macroclimatology - The study of macroclimates, i.e. the climates of extensive regions.

Macrometeorology - The study of large-scale meteorological processes, such as those occurring over a large region, continent, or the whole Earth. These include monsoons, long-wave troughs, and the general circulation of the atmosphere.

8) Microclimate

Microclimate is **t**he climate of a small distinct area, usually in the lowest layer of the atmosphere above the ground surface, in which features of the surface, such as vegetation and buildings, influence temperature, humidity, and wind.

Different microclimates may occur at different layers within a plant canopy, or on either side of a building, for example. Such climates typically occur at scales of less than 100 meters.

Microclimatology deals with pertinent factors (solar radiation, temperature, wind, vapor pressure, carbon dioxide) of the environment in the zone lying between the highest level reached by the plants and the lowest depth to which air penetrates into the soil.

1.2. Weather

Weather is:-

- The day-to-day variation of the atmosphere's condition locally.
- Weather can change quickly.
- The weather is constantly changing day-to-day
- The mix of events that happen each day in our atmosphere

Weather reporters make daily predictions of weather conditions in your area. One day it can be sunny, the next day it is cloudy, and the next day it is rainy. The weather is constantly changing day-to-day. Just because it is summer, that doesn't mean that every day will hot - the daily weather varies. To prepare for your day, most people check the weather report.

Even though there's only one atmosphere on Earth, the weather isn't the same all around the world. Weather is different in different parts of the world and changes over minutes, hours, days, and weeks.

Most weather happens in the part of earth's atmosphere that is closest to the ground called the troposphere. And, there are many different factors that can change the atmosphere in a certain area like air pressure, temperature, humidity, wind speed and direction, and lots of other things. Together, they determine what the weather is like at a given time and location.

The scientific study of weather is called meteorology, and the people who study and predict the weather are m eteorologists. Meteorologists use different instruments to gather information about weather, such as a barometer, which measures air pressure. Air pressure changes when weather conditions change. Another weather instrument called an anemometer measures wind speed. A rain gauge collects and measures the amount of rain that has fallen. A lot of information about the weather is also gathered from satellites. Computers help scientists gather the information from the satellites to track weather patterns and make forecasts. A team of scientists and meteorologists work together to interpret the information and make predictions. In order to gather enough information, data must be collected over a large region.

Things that make up weather

There are really a lot of components to weather. Weather includes *sunshine, rain, cloud cover, winds, hail, snow, sleet, freezing rain, flooding, blizzards, ice storms, thunderstorms, steady rains from a cold front or warm front, excessive heat, heat waves and more.*

1.3. Climate

Climate is:-

- The year-by-year variation of the atmosphere's condition over a large area.
- The average weather usually calculated over a 30-year time period for a particular region and time period (2015 Weather Wiz Kids).
- Climate describes what the weather is like over a long period of time in a

specific area.

Different regions can have different climates. To describe the climate of a place, we might say what the temperatures are like during different seasons, how windy it usually is, or how much rain or snow typically falls.

It is determined by patterns of temperature, precipitation (rain or snow), humidity, wind and seasons (Washington State Department of Ecology).Knowing an area's climate helps people plan which types of crops to plant, where to visit on vacation, and what kinds of clothes to buy. The types of plants and animals that live in an area are also determined by its climate.

Some scientists define climate as the average weather for a particular region and time period, usually taken over 30-years. It's really an average pattern of weather for a particular region.

When scientists talk about climate, they're looking at averages of precipitation, temperature, humidity, sunshine, wind velocity, phenomena such as fog, frost, and hail storms, and other measures of the weather that occur over a long period in a particular place.

For example, after looking at rain gauge data, lake and reservoir levels, and satellite data, scientists can tell if during a summer, an area was drier than average. If it continues to be drier than normal over the course of many summers, than it would likely indicate a change in the climate.

1.4. Sources of Weather and Climate Information

Climate information is delivered through a range of media, which are mainly sourced from national and regional meteorological centers. The media range includes the Internet, facsimile services, television, radio, telephone services, newspapers, journals, and computer software packages.

The main source of weather and climate information is the National Meteorological Service (NMS). The NMS owns and operates most of the national infrastructure needed to provide the weather, climate, water and related environmental services for the protection of life and property, economic planning and development, as well as for the sustainable exploitation and management of natural resources. NMS can be

an Agency under the Ministry of Commerce, the Ministry of Transport, the Ministry of defence and rarely is under the Ministry of Agriculture. Although a typical NMS structure consists of various components, in this context the most important ones are:

- Observation and Data Collection Unit
- Data Collection
- Archiving and Processing Unit
- Forecasting Unit
- Climatology Unit
- Advisory service
- Agrometeorology Unit
- Products Dissemination Unit.

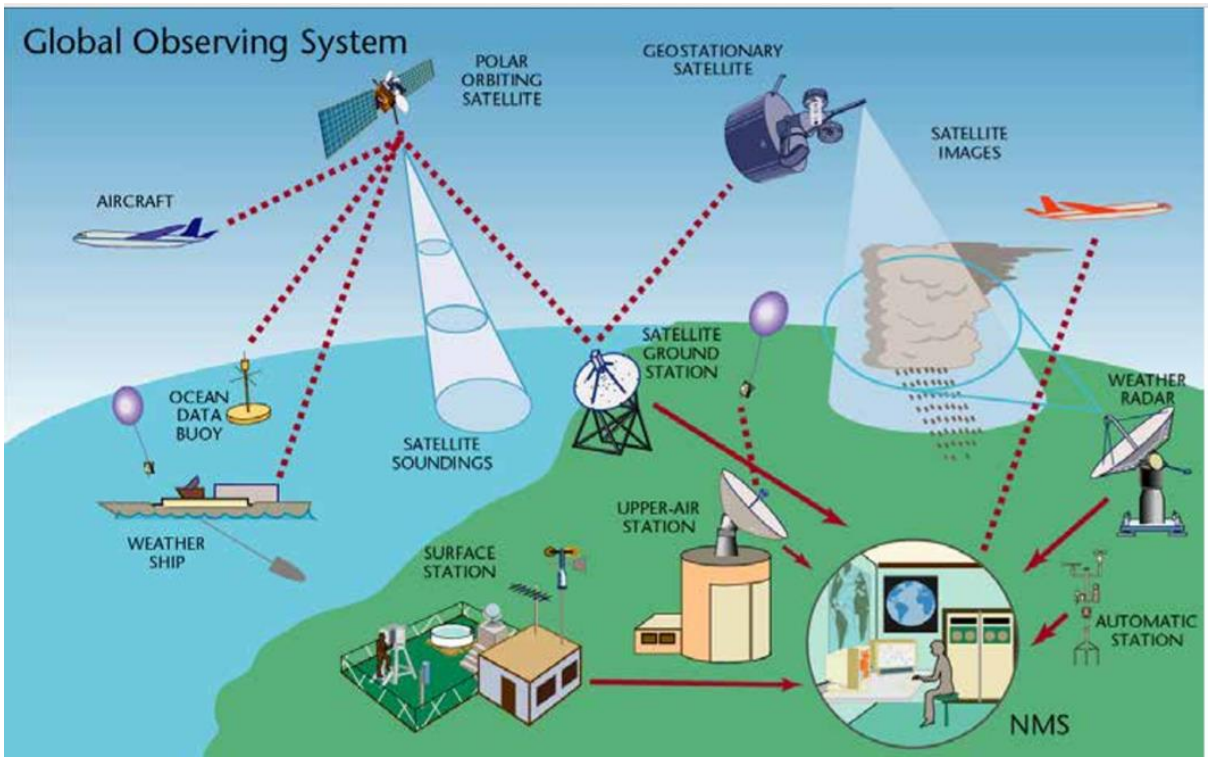
The observation and data collection unit provides the foundation for the entire operation of the NMS and in many countries, especially those with large areas and a small population may consume more than half of the total resources of the NMS. This unit involves the operation of surface and upper air stations networks, weather radar and of the operation of meteorological satellites, as well as the national contribution to and reception of worldwide data from the Global Observing System (GOS) of the WMO World.

The GOS is comprised of operationally reliable surface-based and space based subsystems and includes observing facilities on land, at sea, in the air and in outer space (Fig. 1). These facilities are owned and operated by the member countries of the WMO (i.e. the NMSs) each one undertaking certain responsibilities for the agreed global scheme so that all countries can benefit from the consolidated efforts. Weather and climate information provided by the NMS covers several products:

- Daily weather forecasts
- Monthly climate outlooks
- Seasonal climate outlooks
- Observed climate change signals
- Climate change vulnerability assessment maps
- Advisories/Alerts on extreme climate events such as:-

✓ droughts and floods

Figure 1. Schema of the national observing system as part of the Global Observing System



Source: http://www.wmo.int/pages/prog/www/OSY/GOS.html

1.5. Understanding the need to study agro meteorology

Why do we study weather and climate or in general, why do we worry about the atmosphere?

Have you ever thought about the ways in which the weather influences man?

1. Drought have been costing people's lives and properties
2. Floods frequently threatens lives on the earth planet
3. Navigable water also freeze in winter(causes delays in shipping)
4. Warm weather in winter attracts holiday maker to the coastal areas

Ice could melt and submerge a vulnerable areas (eg. fear for the tiny Netherlands, especially due to climate change) Such kind of influence of weather on humans, livestock, vegetarians, soil fauna and flora are studied using the science of climatology.

The main factors that have the strongest influence on crop production and need to be considered are in particular, those that influence crop growth and development. The two most important elements are temperature and water availability; in both situations daily and seasonal variations are common and temporal and spatial quantities are crucial.

The agro climatic zones help with the planning of agriculture on a regional or national scale and should include adaptations that may be necessary due to climate variability and climate change. Once the agricultural system has been established there are on-going operational activities that are also influenced by the weather and climate. Decisions related to these management practices can be made in response to the weather to optimize the production or minimize the risk of the farming systems. Climate information is commonly used for planning the crop season and for making strategic decisions, such as defining the crop, the variety, planting date, total water demand for irrigation and other; weather information is used for operational decisions such as the exact date to plant based on soil water content, whether to make an application, anticipate harvest (in case of forecast of rainfall), irrigation management and others.

