Netherlands Scientific Council for Government Policy

W 65

Crop production potential of rural areas within the European Communities

I : GIS and data model

J.D. Bulens

A.K. Bregt

The Hague, March 1992

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CONTENTS

PREFACE

The Netherlands Scientific Council for Government Policy has asked the Winand Staring Centre in Wageningen to investigate the crop production potential of the rural areas within the European Communities. The Council needed this information for a project on the possible future developments in the rural areas of the EC as a result of an ongoing growth in agricultural productivity. To get a clear view the Council explored the possible changes in the rural areas.
When exploring possible developments or options it is crucial to define the objectives at stake. Within agriculture not only production is of importance, but also (regional) employment, emissions of pesticides and nutrients to the environment, impact on the landscape, etc. Land use is taken as the key factor in the explorations by the Council. Through different types of land use different goals can be attained. The explorations show the differences in possible future land use when a certain priority is given to the various objectives.
Information on the physical possibilities for land use was absolutely necessary to carry out the explorations. A team from the Winand Staring Centre consisting of Ir. J.D. Bulens, Ir. A.K. Bregt, Ir. C.A. van Diepen, Ir. C.M.A. Hendriks, Ir. G.H. de Koning and Ir. G.J. Reinds led by Dr.ir. H.A.J. van Lanen compiled this information. A report of their research is given in a series of five separate documents under the common title 'Crop production potential of rural areas within the European Community'. The series consists of:

I : GIS and datamodel (W65)
II : A physical land evaluation procedure for annual crops and grass (W66)
III : Soils, climate and administrative regions (W67)
IV : Potential, water-limited and actual crop production (W68)
V : Qualitative suitability assessment for forestry and perennial crops (W69)

The full report shows that a combination of Geographical Information Systems and simulation models can provide useful quantitative information on crop production potentials for different crops at different locations. With this approach the Winand Staring Centre opened up a new and promising line of research.

Prof.dr.ir. R.Rabbinge

ACKNOWLEDGEMENT

At the request of the Dutch Scientific Council for Government Policy (WRR) the Winand Staring Centre (SC) in Wageningen conducted a study on the crop production potential of the rural areas within the European Communities (EC). We gratefully acknowledge the grant provided by the Council. The SC study was supervised by a WRR team comprising Prof.dr.ir. R. Rabbinge (chairman), Drs. H.C. van Latesteijn (secretary), Drs. D. Scheele, Ir. H. Hengsdijk and Drs. E. Bolsius.
The digitized maps and some attribute data used in our study were supplied in a compatible form by the CORINE project team (DG XI, Commission of the European Communities, Brussels). The support of Mr. M.H. Cornaert and Ir. J. Maes is greatly appreciated.
Meteoconsult B.V. in Wageningen provided records of historical weather data for many meteorological stations within the EC.
Furthermore valuable data on crops were provided by colleagues at the Centre of Agrobiological Research (CABO) in Wageningen.

Ir. J.D. Bulens
Ir. A.K. Bregt

1 INTRODUCTION

The Common Agricultural Policy (CAP) of the European Communities (EC) has stimulated agricultural production to such a level that surpluses of some major commodities like wheat, sugar, milk and wine have become structural. In areas favourable for agriculture, farm size increased, narrow crop rotations have been introduced and large amounts of relatively inexpensive agro-chemicals and feedstuffs are being used. The intensification of agriculture in these regions detrimentally affected the environment, nature and landscape (Briggs and Wilson, 1987). In areas less favourable for agriculture, abandonment of land and associated social hardship occurs.
EC-funds are increasingly being called upon to mitigate these undesirable socio-economic and environmental effects of the CAP. However, little or nothing is known about the cost-effectiveness of investments for agricultural development in the various EC-regions.
Therefore, the Dutch Scientific Council for Government Policy (WRR) has set up a project on the possible developments of the rural areas in the EC for a more detailed assessment of the use of the EC-funds. Different land use scenarios will be evaluated on their impact on rural development, taking into account the agricultural, socio-economic, environmental and physical planning aspects.
WRR will develop and apply a model for the General Optimal Allocation of Land use (GOAL model). This model uses a method known as Interactive Multiple Goal Linear Programming. For the purpose of this model the WRR requires, among other input data, information about the regional production potentials of the major types of farming at different input levels.
At the request of the WRR, the Winand Staring Centre investigated the physical crop production potential for rural areas in the EC. The yield potential of some indicator crops when grown on major land units suitable for agricultural use, was determined by a combined use of physical land evaluation methods and a Geographical Information System (Bregt et al., 1989).

