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총 설

Internet-based RAMINS II as a Future Communication Framework for AgroMeteorological Information in Asia

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ABSTRACT

All the countries in RA II (Asia Region in WMO) welcome the establishment of a Web site dedicated to agricultural meteorology, because it is believed that the best way to improve and speed up the flow of information is the use of the Internet and the establishment of a Web site. In providing recommendation for the promotion and improvement of the AgroMeteorological service in RA II, a couple of key suggestions were proposed: (a) Exchanges of data and AgroMeteorological knowledge between member countries and between RAs, (b) Exchanges of experts between member countries as a necessary way to share the knowledge, and (c) Joint research between member countries to solve common problems in AgroMeteorological affairs. In order to meet the above requirements for RAII, an AgroMeteorological information network will be the most critical and dynamic aspect in sustainable agriculture in this region. In addition, the establishment of a Core AgroMeteorological station, recommended by CAgM of WMO, will require its own information sharing systems for communication among member countries. Inevitable use of information technologies (IT) such as information networks, databases, simulation models, GIS, and RS for regional impact assessment of environmental change on AgroEcosystem will be enforced. Thus, the regional Internet-based Agrometeorological information network has been in place since 1999, though all contributions to it have been volunteered by individuals, institutes, universities, etc.

Key words : **WMO, RAMINS, Internet, Regional Association, AgroMeteorology, IT, CAgM**

I. INTRODUCTION

1.1. Current status of AgroMeteorological Products in RAII

Many countries in RAII develop Agrometeorological products for their users on a regular basis. These products, mostly bulletins, are prepared in different forms in various countries because of independent development systems. The Agrometeorological weather forecast is one of the most important focuses of these products. In this context, short- and long-term forecasts bear particular importance.

For the provision of Agrometeorological information, many steps are taken from collecting raw data to final

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delivery to end-users. Depending upon domestic requirements and resources available, each country provides a region-specific set of Agrometeorological information in diverse ways and formats. Unique formats have been employed in their contents, the methods of delivery, etc.

Agrometeorological information also should reflect the requirements demanded by end-users, including receiving feed-back from them, and focus onto communication skills and methods. In addition, analysis tools, raw materials as well as human resources with appropriate expertise are required for successful Agrometeorological information development. Thus, any effort to make improvements on existing Agrometeorological products should include systems analysis of the whole scope of steps and methods that we should take during the production processes. The process of obtaining feedback is not carried out on a regular or systematic basis in the RAII member countries yet. Regarding data processing for AgroMeteorology, only a few countries are using advanced technologies such as GIS and modeling methods in operational service.

1.2. Implementations proposed by RAII members

Regarding recommendations for the development of data transmission, the member countries in the Region II have stated that for better use of agricultural meteorological information, data transmission and distribution should be accomplished through Web sites in the member countries on the Internet.

For those who cannot use the Internet, these data can be distributed through traditional methods. In any case, the data transmission networks differ among member countries. At present, some countries are completely modern and computerized, and others have not yet acquired the hardware and software facilities for quick data transmission. However, any promotion and development should be recommended considering the existing situation of the countries. Of course, all countries welcome the establishment of an agricultural meteorology specialized Web site. It is believed that the best solution for improving and speeding up the flow of information is the use of the Internet and the establishment of the Web site.

II. COMPONENTS OF AGROMETEOROLOGICAL PRODUCTS

The common features of Agrometeorological products include general descriptions of Agrometeorological characteristics of specific regions in terms of agricultural production and resource management. Depending on the requirements and priorities of end-users, the description details or expertise levels of the contents vary to a great extent. In general, due to the shortage of expertise as well as the limited space of bulletins, they have contained insufficient levels of quantity or quality of information. Despite of all these limitations, the essential components for a successful product can be identified as follows:

(a) End-Users
- Farmers, Associations, Extensions, Researchers, Policy-makers, General public

(b) Communication: Sharing, Dissemination, Feed-back

(c) Form: Digital / Document based : Bulletin, Brochure, Letter, Note, Leaflet

(d) Data Format: Text, Numeric, Table, Chart, Figure, Image, Map, etc.