1.6. Health and safety advice during bad weather

The main hazards during a storm are falling from a height, flying debris or falling objects. In particular, you should pay attention to the following:

- extreme care must be taken when working with wind fallen or damaged **trees**, they may be unstable with the risk of crushing for people involved in cutting and removing them
- avoid all work at height, do not consider going on any roof or near exposed edges, winds over 23mph (force 5) will affect a person's balance and increase the chance of falls
- stop work in places with a risk of falling objects or collapse of temporary structures, partially built structures or unsupported gable peaks
- remove or secure loose materials which may be blown and become a hazard
- access onto fragile roofs (such as corrugated iron, asbestos and PVC skylights) damaged during the storm should only be undertaken with

appropriate equipment to prevent falls through the roof

- if **electrical power lines** have been blown down or if there are any exposed electrical conductors, these must not be approached and Northern Ireland Electricity should be contacted on Tel 03457 643643
- check **scaffolding** is secured and adequately tied and if required provide additional ties or supports, following the storm the scaffolding needs to be inspected by a competent person before being brought back into use
- **cranes** should be inspected for damage prior to being brought back into service in accordance with the manufacturer's manual
- cranes should be placed in a safe out of service condition, in particular, Luffing jib cranes must be in free slew with the jib at a safe out of service radius, the manufacturer's manual should be consulted for advice on taking the crane out of service in high winds
- after the storm excavations and **partially completed structures** should be inspected for strength and stability

Self-check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Why do we study weather and climate?(2pts)
2. Define Agro meteorology (2pts)
3. Explain the definition of weather and climate. (4pts)
4. List some sources of weather and climate information. (2pts)

Note: **Satisfactory rating - 10points** **Unsatisfactory - below 10points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet 2-Recognizing changed weather and climate situations.

2.1. Recognize climate changes

Scientists expects climate change but what changes have they observed? Analyses of global observations of surface temperature show that there has been a warming of about 0.6°C over the past hundred years. The trend is toward a larger increase in minimum than in maximum daily temperatures. The reason for this difference is apparently linked to associated increases in low cloudiness and to aerosol effects as well as the enhanced greenhouse effect.

Climate variability refers to variability observed in the climate record in periods when the state of the climate system is not showing changes.

Climate change is a movement in the climate system because of internal changes within the climate system or in the interaction of its components, or because of changes in external forcing either by natural factors or anthropogenic activities.

2.2. Probable Causes of Climate Variability and Climate Change

The main known **external causes** and internal cause of climate variability and climate change are changes in **solar output**.

Internal Causes are:-

I.Greenhouse gase: Within the atmosphere there are naturally occurring *g*reenhouse gases which trap some of the outgoing infrared radiation emitted by the earth and the atmosphere. The principal greenhouse gas is water vapor. The others are carbon dioxide (CO2), ozone (O3), methane (CH4), and nitrous oxides (N2O). These gases, together with clouds, keep the earth's surface and troposphere warmer than it would be otherwise. This is the natural greenhouse effect. Changes in the concentrations of this greenhouse gases will change the efficiency with which the

earth cools to space. The atmosphere absorbs more of the outgoing terrestrial radiation from the surface when concentrations of greenhouse gas increase.

ii. Human activities are changing the concentrations and distributions of greenhouse gases and aerosols in the atmosphere. The main human activities causing an increase in greenhouse gases are the combustion of fossil fuels and deforestation by forest burning.

iii. Volcanic aerosols. Volcanic activity can inject large amounts of sulfur containing gases (primarily sulfur dioxide) into the stratosphere. Once reaching the stratosphere, some gases rapidly oxidize to sulfuric acid and condense with water to form an aerosol haze. Volcanic aerosols increase the planetary albedo, and the dominant radiative effect is an increase in scattering of solar radiation, which reduces the net radiation available to the surface/troposphere, thereby leading to a cooling. This can produce a large but transitory negative radiative forcing, tending to cool the earth's surface and troposphere for periods of up to two to three years.

The amount and speed of future climate change will ultimately depend on:

- Whether greenhouse gases and aerosol concentrations increase, stay the same or decrease.
- How strongly features of the climate (e.g. temperature, precipitation and sea level) respond to changes in greenhouse gas and aerosol concentrations.
- How much the climate varies as a result of natural influences (e.g. from volcanic activity and changes in the sun's intensity) and its internal variability (referring to random changes in the circulation of the atmosphere and oceans.

Enterprise and industry policies for monitoring weather and climate.

- Focuses not only on improving understanding, but helps to inform solutions for problems at local, regional, national, and global levels;
- Integrates diverse kinds of knowledge and explicitly engages the social, ecological, physical, health, and engineering sciences;

- Emphasizes coupled human-environment systems rather than individual human or environmental systems in isolation;
- Evaluates the implications of particular choices across sectors and scales so as to maximize co-benefits, avoid unintended consequences, and understand net effects across different areas of decision making;
- Develops and employs decision-support resources and tools that make scientific knowledge useful and accessible to decision makers;
- Focuses, where appropriate, on place-based analyses to support decision making in specific locations or regions, because the dynamics of both human and environmental systems play out in different ways in different places and decisions must be context-specific; and
- Supports adaptive decision making and risk management in the face of inevitable uncertainty by remaining flexible and adaptive and regularly assessing and updating research priorities.

Self-check–2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I: Multiple choices

1. Among the following one is not the internal cause of climate change (5pts).

A) Greenhouse B) Human activities C) Volcano D) None

Part II: Short answer questions

1. What are the causes of climate changes? (5pts)

_____

_____

_____

Note: Satisfactory rating -10 points and above Unsatisfactory - below 10points

Answer Sheet

Score = _____

Rating: _____

Information Sheet3- Anticipating impact of changes

3.1. Anticipating impact of changes

anticipated impacts of climate change include: sea level rise; ocean acidification; more intense droughts, flooding, and storms; more frequent hot and fewer cold extremes, resulting in increased frequency and intensity of heat waves; and more wildfires as well as extreme weather events. The magnitude of these effects will ultimately depend on what steady-state level of GHGs is achieved, and thus, what average temperature eventually results. It is important to note this is a process that will take thousands of years to achieve equilibrium, and there will be no “new normal” with regards to climate within the lifetimes of any human beings who are currently alive, nor will there likely be for tens to hundreds of generations.

All of these altered environmental conditions pose significant threats to the habitability of the planet, and the survivability of life as we know it. Indeed, the negative impact on Earth’s flora and fauna from climate change is already underway. It is estimated that up to 1 million species of plant and animal species are now facing the risk of extinction this century, and the current rate of extinction is already tens to hundreds of times higher than that seen over the past 10 million years (12). Besides this mass extinction, there have been five other major mass extinctions in the history of life on Earth. Alarmingly, four of these five mass extinctions have now been linked to the emissions of greenhouse gases from geophysical processes. There is nothing in the record of life on Earth to reassure us that humanity has any protected or sacred place in the evolutionary tree; our species will be vulnerable to climate change just as countless millions of other species have been and will be in the future.

Adverse Effects to Human Health

Anticipated adverse impacts due to the climate crisis that are specific to human health include: increased exposures to extreme weather events, including droughts, flooding, and extremes of temperature; altered food-, water-, and vector-borne infectious disease; reduced food, water and air quality; decreased food security; and

loss of access to healthcare resources due to political and economic instability, as well as due to mass migration. Some of the effects on morbidity and mortality include:

- direct effects, including death from heat, heat stress, and heat stroke
- direct injuries, loss of life, and depression and anxiety from extreme weather events
- poor air quality leading to respiratory complications (such as asthma, allergies) as well as cardiovascular disease
- poor water quality and lack of access to clean water leading to increased diarrheal diseases such as cholera
- food insecurity from rising levels of CO2 leading to decreased levels of protein, micronutrients, and B vitamins (and hence, nutritional quality) of rice, wheat, and other crops, as well as reduced yields of vegetables and legumes, in turn leading to under nutrition, stunted childhood growth, and vulnerability to non-communicable diseases
- Geographic spread of mosquitoes and other vectors that can disseminate diseases such as malaria, dengue, yellow fever, zika virus, etc.
- repercussions from climate-induced migration, including adverse mental health outcomes, lack of access to reliable healthcare, food and water and susceptibility to violence

Adverse Effects to Women

The populations who will feel the initial brunt of this climate crisis will be the most societally disadvantaged. These populations are invariably poor and are already living in environmentally marginal circumstances (18). Among such populations, women have been recognized as a vulnerable group, since in many parts of the world they lack adequate access to family planning services, educational resources, and sufficient income (19–21). Additionally, given the differing roles men and women play in most societies, as well as women's unique reproductive burden, climate change impacts are expected to have a differential impact on men versus women

(19–21). In many cases, adverse impacts are likely to be worse for women than men by widening health disparities that already exist in many parts of the world. Examples of adverse health effects to be felt disproportionately by women include (19–23):

- respiratory and cardiovascular disease from greater exposure to poor-quality air, especially due to particulate air pollution from both indoor sources (e.g., cooking and heating sources), as well as from outdoor environmental sources
- anemia and malnutrition from food insecurity and increased nutritional needs due to childbearing and menstruation
- physical and sexual violence, as well as anxiety, depression, and other mood disorders related to climate-induced migration and environmental disasters
- pregnancy-related complications (e.g., intrauterine growth restriction, preterm birth, congenital anomalies, stillbirth)
- lack of access to prenatal care, contraception, and family planning options

Climate change is of global concern for its effects on green growth and sustainable development. It threatens ecosystems and biodiversity, affects water resources, human settlements and the frequency and scale of extreme weather events, with significant consequences for food production, human well-being, socio-economic activities and economic output.

Policy challenges

The main challenges are to mitigate GHG emissions and stabilize GHG concentrations in the atmosphere at a level that would limit dangerous interference with the climate system, and to adapt to and manage risks from climate change. This implies implementing national and international low-carbon strategies and further decoupling GHG emissions from economic growth.

The Intergovernmental Panel on Climate Change provides a large consensus of scientific expertise that the global climate is now warming. This trend is primarily due to human-induced increases in concentrations of atmospheric greenhouse gases (GHG), particularly carbon dioxide (CO2). The observed and future projected rates of

warming appear unprecedented in the current interglacial period. Past changes in Earth's climate are known to have occurred in response to various processes operating at differing time scales.

