Improving Agrometeorological Bulletins - Perspectives from Regional Association III (South America)

Manuel Carvajal[1] and Yumiko Marina T. Da Anunciação[2]

Introduction

In South America it is very important to disseminate information on the close relationship between climate, agricultural production and productivity. The NMHSs have the priority to make institutions and authorities working in the agricultural sector aware about this reality.

The agricultural and livestock yield are based on two conditions, the first is relative to the management of some resources and inputs (soil, crops, animals, varieties, breeds, agricultural labors, pastures develop, plagues and diseases control, irrigation, drainage etc.). The second is relative to the influence of climate, more like a manageable factor than a menace.

There is an urgent need to achieve efficient production systems to obtain high yields in a sustainable way. The development of efficient food security systems in each country around the world makes it necessary to use new technologies for more efficient use of natural resources while assuring at the same time their preservation for use by the future generations.

The remarkable development of the communications in the last decades, in particular the worldwide communication in the cyber-space through the Internet and the world wide web, changed the way the people look at their environment. It created opportunities for the exchange of knowledge and ideas, data, concepts and information, hence allowing a fast development in the knowledge area.

There is a need to create awareness in the people, scientists and authorities (decisions makers) about the importance of applying correctly

[1] Instituto Nacional de Meteorología e Hidrología (INAMHI), Iñaquito (700) N 36-14 y Corea, Casilla Postal 16-310, Quito, Ecuador
Tel.: (593) 22 436 910, Fax: (593) 22 433 934, E-mail: inamhi@inamhi.gov.ec

[2] Instituto Nacional de Meteorología (INMET), Eixo Monumental - Via S1, 70610-400 Brasilia-DF, Brazil
Tel.: (55 61) 344 3333, Fax: (55 61) 344 0700, E-mail: yumiko@inmet.gov.br

the meteorological data in the planning and sustainable development of the agricultural sector.

To achieve this goal, it is necessary that meteorological data associated with agricultural information be made available in an rapid, systematic and opportune manner. The agrometeorological bulletins, documents containing information of diverse meteorological parameters related with agricultural aspects, have been one of the most practical means in most of countries.

Background

The South America Regional Association (ARIII) has been established by 13 countries: Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Guyana, French Guyana, Paraguay, Peru, Surinam, Uruguay and Venezuela.

Twelve countries, with the exception of French Guyana have NMHSs. Nine countries have Agrometeorological sections, excluded Guyana, Paraguay and Surinam. The Agrometeorological Sections are organized:

- as a Department in most of the countries
- as an office in Peru
- as a Division in Brazil.

Methods and Materials

A survey was carried out by sending a questionnaire by Internet to all RA III countries. Some problems were encountered to contact Bolivia, Colombia, Chile and Paraguay and hence, no answers were received.

In the case of Bolivia, the questionnaire was sent by fax because the e-mail was wrong, but no answer was received. In the cases of Colombia and Chile, no answer was received, however we visited all the meteorological service web sites of these countries (IDEAM and METEOCHILE respectively) and, hence, some information was obtained.

As a consequence, not all the countries in RA III have been analyzed and they reflect the current condition of eight nations of South America.

Agrometeorological Bulletins

Issued Bulletins

All the countries issue Agrometeorological Bulletins, except Surinam and French Guyana. Most bulletins are carried out by NMHSs, with the exception of Ecuador (Ministerio de Agricultura y Ganadería (MAG) where an agreement exists with the Instituto Nacional de Meteorología e Hidrología (INAMHI)) within an International project with International funds (World Bank); and of Venezuela, which carries out the bulletin with their Instituto Nacional de Investigaciones Agropecuarias (INIA) with meteorological information provided by the National Meteorological Service.

Geographical coverage

Bulletins have a different geographical coverage (Table 1), with six of them covering the whole country, but at the same time some of them are made according to the administrative classification (states, counties, regions, etc.).