(e) Methods: Phone, Fax, TV, Radio, PC-Network, Internet, Dedicated line, etc.

(f) Contents:
- Types: General, Advisory, Warning, Recommendation, Suggestion
- Weather/Climate/Forecast/Prognosis/Diagnosis information
- Extremes, Special Weather Phenomena, Energy Balance (Flux)
  (Flood, Drought, Frost, Heat wave, Fire, Landslide, Cold injury, etc.)
- Crop, Fruit, Grass, Forest, Animal Husbandry, Fishery
  (Growth, Development, Yield, Population, Reproduction, etc.)
- Disease, Insect, Pest, Weeds
- Farm Management
  (Cropping, Irrigation, Sowing, Harvesting, Post-Harvest, Spaying)
- Resource Management (Water, Air, Soil, Biome)

(g) Developers/Producers/Authors/Publishers/Editors
- Meteorologists, Agronomists, Entomologists, Ecologists, Agrometeorologists, Soil scientists, Virologists, Epidemiologists, etc.

(h) Raw Materials: Meteorological, Agronomical data, non-Agricultural data
- Observed, Processed, Derived, Estimated (inter-/extra-polated)
- NWP Model Outputs, Agricultural Model Outputs
- Domestic or Foreign Origin

(i) Tools: Statistical packages, Graphic tools, GIS, Simulation models
(j) Institution/Organization
- Meteorological, Agricultural, Hydrological, Others
- Research Institute, Extension Office, University, Private Sector, Cooperation
- Local, Central(Federal), Regional, Global Organizations

III. IMPLEMENTATION STRATEGIES FOR AGROMETEOROLOGICAL PRODUCTS

3.1. Strengthening of National Infrastructure

Overall performance of Agrometeorological bulletins can be evaluated in terms of their contribution to users' requirements in timeliness, effectiveness, feasibility, practical aspects, economic values, infrastructure enforcement, productivity, system stability, etc. Above all, the national priority on agriculture will be a critical driving force for a successful bulletin at a farmer's site or at governmental offices. Farmers' recognition of the importance of Agrometeorological information should be high enough for all information to lead to increases in productivity or the stability of agricultural production to a considerable extent. In order to meet users' requirements on time, there should be a sufficient number of experts available in almost all disciplines of Agriculture and other supporting disciplines such as computer technology, etc. Except for several developed countries, most countries suffer from a shortage of domestic experts in this regard. This necessarily leads to a poorer quality of Agrometeorological information. This problem lies in the fact that securing a sufficient number of experts looks non-feasible in many countries for the time being, because of limited resources and chances of educating or training to such a high degree of expertise in a short period of time.

3.2. Improvement of current system efficiency

The feasible alternative to infrastructure strengthening is to improve the efficiency of the current system for Agrometeorological products to such an extent as we can make better use of available resources at the moment. This can be partially achieved by enhanced expertise through intensive education and training of developers or information providers. They would then be capable of carrying out researches to develop more sophisticated applications after such education, even with limited sources of raw data.

Another way to improve Agrometeorological bulletins is to enhance the overall layout and design for better user-friendly interfaces with easily understandable formats. Many skills need to be elaborated for better weather observation, data retrieval, archiving, manipulation, management, analysis, hardcopy, publishing, etc. Various types of collaborations can be made to create a synergy effect in Agrometeorological products with related offices or institutes or organizations, domestically, regionally, and globally. Sharing of resources from different offices can contribute greatly to the strengthening of national Agrometeorological services: human resources with diverse expertise, hardware resources such as facilities and equipments, software resources, etc.