It is now generally agreed that world climate will warm significantly over the next half century, but the effects of that warming on fishery resources are uncertain. Unpredictable changes in biological systems that result from perturbations such as climatic warming can be classified into four types: (1) changes that are consistent with current equilibrium models (predictions); (2) high-frequency, short-lived changes that cannot be predicted by current models (noise); (3) low-frequency, short-lived changes that cannot be predicted by current models (anomalies); and (4) low-frequency, long-lived changes that cannot be predicted by current models (catastrophes). Climatic change is a gradual process and the responses of biological systems are generally expected to be of the first type. However, increases in both the frequency and amplitude of the other types of response cannot be ruled out. The typical, incremental, remedial policy adjustment of governments and agencies is unsuited to uncertain changes in fishery resource dynamics of types 2–4, particularly those of type 4. An emphasis on mitigating the effects of climatic change is also likely to be unsuccessful because it focuses on the status quo and ignores opportunities that may be inherent in the changes taking place. Bolder policies that involve adaptation to new climate conditions and experimental probing of system behavior are more likely to be successful.

Self-check–3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What are the causes of anticipated impacts? (6pts).

2. What are the main police challenges of climate change? (4pts).

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet4- Making report of anticipated impact

At a time when responding to climate change is one of the nations most important and complex endeavors, the National Academies provides helpful analysis and advice to policymakers and stakeholders through its expert, consensus reports and other activities. The reports are produced by committees of the nation's top scientists, engineers, and other experts who are convened to address key scientific and technical aspects of climate change and other topics.

Self-check–4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Why necessary to making report of anticipated impact? (10pts).
2. What is anticipated impact? (5pts)

Note: **Satisfactory rating -15 points** **Unsatisfactory - below 15points**

Answer Sheet

Score = _____

Rating: _____

LG # 17	LO # 2- Interpret weather and climate information

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Monitoring weather and climate information and warnings
- Anticipating and assessing potential variations
- Identifying possible impacts on crops, livestock and work tasks
- Reviewing suitable preventative actions

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Monitor weather and climate information and warnings
- Anticipate and assess potential variations
- Identify possible impacts on crops, livestock and work tasks
- Review suitable preventative actions

Learning Instructions:

1.Read the specific objectives of this learning guide

2. Read the information written in the “information sheets 1 - 3 “. Try to understand what are being discussed. Ask your teacher for assistance if you have hard time understanding them.

3.Accomplish the” self- check” in Page 20

4. If you earned a satisfactory evaluation proceed to “information sheet 2”. However, If your rating is unsatisfactory, see your teacher for further instruction or go back to learning activity #2.

5. Submit your accomplished self-check. This will form Part of your training portfolio.

6.Read the information written in the “ information sheet 2”

7.Accomplish the" self- check" in Page 26

8. If you earned a satisfactory evaluation proceed to "information sheet 3". However, if your rating is unsatisfactory, see your teacher for further instruction or go back to learning activity.

Information Sheet1-Monitoring weather and climate information and warnings

1.1. **Monitoring *weather* and climate *information* and warnings**

Monitoring *weather* and climate *information* is the process of observing and understanding the atmosphere and other components of the earth system (like oceans).Example monitoring global climate indicators such as a temperature changes and rainfall pattern.

These observations are used across the world in monitoring and modeling the climate as well as in studies of the causes of climate change.

Its importance

- Accurate records: comprehensive monitoring allows us to produce accurate long term records of what is happening to the climate.
- Past, present and future comparison: comparing past and present climate and the changes which have taken place over thousands of years means we can get a better picture of what affects the climate and how it might change in the future.

The science of monitoring and studying the atmosphere and predicting its weather and climate is called meteorology.

Warnings can be derived based on observation on life-threatening weather situations for sever.

Storms *Floods*

Tornadoes *Extreme heat*

Hurricanes *Fire threats*

Self-check –1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I: Short answer

1) Why monitoring of weather and climate necessary?(6pts)

_____

_____

_____

Note: **Satisfactory rating - 6 points** **Unsatisfactory - below 6 points**

Information Sheet 2- Anticipating and assessing potential variations

2.1. Assessing potential variations of climate change

Assessments of climate change impacts, adaptation and vulnerability (CCIAV) are undertaken to inform decisionmaking in an environment of uncertainty. The demand for such assessments has grown significantly since the release of the IPCC Third Assessment Report (TAR), motivating researchers to expand the ranges of approaches and methods in use, and of the characterisations of future conditions (scenarios and allied products) required by those methods.

Four are conventional research approaches: impact assessment, adaptation assessment, vulnerability assessment, and integrated assessment. The fifth approach, risk management, has emerged as CCIAV studies have begun to be taken up in mainstream policy-making.

Changes in orbital geometry and variations in solar output and volcanic activity are often considered important drivers on the millennial to centennial and multi-decadal scales, respectively. Anthropogenic activities predating the Industrial Revolution (ca. 1800) may also have produced detectable changes in GHG concentrations. Since 1850, however, anthropogenic GHG forcing has become important enough to link to identifiable trends in global mean temperature, which exceed many of those attributable to natural forcing (e.g.,. Critically, during the next 50–100 years, global climate change caused by increasing GHG concentrations is anticipated to have major impacts worldwide.

Future warming, changes in precipitation patterns, and increased frequency and magnitude of extreme events are likely to affect the structure and function of most ecosystems and their capacity to provide food, fibre, and fuel to a growing global population.

The maintenance of these environmental services, through conservation efforts and sustainable land management practices, will be greatly challenged as the boreal zone responds to climate forcing. It can assess:

- Assessing historic hydrologic changes (example frequency, magnitude, and seasonal variation) can help in revealing ongoing process and high light factors to consider relative to climate change.
- It also help to identify what information best describes potential future condition for any given area, implies how will climate change affect specific locales.
- The premise of this study is that an assessment of historical weather observations can provide adscription of existing seasonal and spatial variability as well as trends that may be extrapolated into the future.
- To accomplish this objective, historic records of precipitation at several sites must be examined, focusing on changes in annual precipitation, rainfall intensity and seasonal patterns.
- It improves scientific understanding of the changing climate system and its impacts.

Self-check–2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Why assessing of anticipated impact is needed? (15pts)

Note: **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**

Information Sheet 3- Identifying possible impacts on crops, livestock and work tasks

3.1. Impact of changes in weather and climate

The reason studying climate and a changing climate is important, is that will affect people around the world. Rising global temperatures are expected to raise sea levels, and change precipitation and other local climate conditions. Changing regional climate could alter forests, crop yields, and water supplies. It could also affect human health, animals, and many types of ecosystems. Deserts may expand into existing rangelands, and features of some of our National Parks and National Forests may be permanently altered. Climate change is an example of how one change can lead to multiple impacts. As the average global temperature (i.e., global warming) increases due to an enhanced greenhouse effect, there are numerous and far ranging effects within the global climate system. These changes within the global climate system are collectively called climate change.

They include:

- increased evaporation of fresh and ocean water leading to increased atmospheric moisture;
- change in the amount and pattern of precipitation;
- variable temperature changes in specific climatic areas;
- change in overall distribution of normal weather events;
- increased intensity and frequency of extreme weather events;
- Change in wind intensity; and warming of oceans resulting in rising sea level.

Because the natural systems of Earth, including the global climate system, are complex and interconnected, the impact of changing one aspect of one system reverberates throughout all of Earth's systems. The impacts of climate change on natural systems are far ranging. For example, the impact on the water cycle includes changes in the size of fresh water reservoirs as seen by the melting of glaciers, ice caps, and permafrost and the evaporation of lakes; and increased amount of water vapor in the atmosphere, which affects the amount of solar energy that is reflected

back into space or absorbed within the atmosphere and increases the amount of precipitation. These changes can then have an effect on the global energy budget and subsequently the global climate system leading to further climate change.

In regards to ecosystems, the changes in regional climates are effectively changes in the abiotic components. Changes in temperature and precipitation patterns lead to shifts in the timing of seasons and thus reproductive timing of plants and animals as well as length of growing season. Shifts in water availability and temperatures affect species distribution (e.g. Location or range where found) and abundance (e.g., numbers of individuals in populations) due to loss/expansion of suitable habitat (e.g., melting permafrost in arctic). Some species may become extinct if they cannot adapt at a similar rate to the changes occurring, resulting in a loss of biodiversity, loss of pollinators and seed dispersers, and biological control of pests. As a result of the many and varied effects of climate change on natural systems, there will also be many ways in which human systems are impacted. Our resource industries, food and health systems, production and manufacturing systems, and infrastructure all will be affected.

3.1.1. Impacts on Agriculture

Humans have been interested in understanding and predicting the effects of climate on crop production since the rise of agriculture, because food production is critical to human survival. A classic Biblical example is in Genesis, where Joseph interprets a dream of the

Pharaoh's as a portent of seven coming years of good grain harvests followed by seven years of crop failure. Crop yields are strongly affected by changes in technological inputs such as fertilizer, pesticides, irrigation, plant breeding, and management practices, but the major cause of year-to-year fluctuations in crop yield is weather fluctuations. Agricultural crops are mainly sensitive to fluctuations in temperature and precipitation, although solar radiation, wind, and humidity are also important. In general a crop grows best and produces maximum yield for some optimum value of the relevant climate variable; as conditions depart from the optimum, the plants suffer stress. The responsiveness of yields, and therefore the financial return, to such inputs as fertilizer and pesticides varies with weather

conditions, so that it is prudent for farmers to make adjustments depending on the weather.

3.1.2.Impact of weather and climate on crops

- Climate change and agriculture are interrelated processes, both of which take place on a global scale.
- Global warming is projected to have a significant impact on conditions affecting agriculture, including temperature, CO2, precipitation and the interaction of these elements.
- These conditions determine the carrying capacity of the biosphere to produce enough food for the human population and domesticated animals.
- Higher temperature cause heat stress in plants. In some cases the plants do not reproduce at all since excessive heat causes sterility of the pollen(masculine reproductive part of the flower)
- There are different effects on plants due to abnormal temperature
    - ✓ Chilling injury(temperature above freezing point difficult for warm T^{O} adopted plants)
    - ✓ Freezing injury(temperature below freezing point of water, forms ice crystal)
    - ✓ Heat injury(extreme temperature)

Plant species and their reaction to climate changing:

With respect to their photosynthetic pathways, plants are grouped into three categories as C3, C4 and CAM. The C3 plants include small grain cereals such as wheat, barley, oats, rice, rye, all legumes, potato, vegetables and their tree formations; C4 plants include coarse grain cereals and grasses such as maize, millet, sugarcane; CAM plants include such as pineapple, which has very different photosynthetic mechanism. Since legumes belong to C3 group, their photosynthetic activity and net photosynthesis rate increases but water use efficiency decreases when CO2 concentration increases .but they are excessively affected by increased temperature. However, this situation is completely different for C4 plants. All plants in this group are significantly affected by increased temperature; they can die with a

small change in the CO2 concentration .The third group, CAM plants [e.g.Pineapple (*Ananas comosus* Merr.)], are not affected by temperature increases, as the CAM mechanism allows the plant to keep leaf stomata closed during the hotter parts of the day, thereby reducing loss of water through evapo- transpiration

Previous studies have indicated that climate change may have dramatic effects on the growth and development of field crops. Increased CO2 concentration increases the water use activity with the growth, especially in legumes. It was also pointed out that increase in CO2 increases productivity. However, positive effects are masked and negative effects will emerge due to increased temperature. There are many complex processes and interactions that determine crop yield under climate change. These metabolic events in plants depend upon mean temperature, the interaction between water stress and CO2 and the interaction between ozone (O3) and range of environmental variables.

