

Improving Agrometeorological Bulletins Perspectives from RA VI (Europe)

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Abstract

A questionnaire with 13 questions was circulated in the RA VI region as well as in the other regions. The original questionnaire suggested by the WMO Division for Agricultural Meteorology was a little modified. The targeted audience was representatives of the `experts in agrometeorology`. As in case of any questionnaire it is always difficult to find the appropriate channel to get useful information. To collect as much information as possible not only the National Representatives in the Region but the members of RA VI Working Group of Agricultural Meteorology and members of the COST Action 718 were asked formally and informally as well. We have got 31 answers from 30 countries and one from the editor of MARS Bulletin. The Region has got 49 members. It means that we have got answers from more than 60 per cents of the asked region. The evaluation of the answers was not easy because from many countries not only one short answer was given but sometimes two-three answers. The people were asked not only to answer the questionnaire but submit few examples. The total amount of the submitted materials, the answers and the examples, takes more than 500 pages. This paper evaluates the collected information about the state-of-the art of the agrometeorological bulletins in the RA VI but we can cover only that part of the Region where we have got answer from.

Introduction

The paper summarises the information could be drawn from a survey conducted among the countries in the WMO RA VI Region. The evaluation follows the questions that were given in the questionnaire. It had 13 questions but the answers are grouped. To help the understanding of the survey two Annex are added to the evaluation. The first one summarises the answers, the second one shows few examples. Of course there was not enough place to show every submitted examples.

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Agrometeorological Units

The majority of the meteorological institutes and services in RA VI operate independent 'agrometeorological unit'. Among the 30 answering countries, 17 operate independent units, 13 do not. Except one small country, every respondent informed that somebody deals with the 'agrometeorology' within his/her service. Sometimes there is a heavy complaint among the agrometeorologists that nobody deals with the 'agrometeorology' but to the surprise of the author, the majority of the responses reported independent units for agricultural meteorology. Taking into consideration that the evaluation focused on the bulletins and the national meteorological institutes and services, we have got answer only from one side of our world. Using this questionnaire we could collect information from the NMHSs but very few from the university and research institutes. Notwithstanding this limitation, we have got a more or less good impression about the state-of the art of the agrometeorological bulletins' organisation background. It appears that the situation is satisfactory in RA VI.

Agrometeorological Bulletin

Concerning the 'Bulletins' question, 23 countries issue some kind of bulletins. We have got negative answer for this question from 7 countries. More or less the same statistic could be given about the involvement of extension services. In nineteen countries the agricultural research institutions and extension services are involved in the preparation of the 'Bulletins'. Sometimes very difficult to highlight what is behind the statistics. Without any evaluation, in the Appendix some extracts are shown from the submitted answers. In case of few countries not only one central bulletin is issued but some regional bulletins are prepared as well. The frequency of the 'bulletins' differs very much from country to country: Monthly or decadal issue (5 countries), five-day or weekly issue (9), 3-4 times per week (3), daily (6) and more than one issue per day (one) were reported. In case of the other 6 countries the frequency of the issue was not clear. One respondent calculated only with the traditionally printed bulletins which contains phenological information beside the climate summary with some evaluation from point of view of weather influence on agricultural activity. Others reported the modern techniques too, the internet or SMS system as 'bulletins'.

The types of Bulletins

The form, size, and contents of the bulletins change from country to country but there is a more or less common structure of every bulletin issued in form of hardcopy or disseminated electronically. The majority of the

respondents (15 countries) gave a short description of their bulletin, the rest (13 countries) submitted smaller or bigger examples or added the address of web side. The submitted homepage addresses are given in Annex 2 (short summary of the answers). Of course it would be impossible to show all submitted examples but as an illustration of the collection, few copies of the typical part of the submitted bulletins are presented. (Apologies to those whose bulletins are not shown in this present paper). As a conclusion we can summarise that the 'Agrometeorological Bulletin' should consist of two parts. The first part could be a diagnosis, the second part a forecast. Both parts could contain beside the meteorological data, phenological information and yield parameters. The diagnosis could be short or detailed, regarding the impact of the meteorological factors in the last period (day, week, month or season) upon the evolution of the growth status of the main crops, estimation of agrometeorological conditions for the growth, development and yield formation of the crops, the sequence of the phenological phases, available soil moisture and soil water deficit at various depths, the advance or delay of the vegetation development and indication of favourable weather conditions for each crop. Beside the meteorological data, the bulletin should deal with the soil moisture as well. The forecasting part could contain information on the perspectives of the meteorological conditions for the next period, day and week. Among the possible meteorological information we have to mention the minimum and maximum expected temperature and rainfall probability, prediction of phenological stage, rate of growth and development of crops and their expected yields and dates of harvesting, expected available water content, as well as certain necessary recommendations for the farmers for the use of different technologies in accordance with the new conditions. Various annexes on daily values of mean, minimum, maximum and normal temperature (as graphics) and distribution of precipitation, available soil moisture and water deficit over the examined region are also included in the bulletin. In both parts, various types of maps are always a core part of the bulletin.

The Target Audience of the 'Bulletin'

For this question 'no' answer was given from 4 countries. One country gave the 'subscription possible' answer which means that if somebody is interested in the bulletin, the person can get it but the distributor is not interested in the type of the customer. The 'farmer', the real and desired end-user was mentioned only in 9 cases. The target of the bulletin is the government in 7 countries. The extension services or private companies was mentioned in 12 countries. Research institute was marked in 7 countries. The answer to this question was not restricted to one user. The 'typical' answer

was to mention at least two or three possible users of the bulletin. The results of this question was not really surprising that the user of the bulletin is not 'the farmer' himself. Taking into the consideration the frequency of the bulletins, and the distribution method, it is not really surprising. On the other hand, one has to ask whether it is really the job of the agrometeorologist community to reach the real end users. Maybe we have to reach only the effective intermediate audience eg., extension services.

Feedback from the Users and Economic Value of Bulletin

On the question of regular efforts to collect feedback from the users, many countries (20) replied in the negative. Only one third of the answering countries, 10 countries, gave a positive answer for this question. This result somehow coincides with result of the answer given for the previous question that the target audience of the 'Bulletin' is 'the farmer' in case of 9 countries. This of course does not mean that the agrometeorologist community is not interested in the results of its efforts to produce a nice and useful bulletin. It would be very nice to collect feedback regularly from the users and show a good cost/benefit ratio. Regarding the economic value of the 'bulletin', a majority of the countries (16) responded that no effort is made to collect such information. Very discrete answer came from 6 countries (some, it is difficult, partly, etc). The author participated in a cost/benefit ratio examination of meteorological products and has got his experience about the difficulties of such type evaluation. Hence he agrees with the answer of one country: 'that's hard to do'. This question is much more difficult than the previous one. Only one country gave a quantitative response in saying that the use of agrometeorological prognosis enables reducing loses in agriculture by 20-30 %.

Extreme Events

Different answers were given for this question. To evaluate the answers, only two categories were used. If the 'bulletin' deals with the extreme events in anyway the answer was scored as 'yes'. The answer was also regarded as 'yes', if any activity was reported under the flag of dissemination of agrometeorological information concerning this theme. We have added one score to the 'negative' answer if dealing with extreme events was mentioned as regular warning activity of the meteorological institute, service. Using this type of categorisation, we have got 17 'yes' answers for this question and 13 'no' answers. The mentioned possible extreme events were drought, forest fires and floods. Nobody mentioned frost as a possible dangerous event.

Use of New Techniques

We have received various answers for this question. From 9 countries came definitive 'no' answer for the possible use of modern techniques. Some countries gave a very detailed answer, the others submitted only list of the tools. The direct use of remote sensing techniques for agricultural meteorology aren't yet fully developed. Few countries mentioned it as a possible complementary tool for the preparation of agrometeorological information. We can mention one exception. It is the MARS bulletin. It is not really surprising because the basic activity of the EU Joint Research Centre is the application of remote sensing. Unfortunately it is not yet public information. Beside the JRC, few other countries use NOAA AVHRR data, making some efforts to systematically compute NDVI and use this information to detect the state-of-the art of vegetation or use it as input parameters in plan models. Different types of simulation models of soil moisture, plant-growth and pest and disease interactions are used in few countries as an important tools both in standard information service (via the bulletin) and giving extraordinary custom reports or studies for crop commodities, governmental organisations, plant protection research and service. It is possible that in many countries the GIS is used for agrometeorological applications but perhaps not reported in their responses.