IV. INTERNET-BASED REGIONAL AgMet. INFORMATION NETWORK SYSTEM IN ASIA

4.1. Perspectives of Internet for Agrometeorological Products

(a) Promising communication network with/within End-users
- Better mutual understanding, trust
- More efficient applications at farmers' fields
- Facilitating communications within user groups

(b) Multi-directional interfaces for feedback from end-users
- Reflection of impending requirements
- Validation of applications

(c) Open frame for collaborations among agencies concerned
- Domestic
- Interregional
- International

(d) Cyber space for education and training on new technologies
- Diverse curricula for different communication levels
- Horizontal communication technologies within end-user groups

4.2. Background of Regional AgMet. Information Network

(a) Agrometeorological information is the most essential resource in Agriculture, thus, almost all agricultural activities are prone to changes in

weather and climate.
There is increasing demand for regional non-climate/meteorological data, for example surface vegetation and soil moisture status from the Agronomic sector and for better long-term climate forecasts

(b) AgMet information sharing among countries is the most critical and dynamic aspect in Sustainable Agriculture

(c) Establishment of a Core AgMet Station, recommended by CAgM of WMO (1999), will require own information sharing systems for communications among member countries.

(d) Existing WMO GTS will not be sufficient to meet this requirement in terms of Network performance because it is already suffering from traffic bottlenecks.

(e) Inevitable use of Information Technologies such as information networks, databases, simulation models, GIS, RS for regional impact assessment of environmental change on AgroEcosystems

(f) Willingness to share resources available among countries will be a promising way in solving Regional food security problems.

(g) Proposal made by RAII WG on Agrometeorology on 5. Sept. 1999 in Teheran, Islamic Republic of Iran.

(h) Considered as the next project of APAN Agriculture working group

4.3. Outline of the Proposal

(a) Objectives
- To establish a high performance communication network for Agrometeorological Information in Asia using the Asia-Pacific Advanced Network (APAN) at minimal cost
- To identify available resources and make them available to the public in the region with very high efficiency employing Distributed Object Architecture
- To provide diverse, Broker-based CORBA/IIOP interfaces that can mediate resources between the End-user and the Developer/Information Provider.

(b) Structures
- *Systems*
  Servers for Simulation models, Databases, System Analysis
  High speed network frame(APAN)
  Web interfaces for stand-alone simulation models with near real time DB access
  Multi-tiered Interface Architecture under distributed computing environment
- *Information*
  Existing DB : RS, Agronomy, Management, Climate, etc. (MAFFIN, FAO, IRRI, NOAA NCEP)
  Met Data resources : Synoptic data, Forecasts (S,M,L), Prognosis, Adaption data
  Development tools : Simulation models for climate, crop, resource management, root zone dynamics, farm management, etc.
  Derived Products : Climate change scenarios, seasonal- and interannual forecasts, crop growth and development, regional food demand/production, etc.
- *Interfaces*
  TCP/IP based Internet Web interface with GUI (HTTP/JAVA)
  Object Oriented Client/Server architectures free of OSs, languages, platforms, networks. (CORBA /RMI)
  Multi-directional communication networks between end-users and researchers
- *Operations*
  Contributions from member countries : Facilities, equipment, space, man power,
  Operational costs, hardware, software, upgrade, feedback, evaluation, etc.

(c) Affiliations
Collaborative/Joint Development by voluntary persons, institutes, regional organizations

Japan
- NARC: Core Secretary Office, General Administration
  Infrastructure/Architecture Development
- NIAES: Climate Change Information
  GHG flux Information
  Climate Change Impact Assessment Tools
  Crop-Simulation Models
- *MAFFIN: Center of Ag-Archives & Computer Management*
  Key Ag-DB and -Application Servers
  RS, Mesh Met data, Models, Library etc.

Korea
- KMA : Meteorological Information Provider
  World Climate Data(APCN)
  Long-term forecast data

Adaption Data
User Interface and Object Broker Technology Establishment

- RDA: Ag-DB and - Application Mirrors
Simulation model Servers
AgMet-Broker Provider
Statistical Analysis Tools

Regional Associations

- Joint AgMet Society in future
Asia AgMet Committee (Japan/Korea/China) :
- APAN: Communication Network Administration
Between Countries high- speed backbone
Other WGs : Information & Technology Advisory
AG-WG : Technical Committee for RAMINS II
- AFFITA: IT and User application Provider
at Regional level
as National Delegates
also responsible for domestic utilization
Operational Management of Object Brokers
Under the supervision by National Delegates
Operation and Management Committee