The sensitivity of C3photosynthesis to temperature declines as plants become limited by CO2, much like the patterns exhibited by C4 plants.Like CO2, temperature has important phenological effects on plants and their responses such as time of decomposition, flowering (anthesis), N mineralization net photosynthesis, maintenance respiration, growth respiration, etc.

The effect of climate changing on productivity and cultivation of cultivated plants: Plants serve as indicators of climate change that can be compared with temperature measurements. In some cases, certain phases of plant growth and reproductive cycle are very sensitive to specific climatic factors. Increased temperature causes changes in the soil moisture content. This leads to the cultivation of plants, which are adapted to drier conditions. Species which can tolerate stressful environmental conditions in the era of climate change will be chosen; and this adaptation is likely to have a vital importance from the standpoint of plants breeding. Higher CO2 concentration leads to increased growth and transpiration rates. It leads to extension of the cultivation range of crops such as wheat, corn, legume, soybean and potato. This causes extra CO2 generation, which is used by the plants. In this process, called as CO2 fertilization, metabolic rates will increase and plants will age more rapidly, since temperature and the length of the

vegetation process are directly proportional and the shortening of the period between cultivation and harvest

Furthermore, productivity will drop and a vicious circle will emerge, since plants will produce too small dry matter. On the other hand, if the yield is desired to be enhanced, cool season cereals with "*vernalization*" requirement will be certainly affected negatively by temperature increases. As higher CO2 accelerates photosynthesis and its concentration is increasing, the productivity of C3 plants will not drop (generally) it will increase by 36% compared with 35-80% in legumes.

3.1.3. Impact of weather and climate on natural system

Regionally and globally our climate is changing. To fully grasp the implication of a changing climate upon Earth and ourselves, we need to have an appreciation of the range of natural systems and how they are interconnected. System thinking is the approach of studying the interactions amongst components within the context of a whole system, as well as the interactions between systems. Earth is composed of many natural systems with numerous interactions within and between these systems. Due to this level of complexity, one small change can lead to numerous significant changes in one or more of the systems. The main natural systems of Earth include:

- **Biological systems**, i.e., individuals, species populations, and communities;
- **Ecosystems**, i.e., the interactions amongst living organisms and physical and chemical factors in the environment;
- **Global energy budget**, i.e., flow of energy originating from the Sun into and out of Earth's systems;
- **Water cycle** (hydrological cycle);
- **Cycling of carbon**, **nitrogen**, and other elements or molecules (biogeochemical cycles);
- **Rock cycle**, i.e., geological processes; and the
- **Global climate system**, i.e., the interactions that create the climates and weather patterns throughout Earth.

Also, Earth can be divided into distinct physical zones or “spheres”, including the geosphere (the solid parts of Earth), the hydrosphere (the oceans and fresh water parts), the atmosphere (the area above the surface of Earth containing gases), and the biosphere (the living component). The natural systems often involve energy flowing and elements or compounds cycling through these spheres.

3.1.4. Impacts of Weather and Climate Changes on Human Activities

Choose a few true statements and brainstorm with the class how the impacts of climate change on natural systems may also affect our ability to meet our basic needs. Show the students the list of basic needs and associated natural systems created earlier. Also, remind students that in most human communities, access to these needs are facilitated by humans systems. Facilitate a discussion of how climate change will impact our lives. To end the discussion on a positive note, inform the students that governments and organizations are discussing how we can adapt to the changing climate and implementing new policies. As individuals, as well as communities, we can be informed, engaged citizens as well as take direct action to reduce greenhouse gas emissions as frequent mild, sunny weather. Their valuations of those characteristics may be expressed as a willingness to accept a somewhat lower real wage or to pay more for housing of comparable quality in order to live in a preferred climate.

Climates are tied to particular locations, so that when individuals decide to move them- selves and their productive activities to a certain place, they are also choosing the climate in which they will live and operate. For most economic activities, climate is only one of many factors influencing choice of location. For some activities, the characteristics of climate are a central factor in location decisions. The expected availability of snow is an important concern for the location of ski resorts. A sufficiently low risk of severe freezes is a critical consideration in the location of orange groves, and crop selection decisions and farm management strategies are heavily influenced by probable growing-season conditions.

The location of other industries is tied to the availability of particular natural resources. The lumber and paper industries require trees. Hydropower dams are located where stream gradients and rates of flow offer significant potential

generation. Fishing fleets and processing capacity are based to allow access to expected concentrations of commercially valuable fish. Such resources are themselves tied to climate. The connections are obvious for hydropower, where drought conditions can quickly lead to reduced generation. The impacts of climatic variations on the timber industry are less immediate, although prolonged droughts can significantly reduce the stock of healthy standing trees and often create favorable conditions for forest fires.

Self-check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I: Multiple choices

1. From the following on is a not natural system of earth. (2 pts.)

A. biological systems B. ecosystem C. rock system D. Nitrogen cycle

2. One of the following is physical zones or “sphere” of earth. (2 pts.)

A. geosphere B. hydrosphere C. atmosphere D. all

3. The changes within the global climate system are called (2 pts.)

A. weather change B. precipitation change C. climate change D. cloud change

4. The following statements are true about impact of climate change on natural system, except. (3 pts.)

A. it changes size of fresh water reservoir

B. it increase amount of water vapor in the atmosphere

C. it influence the amount of solar energy

D. it is not increase the amount of precipitation

5. Which of the following is/ are impact of severe weather on human activities? (3pts.)

A. it can damage property

B. It can cause loss of life and population displacement

C. it destroy agricultural crop yields

D. all

Note: **Satisfactory rating -12 points Unsatisfactory - below 12 points**

Information Sheet 4- Reviewing suitable preventative actions

4.1. Preventive action

A **preventive action** aims to correct a potential problem. Unlike a corrective action, which fixes the root cause of a current issue, preventive actions try to address problems before they happen.

While they may be implemented after an incident occurs in the workplace, these strategies don't always focus on what has already happened. Instead, they try to eliminate the cause of a *potential* issue.

Preventive actions are often less tangible than corrective actions. They don't always involve a visible, physical change, but are more behind-the-scenes instead. Some examples include:

- Implementing new training programs for employees
- Regularly reviewing and updating company documents such as policies, procedures, code of ethics or code of conduct
- Conducting internal audits
- Performing regular maintenance on equipment and machinery
- Establishing "alarms" in your work processes that alert you to impending problems
- Creating emergency plans for natural disasters, security breaches and other incidents

While it may seem easier to keep things as they are in your organization, change is often necessary to prevent issues. A quick annual review of your employee handbook costs a lot less time and money than dealing with internal fraud, harassment, accidents or other incidents.

The preventative action may include:-

- Provision of shelter
- Shedding animals

- Covering fodder
- Moving fodder
- Fire fighting equipment's
- Moving stock
- Preparing fire breaks and assured water supply
- rescheduling work tasks
- Operating sprinklers in order to cool animals in extreme heat.

4.2. Creating an Action Plan

In order to decide what preventive actions your organization needs, perform a risk analysis. This process identifies gaps, risks and potential issues that could arise from your processes. From there, make a plan of action to address each area of risk.

Self-Check 4	Written Test

Name: _____ Date: _____

Instructions: Answer questions listed below. Each question holds 5 marks.

1. What is a preventive action? (8pts).
2. What is the difference between preventive action and action plan? (4pts)

Note: Satisfactory rating 12 points and above Unsatisfactory below 12points

LG # 18	LO #3- Carryout preventive action

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Disseminating information and advice promptly
- Determining preventative action
- Implementing actions to minimize loss and damage
- Adjusting and revising livestock or crop management program and work schedules

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Disseminate information and advice promptly
- Determine preventative action
- Implement actions to minimize loss and damage
- Adjust livestock or crop management program and work schedules

Learning Instructions:

1.Read the specific objectives of this learning guide

2. Read the information written in the “information sheets 1 - 3 “. Try to understand what are being discussed. Ask your teacher for assistance if you have hard time understanding them.

3.Accomplish the” self- check” in Page 20

4. If you earned a satisfactory evaluation proceed to “information sheet 2”. However, If your rating is unsatisfactory, see your teacher for further instruction or go back to learning activity #2.

5. Submit your accomplished self-check. This will form Part of your training portfolio.

6.Read the information written in the “ information sheet 2”

7.Accomplish the” self- check” in Page 26

8. If you earned a satisfactory evaluation proceed to “information sheet 3”. However, if your rating is unsatisfactory, see your teacher for further instruction or go back to learning activity.

Information Sheet 1- Disseminating information and advice promptly

1.1. Disseminating information and advice to relevant person

Climate and ***weather*** play a vital role in many human activities such as

- ***Agriculture***
- ***Energy production***
- ***Disaster mitigation***
- ***Health.***

Providing timely and advanced information to prevent or avert disaster is important.

There is great need for a mechanism to provide timely and advance information to the local communities in dry land areas to help them plan for appropriate interventions to prevent or avert impending disasters. In the same way, forecasting production of the main food crops and livestock is an essential outcome of such

mechanisms for planning. This can be achieved through collecting, analyzing and interpreting data/ information on crop and livestock production, marketing, pricing and stocks in the affected areas. For this information to be useful, it should be:-

- Simple
- Properly interpreted and
- Disseminated in a timely and effective fashion through appropriate media.

