

Perspectives from Regional Association III (South America)

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Abstract

It is known that agricultural production still depends on daily atmospheric conditions and the climate resource, among other factors, despite the fact that rapid technological progress had been made in the last years.

An adequate and appropriate awareness of the environment feature and the forecast of weather conditions allow guidelines to be established for decision making concerning planning and carrying out routine operational activities in agriculture. The National Meteorological Services, through their agrometeorological departments, are in charge of analyzing and interpreting the behavior of the various atmospheric variables and their impact on agricultural production and orienting the outputs of this process to the farmers in order to contribute to operational decision making and planning.

A summary of how the different agrometeorological services in the Regional Association III (RA-III) work and how they provide their operational services to the different users in each country is presented here.

Introduction

Agrometeorology relates the meteorological parameters with the life of animals and plants, and if used correctly, it can contribute to increased production and/or reduced damages caused by adverse meteorological phenomena to the agricultural activity. In recent years, at a global level, this branch of meteorology has been developed in an impressive way, due to such factors as the world food crisis, which has induced people to seek new techniques to increase agriculture and fishery production, enabling them to allocate greater financial resources to activities related to agriculture. In South America, where agriculture, fishing, and forestry represent 12 percent of the gross domestic product (GDP), adverse climate conditions are frequent. The need of users to know about these conditions has increased the demand for agrometeorological services and has led national meteorological services to incorporate operational areas dedicated to meet this need. Thus, nowadays, some services have gradually incorporated in their operational activities the preparation of short-, medium-, and long-term agricultural forecasts; early warning notice; and agrometeorological bulletins and advisories; and have developed agrometeorological studies with the purpose of contributing, through the use of appropriate tools and methodologies, to agricultural planning.

In order to know the evolution of weather and climate of a given place in a timely and reliable way (using a representative spatial range), it is necessary to have qualified staff and the necessary infrastructure to be able to obtain, compile, validate, analyze and store the data, in a way that it could meet the established expectations, especially if it will be used for the generation of services (WMO 2001).

The present work presents in a global way an outlook of the agrometeorological services established in the member countries of RA-III. It is based on a questionnaire suggested by the Agriculture Meteorology Division of WMO, slightly modified to obtain more information. Nevertheless, some brief responses didn't permit more detailed analysis.

The questionnaire was distributed by e-mail. Eight countries, from a total of 12 countries answered: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru, and Venezuela. They provided enough elements to identify the strong and weak points of the operational agrometeorological services in each country. In the case of Paraguay and Uruguay, responses obtained in a 2002 questionnaire were used.

Visualization of the Present Agrometeorological Services in South America

The Regional Association III (South America) consists of 13 countries: Argentina, Bolivia, Brazil, Colombia, Chile, Ecuador, Guyana, French Guyana, Paraguay, Peru, Surinam, Uruguay, and Venezuela (Figure 1). Twelve out of the 13 countries have meteorological services, except French Guyana.



Figure 1: Member countries of Regional Association III.

A high percentage of agrometeorological services in South America are part of the national meteorological services and depend, to a great extent, on the financial resources provided by the government; however, there are also some countries like Paraguay and Venezuela with agrometeorological units in institutions that are independent from the national meteorological

service. In the case of Paraguay; the Agriculture Research Directorate and Agrometeorological Program of the Ministry of Agriculture and Livestock is the institution that assumes the role of agrometeorological services. In the case of Venezuela, this role is assumed by the Agriculture Research Institute (INIA) and the Ministry of Environment (MARN).

Seventy percent of the national meteorological services, according to the survey (Table 1), have independent agrometeorological units concerning the operational aspects, and 100 percent of those consulted, financially depend on the governments funds, which makes them highly vulnerable to the budgetary allocation when the national economy is in crisis or when the governmental priorities change (WMO 2003).

National Meteorological Services with independent agrometeorological units									
Argentina	Bolivia	Brazil	Colombia	Chile	Ecuador	Paraguay	Perú	Uruguay	Venezuela
Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No

Table 1: National meteorological services with independent agrometeorological units.

The main users of the agrometeorological services generated in each country are, without a doubt, the individual farmers who benefit from these services in making decisions regarding daily agricultural matters, and/or planning at a medium term. In addition to farmers, current agrometeorological information is distributed through official institutions that use this information in their own management (ministries of agriculture, media, regional governments, forest corporations, agricultural and livestock services, students and researchers, and others).