International Organization affiliated

- FAO: Ag-Information Provider
- *WMO: Meteorological Information Provider*
- Others: Ag-oriented Information Provider, Technical Advisors

4.3. Tentative Acting Plans

So far plans have been discussed on an individual basis, thus appropriate financial resources, a prerequisite for the successful establishment of this important network systems for Asian countries, have not yet been secured

(a) Identification of Available Resources ~ *2002. Dec.*
Database, Tools, Applications, Facilities, Networks, Interfaces, Experts, Funds, Others

(b) System Development *2003. Dec. ~*
Requirement Analysis, System Architecture Analysis, System Frame Design
Data Archives, Interface Development, Operational Tests

V. Conclusion

Agrometeorological products include general descriptions of Agrometeorological characteristics of specific regions in terms of agricultural production and resource management. Due to the shortage of expertise as well as the limited space of bulletins, insufficient levels of quantity or quality of information are available. Despite of all these limitations, the essential components for a successful product can be identified as follows: (a) End-Users, (b) Communication, (c) Form, (d) Data Format, (e) Methods, (f) Contents, (g) Developers, (h) Raw Materials, (i) Tools, (j) Institutions, etc.

Many countries in RAII develop agrometeorological products for their users on a regular basis. Most products are prepared in different forms in various countries because of independent development systems. For the provision of AgroMeteorological information, many steps are taken from collecting raw data to final delivery to end-users. Unique forms have been employed in their contents, the methods of delivery, etc.

Agrometeorological information also should reflect the requirements demanded by end-users, including receiving feed-back from them, and focus on communication skills and methods. In addition, analysis tools and raw materials, as well as human resources with appropriate expertise, are required for successful Agrometeorological information development. Thus, any effort to make improvements on existing Agrometeorological products should include systems analysis of the whole scope of steps and methods that we should take during the production processes.

Prospects of the Internet for Agrometeorological products can be summarized as follows: (a) Promising communication network with/within End-users, (b) Multi -directional interfaces for feedback from end-users, (c) Open frame for collaborations among agencies concerned, and (d) Cyber space for education and training on new technologies.

In order to identify the most promising way of regional collaborations for the improvement of Agrometeorological information services in RA II, based on Internet technology currently available, the Regional AgroMeteorological Information Network System in Asia (RAMINS II) has been initiated with the following objectives: (a) To establish a high performance communication network for AgroMeteorological Information in Asia using the Asia-Pacific Advanced Network(APAN) at minimal cost, (b) To identify available resources and make them available to the public in the region with very high efficiency employing Distributed Object Architecture, and (c) To provide diverse Broker-based CORBA/IIOP

interfaces that can mediate resources between End-users and Developer/Information Providers.

RAMINS II will consist of (a) Servers for Simulation models, Databases, System Analysis, (b) a High speed network frame(APAN), (c) Web interfaces for stand-alone simulation models with near real time DB access, (d) Multi-tiered Interface Architecture under distributed computing environment, with diverse information such as (a) RS, Agronomy, Management, Climate data, (b) Meteorological data resource : Synoptic data, Forecasts (S,M,L), Prognosis, Adaption data, (c) Development tools : Simulation models, (d) Derived Products : Climate change scenario, seasonal- and interannual-forecasts, crop growth and development, regional food demand/ production, etc. This system will be operated by contributions from member countries of facilities, equipment, space, man power, operational costs, hardware, software, upgrade, feedback, evaluation, etc.

REFERENCES

CAgM Working Group Report, (in press) Agricultural Meteorology Working Group on "Communication of Agrometeorological Information", Methods used in the countries belonging to the Regional Association II.

CAgM Report, (in press). Inter-regional workshop on improving Agrometeorological bulletins, 15-19 October 2001, Bridgetown, Barbados, WMO.

CAgM Working Group Report, 2000. Agricultural Meteorology Working Group on "Data Management of Agrometeorological Information".