Limitations

Unfortunately 9 countries did not give any answer for the question about the shortcomings and limitation in the current methods from the few responses we can conclude that the real limitation factor in issuing high quality and detailed bulletins, is the lack of human resources, the suitable trained and skilled expert. Concerning the bulletins distributed in printed and in hardcopy form few respondents mentioned the lack of funds for printed materials as limitation and added that it is necessary to find financial support from public authorities. Many said that the publishing of the hard copy should be continued until all the farmers are connected to the Internet. This approach concerns the basic problem of the usefulness of the traditional type bulletin in the everyday agricultural practice. The farmer subscribes to the bulletin almost rarely, partly for lack of money, but the main reason is probably in rather late processing and delivery of it by mail. Internet version is often not readily available to the farmers due to lack of commodity. Delays in printing of up to 3 or more, sometimes 7 days, minimises the possibility to present meteorological forecasts in the bulletins. It is not true for the Internet version. This leads us to the general evaluation of processing and dissemination of agrometeorological information which is a much wider theme than the

evaluation of the 'bulletin'. Few respondents mentioned the less difficult, but existing problem concerning the everyday preparation of the bulletin, i.e. time availability, problems in the measurements of special parameters of particular relevance to agrometeorology, lack of knowledge of local conditions, difficulties in obtaining of phenological data, etc. Other limitations include the personnel available to produce the regional texts and fax sheets, although the models run automatically each morning for filling tables. Shortcomings in quality are sometimes the precipitation forecasts of the numerical model.

Comments and Suggestions

Among the 30 answering countries 12 did not add any comments and suggestion to the methods of preparing of agrometeorological bulletin. We can divide the suggestions into two groups. The first group deals with the dissemination techniques of the bulletin, the second gives idea on how to improve the content and the preparation of the bulletin. Maybe the real background of the present survey was collecting ideas to standardise the format of the bulletin. Only two respondents made an explicit mention of the need for standardisation of the bulletin format. Concerning the distribution of bulletins, all respondents agree that the best way of effective distribution of the agrometeorological information is the electronic distribution: web or on-line information. In case of the preparation and content, we need good quality data, meaning that they should reach a certain degree of accuracy. There is no need for a lot of stations in a plain valley, but the coverage should be greater in an area with a complex topography. There is a lack of appropriate methods of interpolation. Finally, the methods of dissemination and presentation of the agrometeorological information should be revised and updated. Among the special needs of agricultural meteorology, it was mentioned that short range forecasts of precipitation and better measurements and forecasts of the relative humidity are of importance. Additional methods of analyses and visualisation (including GIS technique) of the agrometeorological information should be applied. For example, some additional sophisticated methods for data interpolation could be used for data mapping. Some tables and graphs attracting the users can be also useful. A comparison between current soil and crop status with long-term data or particular time slice can be also helpful to determine the relevant departures. Animated figures can be also helpful when the bulletin is posted on the Internet. On the web page of any bulletin posted on the Internet a counter and a link for a feedback should be used.

Conclusions

Many examples which were submitted proved that the traditionally prepared and distributed 'agrometeorological bulletin' continues to be used in many countries in the region. In few countries, reports are made available on the web sites. Nobody reported that the traditional hard copy format is out of date and it is high time to stop issuing of it. But from the answers it is apparent that the colleagues dealing with the problem never thought only of the traditionally prepared 'bulletin' they tried to evaluate the whole information system of 'agrometeorology'. Our regular task is to supply the user with really useful information independent of its format. In order to improve agrometeorological bulletins, the following suggestions were made:

- developing procedures to identify user needs and requirements
- improving communication between agrometeorologists and users of agrometeorological information
- promotion and integration of new techniques (GIS, remote sensing and satellite imagery applications) in operational agrometeorology in order to identify, assess, monitor and prevent of risks;
- use of improved methods, procedures and techniques for the dissemination of agrometeorological information
- more active applications of models for yield forecasting, water balance, etc.

From the point of view of common action, it would be very desirable if WMO could include in its short-term work plan a proposal to develop and issue a technical note about the preparation of 'agrometeorological bulletins'.

Acknowledgements

The author expresses his sincere thank to every colleague for his/her effort and help to produce this summary. It was a real enjoy to read the answers and see the everyday work and effort of specialists to help the agricultural activity within our Region. A review of submitted examples was the other pleasure of the rapporteur notwithstanding the fact that the submitted papers were not understandable because of language problem but the contents were absolutely clear. Agrometeorology has an international 'language' for everybody. With very small 'training' everybody can use the agrometeorological bulletins of other countries. The author would like to express his thanks to WMO for the possibility to participate in the present work. It was a real great pleasure.

ANNEX 1

QUESTION	
1)	Has your national meteorological, hydrological, hydrometeorological service, institute (NMHS) got an independent agrometeorological unit in your country?
2)	If not, does somebody deal with 'agrometeorology' in your national service (NMHS)?
3)	Are agrometeorological bulletins and advisories issued by the national meteorological service (NMHS)?
4)	Are any agricultural research and extension agencies in your country involved either in the preparation of dissemination of bulletins or both in your country?
5)	If yes please inform about the frequency of delivery of these bulletins!
6)	How is the information presented in the bulletin collected and analysed and in what form is this information presented? (Please do not forget to send me a copy of any kind of bulletin, advisory paper or any 'agrometeorological information' printed in newspapers, etc in your country)
7)	What is the target audience of these bulletins and how are they reached?
8)	Is there any regular effort to collect the feedback from the users of these bulletins?
9)	Have any efforts been made to assess the economic value and benefit of the use of information provided in the agrometeorological bulletins?
10)	Is there any effort to issue bulletins of a special nature to address specific extreme events such as droughts, floods, forest fires, etc?
11)	To what extent new techniques such as remote sensing techniques (near-to surface or satellite born surface mapping, etc), simulation models (plant-growth, plant-soil-atmosphere, etc. models) and GIS are used in the analysis and preparation of information?
12)	What are the shortcomings and limitations in the current methods of preparing agrometeorological bulletins?
13)	Please submit your comments and suggestions to improve agrometeorological bulletins!
14)	DID THEY SEND ANY COPY?
15)	ANSWERING PERSON(S)

ANNEX 2

	AUSTRIA	BELGIUM
1	no	no
2	yes	only service involved indirectly in agrometeorology is Department of Climatolology, redaction of METAGRI, by mail, fax or BBS
3	yes	no advisory bulletin issued
4	no	Soil Service of Belgium: agromet weather forecast Private association: advisory for pest and diseases
5	daily	daily, via internet paper and fax on request
6	example	Example: www.bdb.be/weer/weerfr.html
7	farmers by fax and web	private, industry, governments
8	no	no
9	some	the results are not published
10	occasionally	no such effort
11	for evapotranspiration estimation	agromet simulation models satellite data, GIS adaptation of CGMS model http://b-cgmas.cragx.fgov.be
12	many but the most essential is that the “synoptic people” do not consider agromet forecast as very attractive in terms of income and effectiveness	The necessity to find a financial support from public authorities
13	better dissemination (web and on-line infor), user contact	Potential number of users decreasing. The cost/benefit ration of such information is not proved if they have to pay to get these bulletins. External support is thus necessary if we want to develop the use of such bulletins and make them available for a wider range of people
14	yes, fax	yes, bulletin
15	Mr. Hartwig Dobesch	Mr. Robert Oger