Agrometeorological Products

It is important to note that some institutions, such as the National Meteorological Services of Argentina and Peru, publish all of their products through a web site in which is possible to get information of decadal water balance, decadal agroclimatic bulletin, evolution of main crops, status of the soil moisture, daily forecasts for agriculture, and processed satellite images.

The operational agrometeorological products provided by the National Meteorological and Hydrological Services in South America are mainly disseminated through regularly issued bulletins and agrometeorological announcements, such as daily forecasts and information on special events and warnings that in the specific case of Chile, refer to frost, forest fire, and vegetable diseases and pests. The last one mentioned was suspended after a decade of issuing warnings, due to the lack of information related to the insects caught in the farms where this activity occurred.

Generally speaking, national agrometeorological services, of the member countries that were consulted, incorporate within their functions the elaboration of studies and research to support the agricultural sector. For example, the National Meteorological Service of Brazil disseminates information in support of the agricultural reform and subsistence agriculture. Chile elaborates on agricultural zoning of some regions, and provides these to the INIA, and Regional Secretariats of the Agriculture Ministry. Peru elaborates agroclimatic studies for different regions that are useful to farmers and decision makers and persons involved in planning. Bolivia carries out these activities cooperating with research institutions, etc.

In general, all the Agrometeorological Services consulted in South America provide severe weather events forecasts, but only 30 percent of the Services elaborate the assessment of the impacts caused by these events (Table 2).

	Argentina	Bolivia	Brazil	Colombia	Chile	Ecuador	Paraguay	Perú	Uruguay	Venezuela
Issuing regular agrometeorological bulletins and advisories	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issuing early warnings/alerts as appropriate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Helping with strategic studies, (agroecological zoning)	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Assessment of the impact of extreme events, e.g., floods, cyclones etc.,	Yes	Yes	No	No	No	Yes	No	No	No	No

Table 2: Operational agromet services provided by meteorological & hydrological services in South America.

The evaluations are carried out in general by other organizations or are private or governmental like the Ministries of Agriculture or the Interior; with the exception of the Agrometeorological Service of Argentina, Ecuador, and Bolivia, which carry out these evaluations.

Sixty percent of the countries consulted (Argentina, Brazil, Ecuador, Paraguay, Peru, Uruguay) generate services that contribute to natural disaster reduction. Thus, for example, concerning early warnings, the totality of the Services provides some form of aid to the agriculturist by means of warnings related to precipitation events (excessive rain, hail, and drought), conditions of wind outside the normal ranks, eruption of warm or cold air masses abnormally (frost, heat waves), etc.