As can be seen from Table 1, none of the countries cover completely the country's surface, because there are some areas that are not appropriately analyzed for different reasons. The most common reason is the scarce agricultural production associated with the lack of meteorological/climate information due to the limited number of meteorological stations in the area.

	*1	2	3	4
Argentina		X		
Brazil	X	X		
Colombia	X	X		
Chile	X	X		
Ecuador	X	X	*X*	
Peru	X	X		X
Uruguay		X		
Venezuela	X	X		

*1 = National / 2 = Regional / 3 = Province / 4 = Department

Table 1. Geographical Covering of Agrometeorological Bulletins in South America (ARIII).

Frequency of issue

The frequency of issue of Agrometeorological Bulletins varies from one country to another (Table 2), the preparation of decadal bulletins (10 days) and monthly bulletins being the most common in Argentina, Brazil, Colombia and Chile. Ecuador and Peru cover both periods and Venezuela only monthly. This group is around 77%.

Daily emissions are made in Brazil, Colombia, Peru and Uruguay only for limited areas. Weekly issues are made in Colombia, Chile, Ecuador and Peru and in the case of Ecuador the bulletins are also transmitted by radio. In the mentioned countries, with the exception of Colombia, special advise bulletins are also prepared which are discussed further. Peru is the only one that issues an annual agrometeorological bulletin.

	*1	2	3	4	5
Argentina			X	X	
Brazil	X		X	X	
Colombia	X	X	X	X	
Chile		X	X	X	
Ecuador		X	X	X	
Peru	X	X	X	X	X
Uruguay	X				
Venezuela				X	

*1 Daily / 2 Weekly / 3 Decade (10 days) / 4 Monthly / 5 Annual

Table 2. Frequency of diffusion of Agrometeorological Bulletins in South America

Content

Climatological and / or Meteorological Information

The nature of information available in the agrometeorological bulletins of South America is given in Table 3.

In Argentina, Brazil, Colombia, Ecuador, Peru Uruguay and Venezuela (88%), the information presented is mainly meteorological: precipitation and extreme temperatures, associated in most cases with agricultural information, in particular in those issued daily and weekly.

	*1	2	3	4	5
Argentina		X	X		
Brazil	X	X	X		
Colombia		X	X		
Chile	X	X	X		
Ecuador		X	X		
Peru	X	X	X	X	
Uruguay		X	X		
Venezuela		X	X	X	

*1 Climate / 2 Meteorological / 3 Agriculture / 4 Livestock / 5 Markets

Table 3. Information available in the Agrometeorological Bulletins of South America.

On the other hand, the bulletins containing 10 days and monthly information include, besides rain and extremes temperatures, other meteorological parameters like wind (velocity and direction), relative humidity, sun radiation and/or sunshine. Data on ETP and atmospheric pressure are less common. In most of them, reference is made to humidity conditions versus crop water requirements like the humidity index and water balance might be applied.

The climatic information in the bulletins issued by Brazil, Chile and Peru (38%), include the description of climatic conditions and climatic behavior and their possible influence in the crop development. The forecasts of future climatic conditions for the following 10 days or month are presented (according to the frequency of the bulletin) based on tendency and historical information.

Agricultural information

References are made concerning phenological phases of crop development and how the climatic conditions could affect or will be affecting the crop development. The days for sowing and harvesting based on the agricultural calendar of each area are analyzed.

Special emphasis is made on some crops, which have been classified for the analysis as: 1) main crops a) short physiological cycle, b) perennial and 2) other crops.

1) Main crops:
   a) Short physiological cycle: corn, wheat, rice, soybean, barley, cotton, sorghum, beans and potato in Argentina, Brazil, Colombia, Chile, Ecuador, Peru and Venezuela.
   b) Perennial: banana, vine, coffee, sugarcane, oil palm and oranges in Brazil, Colombia Chile and Peru.

2) Other crops: mango, pineapple, cocoa, apple, peach, leguminous crops, olives, *Medicago sativa* (most of them are mentioned exclusivity in the Peru's bulletins and some in Chile's bulletin).