Information can be disseminated through

- International Research Institute (IRI)
- Printed bulletins
- On the Internet

The most common means of dissemination is mass media, mainly television, radio and newspapers, whereas facsimile, telephone and pagers specifically target certain user groups; moreover, the Internet has increasingly gained importance in weather information distribution. These products represent the most common type of information to reach farmers to base their decisions such as planting dates, harvest date, etc.

Technologies and scientific advances in recent decades have not only provided us with a good understanding of the climate and weather but also a large variety of observations and forecasts that can help in our efforts to manage systems sensitive to meteorological events. Although such information is not exclusive in managing disasters, it is very useful in mitigating losses. There is great need for a mechanism to provide timely and advance information to the local communities in dry land areas to help them plan for appropriate interventions to prevent or avert impending disasters. In the same way, forecasting production of the main food crops and livestock is an essential outcome of such mechanisms for planning.

This can be achieved through collecting, analyzing and interpreting data/ information on crop and livestock production, marketing, pricing and stocks in the affected areas. For this information to be useful to the rural communities in dry lands, it

should be simple, properly interpreted and disseminated in a timely and effective fashion through appropriate media.

1.2.Current dissemination of climate information in bulletin form related to Climate Watches.

Since the early 1980s, many countries (e.g., USA, Australia, Japan, China, Peru, Brazil, and UK) have developed real-time operational activities to monitor and assess the state of the climate and to disseminate the information to interested users. Initially, the information was disseminated as printed bulletins, which took as much as a month to get to subscribers. During the last decade online versions for some of the bulletins have become available on the Internet, which has allowed for a near real-time dissemination of climate information. Most of the climate bulletins include information on the state of the ENSO cycle, which is a major cause of inter annual climate variability. Some countries now issue climate advisories or watches concerning the extreme phases of the ENSO cycle (El Niño and La Niña

Many countries have developed statistical and dynamical climate prediction techniques for the ENSO cycle. Discussions concerning those predictions are included in some of the climate bulletins and on several websites. Some centers provide free e-mail notification when products are updated. Some centers disseminate regional temperature and precipitation climate outlooks based on those climate prediction techniques. For example, the International Research Institute (IRI) for Climate Prediction, through its website, provides information regarding the state of the ENSO cycle, and outlooks for tropical Pacific SST anomalies and related global temperature and precipitation anomalies, which are based on several statistical and dynamical prediction techniques.

There are excellent sources of information on general weather, and this information is readily available. Information has value when it is disseminated in such a way that end users receive the maximum benefit from applying it. Areas of agricultural expertise that have prospered throughout the years are those with a product that is appreciated and used by farmers. Plant breeding, soil science, entomology, and plant pathology are areas that have been particularly successful. Each has some specific products that attract agricultural producers.

The opportunity for agro meteorological services will grow dramatically if the importance and economic benefits of agro meteorological service are demonstrated. A major challenge to agricultural meteorologists is to educate agricultural producers to use weather data in various management decisions.

The relevant personnel may include:-

- Other staff and colleagues,
- Owners and managers and
- Neighbors

Self-check–1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Explain the importance of disseminating information to local communities, especially in dry land areas? (4point
2. Compare and contrast previous and recent way of dissemination of climate information? (3 point)

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

2. Determining preventive method

2.2.1 Effect of climatic change on livestock

Our climate is changing, both naturally and due to human exploitation. There is already undeniable evidence that animals, birds and plants are being affected by climate change and global warming in both their distribution and behavior.

Unless greenhouse gas emissions are severely reduced, climate change could cause a quarter of land animals, birdlife and plants to become extinct. Climate variability and change affects birdlife and animals in a number of ways; birds lay eggs earlier in the year than usual, plants bloom earlier and mammals are come out of hibernation sooner. Distribution of animals is also affected; with many species moving closer to the poles as a response to the rise in global temperatures. Birds are migrating and arriving at their nesting grounds earlier, and the nesting grounds that they are moving to are not as far away as they used to be and in some countries the birds don't even leave anymore, as the climate is suitable all year round.

A sea level rise of only 50cm could cause sea turtles to lose their nesting beaches - over 30% of Caribbean beaches are used by turtles during the nesting season and would be affected. The already endangered Mediterranean Monk Seals need beaches upon which to raise their pups and a rise in sea level could there could damage shallow coastal areas used annually by whales and dolphins which need shallow, gentle waters in order to rear there small calves.

Humans have already destroyed many of the natural migrations of animal

The migratory journeys of Wildebeest in several African countries are stopped by fences. Changing rainfall patterns are causing dams to be erected in some areas of our planet, not taking into account the migratory fish and mammals that annually migrate up river to breed and spawn and water birds which rely on wetland sites for migration are at threat from rising sea levels caused by human effects. On the other side of the coin, the atmosphere is sucking moisture from the land at a greater rate than ever before causing severe droughts in many countries which are now facing reduced crop production and major drinking water shortages.

Although it is thought that no species has yet become extinct exclusively because of climate change, many migratory and non-migratory species are expected to become extinct in the near future.

Effect of climatic change on crops

The effect of climate changing on vegetation can be dramatic, due to variations in the amount of CO2 available for photosynthesis. Prior to the industrial revolution, the level of atmospheric CO2 was 270 ppm. It has exceeded 375 ppm in modern times and it is expected to reach 600 ppm during the 21st century

In addition to increases in CO2, the annual increase of CH4 is 1.0% and that of N2O is 0.3%, whilst tropospheric O3 also affects the situation. In addition, climatic factors such as temperature, precipitation, moisture and pressure affect the development of the plants, either alone or by interacting with others factors. climate warming due to an antropogenic increase in greenhouse gases is predicted to increase the earth's average surface temperature during the next 50 to 100 years. Consequences of increasing temperature in several organisms point to changes in physiology, time of life cycle events, and distribution of individual species with shifts toward higher altitudes or latitudes. Many ecological (carbon sequestration, nutrient & water cycles, species competition, pests & diseases, bird migration & reproduction & species interactions), agricultural (crop suitability, yield potential, length of growing season, risk of frost damage, epidemiology of pests & diseases, timing and amount of pesticide use & food quality) and socio-economic and sanitary (duration of the pollen season & distribution & population size of disease vectors) factors depend strongly

on plant and animal phenology. These, in turn, are increasingly influenced by climate change.

Various agricultural activities in the spring season are less affected by climate changing than in the summer season (especially blooming). The main reasons for climate changing are the automotive and petrochemical industries, emissions from factories, planes and cars, iron and steel establishments refineries, rice paddies over-use of nitrogen-based fertilizers erratic and/or insufficient agricultural applications, forest fires, devastation of natural vegetation and green spaces and burning of agricultural biomass (e.g., sugarcane & rice stalks, stubble). The effects of CO2 are most significant, since its overall contribution to climate changing is 300 times bigger than other greenhouse gases. On the other hand, ice on Greenland is melting (2000 to 2008, 1500 gigatons-one gigaton & 0.75 mm per year) but new research findings show that it is disappearing much faster than previously thought and this means that ocean levels are also rising more quickly.

A gradual increase in the earth's temperature results in the following events: big masses of ice are melting in the poles and accordingly biological diversity in the poles is disappearing. The melting of the polar ice caps releases very large amounts of fresh water into the oceans and a rise in sea level is predicted between 2-50 cm, Sea level rise may submerge some countries (e.g., Tuvalu Islands); it may lead some countries to build preventive structures (such as Dam) (e.g., The Netherlands), which provide revenue from the coastal trade, while some countries will have to take both long-term and short-term measures. Frequency of particularly "*hot and dry*" weather events has increased significantly following the trend on local and regional scale with an unpredicted dimension; water sources, dams, flora and fauna are negatively affected.

The range of various diseases and insect species has shifted in response to changing climate.The preventative action may include:-

- Provision of shelter
- Shedding animals
- Covering fodder

- Moving fodder
- Fire fighting equipments
- Moving stock
- Preparing fire breaks and assured water supply
- rescheduling work tasks
- Operating sprinklers in order to cool animals in extreme heat.

For example heat index can be used to determine the risk of heat related illness .what actions are needed to protect workers and when those actions are triggered. Depending on the heat index value, the risk for heat related illness can range from lower to very high to extreme.

As the heat index value does up, more preventative measures are needed.

Heat index value is divided into four bands associated with four risk levels.

- Less than 91^{o}F:- lower (caution)basic heat safety and planning
- 91^{o}F to 103^{o}F:- moderate implement precautions and heighten awareness
- 103^{o}F to 115^{o}F :-high additional precautions to protect workers
- Greater than115^{o}F:-very high to extreme triggers even more aggressive protective measures.

Develop an illness prevention plan

Step 1: develop a heat related illness prevention plan before heat index levels rise

Step 2: train workers before it gets hot

Step 3: track the weather for the work site daily and assess the risk the workers

Step 4: implement your plan when the heat index is at or above 80^{o}F.

- Provision of shelter, shedding sheep and moving stock,
- covering or moving fodder, fire fighting equipment and preparing firebreaks, auxiliary power, supplies, securing

Equipment and buildings, assuring water supply and rescheduling work tasks.

Self-check-2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I: Short Answer Questions

1. Preventive action includes:

_____

_____(10pts)

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

Information Sheet3_ Implementing actions to minimize loss and damage height

3.1. Reducing loss and damage of climatic change

The Bali Action Plan requires the Parties to address enhanced action on adaptation, including, inter alias, consideration of risk management and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance. Disaster risk reduction and strategies and means to address loss and damage associated with climate change. Impacts in developing countries that are particularly vulnerable to the adverse effects of climate change

Window Mechanism to Address loss and damage from climate change Impacts in SIDS and other developing countries particularly vulnerable to the impacts of climate change. This Multi-Window Mechanism would consist of three inter-dependent components:

1. Insurance Component
2. Rehabilitation/Compensatory Component
3. Risk Management Component

These three components play different and complementary roles and comprise necessary components of an integrated approach to risk reduction, risk transfer and risk management efforts. Taken together, the three components aim to enhance adaptive capacity.