BULGARIA	
1	No
2	Yes, The section of Agrometeorology which is a part of the Department of Meteorology at the National Institute of Meteorology and Hydrology (NIMH), Sofia, Bulgaria
3	The monthly hydrometeorological bulletin. The agrometeorological information within the bulletin consists of assessments of soil and crop, The Operational Working Group of Agrometeorology, which is a part of the Section of Agrometeorology, issues agrometeorological prognoses and advisories, disseminated directly to governmental and private organizations and institutions, farmers, etc. or through the media
4	Yes for example, the Ministry of Agriculture issues agricultural bulletin including information on the sowed agricultural land, crop yields, etc.
5	
6	Information in the hydrometeorological bulletin of the NIMH is collected by the national operational network of the NIMH. The information is presented using text, tables and figures (including maps). The bulletins are available as hard copies as well as on the Internet ,
7	private and governmental organizations, regular users of the bulletin are the Ministry of Environment; the Ministry of Agriculture, insurance companies.
8	
9	Generally, efforts have not been made to assess the economic value and benefits of the use of information, provided within the NIMH hydrometeorological bulletin. However, statistic of the income as a result of the NIMH services of requests for meteorological and agrometeorological information (including expert reports, etc.) are available. Simeonov et al. (1999, Proceedings of the ECAM' 1999, Norrkoping, Sweden)

10	Extreme events such as drought, forest fires, floods, etc. when occur are always described within a special chapter (extreme events) of the monthly NIMH hydrological bulletin. Annual assessments of extreme meteorological events are provided officially to the Bulgarian Information Agency (BTA) during press conferences organized by the NIMH. Information on extreme meteorological events in Bulgaria is provided every year to the Euro RA VI Bulletin (issued in Germany) and WMO (for annual assessment of the world weather).
11	Crop-growth simulation models were/are running in order to assess current and expected crop growth, development and yield formation using operational weather data and agrotechnological data. Efforts are made in order to apply remote sensing techniques and GIS in order to assess, analyze and visualize soil moisture and crop status
12	The current methods of preparing the agrometeorological information included within the NIMH hydrometeorological bulletin are based mainly on expert assessments which is a source of limitation.
13	Additional methods of analyses and visualization (including GIS) of the agrometeorological information should be applied, some additional sophisticated methods for data interpolation could be used for data mapping., Some tables and graphs attracting the users can be also useful. comparison between current soil and crop status with long-term data or particular time slice can be also helpful to determine the relevant departures, figures can be also helpful when the bulletin is posted on the Internet, on the Internet a counter and a link for a feedback should be used.
14	www.meteo.bg
15	Mr. Vesselin Alexandrov, Mr. Valentin Kazandjiev

	CROATIA	CYPRUS
1	yes	yes
2	-	
3	yes	yes
4	Agrometeorological Bulletin	yes
5	one per month	Monthly Agrometeorological Bulletin
6	enclosed are the Bulletin and Journal Extraordinary meteorological and hydrological events in Croatia	copy promised, I have not received
7	phenological phases, soil temperatures, evapotranspiration, class A soil moisture Palmer method, growing degree days	agronomists, extension office, insurance company, plant pathologists, progressive farmers
8	no	yes, questionnaire are prepared from time to time to check the usefulness of Bulletin
9	no	no
10	yes, it is collected in the journal Extraordinary meteorological and hydrological events in Croatia	no
11		not yet used, some modelling techniques, chilling, plans to issue daily bulletin, GIS
12		time availability
13		a. Past Weather Conditions b. Current Weather Conditions c. Weather Predictions for the next week d. Explanation of the effect of the weather on the crops. e. Reminder to the farmers about the current agricultural activities f. Combination of meteorological information with agronomical data g. Use of GIS and agromet modelling techniques.
14	yes	
15	Mr. Branko Gelo	Mr. Stelios Pashiardis

CZECH REPUBLIC	
1	yes
2	
3	yes
4	
5	
6	As a factographical background serves the operational meteorological databank (at about 100 stations, daily actualization, incl. checking procedures). Maps and tables presented in the bulletin are prepared by special software that works interactively, enabling to parameterize an individual task. The bulletin is issued both as classical paper periodical by mail and as an html-file by means of internet (protected by a password)..
7	The bulletin is oriented mainly to bigger producers (agricultural cooperatives or corporations), agricultural research institutions, breeding stations, plant-phytopathological services.
8	No
9	
10	Warnings against floods, strong storms, heavy rains and likely are issued by our Central Prediction Service. As far as drought is concerned, permanent monitoring of it using both measured data and output of the soil-moisture model is one of main activities of the Department of Biometeorology)
11	Remote sensing techniques for agricultural meteorology aren't yet fully developed in Czech Republic. As CHMI disposes by NOAA AVHRR data, we have made some efforts to prepare a system computing NDVI. The whole thing is in the state of collecting experience and working on data processing software. Simulation models of soil moisture, plant-growth and phytopathological interactions are used as important tools both in standard information service (via the bulletin) and giving extraordinary custom reports or studies for crop commodities, governmental organizations, plant protection research and service. GIS is used for some most important customs only.

12	<p>Individual farmers subscribe the bulletin almost rarely, partly for lack of money, but the main reason is probably in rather late processing and delivery of it by mail. Internet-version is often not attainable or dear for them.</p> <p>Terms of processing lead to a 5 – 7 days of retardation, which minimize the possibility to present meteorological forecasts in the bulletins (this is not true for the Internet-version).</p>
13	
14	yes
15	Mr. Jaroslav Valter

	DENMARK	FINLAND
1	No	No
2	Danish Met. Service has an automatic operational production and dissemination of data to a system: Agrimeteorological Information System (AMIS), managed by Forecasting Services Department	Yes, climate service group
3	No	yes
4	The Danish Institute of Agricultural Science, <i>www.agrsci.dk</i>	no
5	updated daily, some four times a day	5 days
6	The Danish Institute of Agricultural Science presents meteo data : <i>Pl@ntelInfo (www.planteinfo.dk)</i> , 10x10 km grid, local forecast for a specific grid point as an SMS on request	www
7	subscription is possible	agricultural organisations and farmers
8	yes	occasionally
9	not done so far. Could be interesting what is for instance the economical benefit of reducing the use of pesticides	during the development of the service
10	not specially targeted towards the agricultural society. Warning are issued to general public	climate service observes the climate events and can issue special notes if necessary

11	Some of the data in AMIS are produced on the basis of numerical models using the new techniques. DMI is currently working on a system to assess the daily precipitation in 10 x 10 km AMIS grid. Further DMI is investigating the possibility of very short range forecast of precipitation in 10 x 10 grid	satellites and weather radar are used for the tracking of precipitation areas. Simulation models are used by the agricultural research organisations (Agrifood Research Finland)
12	The measurements and forecast of relative humidity near the ground, which is very important for estimating the potential contagiousness of fungi on daily basis, especially in potatoes. If the potential contagiousness is high, the farmer have to protect the crop. However it is the governmental policy to dramatically reduce the use of pesticides, so it is important to know exactly when it is necessary to use pesticides	lack of expert personnel
13	Very short range forecast of precipitation and better measurements and forecast of the relative humidity	
14		
15	Mr. Michael Steffensen	Mr. Ari Venalainen Ms. Lea Leskinen

FRANCE	
1	Yes. The national agrometeorological unit of METEO-FRANCE is located in Toulouse (France) and is in charge of co-ordination of all agrometeorological activities in Météo-France, software development and production (specifications for new agrometeorological software, software conception and development), international representation (COST actions, World Meteorological Organisation), nationwide studies.
2	
3	- At the national level, a climatological bulletin is issued on a monthly basis by Météo-France the year long. This bulletin is elaborated with climatological data of the national database of Météo-France. - Every month, from April to October, maps of heat unit sums and potential water balance are performed and sent by Internet to a research center on corn seeds. They are used to study the implementations of new hybrids of maize in France, according to the weather constraints. - At the local level, agrometeorological bulletins are made. There are meteorological forecasts for the 7 coming days, agrometeorological data from the past days, and agrometeorological advice elaborated in collaboration with agricultural institutes.
4	Some agricultural agencies (chambers of Agriculture, pest and disease service,...) write and disseminate their own agrometeorological bulletins . For that, they use the meteorological data of their own network or the meteorological data provided by Météo-France (measurements and/or forecasts). Sometimes, they use the communication means of Météo-France to disseminate the bulletins (for example by answering machines).
5	The frequency of delivery of a bulletin depends on the use of this bulletin. - If the bulletin is elaborated with climatological data (ex: temperature, rainfall...) or agroclimatological data (ex : PET, heat unit sum, ...), the purpose of this bulletin is to assess the impact of the meteorological parameters of previous months on one or many crops, the dissemination is on a monthly basis. - If the bulletin is elaborated with meteorological forecast, the purpose for the end-user (generally farmers) is to manage their work in the coming hours or days, and the bulletins are updated about 5 times a day. Departmental scale: Departmental weather forecasting (France is broken down in 95 administrative departments) accessible on answering machines. Some of them are more specialized in 'agrométéorologie' and contain the

