WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR BASIC SYSTEMS
OPAG ON INTEGRATED OBSERVING SYSTEMS

EXPERT TEAM ON
OBSERVATIONAL DATA REQUIREMENTS AND
REDESIGN OF THE GLOBAL OBSERVING SYSTEM
Seventh Session

Geneva, Switzerland, 12-16 July 2004

Distr.: RESTRICTED

CBS/OPAG-IOS/
ODRRGOS-7/Doc. 5.2

(1.VII.2004)

Item 5

Original: ENGLISH

REVIEW AND UPDATE OF STATEMENTS OF GUIDANCE

SOGs FOR AGROMETEOROLOGY

(*Submitted by the Secretariat)*

Summary and Purpose of Document

The purpose of the document is to inform the Expert Team of the revised Statement of Guidance for Agrometeorology.

ACTION PROPOSED

The meeting is invited to use this information when preparing updates to the Statements of Guidance.

STATEMENT OF GUIDANCE FROM AGRICULTURAL METEOROLOGY

Weather data are needed on a regular basis by the agriculture, forestry and fisheries sectors for both strategic and tactical applications. These data assist the land management agencies in a variety of projects such as monitoring air quality, rating fire danger, and providing information for research applications. The collection of agrometeorological data is critical for running different crop weather- yield models for the assessment of the state of the crops and for forecasting their yields.

Ground observations

Soil moisture and soil temperature

In addition to the standard weather elements ie., air temperature, precipitation, relative humidity, wind speed/direction and solar radiation, it is important to also collect soil moisture and soil temperature data at strategically located stations. These data are critical for monitoring drought, for satellite remote sensing ground truth procedures and for soil moisture model initialization and verification. Optimum monitoring of soil moisture requires measurements to depths of 50-100 cm every 5-7 days.

Snowmelt

Snowmelt from mountainous areas provide the principal source of irrigation water during the summer and it is recommended that these data be collected on a routine basis.

Phenology

Observations on crop phenology according to standard description of crop growth stages, along with the standard weather data, are crucial for a number of applications including crop management, especially pests and diseases and for use of crop models for crop yield forecasting.

Aeolian sedimentation loads

There is an increasing frequency of occurrence of sand and dust storms in different parts of the world and they carry considerable impacts on agricultural productivity in the near term and on soil productivity losses in the long term. It is essential to include measurements of aeolian sedimentation loads in the standard agrometeorological stations of NMHSs. It is also essential to include a routine and comprehensive analysis of wind speed and direction data and disseminate this information to the users. These data should be applied to analyze the impact of sand storms on agriculture. Use of air quality networks to aid in data collection on dust and sand storms may also be examined.

Satellite observations

Agricultural meteorology is one of the fields of hydrometeorology for which satellite data are very important. Agrometeorological parameters are very variable in time and space. Ground observations do not provide end–users with required spatial and temporal resolution. Information about large areas can only be obtained by remote sensing. The flow of data from new satellites such as Meteosat-8, Terra, etc. is much more informative which opens new areas for agrometeorological applications.

Leaf area index (LAI)

LAI is one of the principle variables sought from agrometeorological satellite data for use in crop simulation models. It is used for the assessment of the state of the crops. The spatial coverage is acceptable for the NOAA and Terra satellites (with an observing cycle from 5 to 7 days). The time of delay of up to 1 day is acceptable, which is met by almost all instruments. The horizontal resolution of 0.25–1.0 km is acceptable. The measurement accuracy is a drawback as all instruments are below threshold, so it is necessary to launch instruments enabling better techniques (more spectral bands in the visible and higher spatial resolution).

Vegetation type and cover

Majority of agrometeorological calculations, reviews, forecasts are prepared for specific crops. Present-day operational satellite imagery from visible and near infra-red channels offers good resolution and frequency, and marginal accuracy to detect crop type.

Fires

The current capability for detecting fires with satellites is not acceptable. No instrument meets all requirements. The EOS AM-1 and PM-l, NOAA, and METOP satellites are or will be marginally meeting requirements for monitoring fires, but it is necessary to solve problems regarding data delay (EOS) and data accuracy (NOAA, METOP). Geostationary monitoring of fires (GOES-8) is showing promise and indicating that a trade-off between spatial and temporal resolution can be made. Satellite images are widely used for evaluation of big enough forest fire areas or fire consequences.

Frost

The monitoring of frost conditions can be accomplished by remote sensing under clear sky conditions. Transient phenomena of this type require high frequency measurements (as high as every 15 minutes) with high horizontal resolution (better than 1 km). Geostationary satellites are optimum regarding frequency of observations (but they lack acceptable spatial resolution). Research polar satellites have adequate horizontal resolution (better than 100 m), but lack acceptable observing frequency. Currently monitoring frost by remote sensing can be obtained on large scales only. Local frost monitoring is not possible.

Soil moisture

Soil moisture is one of the most useful variables in agrometeorology. Optimum monitoring of soil moisture requires measurements to depths of 50-100 cm every 5-7 days, with horizontal resolution better than 100 m. Current active and passive microwave sensors determine soil moisture of upper few cm only with resolutions on the order of tens of meters for SAR systems and tens of kilometers for passive systems. Noting the usefulness of this parameter, even with the reduced resolutions of current measurements, some problems can be addressed.

Solar radiation

Incoming solar radiation is measured by geostationary satellites at an acceptable level. Diurnal changes of clear and cloudy sky conditions offer useful input to agrometeorological models.

Precipitation

Microwave imagers and sounders offer information on precipitation of marginal horizontal and temporal resolution, and acceptable/marginal accuracy (though validation is difficult). Satellite-borne rain radars, together with plans for constellations of microwave imagers, offer the potential for improved observations.

There are a lot of applications for precipitation estimation on the basis of cloud type detection. Such techniques are applicable only for specific territories and intervals in vegetation periods.

Phenology

Phase (stage) of plant development is a good indicator of biological time. Phases differ in such crop parameters as color, LAI, etc. On the basis of relevant techniques and available satellite data it is possible to detect principal phases for cereals (for example the so called “Green wave”). Current spatial and temporal resolution of satellite information is acceptable.

_____