1. Insurance Component

The Insurance Component of the Multi-Window Mechanism would assist SIDS, LDCs and other developing countries particularly vulnerable to the impacts of climate change in better manage financial risks associated with increasingly frequent and severe climate -related extreme weather events, such as hurricanes, tropical storms, storm surge, floods and droughts. These events already result in significant loss or damage and many hazards will be caused or exacerbated by climate change. Thus climate change impacts create an additional burden on SIDS and other particularly vulnerable countries. In many cases these impacts now exceed or threaten to exceed countries' adaptive capacities. Risk sharing and risk transfer mechanisms can reduce the vulnerability of developing country economies to these hazards. The

Insurance Component of the Multi-Window Mechanism would facilitate the development and implementation of financial risk management tools tailored to the needs of countries that are particularly vulnerable to the impacts of climate change, in order to facilitate the establishment of affordable, sustainable and equitable risk sharing and risk transfer mechanisms.

In many SIDS, insurance markets are undeveloped or almost non-existent; the scale, the physical infrastructure, data systems and financial infrastructure needed to support the engagement of the private insurance sector is lacking. In SIDS with more developed insurance markets, insurers respond to increasing climate -related risk by raising the cost of insurance premiums, or restricting or removing coverage œ the end result is less coverage and a decrease in ability to recover from extreme events. In the absence of tools to manage growing climate -related risk, SIDS face substantial challenges to their sustainable development from an inability to access credit for development and also an inability to speedily access capital in the wake of extreme weather events.

In recognition that SIDS face an additional burden resulting from the impacts of climate change, an internationally-supported mechanism is needed to assist impacted Parties in exploring and establishing appropriate and cost-effective mechanisms to manage the increasing financial risk associated with climate -related hazards. The Insurance Component would leverage private and public sector funds to enhance adaptive capacity. Greater access to conventional risk sharing and risk transfer instruments (such as risk pooling and assisted reinsurance schemes) and to innovative risk sharing and risk transfer instruments (including indexed-based mechanisms such as catastrophe bonds and weather derivatives), should assist SIDS in reducing the cost of insurance, in order to better equipped to manage the financial impacts of climate-related extreme events. Index-based approaches (e.g., using parametric triggers linked to wind speed or level of precipitation), may reduce transaction costs, information needs and typical challenges associated with insurance tools (moral hazard, adverse selection, etc.).The improved availability of cost-effective new and innovative insurance tools can provide cost savings, enhance financial and social security, increase adaptive capacity, improve coordination

between the public and private sectors in identifying, reducing and addressing climate -related risk, and support sustainable development.

The Insurance Component would work closely with the Risk Management Component to enhance for exposed sectors and infrastructure. Insurance tools, such as hazard mapping, can support risk reduction and risk management efforts. Similarly, improved risk management tools, including risk assessments and GIS mapping (supported by the Risk Management Component) can enable the expansion of private insurance markets and facilitate the development of innovative schemes. The Insurance Component could support risk reduction by creating incentives for the implementation of risk reduction measures. A degree of international support is needed to ensure that risk sharing and risk transfer mechanisms not only reduce costs on vulnerable countries, but also lift the burden of climate risk that would otherwise remain with the countries that have contributed little to the GHG emissions that have caused this increase in risk.

2. Rehabilitation/Compensatory Component

The second Rehabilitation/Compensatory Component is needed to address the progressive negative impacts of climate change such as sea level rise, increasing sea and land temperatures and ocean acidification that result in loss and damage (e.g., permanent or extended loss of useful land, damage to coral reefs, damage to water tables, loss of fisheries, etc.). Even with a range of new and innovative risk transfer mechanisms possible (through the Insurance Component), and risk reduction measures in place (through the support of the Risk Management Component), a measure of residual risk will remain. The UNFCCC Technical Paper on managing risk notes that even with the successful development and deployment of existing and new risk-transfer mechanisms, the vulnerable would still be at risk from climate hazards. Owing to the increased interdependence of global economy and society, impacts in poor and vulnerable regions could cascade throughout the world. It would therefore be cost- effective as well as equitable for the international community to contribute to managing these risks.“10 In this regard, the Technical Paper notes AOSIS‘s earlier proposal for an international insurance pool —to be

funded by developed countries to compensate small-island and low- lying developing countries for the otherwise uninsured loss and damage from slow-onset sea level rise“11 (emphases added).

The Rehabilitation/Compensatory Mechanism would address loss and damage from change climate risks that cannot be addressed under the Insurance Component or be minimized or eliminated through the Risk Management Mechanism and that exceed the adaptive capacity of particularly vulnerable countries. Rehabilitation/Compensatory payments could be triggered by changes in parameters relative to baselines. Parameters could include:

- Sea level rise
- Sea surface temperature
- Air temperature
- Precipitation
- Wind speed
- Soil salinity
- Ocean acidity

Loss and damage addressed should include:

- economic loss
- property loss and damage
- loss of life
- environmental damage (e.g., coral reef damage, salt-water intrusion, damage of fisheries, ecosystem damage)

Baseline data could be:

- rely on historical data where available (e.g., long-term averages of extreme event frequency or severity, precipitation)
- be established by Parties through risk assessments
- be based on data gathered by the Multi-Window Mechanism‘s Technical Advisory

The Rehabilitation/Compensation Component is closely linked to the Risk Reduction Component, which would provide resources to ensure that reasonable risk reduction measures are taken in light of the assessed risk. The Risk Reduction Component would also provide support for the tools needed to assess climate risk. This interaction between the Multi-Window Mechanism components recognizes the role of particularly vulnerable.

Developing countries in undertaking risk reduction efforts, as well as Convention obligations on the provision of funding to assist particularly vulnerable countries in meeting the costs of adaptation.

3. Risk Management Component

A Risk Management Component is the third integral component. This Component would provide advice and assistance to countries on risk management techniques, facilitate the provision of support for the collection of weather data and analysis, provide support to risk assessments, identify hazards, recommend appropriate investments in risk reduction and assist in building capacity to manage climate-related risk and reduce risk exposure. The Risk Management Component would provide both technical and financial support to risk reduction efforts in connection with climate -related extreme weather events (e.g., retrofitting buildings to withstand greater wind speeds, integration of risk assessments into planning processes, upgrading infrastructure).

It would also facilitate consideration of ways to reduce risk from the impacts of progressive negative impacts of climate change that result in loss and damage, including sea level rise, increasing sea temperatures, increasing air temperatures and ocean acidification, which have impacts on coastal infrastructure, shorelines, coral reefs, etc). The Risk Management Component would work closely with the two other Components within the Multi-Window Mechanism. Financial support for this component of the Multi-Window Mechanism would be drawn preferably from the Convention Adaptation Fund proposed by AOSIS. Funding could also come from the Adaptation Fund. Technical support could be contributed from a range of intergovernmental organizations, disaster management agencies and donor entities with relevant expertise.

Self-check–3	Written test

Name…… ID…… Date…….

Part I: Short Answer Questions

1. Discuss the components of multi window mechanism to address loss and damage from climate change impacts. (4point)
2. Briefly discuss rehabilitation/compensatory component. (3 point)
3. What are the loss and damage addressed by rehabilitation/compensatory component? (3pts)

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

Information Sheet4_ Adjusting and revising livestock or crop management program and work schedules

4.1. Adjusting and revising work task according to weather and climatic change

The Climate Change Adjustment Program is aimed at assisting primary producers who are likely to be affected by climate change, including those experiencing hardship caused by drought. The program assists farmers in obtaining professional advice, training and re-establishment assistance, and provides support to farmers to adjust their businesses to manage the impacts of climate change. Targeted training activities focus on areas such as whole farm planning, business and risk management, and understanding the implications of climate change. An advice and training grant of up to $5500 is available to eligible farmers and their partners, and may be used to receive advice and training from recognized professional advisers, registered training organizations, TAFE and universities. Grants of up to $150000, are available to eligible farmers who have considered their options and have made the decision to sell the farm and leave farming.

Self-check–4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I: Short Answer Questions

1. Why adjusting and revising work task according to weather and climatic change is necessary in crop production (10pts)?

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

LG # 19	LO # 4- Monitor weather and climate

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Accessing regular updates
- Reviewing viability of livestock and crop management practices and scheduling of work tasks
- Undertaking research on forecasting techniques
- Documenting and recording relevant information

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Access regular updates
- Review viability of livestock and crop management practices and scheduling of work tasks
- Undertake research on forecasting techniques
- Document and recording relevant information

Learning Instructions:

1.Read the specific objectives of this learning guide

2. Read the information written in the “information sheets 1 - 3 “. Try to understand what are being discussed. Ask your teacher for assistance if you have hard time understanding them.

3.Accomplish the” self- check” in Page 20

4. If you earned a satisfactory evaluation proceed to “information sheet 2”. However, If your rating is unsatisfactory, see your teacher for further instruction or go back to learning activity #2.

5. Submit your accomplished self-check. This will form Part of your training portfolio.

6.Read the information written in the “ information sheet 2”

7.Accomplish the” self- check” in Page 26

8. If you earned a satisfactory evaluation proceed to “information sheet 3”. However, if your rating is unsatisfactory, see your teacher for further instruction or go back to learning activity #6.

9.Read the “ operation sheet “ and try to understand the procedures discussed

10. Do the LAP test in page 30 (if you are ready) and show your output to your teacher. Your teacher will evaluate your output either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work. But if satisfactory, you can proceed to Learning guide 2.

Information Sheet1- Accessing regular updates.

1.1 Regular updates of climatic information

An overriding 83% of people wanted information about climate change delivered by the radio Government AM station. This indicate that Government radios by far the most cost effective way of information dissemination and educating people about climate change and the medium chosen by the people as the most convent to learn about climate change. The problem is penetration of radio to the remote areas.

Next important media are newspapers (through little penetration) and then DVDs (which almost zero penetration). However DVDs are extreme teaching aids during consultation/workshops. E.g title like “Ten things you and your family can do to adopt to climate change”

It would be use full to have a media task force comprising, Government Department, climate change action Group, NGO to coordinate media messages about climate change consultations/workshops are regarded as the most effective ways of bringing about adaptation in behavior (together with laws and their effective implementation).

Self-check – 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

I Multiple Choice

1. Why necessary to regular updating of climating information is needed?(5pts)
2. What is regular updating of climate information?(5pts)

Note: **Satisfactory rating -10 points Unsatisfactory - below 10 points**

Information Sheet2-Reviewing viability of livestock and crop management practices and scheduling of work tasks

2.1 Best management practices for livestock.

Best management practices (BMPs) are land management strategies that prevent or reduce the movement of sediment, nutrients, pesticides and other pollutants from the land to surface or groundwater. They are designed to protect water quality from potential adverse effects of land management practices from all locations within a watershed. Best management practices include soil and water conservation practices, other management techniques and social actions developed for a particular region as effective and practical tools for environmental protection. Best management practices can be used by homeowners, municipalities, farmers, industries, county, state and federal governments and agencies or anyone who manages or owns land. While BMPs are tailored to a particular land management situation and geographical location, they are implemented for the same basic goal of protecting our water resources. The focus of this fact sheet is on the use of BMPs on livestock farms.