	<p>weather forecasting adapted to the cultures of the department, agrometeorological information over the previous days and the agronomical advice (pest and disease, irrigation...). They are generally set up thanks to collaboration between the Departmental Center of METEO-FRANCE and the Departmental Chambers of Agriculture and/or the Services of the Protection of the Plants of the department. The 3615 METEO-FRANCE (Videotext) provides weather forecasts on each department, for the 7 coming days. These forecasts are updated 4 times a day. Now, from the 36 17 METEO-FRANCE, the user can obtain the departmental forecast by fax. This means of access to information, very much used now by the farmers, will be doubtless gradually abandoned for the benefit of Internet in the next years. Local scale To refine the meteorological forecasts at the local level, France has been broken down in 700 homogeneous zones from the forecasting point of view. There are about 5 to 10 zones per department. The farmers can reach these very accurate , local forecasts elaborated by the Departmental Center of METEO-FRANCE, by 3 hours step and valid up to coming 36 hours , updated at least 6 times per day(ATMOGRAMME). This service represents a true tool tactical decision-making aid for the farmers, since it makes it possible to realize savings on chemical amounts and irrigation. ATMOFAX: ATMOFAX is a service of METEO-FRANCE making it possible to the farmers to obtain by telefax the ATMOGRAMME of their zone of interest as soon on request. This service can be accessible through organisation of farmers such as the co-operatives, the Chambers of agriculture. Each farmer of the group obtains a code of access which allows him to be connected to the fax server of METEO-FRANCE on request and to obtain in the same telephone call its ATMOGRAMME as well as the number of ATMOGRAMME consumed since the beginning of his subscription. This service can be supplemented by the access to the weather reports (up to 7 days) worked out by the Departmental Center of METEO-FRANCE. It is provided by telefax to each farmer by the headquarters of farmers.</p>
<p>6</p>	<p>For example the bulletin of the Ministry of Agriculture about the state of crops at the national level elaborated with maps of rainfall, outputs of water balance model and output of ISOP. This information is provided by Meteo-France on a monthly basis by Internet. Since 1997, an integrated system called ISOP has been developed between three French participants: the ministry of Agriculture (through its Department of Statistics, SCEES), the institute for Agronomical</p>

Research (INRA) and the national meteorological service (METEO-FRANCE). The purpose is to produce reliable estimations of the forage production, in order to give objective information to the ministry of Agriculture to estimate real production losses in case of local or global drought. Input data are various and multiple, including spatialized daily meteorological parameters, percentages of soil types, nitrogen status and amounts and frequency of mowings or grazings, estimated from a national survey. The STICS crop model is applied to three kinds of grassland: permanent, temporary and pure legumes. The results are available for 200 regions of forage production (RFP) and synthesised in alert maps and temporal graphs for selected drought-stricken areas. The model is part of the *multi-crop simulator STICS* and simulates the evolution of grass above ground dry matter and water and nitrogen balances. The current year assessed values will be compared with « Reference » values calculated as statistical values (fractiles) on the period 1982-1996 for each grassland type and each RFP. The STICS crop model needs daily meteorological parameters (temperatures, rain, global radiation and PET). These data should be available for the reference period (1982 to 1996) and also for the current year to provide « real-time » outputs with a short delay. The management practices for mowing frequency and nitrogen supply are estimated from a national survey (8800 fields surveyed in autumn 1998) for the 182 (out of 200) RFP with a representative grassland surface (more than 7000 hectares). The results were translated into direct inputs for the STICS crop model: values of thermal time between mowings, number of mowings, amounts of nitrogen supply during winter and spring, initial nitrogen indices To take into account the different soil types on which the grasslands are to be found, the EU (1/1 000 000) soil map is used to provide soil map units where only predominant soils are listed. These soils are then characterised by their water capacity and nitrogen mineralization properties per layer and introduced in the system. METEO-FRANCE has developed a service allowing a simple access to the climatological data of the stations managed by METEO-FRANCE. This service called COLCHIQUE is attended to the professional users who need climatological data occasionally or on a regular frequency. The technical institutes, the plant health and agro-alimentary companies, the research centers, frequently need climatological data to refine their studies, to compute crop model or pest and disease model or to estimate crop productions. COLCHIQUE allows the acquisition of a meteorological dataset less than 2 days after measurement, from

	about 150 synoptic stations of METEO-FRANCE and approximately 1000 automatic stations. Observations of temperatures, wind, pressure, moisture... are accessible on a daily, 10 day period, or monthly basis and also elaborated products like deviation or ratio to “normal”, hydric assessment... For example, the agricultural institute involved in the sugar beet study collect the meteorological and agrometeorological data of the database of Météo-France using COLCHIQUE. And after, it elaborates every month a specific bulletin taking into account the agroclimatological conditions.
7	Farmers: with for example , bulletins elaborated with forecast information (ATMOFAX, answering machines...) and advice to manage irrigation or to fight against pests and disease. Agricultural technicians, departmental services of the Ministry of Agriculture: with for example , bulletin elaborated by the Ministry of Agriculture (Agreste Conjoncture – Grandes Cultures), For example, agricultural technicians of Chambers of Agriculture or cooperatives in the north of France with the bulletin elaborated by the technical institute involved in the study of sugar beet (Enquête sur la situation betteravière au 15/08/2001). NB: Now, all agrometeorological services provided by Météo-France and described in this document are available by Internet.
8	Yes, for the bulletins disseminated by answering machines, by Minitel , by fax and also by Internet... it is possible to evaluate the success of each service studying the number of end-users and the number of requests. At the departmental level, there are a lot of meetings between the end-users and the delegate of Meteo-France to define the needs, to evaluate the feedback of new services. Sometimes, the Commercial Service of Météo-France make national surveys to assess the impact of services.
9	It is possible to evaluate if a farmer has realized savings on the chemical amounts or irrigation amounts when he has taken into account meteorological information.. But it is difficult to estimate the economic value and also the real environmental benefit at a national level. For that, the Ministry of Agriculture would have to do a survey in partnership with the Ministry of Environment and Météo-France.
10	DROUGHT - In order to estimate and monitor the risk of severe drought and determine the most affected areas, maps on agrometeorological parameters, such as potential water balance or state of available water, are produced on a regular basis or on request. This information is completed with other data like the levels of the water tables and compared with the statistical values. FOREST FIRES: For