Peru and Venezuela are exceptions, as they are the only ones mentioning the *Medicago sativa*. Venezuela is a particular case because of its investigations made in the livestock area through the INIA. The other countries provide information about grasses but little about livestock, in the same way they do not provide information about the market and its behavior.

Final users

The principal target users are the general public, farmers and association of producers, technicians, authorities and commercial companies (Table 4). The country's entire information of public character is offered, mostly to guide farmers, associations of producers, technicians and authorities (Brazil, Colombia, Chile, Ecuador, Peru and Venezuela). Argentina is the only one sending information to commercial companies.

	*1	2	3	4	5	6
Argentina	X		X	X	X	X
Brazil	X	X	X	X	X	
Colombia	X	X	X	X	X	
Chile	X	X	X	X	X	
Ecuador	X	X	X	X	X	
Peru	X	X	X	X	X	
Uruguay	X		X			
Venezuela	X	X	X	X	X	

*1 Public character / 2 Farmers / 3 Association of producers / 4 Technicians 5 Authorities / 6 Commercial companies

Table 4. Final users of Agrometeorological Bulletins in South America.

Means of diffusion

Means of diffusion of agrometeorological bulletins is shown in Table 5.

All countries use the Internet (Wide World Web) for the diffusion. With the exception of Uruguay, all the NMHSs have their portals (Argentina, Brazil, Colombia, Chile, Ecuador, Peru and Venezuela). This is followed by diffusion through the written press like newspapers or magazines (Argentina, Brazil, Colombia, Peru, Uruguay and Venezuela), through the radio (Ecuador, Peru and Uruguay), by fax and only to specific users (Argentina and Uruguay), by mail with same approach that the previous one (Brazil and Peru). No country of the Regional Association uses the television as a means of diffusion of their Agrometeorological Bulletins.

	*1	2	3	4	5	6
Argentina	X	X		X		
Brazil	X	X			X	
Colombia	X	X				
Chile	X					
Ecuador	X		X			
Peru	X	X	X		X	
Uruguay		X	X	X		
Venezuela	X	X				

*1 Internet / 2 Press / 3 Radio / 4 Fax / 5 Mail / 6 Television

Table 5. Means of Diffusion in South America.

Preparation and / or associated diffusion

With respect to the question as to whether research or extension agencies participate in the elaboration and / or diffusion of Agrometeorological Bulletins, it must be mentioned that a complete participation exists in Argentina, Colombia and Ecuador and in the case of Peru these institutions are users.

The diffusion is carried out exclusively by other agencies in Uruguay and in Venezuela, where the bulletins are elaborated by the National Institute of Agricultural Investigations (INIA) and it is therefore considered that preparation and diffusion are shared. Brazil does not have any participation with other institutions.

New Technologies applied

The existence and availability of new technologies in the world made it possible that some countries of the region have implemented some of them. Geographical Information Systems (GIS) are employed in Brazil, Colombia, Chile and Peru and the use of specialized programs is common in Brazil, Colombia, Chile, Ecuador, Peru and Uruguay.

Application processes have been studied in Argentina; Satellite images are used in Brazil and numeric models are employed in Uruguay.

Economic analysis

The analysis of the economic contribution to the agricultural sector through the information edited in Agrometeorological Bulletins is unfortunately not carried out in any country of the Association.

With or without price to the user

In Argentina, Ecuador and Venezuela the bulletins are free, on the other hand in Peru and Uruguay they have a specific cost. The situation in Brazil is different, as some bulletins are for free distribution and others for sale, according to user's type. The price for the users in Colombia and Chile is not known.

Special advise bulletins

Special advice or alert bulletins are issued in Argentina, Brazil, Colombia, Chile, Ecuador, Peru and Uruguay, when the conditions of time or climate are adverse for agriculture and are specific for affected areas. Venezuela does not issue this type of bulletins.

Chile diffuses special bulletins for "cold hours" directed to fruit farmers (May -September) and decadal bulletins about the "degree days" for agricultural labor (October - March) only for certain regions of the country.