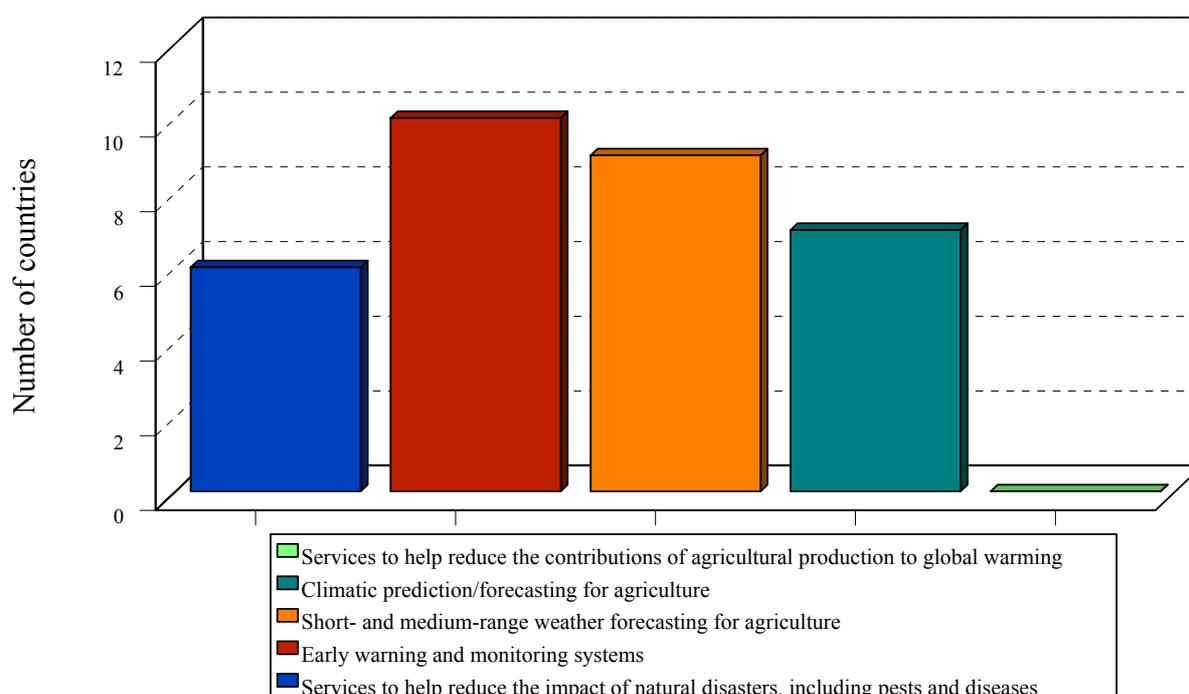


Figure 2. Important agrometeorological services provided by Meteorological Services.

As the forecasts time period extends, it is less likely that the services can incorporate them into their routine activities; this is why 90 percent of the services responding to the survey provide medium-term forecasts and 70 percent generate long-term outlooks.

	Argentina	Bolivia	Brazil	Colombia	Chile	Ecuador	Paraguay	Perú	Uruguay	Venezuela
Services to help reduce the impact of natural disasters, including pests and diseases	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	No
Early warning and monitoring systems	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Short- and medium-range weather forecasting for agriculture	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Climate prediction/forecasting for agriculture	Yes	Yes	Yes	Yes	Yes	Yes	Not	Yes	No	No
Services to help reduce the contributions of agricultural production to global warming	No	No	No	No	No	No	No	No	No	No

Table 3. Important agrometeorological services provided by the National Meteorological Services.

As you can see in Table 3, from the environmental point of view, it is important to highlight that the Meteorological Services consider they are not providing specific products to help diminish global warming; which is related to the agricultural activities.

Availability of Data, Analytical Tools, and Methods

Seventy percent of the countries that were consulted (Table 4) consider the availability of data to be inadequate, even though they have an easy access to computer databases and there is still quite a discontinuity of information. In the case of Chile, they hope to incorporate the information generated in the agrometeorological network during 2005 into the climate data base of the National Meteorological Service. In Peru, despite the fact that we have an agrometeorological network consisting of 47 automatic stations, their range is still limited. For this reason, the availability of data is considered inadequate. Most of the meteorological services have analytical tools, but they are not sufficient or limited in their use. Computational development has allowed 30 percent of the countries (Chile, Peru, and Venezuela) to use analytical tools, especially statistical, which have been applied in studies and research to support the productive agricultural sector.

The capacity to use these analytical tools (software) should be associated with the capacity of the professionals to understand and apply them as well; but, in practice, this doesn't apply in most parts of the region, because they learn to use this software in an autodidactic way. Eighty percent of the national meteorological services have established methodologies in forecasts as well as in other aspects related to the dissemination of meteorological services applied to agriculture.

	Argentina	Bolivia	Brazil	Colombia	Chile	Ecuador	Paraguay	Perú	Uruguay	Venezuela
Current availability of data	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Analytical tools	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No
Methods of provision of operational agrometeorological services	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Table 4. Deficiencies and limitations in developing agrometeorological work.

Concerning research and agricultural extension, all national meteorological services carry out investigations and agricultural extension on a daily, weekly, monthly, annual, and irregular basis.

	Argentina	Bolivia	Brazil	Colombia	Chile	Ecuador	Paraguay	Perú	Uruguay	Venezuela
Daily					X					
Weekly	X									X
Monthly	X	X	X							X
Yearly	X									X
Irregular	X			X		X	X	X	X	

Table 5. Frequency of research services and agricultural extension.

Support for International Agreements

It was not possible to obtain information from Paraguay and Uruguay. From the 8 responding countries, 63 percent of the services are more aware of the agreements related to climate change (United Nations Framework Convention on Climate Change) and desertification (United Nations Convention to Combat Desertification). In view of the primary activities in meteorology and the need to respond to the most frequent requirements of the community, the aspects related to Biological Diversity and World Food Supply have received a minor attention (50 and 25 percent respectively) (Table 6).

	Argentina	Bolivia	Brazil	Colombia	Chile	Ecuador	Paraguay	Perú	Uruguay	Venezuela
United Nations Framework Convention on Climate Change (UNFCCC)	No	Yes	Yes	Yes	Yes	No	--	Yes	--	No
United Nations Convention to Combat Desertification (UNCCD)	No	Yes	Yes	Yes	Yes	No	--	Yes	--	No
Convention on Biological Diversity	No	Yes	No	Yes	Yes	No	--	Yes	--	No
World Food Summit Plan of Action	No	Yes	No	No	Yes	No	--	No	--	No

Table 6. Knowledge of international conventions and agreements.