	<p>more 20 years in the south-east of France, studies and experiments are performed to monitor and prevent forest fires. This activity is one of our core missions. The drought indices calculated by Météo-France are communicated to Civil Protection Agency from June to September. The indices are calculated with meteorological data of ground network, with meteorological forecasts. This information is spatially improved using remote sensing (surface temperature and vegetation index from NOAA-AVHRR). METOFLASH The Météoflash message informs the farmer, by telefax, of the arrival on its zone of a weather phenomenon which can affect the cultures, the cattle, the materials and the program of work. The warning message concerns the phenomena such as storm, strong rain, frost, very strong frost, strong heat. Service is available by subscription through the departmental centre of METEO-FRANCE concerned.</p>
<p>11</p>	<p>Remote sensing data (surface temperature and NDVI from NOAA-AVHRR) are used by Meteo-France to improve forest fires bulletins. Simulation models are used by agricultural institutes (Chambers of Agriculture , technical institutes, cooperatives...) ISBA is a soil-vegetation-atmosphere transfer (SVAT) scheme developed at the National Center for Meteorological Research (CNRM) at Météo-France which is used to model the exchange of heat, mass and momentum between the land or water surface and the overlying atmosphere. The model is used in so-called stand-alone mode for development, and in coupled mode in which the model supplies the lower boundary conditions to atmospheric numerical weather prediction models or the upper boundary conditions for distributed hydrological models. ISBA is currently coupled to the Météo-France operational numerical weather prediction model (ARPEGE), the Météo-France climate model or GCM (ARPEGE-climate), the non-hydrostatic mesoscale atmospheric model Meso-NH, and the distributed macroscale hydrologic model MODCOU. In 2002, the purpose is to do an operational service in hydrology and agrometeorology using ISBA linked to MODCOU with interpolated meteorological data in input. http://www.agri-quest.com Agri-Quest is an internet agricultural monitoring service developed by a private agency: real time nationwide mapping and monitoring of vegetation conditions calculated with NOAA-AVHRR data. More than any other economic sector, the food and agriculture industries are affected by climatic risks. Among the various methods available for anticipating variations in productivity, remote sensing offers a wide range of simple techniques tested and proved over the past twenty years by numerous</p>

	national and international organizations. For agricultural monitoring, Agro-Quest provides weekly maps and curves that help end-users make objective, real-time analyses of crop potential from sowing time to harvest. They provide two solutions: "Essential" and "Professional" offer. The use of GIS is increasing in France. A lot of organisations involved in agriculture and in agrometeorology use GIS to define agricultural potentialities, to define polluted areas.
12	Weak knowledge of small-scale meteorological conditions (depending on topography, kinds of soil,...) to give advice adapted at each farmer. – Difficulty to obtain phenological observations and to concentrate these data in a centralized database. - Weak collaboration between all the institutes involved in the elaboration and the dissemination of agrometeorological advice (there is sometimes a feeling of competition). Partnerships would be necessary.
13	
14	yes
15	Mr. Jean-Pierre Beysson, Ms. Victorine Perarnaud

GERMANY	
1	yes, Deutscher Wetterdienst (DWD) has a business unit called 'Landwirtschaft', which means that it deals with agrometeorology.
2	-
3	yes
4	yes, in some cases regional agricultural chambers (or research) gives contributions to the more biological parts of texts (in advisories)
5	In case of backward bulletins: weekly and monthly, in case of forecasts and advisories: daily ('wetterfax')
6	collected: by data flow within DWD, generally from synoptic weather reports, forecasts from numerical model, in addition early reports for plant phenology. analysed (i.e. used and processed): by agrometeorological models. presented: mostly in text and tables, sometimes pictograms in 'wetterfax'.
7	Farmers, vegetable growers, horticulturalists, vine growers, extension service and Agricultural chambers. They are reached by telephone answering machine and by fax.
8	no
9	no
10	There is a service of DWD for forestry. Rather new: <i>http://www.dwd.de/services/gflw/lw_home.html</i> . Here you find 'Waldbrand-Warnindex' at the left side to click on. Regrettable not yet in English.
11	Remote sensing or GIS is not directly used for agromet. information service. Simulation models are used for a lot of agromet. topics (crop and soil conditions, harvest conditions and quality, pests & diseases, etc.)
12	Telephone service (renewed daily) is limited by time (2 to 3 minutes advisories). The daily, regional 'wetterfax' consists of one sheet with results of the most interesting topics of the season. So, second order important information is not given to the farmer. Limitation is also the personnel available to produce the regional texts and fax sheets, although the models run automatically each morning for filling tables. Shortcomings in quality are sometimes the precipitation forecasts of the numerical model.
13	Bulletins (weekly, backward) and advisories (forecasts) should be placed more and more in the internet.
14	
15	Mr. U. Gärtner, Mr. Hans Friesland

	HUNGARY	IRELAND
1	no	Sometimes yes and sometimes no i.e sometimes the post is vacant
2	Yes, we do agrometeorological research and there are special services for the agriculture.	When no somebody always deals with agrometeorological matters
3	Agrometeorological Bulletins are not published any more. Instead, special agrometeorological information called Agrometeorological Information Program (AIP) is given for customers on commercial base.	Yes
4	No, but there are web sites that include our agrometeorological information (e.g. the web site of an agricultural chamber)	Yes..Teagasc the national agricultural advisory agency
5	The AIP is delivered once or twice a week.	Bulletins are issued weekly or monthly...advisories are issued as required and Teagasc have some on their web site
6	The AIP is presented either as a plain text (sent via fax) or as a html file that can be seen on Internet. Examples are attached.	Met Eireann has an agmet section in its MWB(monthly weather bulletin) Weekly weather data from Met Eireann and data on the progress of crops appear in the 'Farmers Journal' or in the farming section of our national newspapers.will post samples.
7	Our customers are mainly agricultural firms. They are mostly reached via fax. The Internet (sometimes with restricted access) is also used.	Agricultural advisers or farmers.

8	There is no such regular effort, but some meetings were organised between customers and meteorologists.	No.occasional
9	no	no
10	Yes, last time an analysis was published about the meteorological causes of the inland waters in 1999.	No.only if requested by the publishing media
11		Very little used
12		The time lag
13		More web-based information which is regularly updated
14	yes	
15	Mr. Gabor Kis-Kovacs	Mr. Denis L. Fitzgerald

ITALY	
1	In Italy a national service on meteorology/agrometeorology does not actually exist, since the service is given locally by regional different Meteorological Services. Some of them got independent agrometeorological units, some do not However, the UFFICIO CENTRALE DI ECOLOGIA AGRAIA edits monthly the BOLLETTINO AGROMETEOROLOGICO NAZIONALE (that started in Jan 93 that is posted to about 1000 Associations, services, etc.)SEE: www.inea.it/uceaind.htm
2	
3	
4	<p>yes, - ARSSA in Abruzzo region, Notiziario agrometeorologico. Weekly from April to September, monthly for other periods. Via mail, fax tv, internet at www.arsaa.abruzzo.it/car</p> <p>- Assessorato Agricoltura regione Campania. Bollettino Agrometeorologico, weekly, via fax, tv, mail</p> <p>- ARPA Emilia Romagna. Bollettino Agrometeorologico Regionale. Weekly, radio, internet: www.smr.arpa.emr.it, fax on demand, tv, also ARPA Rivista (bimonthly), mail</p> <p>-CSA Friuli Venezia Giulia, Bollettino Agrometeorologico, internet, www.agromet.ersa.fvg.it, tv, fax</p> <p>- ERSAL Lombardia. Bollettino Agrometeorologico Regionale, weekly and monthly (Agromese), fax on demand, e-mail, tv (www.ersal.lombardia.it)</p> <p>- AsSSAM Marche. Notiziari agrometeorologici provinciali, weekly, fax or e-mail, www.meteo.regione.marche.it</p> <p>- Assessorato Agricoltura regione Piemonte. Daily Dati Rete Agrometeorologica Piemonte: www.green-planet.it</p> <p>SAR Sardegna. Bollettino Agrometeorologici Circondariali, daily, newspapers, tv, radio, www.sar.sardegna.it</p> <p>ARSIA Toscana Report mensile andamento agro-meteo climatico e stato culture in Toscana. Monthly mail, fax, e-mail, internet: www.meteo.arsia.toscana/meteo/hpmeteo.htm</p> <p>-Istituto S.Michele all' Adige. Trentino Alto Adige. Bollettino Agrometeorologico known as MeteoTrentino, self-fax, tv, www.provincia.tn.it/meteo/agrometeo/htm</p>

	- ARPAV veneto. Bolletino Agrometeorologico, three per week in spring, summer, lower frequency in other periods, fax on demand, tv, newspapers, <i>www.arpa.veneto.it</i>
5	
6	different forms, see internet for more detailed info if needed
7	target audience are farmers and farmer associations, services, universities and research institutions, technicians
8	some effort comes from people in order to develop user-friendly information
9	not to my knowledge official efforts
10	no, but special projects are carried out
11	many data from models and remote sensing are utilised for information and bulletins
12	
13	
14	
15	Ms. Federica Rossi, Mr. Domenico Vento

	ISRAEL	MALTA
1	yes	no
2	yes	no
3		no
4	Some agrometeorological bodies that maintain automatic weather stations issue reports based on the collected data.	no
5	The operational bulletins are issued weekly except for the IMS agromet. Bulletin which is issued 3 times a month - day 1-10, 11-20 and 21-end of month.	
6	The IMS bulletins (samples included) are slightly different in winter and summer. 16 stations are included representing widely different areas in Israel. The basic elements and derived agrometeorological indices are evaluated daily and their combined 10-day means or totals are compared to long-term averages.	
7	customers are: - Governmental offices, Agricultural research & development institutes, Forestry authorities, University libraries, Companies and factories, Engineers, Agricultural managers and Farmers. Today, the customers are reached by mail.	