Shortcomings and Limitations

A summary of shortcomings and limitations is given in Table 6.

Bolivia, Colombia, Chile and Paraguay are not included in this point because no answer was obtained about the questionnaire.

	*1	2	3	4	5	6
Argentina	X	X	X	X	X	
Brazil	X	X	X		X	
Ecuador	X	X	X			X
Peru				X		X
Uruguay	X	X				
Venezuela	X	X	X	X	X	

*1 Human resources / 2 Economic Resources / 3 Information available
4 Equipment / 5 Specific Programs (software) / 6 Means of Diffusion

Table 6. Shortcomings and limitations identified in South America.

Lack of economic resources is an important constraint for the NMHSs of the region. In the particular case of Ecuador, the bulletins have been historically issued with external financial support (International Organizations, USAID and nowadays the World Bank), it would be needed to institutionalize the bulletin preparation.

Similar problems arise regarding human resources, because of the limited number of officials assigned and the lack of training in specific areas needed for the improvement of the content of bulletins. Limitations of human and economical resources is a constraint in Argentina, Brazil, Ecuador, Uruguay and Venezuela.

A common deficiency exists in quantity and quality of information; most of them are related to some meteorological parameters in certain areas, as the stations are insufficient to cover the entire surface dedicated to the agricultural production.

The limited agricultural information could be a consequence of the scarce participation with other institutions. The nations that consider this condition as an obstacle are Argentina, Brazil, Ecuador and Venezuela.

Among the limitations identified were the lack of equipment (Argentina, Peru and Venezuela) and the lack of specialized software (Argentina, Brazil and Venezuela). The type of system used for diffusion constitutes an obstacle for Ecuador and Peru.

Conclusions and Recommendations

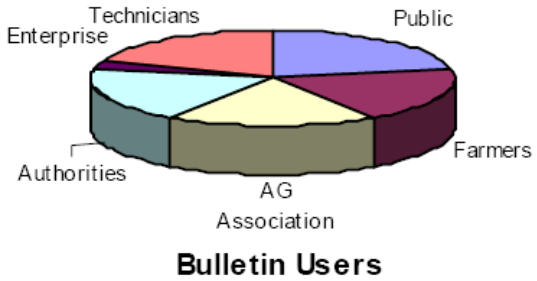
According to the present analysis and with the contribution of the countries sending their input on how they would improve their bulletins, the following alternative solutions were identified:

Training courses of technical assistance in:

- Standardization of methods, presentation, contents and diffusion,
- Application of new techniques for the elaboration and analysis of information,
- Identification of the type of information useful for the livestock sector,
- Aspects of vegetable physiology under adverse conditions,
- Implementation of new technologies like GIS, Radar, Images from satellites, GPS and mathematical / simulation models,
- Methods to foster /make the active participation of the users in the content and analysis of the bulletins,
- Systems or methods to analyze economic contribution given trough the agrometeorological information.
- Effective Administration of climatic, meteorological, agricultural, livestock data and their relationships.

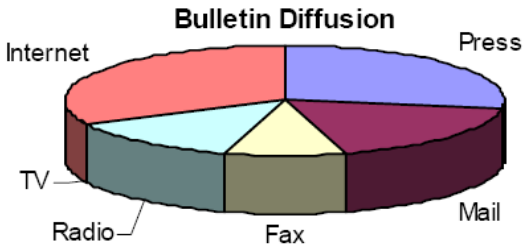
ANNEX I

Users	Countries
Public	8
Farmers	7
AG Association	7
Authorities	7
Enterprise	1
Technicians	7