What Are Some BMPs I Can Use on My Farm?

1. Low Cost BMPs

Soil testing allows for the nutrient content of pasture areas to be known with certainty. After testing your soil and receiving your free soil test report, you will know how much fertilizer to apply to each pasture. The benefits of precise fertilization based on soil test results can both save you money and protect the environment by preventing an over-application of nutrients and reducing nutrient losses from storm runoff.

2. Nutrient management plans (NMPs) are effective tools that provide a whole-farm systematic means of identifying water quality concerns and of evaluating the need for BMPs on each individual field. Trained professionals generally develop nutrient management plans.

Nutrient management plans have several components that allow farmers to efficiently manage fertilizer applications that save money while also protecting the

environment. A typical NMP has a pasture-by pasture inventory of soil fertility and a corresponding fertilization time, rate and placement for each pasture. A NMP will also contain a place for fertilizer application records and fertilizer application buffer areas. The use of a NMP will reduce nutrient losses in storm runoff from your pastures.

Utilization of warm- and cool-season forages can reduce sediment and nutrient runoff from pastures, and it can increase the length of the grazing season on your farm.

Stream fencing is implemented to prevent stream bank erosion and nutrient and sediment loss from the pasture.

Alternative water sources can keep cows out of riparian areas and the stream channel.

and can provide an alternate source of water for cattle. To increase their longevity, ponds should be fenced to exclude cattle. However, limited access by cattle to a portion of the pond is desired by many farmers. For more information and design specifications, check with your local conservation district and USDA-NRCS office.

Pasture fencing divides pastures and increases the number of grazing paddocks. This allows better utilization of forage by cattle and forage regrowth after grazing.

Cattle crossing on a stream. The crossing keeps the cattle out of the stream except at the time of crossing.

2.2. Reviewing viability of crop management practices and scheduling of work tasks

There are globally accepted management practices for agricultural crops. These management practices for agricultural crops yield results. They include the use of cover crops, crop rotation, intercropping, agroforestry, soil testing, record keeping,

proper water and irrigation management, pesticide and/or fertilizer management as well as tillage systems, amongst others. Paying close attention to these key issues in agricultural crop management would maximize crop yield, enhance soil quality, and ensure biodiversity conservation while minimizing general environmental costs.

The use of cover crops Cover crops are plants that are grown to stay low on the ground mostly during the off-season period to prepare the land for the plantation of cash crops. However, White opines that cover cropping could also be a second plantation of an unharvested crop in line with the cash crop. They play significant roles in sustaining agricultural produce in farmlands. They improve soil fertility and soil quality, prevent soil erosion as well as prevent nitrogen leaching or runoffs while improving the quality of water and sustaining microbial biodiversity in the soils. They supply essential nitrogen that aids in maintaining pH levels and reduce soil compaction.

Cover crops are 'deceitful crops' used in distracting pests from attacking the agricultural cash crops on the farm. Thus, the use of cover crops in agricultural crop plantation is recommended by many agriculturalists as one of the best and sustainable management practices for agricultural crops.

Crop rotation and intercropping Crop rotation and intercropping are some of the best agricultural crop management practices that have long been used in organic farming and now in conventional farming .Crop rotation are agricultural practices of growing different or dissimilar crops on the same farmland in different seasons. On the other hand, intercropping is a multiple cropping system whereby two or more crop species are planted simultaneously on the same farmland in one planting season.

Wind chill

If you go outside on a windy day, you may quickly find that the thermometer doesn't reflect how cold you really feel. This effect is what weather forecasters call the wind chill. Basically, the wind makes a cold day feel colder by wicking heat away from your skin. Although wind chill is well understood and easy to explain, it's not as easy to measure, and in fact there is no universally agreed-upon scale for describing wind chill.

Wind chill affects cattle

In northern climates where wind chill can be a big issue during colder months, planning ahead for winter weather can save money in reduced feed costs, reduced illness and health costs, less loss of body condition and better gains on young animals. If there are no natural windbreaks, artificial wind barriers can be created.

Impact of wind chill in combination with energy requirements for cattle during cold weather suggests there is value (in feed savings, well-being of the animals, etc.) if cattle are protected from wind when temperature drops below their thermoneutral zone (critical temperature)," he says.

The hair stands up, with tiny air spaces creating excellent insulation to hold body heat in and keep cold out. This hair "blanket" works well to keep cows warm — unless the hair gets wet and flattens, allowing moisture next to the skin. When animals get wet, they are as vulnerable to cold as if they were smooth-skinned. The wet in combination with cold is more stressful than just wind and cold.

efficiency and lowers your feed costs during temperatures below their critical point," says Ames.

Effects of prolonging dry period on pasture and animals

Grazing can be visualized as beautiful cows in lush pastures in north-western Europe or New Zealand-livestock in harmony with nature. Indeed, livestock can improve soil and vegetation cover and plant and animal biodiversity, as described in this chapter's case studies of widely different conditions in Kenya, the western United States and Guinea. By removing biomass, which otherwise might provide the fuel for bush fires, by controlling shrub growth and by dispersing seeds through their hoofs and manure, grazing animals can improve plant species composition. In addition, trampling can stimulate grass tillering, improve seed germination and break-up hard soil crusts.

However, many people associate grazing animals with overgrazing, soil degradation and deforestation.

Self-check–2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

I Short answer

1. What are the best practices that should be done during livestock productions?
2. What is crop rotation?

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

Information sheet 3- Undertaking research on forecasting techniques

3.1. Weather and climate forecasting

Weather forecasting products vary from place to place and from season to season, but they generally refer to the main weather elements affecting farm planning and/or operations such as: sky coverage by clouds, hours of sunshine, solar radiation, precipitation, temperature (maximum, minimum and dew point), relative humidity, wind speed and direction, extreme events (heat and cold waves fog, frost, hail, thunderstorms, wind squalls and gales, low pressure areas, different intensities of depressions, cyclones, tornados).

Three types of weather forecasts are prepared by the weather forecasting agencies in most of the countries of the world. These are the short-range forecast valid for 48 hours, the medium-range or extended forecast valid for five days, and the long-range or seasonal forecast valid from a month to a season. Each of these forecasts has a role to play in agriculture. Whereas short-range forecasts are most valuable in daily farm operations, medium range and seasonal forecasts are important in longer-term farm operations and planning. Based on these forecasts, farmers can make the best use of favorable weather conditions and adjustments can be made for adverse weather.

Types of Weather Forecasting

There are three types of weather forecasts such as:

1. Short-range forecast valid for 48 hours,
2. Medium-range or extended forecast valid for five days,
3. Long-range or seasonal forecast valid from a month to a season.

Each of these forecasts has a role to play in agriculture. Whereas short-range forecasts are most valuable in daily farm operations, medium range and seasonal forecasts are important in longer-term farm operations and planning. Based on these

forecasts, farmers can make the best use of favorable weather conditions and adjustments can be made for adverse weather.

3.1.1. Short-Range Weather Forecast (SRWF)

- SRWF is based on a detailed analysis of the physical processes occurring in the atmosphere.
- It incorporates information about current weather conditions and forecast information on high and low temperatures, wind velocity and direction, time and amount of precipitation, relative humidity, sunshine duration, and sudden weather hazards.
- This forecast information is available through television, radio, and newspapers and via the telephone from the forecasting agencies.
- The information is sufficiently accurate and can be effectively used for many field operations including spraying, nitrogen top dressing and preventing damage from frost.

3.1.2. Extended Weather Forecast (Up to Five Days)

- The basis for preparing extended forecast information is similar to that of the short-range forecast, but the forecast is not very detailed.
- An extended forecast contains generalized information including change of weather type, sequence of rainy days, extended wet and dry spells, and general weather hazards such as cold and heat waves.
- The forecast information is sufficiently accurate and available from meteorological centers.
- The extended weather forecast is most effective and useful in agriculture as it gives sufficient lead time for both planning and executing farm operations.

3.1.3. Seasonal Climate Outlook or Long-Range Weather Forecast

- A seasonal climate outlook or long-range weather forecast is essentially a statistical product relating past climatic data with phenomena such as Southern Oscillation Index and sea-surface temperature. Of late, coupled ocean-atmosphere general circulation models (OAGCMs) are being

increasingly used to make long-term forecasts by modeling the circulations and interactions of the ocean and the atmosphere.

- The seasonal forecast emphasis is on abnormalities in rainfall and temperature.
- Seasonal forecasts are prepared in every country by its national meteorological center.
- The products are available at the Internet sites of the respective organizations and can be obtained by fax as well.
- While using the forecast information, it is important to bear in mind that weather forecast accuracy is inversely related to the lead time of the forecast.
- The shorter the lead time, the greater the accuracy of the forecast. Weather forecasts for longer time spans become more and more generalized, and their accuracy decreases as the lead time increases. This happens because regional-scale changes in atmospheric patterns occur suddenly, which cannot be accounted for in the methodologies used for making long range forecasts. A 24-hour forecast is more accurate and comprehensive than a 48-hour forecast. A five-day forecast is less accurate and less specific than a 48-hour forecast. Similarly, a long-range or a seasonal forecast is much more generalized and less accurate than a five-day forecast.

3.2. Methods of Weather Forecasting

The following are the most widely used methods of weather forecasting that can be used.

Persistence

The simplest method of forecasting the weather, persistence, relies upon today's conditions to forecast the conditions tomorrow. This can be a valid way of forecasting the weather when it is steady state, such as during the summer season in the tropics. This method of forecasting strongly depends upon the presence of a

stagnant weather pattern. It can be useful in both short range forecasts and long range forecasts.

Use of a barometer

Measurements of barometric pressure and the pressure tendency (the change of pressure over time) have been used in forecasting since the late 19th century. The larger the change in pressure, especially if more than 3.5 hPa (2.6 mmHg), the larger the change in weather can be expected. If the pressure drop is rapid, a low pressure system is approaching, and there is a greater chance of rain. Rapid pressure rises are associated with improving weather conditions, such as clearing skies.