8	The IMS evaluates feedback based on periodic questionnaires issued to the subscription population. It should be noted furthermore, that the subscription base has increased from year to year in its current format which began in 1994.	
9	no	
10	no	
11	GIS techniques are in a development stage. Plant-growth is represented through the Penman-Monteith standard FAO model for a short grass. This will be generalized to simulate water requirements of various crops in their phenological stages.	nil
12	There is currently a 2-3 day delay in the dissemination as the bulletin is issued through the regular mails. Shortly, it will be disseminated by e-mail to accelerate its dissemination.	
13		co-operation between Ministry of Agriculture and the Met Office should be start as soon as possible. Assistance is necessary and welcomed
14	no	
15	Ms Ora Karni	Mr. Francis T. Gauci

	The NETHERLANDS	NORWAY
1	no	yes, a special unit for agrometeorology at the Plant Protection Centre of The Norwegian Crop Research Institute.
2	Yes, focal point of the Royal Netherlands Meteorological Institute (KNMI) is Mr. Marcel Molendijk (<i>marcel.molendijk@knmi.nl</i>)	A liaison officer at DNMI has the responsibility of ensuring good contact.
3	no	internet applications DNMI and a private company called STORM sell meteograms directly to the farmers.
4	yes, several agencies prepare and disseminate bulletins. Apart from the commercial weatherburo's, DLV-meteo provides agromet services. DLV Meteo (address: Dr. W. Dreeslaan 1, 6721 ND Bennekom, The Netherlands, Tel.: +31317491511, E-mail: <i>Meteo@DLV.Agro.nl</i>) is part of the DLV. DLV is a Dutch organisation in extension and consultancy in agriculture and environment.	Yes, The Norwegian Agricultural Extension Service is working in close co-operation with The Norwegian Crop Research Institute on the Internet solutions. They include relevant agrometeorological information in the information bulletins to their members. These are distributed by fax or by mail.
5	fax, sms and internet products. The frequency of these product depends on the type of product, but on average 3 to 5 times a week.	The printed bulletins are usually submitted weekly during the growing season.
6	Most products are presented in the form of a fax message. These contain a weather forecast focussed on the type of product, e.g. a plant disease forecast has a weather forecast focussed on	a network of 64 automatic weather stations, data are presented on the Internet four times daily. NAES uses together of the local conditions to submit their weekly bulletins.

	spraying (wind, leaf temperature, RH, rain).	
7	Fax reaches cca 1000 farmers through a partner in agricultural advisory service.	Active farmers.
8	season products are evaluated using feedback and other parameters, e.g. commercial benefits.	The Norwegian Agricultural Extension Service is a member organisation.
9	That's too hard to do.	no
10	SMS service for a regional water board, only sent if forecasted rain are larger than 15 mm.	No, the general media covers such events well.
11	For most of our agricultural products, a SVAT is used calculate the canopy climate give a hourly 5 day forecast. For regional water boards we use the information of cumulative radar images, different GCM's and a GIS package to generate a special rain forecast product.	We do not use neither of these techniques. Our priority have been to use agrometeorological data in decisionmaking tools for pest control, see http://vips.Planteforsk.no .
12	Too little clients, as benefits are difficult to detect, and too little actual feedback on the performance of the SVAT.	printed matter is expensive to produce and distribute, we aim for a good Internet service.
13		yes
14		yes
15	Mr. Marcel Molendijk	Ms. Benta Herstad, Mr. Tor Sivertsen

	POLAND	PORTUGAL
1	no	yes
2	yes	
3	yes	yes
4	yes	not in Agrometeorological Bulletins. However, there are agencies belonging to the Ministry of Agriculture that issue bulletins and advisories related to crop diseases and parasites.
5	decade	
6	see the example	The information is collected every five days by telecommunications, there is a Fortran computer programme which is run to determine water balance in the soil, and it is issued at the Lisbon Meteorological Institute, three times a month.
7	the bulletin is prepared to an order of ministry of agriculture	The target audience is above all farmers and agronomist engineers
8	no	yes, sometimes
9	no	not yet.
10	yes	yes, there are, specially for floods
11	no	at the moment, these techniques are not used as routine, but only for certain specific purposes.
12	the lack of funds for training, models, instrumentation and specialists	GIS is not used as routine yet, and the charts are still analysed subjectively. Another limitation is that the bulletins are still sent by mail.

13		to improve Agrometeorological Bulletins, it is necessary to develop a better model, and use information about the different types of soil and vegetation, as well as GIS.
14	yes	yes
15	Ms. Malgorzata Kepinska-Kasparzak	Mr. Fernando Quintas Ribeiro, Ms. Rita Guerreiro

	SLOVAKIA	SLOVENIA
1	no	yes
2	yes	
3	yes	yes
4	no	no
5	meteorological and some phenological data are collected and analysed weekly other phenological data are collected and analysed in two weeks intervals during the vegetation season or monthly at the end of the vegetation season and during the winter	
6	agrometeorological and phenological informatin is send by mail to farmers and some other institutions dealing with agriculture Short information is published weekly (vegetation season) or monthly (winter) in special newspaper for agriculturists "rolnicke noviny"	all information and analyses are collected at Met office and presented in monthly Bulletin sent every month to 150 places in Slovenia and abroad
7		the target audience is Biotechnical faculty, all Agricultural high schools, a lot of crop producers and libraries
8	not regularly, last questionnaire in1999	no
9	partly, questionnaire 1999	yes
10	no bulletins but papers	yes

11	no	Plant-growth, plant-soil-atmosphere models are used to help farmers with irrigation and with plant disease defence
12	Specialists in agrometeorology	
13	new guide for agrometeorology (wmo), preparaton of specialists, new moderne type of the information dissemination free of charge	in Slovene agricultural area the improvements of agrometeorological bulletins for farmers are being prepared in a way they could be reached electronically or by fax.
14	yes	yes
15	Ms. Olga Braslavska	Mr. Iztok Matajc

	SPAIN
1	yes, there is a small section (six people) that is included in the Meteorological Applications Department.
2	
3	yes, there is as weekly agrometeorological bulletin at national level that started to be produced in 1992. In some Regional Meteorological Centers, some agrometeorological bulletins at regional level are issued. On the other hand a national water balance is also available every ten days.
4	yes
5	weekly (decadal in the case of the water balance)
6	the information of this bulletin is collected and analysed through the means of the INM (Synoptic network stations).
7	the agromet. bulletin is sent to the Ministry of Agriculture that disseminate internally this information. Other users, in particular some enterprises related with the agricultural sector, have interest in this bulletin. In this case they have to pay for receive this information (fax, paper). In the case of the water balance, the information is received free of charge by different Official Institutions and Agencies. On the other hand there is a lot of users that are subscribed to receive the information every ten days and pay for it.
8	no
9	not regularly.
10	yes. There are bulletins of local coverage for droughts, as well as national bulletins and local ones for forest fires danger rate predictions.
11	not at the moment, but we are now involved in the implementation of these techniques, in particular the GIS as a tool to analyse and prepare the information.
12	lack of adequate observations (coverage and quality), as well as good methods of spatialisation of the meteorological information.