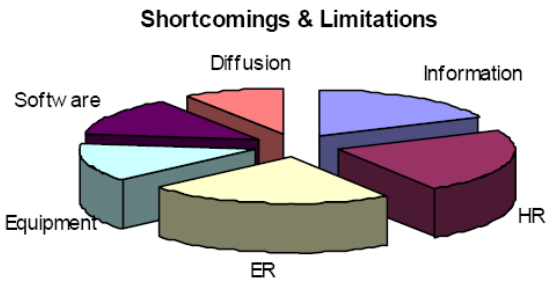


Bulletin Users

Diffusion	Countries
Press	6
Mail	4
Fax	2
Radio	3
TV	0
Internet	7



S & L	Countries
Information	4
HR	5
ER	5
Equipment	3
Software	3
Diffusion	2



ANNEX 2

South America - Regional Association III (AR III)

Country	Address	Contact
Argentina	Servicio Meteorológico Nacional Fuerza Aérea 25 de mayo, 658 Capital Federal	Mrs. Liliana N Nuñez agro@meteofa.mil.ar phone/fax: +54-114-514-4230/ 514-4257 www.meteonet.com.ar
Bolivia	Servicio Nacional de Meteorología e Hidrología (SENAMHI) Calle Reyes Ortiz, 41 Casilla n.10993 La Paz	Mr. Carlos Díaz Escobar phone/fax: +59-12-35-58-24/ 39-24-13
Brazil	Instituto Nacional de Meteorologia Ministério da Agricultura, Pecuária e Abastecimento Eixo Monumental Sul – Via 1 Brasília – DF	Mr. Alaor M. Dall´Antonia alaor@inmet.gov.br phone/fax: +55-61-343-2190/ 344-0700 www.inmet.gov.br
Chile	Dirección Meteorológica Ministerio de Defensa Nacional Casilla 63, Correo Aeropuerto Internacional Arturo Merino Benitez Santiago	General de Aviación Hugo Oliva Aupt dimetchi@meteochile.cl phone/fax: +56-2-676-3437/ 601-9590 www.meteochile.cl
Colombia	Instituto de Hidrología, Meteorología Y Estudios Ambientales Ministerio del Medio Ambiente Diagonal 97#17-60 Piso 1,2,3,7 y 10 DC Santafé de Bogotá	Mr. Carlos Castaño Uribe pablol@ideam.gov.co phone/fax: +57-1-635-6035 / 635-6130 www.ideam.gov.co
Ecuador	Instituto Nacional de Meteorología y Hidrología (INAMHI) Iñaquito 700(36-14) y Corea Casilla Postal 16-310 Quito	Ing. Nelson Salazar nelsonsd@inamhi.gov.ec phone/fax:+59-32-43-6910 43-3934

France Guyana	Meteo France BP 6022 97306 Cayenne	Mrs. Dominique Dago dominique.dago@meteo.fr phone/fax: +59-4-28-2153/ 28-2151
Guyana	Hydrometeorological Service Ministry of Agriculture 18 Brickdam Stabroek Georgetown	Mr. Dilip K. Jaigopaul dkjhym@guyana.net.gy phone/fax:+59-2-225-4247/ 226-1460
Paraguay	Dirección de Meteorología e Hidrología Avda. Mariscal López, 1146, 3er piso Casilla de Correo, 1131 Asunción	Ing. Henry B. Valiente Ramírez dmh@highway.com.py phone/fax: +59-521-22-2139
Peru	Servicio Nacional de Meteorología y Hidrología (SENAMHI) Jr. Cahuide 805, 4to.Piso Casilla Postal 1308 Lima 11	Mr. Gustavo Ebermann senamhi@senamhi.gob.pe phone/fax: +51-1-470-4085 471-7287 / 20-1950
Suriname	Meteorological Service P.O. Box 2273 Duisburglaan 1 Paramaribo	Mr. Cornelis R. Becker cbecker@sr.net phone/fax: +59-7-49-1143/ 49-0627
Uruguay	Dirección Nacional de Meteorología J. Barros Amorin, 1488	Mrs. Graciele Salaberry gsalaber@adinet.com.uy phone/fax: +59-82-400-7596 408-8476
Venezuela	Ministerio de La Defensa Aviación Servicio de Meteorología Apartado de Correos 2197 Edo. Aragua 2101-A Maracay	General de Brigada Francisco de Camargo Duque fax: +58-24-333-8043