The agrometeorological services, at the same time, consider that their activity should be improved as time passes, by training their agrometeorologists and agronomists in all the aspects related to forecasts and local agriculture and in a way that allows them to provide accurate, agrometeorological outlooks. This training could be done through WMO experts' consultancy, universities, agricultural research institutes, etc., attending specific short-term courses, hands-on training, exchange of knowledge and information between the agrometeorological services in the region, etc.

Sustainability of the Services

A meteorological service is considered to be working efficiently if it assures the continuous provision of basic data, which means that it will have to use resources to regularly maintain the present network, with the purpose to obtain continuous quality data. The networks should become automatic and extend their range to agricultural areas lacking information.

The services should favor the best way to attain sustainability and to maintain a progressive development in time; incidentally, the operators of the agrometeorological services consider that one of the most important aspects is to make the authorities and users, in general, aware of the important role that the agrometeorological information has for the operational part of agriculture and its planning.

In the last 5 years, some agrometeorological services have faced a reduction in their budgets, which is very dangerous to sustainability and development. To solve this increasing problem, the services considered it necessary to generate a strategy to convince relevant authorities to provide funds to maintain networks, replace instruments, foster the dissemination and application of agrometeorological information generated in each country, train the technical and professional staff of the services, and implement agrometeorological models, among other things.

The information obtained from the members of the Commission for Agricultural Meteorology in RA III who gave their answers to the questionnaire used in the present work suggests the following conclusions and recommendations:

Conclusions

- A high percentage (70 percent) of the 10 meteorological services that were surveyed, have independent agrometeorological service units, which makes it easy to generate agrometeorological products.
- National meteorological services could be affected in the development of their various application areas because they depend financially on the government and also on the competition of private institutions with more financial resources, who recently entered the agrometeorological community.
- Farmers are main users of agrometeorological services and the ones who constitute the most progressive sector in this activity.
- In most of the national meteorological services, the agrometeorological activity is at a disadvantage with respect to other areas of national meteorology. These disadvantages are directly related to the budget, training, and prioritization in the development of their corresponding services. This contributes to delays in the agrometeorological progress that everyone hopes to attain.

- Most of the services issue bulletins, agrometeorological warnings, and agrometeorological and weather forecasts; carry out agrometeorological studies and research, and some of them assess the impacts caused by extreme weather events.
- The services agreed that their activities do not provide support to reduce the emissions of greenhouse gases from agricultural activities.
- A high percentage of the services (70 percent) considered that the range of the information and the extension of the data series are not sufficient. The same percentage considers that they have limitations and deficiencies in obtaining analytical tools.
- Eighty percent of the services estimate that they have deficiencies and limitations in the way they deliver agrometeorological services.
- One hundred percent of the services have incorporated into their activities interactions with research services and agricultural extension. However, these exchanges are irregular and only a limited number of services do this on a daily basis.
- The meteorological guidelines that national meteorological services have, and community pressure, causes them to become more interested in aspects related to United Nations Conventions on Climate Change and Desertification than on the Convention on Biological Diversity and the World Food Summit Plan of Action.

Recommendations

- Improve spatial resolution and adapt global models as tools for prognosis.
- Invest in the dissemination of meteorological tools applied to agriculture, oriented to the small and medium farmers.
- Implement the services modern tools that combine the different levels of information, besides the agrometeorological one, obtaining a global view that could be of help to the farmers and different levels of decision making in a country. (For example, the implementation of a geographical information system.)
- Implementation of radar use and satellite information.
- Carry out strategic associations with institutions that may need the agrometeorological products to be able to increase the agrometeorological stations network, maintain the existing ones, and develop competitive agrometeorological products.
- Implement a regional training program to include aspects related to climate modeling, interpretation of satellite imagery oriented to agriculture, geographical information systems, and handling of agrometeorological databases and analytical tools.
- Standardization of products, services, methods, and regional climatic and agroclimatic procedures.
- Carry out a program of regional exchange that will consider the transfer of methodologies and knowledge of the professionals of the different services, by means of seminars, workshops, or hands-on training.
- Carry out studies on climate variability and climate change and its impact on agriculture at a regional level.

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