13	<p>a) In the first place there is a need for data of good quality, meaning they should reach a certain degree of accuracy.</p> <p>b) These data should be adequately distributed from the point of view of the physiography of the terrain. There is no need for a lot of stations in a plain valley, but the coverage should be greater in an area with a complex topography.</p> <p>c) There is a lack for adequate methods of interpolation.</p> <p>d) Finally, the methods of dissemination and presentation of the agrometeorological information should be revised and updated.</p>
14	no
15	Mr. Antonio Mestre

	SWEDEN	SWITZERLAND
1	no	yes, within the frame of NMHS
2	yes. SMHI is very strictly divided into two parts: 1) infrastructure and non-profit assignments (Governmental Service Division) 2) commercial activities with a division called Media and Business Service Division. Inside this services on agrometeorology is available on commercial Basis. Mr Christer Hammar is responsible for the service	
3	No, not as a specific public service. Information on Commercial Services can be found at http://www.smhi.se choose Business and then Agri in the English version.	yes
4		MeteoSwiss and agricultural research institutes
5		daily delivery of agrometeorological bulletins
6		distribution by fax, phone and internet
7		farmers, agricultural research institutes and advisory service centres
8		no
9		only estimates

10	Warning are issued at Internet, radio, TV and other media regarding floods and forest fires.	forest fires warnings for the Southern Slope of the Alps and frost warnings (bt radio)
11	Plant-growth models and GIS have been used, but the commercial service today is mainly special meteorological services to farmers and organisations. At university we are working on models for crop growth and forecasts for pests and diseases, partly at our department and unit of integrated pest management. we have some information on internet, which is available for all. eg we have forecasts for aphids, potato virus y, sclerotinia stem rot, frit flies, late blight, carrot fly	-
12		-
13		improvement of local forecast
14	no	yes
15	Mr. Roland Sigvald, Mr. Gunlög Wennerberg	Mr. Daniel K. Keuerleber-Burk

UKRAINE	
1	There is no independent agrometeorological unit in Ukraine.
2	Hydrometeorological Service of Ukraine possesses the agrometeorological sector that includes the system of agrometeorological observation on 178 existed hydrometeorological stations; system of collecting daily and 10 days data; system of data processing, analysis and integration, preparation of analytical materials, prediction and providence with them interested users; system of research and development of methodology on observation and prognostication.
3	Ukrainian Hydrometeorological Center and regional Centers on Hydrometeorology publish agrometeorological bulletins.
4	Agrometeorological department of Ukrainian Hydrometeorological Center and Agrometeorological groups of Regional Centers for Hydrometeorology deal also with preparation, composition, and dissemination of agrometeorological bulletins
5	36 decade agrometeorological bulletins and 1 survey of agricultural year, annually
6	For composition of decade agrometeorological bulletins there are used materials of meteorological and agrometeorological observation (fenology and determination of humidity store) on 178 State meteorological stations Each agrometeorological bulletin contains 3 parts comprising text, tables and maps: Meteorological conditions of decade. Meteorological characteristics of decade are provided; favourable and unfavourable parameters are emphasized; abnormalities are enlightened and compared with normals. Influence of meteorological factors upon crops vegetation. This part also comprises agrometeorological predictions and computation results scope, probabilistic characteristics for further development of building up agro-meteorological conditions, agrometeorological assessment of weather expected according to long-term weather forecast, (month, season), degree of conformity of expected conditions to needs of crop. Data also provided on expected harvest in comparison with mean long-term and last year indexes. Status of water resources and levels of underground water. A short survey of Ukrainian water resources stage and characteristics of underground water bedding is provided.

	Information from meteorological stations and posts (in KH-21 format) are sent to regional Centers for Hydrometeorology and thence to Ukrainian Hydrometeorological Center.
7	10 days bulletin (has been editing since 1921) is the main periodic information and prognostic agrometeorological issue that is edited for use of the wide range of consumers in agricultural, scientific and research, and senior institutions and organizations.
8	Bulletins readers' opinions are periodically collected.
9	Economic value is assessed periodically. According to experts' opinion the system of agrometeorological prognostication enables to reduce losses in agriculture by 20-30%.
10	Special bulletins about extreme events are issued when necessary.
11	New technologies are used insufficiently. First steps are made in use of remote sensing and crop stage in the framework of TACIS project. Elements of GIS are used on agrometeorologist's workstation.
12	
13	Methodology of information analysis and preparation of agrometeorological bulletins may be improved by means of implementation of area assessment of meteorological and agrometeorological parameters obtained remote sensing and use of and models. Form may be improved by presentation of colour diagrams, maps and so on. But taking into consideration bulletin's edition (i.e. 70 copies) it will be rather expensive.
14	yes
15	Ms. Oksana Bogolubova

	UNITED KINGDOM	YUGOSLAVIA
1	yes, the agromet unit is independent and is called ADAS	yes
2	not applicable	
3	agromet bulletins and advisories are issued through Met Office (NMHS) staff on contract ADAS	yes
4	yes, mainly ADAS	yes
5	Bulletins are issued weekly	weekly, monthly, annual Weekly Agrometeorological Bulletin, Monthly Agrometeorological Bulletin, Advisories concerning fruit trees protection against plant diseases, FHMI Annual Agrometeorological Analyses, some products on internet
6	Weather data collected from Met Office synoptic network is processed by the Met Office into a weekly summary and transmitted to AgroMet staff at ADAS. An edited example of a weekly bulletin is attached. Information is also produced in tabular form.	newspaper, tv, radio
7	The target audience is farmers, growers, agrochemical companies and private consultants	
8	Some feedback is sought from users, but not much.	
9	If so, ADAS is unaware of it.	

10	The UK Environment Agency produces monthly reports covering floods and drought. These are available from their web site http://www.environment-agency.gov.uk/	agro@meteo.yu
11	Remote sensing is not used in AgroMet Bulletins : Plant growth models are used in some specialised services, not in bulletins. Plant - soil - atmosphere models such as MORECS for evaporation and soil moisture are helpful in compiling sections of bulletins. GIS (ArcView) is used in the production of maps and figures for bulletins.	simple water balance model
12	Time and funding are limitations in current methods. When bulletin editors are looking for cost savings they sometimes delete the AgroMet section. Our response is to offer a cheaper, monthly summary.	weather-plant, weather-pest and diseases models are not used in operational practice, lack of specialist
13	To improve agromet bulletins, they must be good value for money with contents users 'cannot do without'	
14		yes
15	Ms.Ruth Patton	Mr. Momcilo Zivkovic

ANNEX 3

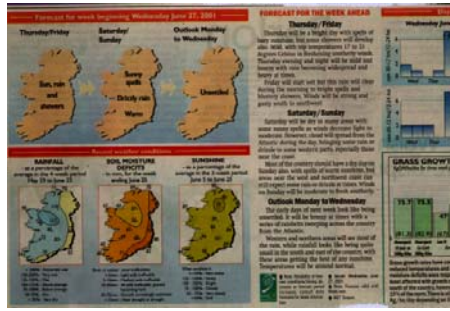


Figure 1. Two examples of agrometeorological information were published in newspaper. It looks like as part of 'Bulletin' IRELAND