Looking at the sky

Along with pressure tendency, the condition of the sky is one of the more important parameters used to forecast weather in mountainous areas. Thickening of cloud cover or the invasion of a higher cloud deck is indicative of rain in the near future.

Now casting

The forecasting of the weather within the next six hours is often referred to as **nowcasting**. In this time range it is possible to forecast smaller features such as individual showers and thunderstorms with reasonable accuracy, as well as other features too small to be resolved by a computer model. A human given the latest radar, satellite and observational data will be able to make a better analysis of the small scale features present and so will be able to make a more accurate forecast for the following few hours.

Use of forecast models

In the past, the human forecaster was responsible for generating the entire weather forecast based upon available observations. Today, human input is generally confined to choosing a model based on various parameters, such as model biases and performance. Using a consensus of forecast models, as well as ensemble members of the various models, can help reduce forecast error.

3.3. Uses of weather forecasting and methods

In the modern world there is an increasing and persistent demand for more accurate and location specific weather forecasting.

The needs for the predictive information is many (from factories to farms and consumption), satellite launching station to commerce and industries.

Agronomic decisions guided by rain fall forecasts may involve:

- Selection of crop and varieties
- Adjusting planting density and fertilizer application levels
- *Allocation of area to a given crop (heavier soils could be more preferred if forecast is for dry conditions or more freely drainage soils if forecast is for the wetter condition).*

Forecasts are important for the farmer…onset dates, decision making like to sow, warnings …

Self-Check 3	Written Test

Name: _____ **Date:** _____

Directions: Answer all the questions listed below. Illustrations may be necessary to aid some explanations/answers.

1. Write three types of weather forecasts are prepared by the weather forecasting agencies (4pts)
2. Mention some of the use of weather forecasting in agriculture? (2pts) cause
3. List some of the preventative action taken (4pts)

Operation Sheet -Providing assist based on weather forecasting

To assist any one of the agricultural crop you should forecast the weather for agronomic decision.

Methods of forecasting

1. Persistent forecast.
2. Steady state (trend) Method/now casting.
3. Analogue method/predicting by weather type.
4. Climatologically forecast
5. based on climatology of the area

LAP Test

Practical -Demonstration

Name _____ ***Date***_____

Time started _____ ***Time finished*** _____

Instructions:

1. You are required to perform any of the following:

1.1. You will be go to the climatology of the area (weather station) in which it is found

1.2. You will be provided with the different instrument in the station

1.3. Then observe the instruments found in the station one by one

1.4. Recording data from your observation and try to forecast weather and climate based on one of the method given in the operation sheet

Information sheet 4- Documenting and recording relevant information

4.1. Documentation and Record Keeping

4.1.1. Importance of documentation and record keeping

Record-keeping and documentation are an important process that facilitates:

- Continuity of care
- Accountability
- Service improvement

1. Continuity of care. Records provide a case history and a more holistic picture in order to follow-up on services or try different approaches to assist the client. This is especially for clients with long-term or complex needs, or who require multiple services. Accurate and up-to-date recording is important especially when there is an emergency and the staff-in-charge is not available (due to illness, vacation, resignation, etc.). Good records and documentation will facilitate communication between service providers to ensure coordinated, rather than fragmented, service.

2. *Accountability*. It is important to be able to provide relevant client information at any given time and the organization's response to their needs. The information may be needed to respond to queries from stakeholders, who may include the client's family, funders, donors or the courts. One important source of information is the client records.

3. *Service improvement.* Well-documented records can also lead to improved services to the clients by helping the staff organize his/her thoughts. Aggregated client information can also facilitate service planning, service development and service reviews. The information can also form primary data to conduct evidence-based research.

Guidelines for documentation

Given the diverse nature, size and complexity of client needs and intended client outcomes, there may seem a myriad of information to document and store. What then should be documented?

1. *History and needs of client*. At the point of admission, detailed information on the needs and background of the client is documented during intake assessment.,

2. *Services rendered*. When the client is participating in the service/programme, information on services rendered is documented in the client's care plan.

Other key information to document, accompanied by supporting documents, is fees charged and subsidies received (for e.g., qualifying information for subsidies under means testing or other sources).

3. *Client outcomes*. Agencies should document client outcomes achieved or not achieved during periodic reviews, discharge or follow-up. Additional information may be derived from milestones achieved by the client or caregiver satisfaction surveys. The ability to produce documentation of clients' achievements further enhances the accountability of the programme.

4. *Programme*. Information Minutes of meetings, case conferences and email exchanges towards critical decision making are important to record. Such documentation, in addition to other sources of information, could provide a background to the reasons why certain proposals were accepted or rejected.

Best practices for documentation

Different staff would have unique writing styles according to individual preferences. To ensure consistency, it is best to bear in mind the following when documenting case notes:

1. *Concise*. Client notes should include only relevant information in appropriate detail, i.e. only provide information that is directly relevan*t* to the delivery of services *for* intended client outcomes. Staff should try to ensure minimal burden to the client and his caregivers by asking only required information and not asking for them repeatedly. With the client's consent, assessment history should be transferred and verified from a referring provider to the current provider instead of subjecting the client to repeated assessments.

2. *Accurate*. Besides providing accurate information, direct quotes from the client, caregivers or other professional staff (such as comments from psychologists or doctors) could be reflected if necessary to provide a full picture of the client. As the information may be shared with other agencies, the records must be legible; the

reference terms used must be consistent and the records free from jargon (meaningless words).

3. Up-to-date. Progress notes, crisis intervention or incident reports should be written as soon as possible after an event has happened to prevent loss of information due to time lapse. All significant facts should be recorded. Such reports should not assign blame on individuals and be free from irrelevant speculation or offensive, subjective statements.

4. Meaningful. The notes should capture thoughtful reflective thinking and professional judgment of the intervention and services provided.

Notes should distinguish clearly between facts, observations, hard data and opinions. Where opinions or professional diagnosis or 10 recommendation of a particular intervention is made; these should be properly acknowledged, dated and signed. Records requiring validation and authorization must be properly completed and signed.

5. Internally consistent. Notes should be structured according to a preset format that may be unique to each organization or professional group within the organization (for e.g., use of standard care and discharge plan templates). Acronyms used should be meaningful to all within the organization. Consistency and standardization helps to bring clarity to staff and reduces the time taken to search for vital information amidst the huge amount of client information available.

Guiding principles for record keeping

The following section provides some guiding principles for good record keeping practices in terms of record retention, transmission and destruction.

Record Retention

1. **Storing records**. Records can be stored as case files, log books, softcopy databases, etc. Agencies should take reasonable steps to ensure that client's records are stored in a secure location and are not available to others who are not authorized to have access. Agencies need to also have a policy on backing up of soft-copy data, access rights and security. Precautions should be made to protect soft copy records from electronic viruses or technical failure, and written records from damage due to fire, water or even rodents (e.g. termites).

2. Protecting records. Agencies should develop its own confidentiality policy to protect the client's written and electronic records and other sensitive information, and the obligations of all workers to abide by them. Agencies should seek to balance an individual's right to confidentiality with their right to services, care and protection.

***3.* Access to records**. When providing clients with access to their records, staff should take steps to protect confidentiality of other individuals identified or discussed in such records. Both client requests and rationale for withholding records should be documented in client's files. Sensitive and confidential information must be released only to authorized parties; with client consent, wherever applicable.

Transmission of information

1. *Maintain confidentiality*. Agencies should take precautions to ensure and maintain confidentiality of information transmitted to others through the use of computers, electronic mail, fax machines, telephones and telephone answering machines.

2. Consent. Human interest stories are essential for publicity or fund- raising. However, agencies should inform the clients on the purpose of the publicity, whether it is an interview or profiling clients in magazines or annual reports (including sharing of photographs). After giving the information, the agency should seek the client's permission. The client should be given the right to decline without being deprived of service.

3. Release of information. Agencies should not disclose sensitive information when discussing clients, whether with the media or to external consultants unless there is a compelling reason to do so.

Record Maintenance and Destruction

1. *Update of records*. Agencies should develop its own internal policy on time frames for update of records, including care plans, progress reports, incident reports, etc.

2. *Termination of service*. Agencies should store records following termination of services to ensure reasonable future access. As a general guide, case records should be kept for at least three years, and financial records, seven years. Agencies need to ensure that their record-keeping practices comply with all contractual, regulatory or legal requirements.

3. *Deceased clients.* Agencies should protect the confidentiality of deceased clients with the standards mentioned. The transferring or disposing client records should be conducted in a manner that protects client confidentiality and is consistent with government, contractual and any other regulation.

3.4.4. Reviews of records for service improvement

It is good practice to review records so that service improvements can be made. Hence, records should be reviewed periodically to establish:

- Whether assessments conducted were thorough, complete and timely.
- Whether clients were actively involved in making informed choices regarding services received.
- Whether clients were given appropriate services to achieve client outcomes.
- Whether the achievement of client outcomes could be improved upon.

Records for continuous improvement

Records will provide the primary data source for many uses. These include:

1. A study of the data of client outcomes to assess the impact of intervention and analyse areas for improvement
2. Further research in the area of evidence-based practice, to study the proven methods for the myriad and complexity of issues presented by clients.
3. Demonstrating of accomplished standards of practice for possible accreditation.

Record Formats

Standard record formats have been adopted for climatological data which are archived at minutely, fifteen minute, hourly, daily or monthly intervals. Each record consists of station identification, date and element number followed by the data repeated for each time interval. The datum for each time interval is recorded as a five (5) digit integer plus a leading sign field and a following flag field. The units and decimal position are implied by the assigned element number.

The five (5) record formats are:

Daily Record of Hourly Data (HLY) - Length 186

| STN ID | YEAR |MO |DY |ELEM |S| VALUE |F|
|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

This data is repeated 24 times.

Monthly Record of Daily Data (DLY) - Length 233

| STN ID | YEAR |MO |ELEM |S| VALUE |F|
|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

This data is repeated 31 times.

Annual Record of Monthly Data (MLY) - Length 98

| STN ID | YEAR |ELEM |S| VALUE |F|
|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|

Self-check–4	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

1. Why keep records? (2pts).
2. What should be documented? (4pts)
3. What do I have to bear in mind when documenting client information? (3pts)
4. How do I store and maintain records? (3pts).
5. Why review records? (2pts).

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