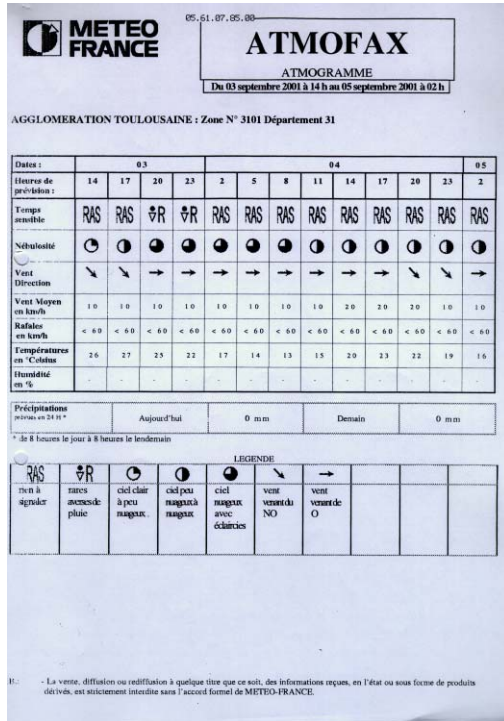


Figure 2. Direct information distribution in fax format by METEO FRANCE



Figure 3. Cover page of traditional bulletin issued by DWD, Germany

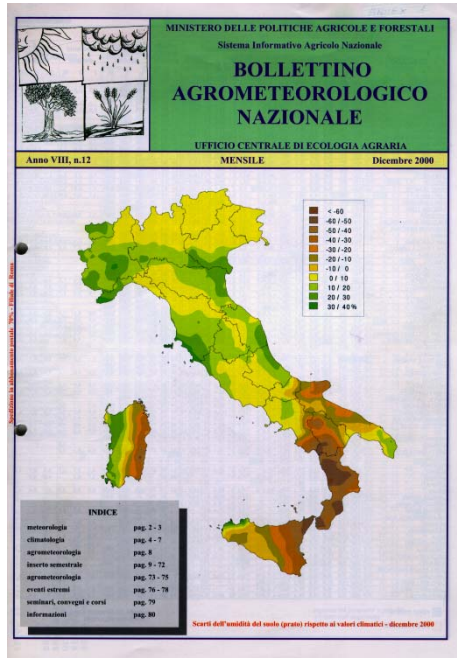


Figure 4. The cover page of the National Bulletin, ITALY

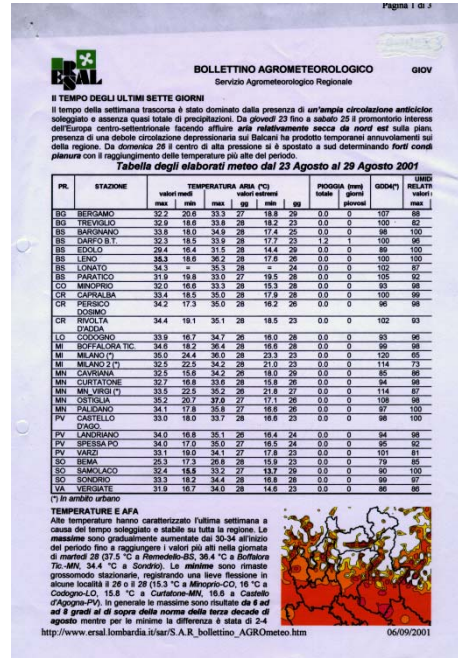
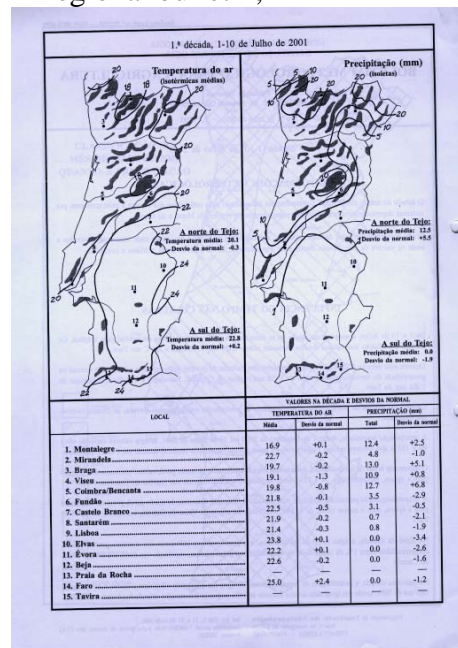


Figure 5. The cover page of regional bulletin, ITALY



Figure 6. The cover and an inner page with maps showing the territorial distribution of investigated elements, PORTUGAL



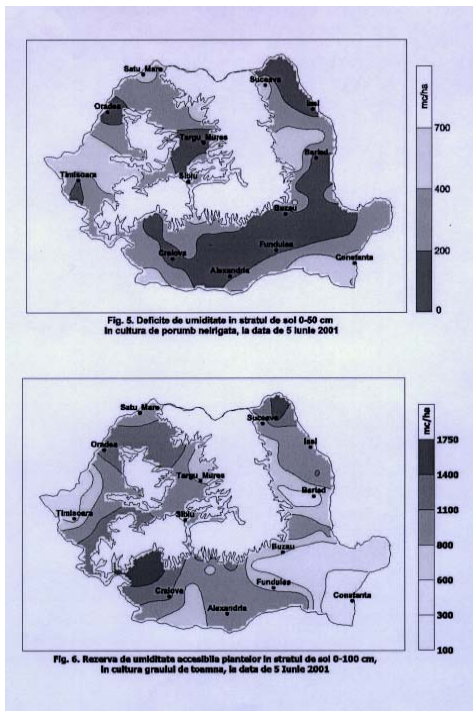


Figure 9. Animation of territorial distribution in agromet bulletin Hydrometeorological Service, ROMANIA

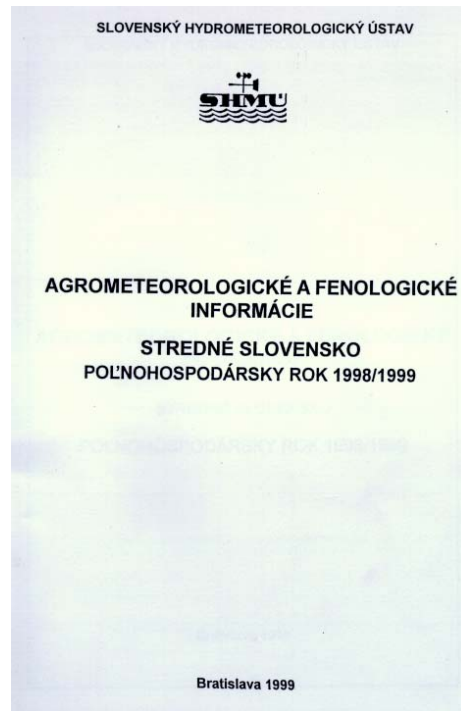


Figure 10. Cover page of annual agrometeorological and phenological report SLOVAK REPUBLIC

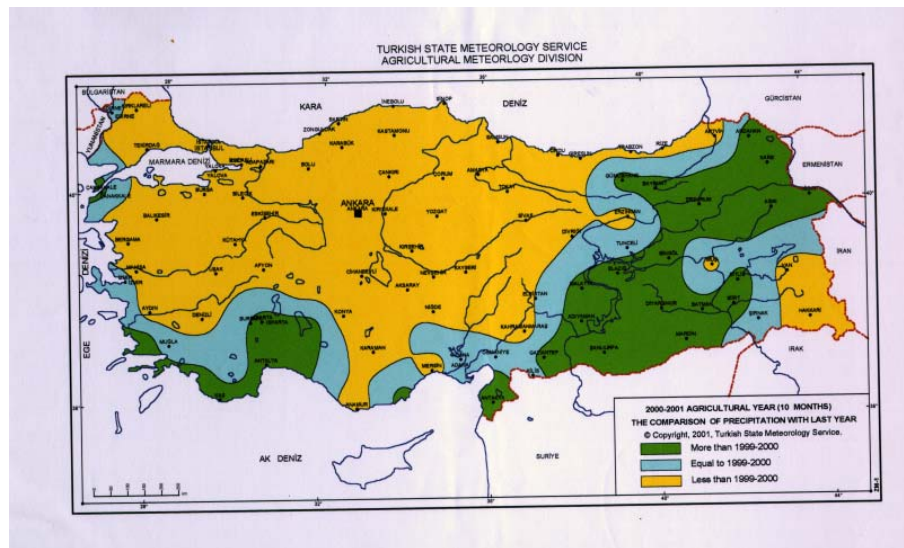


Figure 11. Evaluation of agricultural year, comparison of the precipitation with previous year, TURKEY