In this working document attention is focused on the GIS aspects of the project. The concepts of a GIS are discussed in chapter 2. The link of the GIS with the physical land evaluation procedures used to assess the production potential of rural areas within the European Communities is described in chapter 3. In chapter 4 and 5 the use of GIS for processing of simulation model input and output data is described. The Data Model for storage of data is described in chapter 6.

2 GEOGRAPHICAL INFORMATION SYSTEM

An important aspect of the study was the use of a geographical information system (GIS). In this chapter some general aspects of GIS will be discussed.
Geographical information systems are computer-based systems for the capture, entry, storage, processing and output of spatial data. In recent years, GIS has become a major focus in the development of information technology in geosciences. GIS technology is also eagerly adopted in fields such as natural resource management, environmental monitoring, landscape design and urban and regional planning.

2.1 GIS COMPONENTS

Geographical Information Systems consist of four major components:

* hardware
* software
* data
* human resources and organization

Each of these components will be briefly discussed in the following sections.

2.1.1 Hardware

Most of the hardware components of a GIS are common to any computerized system, such as a central processing unit (CPU), disk, tape unit, terminal and printer.
The GIS has, in addition, several specialized hardware components such as:

* a digitizer or scanner, which is used to convert geographical data in the form of maps into a digital form
* a plotter, which is used to present maps and other types of graphic output
* a graphic display unit, which is used for editing and display of geographical data

2.1.2 Software

The software component of a GIS is able to perform functions like:

* data input (digitizing)
* data storage and management

* data manipulation and analysis
* data output and presentation

The data manipulation and analysis possibilities within the standard GIS-software are quite limited. They are mainly restricted to some "within" and "between" map operations like:

* changing of map scale, projection and presentation
* generation of buffer zones
* production of thematic maps
* overlaying of several maps

The overlay operation of different maps is the most important GIS function at this moment.

Nowadays there are several GIS-software packages available, which perform the functions mentioned. In the study presented, ARC/INFO (ESRI, 1989) was used.

2.1.3 Data

A very important element of GIS is the geographical data in the system. Without data the GIS is just an empty shell and of no use whatsoever.

The geographical data to be stored in a GIS consists of two components:

* geometry
* attribute

The geometry describes the location of the object (points, lines, areas and volumes). The attribute describes the nature of the object (e.g. road, soil type, climatic region, administrative boundary).

The geometry of a geographical object can be stored in a GIS in two different ways, either in vector or in raster form.
In raster form the object is represented as an array of rectangular or square cells, each with a specific characteristic and an assigned attribute value. In vector form, the object is represented by (a set of) straight-line segments called vectors. Data from remote sensing imagery are in raster form, most analog maps (soil map, climatic map) are digitized and stored in vector form.

The three base maps used for this project, namely a soil map, a climatic map and a map with administrative boundaries were all stored in the GIS in vector form.

2.1.4 Human resources and organization

When describing GIS most people think in terms of hardware and software. The data, human resources and organization are often forgotten. They form, however, the most important components of a GIS. In order to use an GIS effectively it needs to be placed in an appropriate organizational context. It should be integrated into the whole work process and personnel and decision makers must be trained to use the GIS technology properly. Without human resources and good organization it is impossible to establish a GIS, that is able to answer the questions of researchers, planners and policy makers.

2.2 GIS and physical land evaluation models

The possibilities for analysis on attributes or a combination of attributes (e.g. as performed in land evaluation) are limited in a GIS. The available land evaluation models are much better suited to attribute analysis. A linkage between GIS and models is attractive (Bulens et al., 1990). The GIS can be used for analysis of the geometry of the data, and the model for analysis on the attributes. In general, different types of linkages between a model and a GIS can be distinguished as follows:

- ad hoc linkage
- partial linkage
- full linkage

In the case of an ad hoc linkage, GIS and model are developed separately. Data needed for the model are selected from the available information systems. Quite often the data availability do not match the data demands of the model. Ad hoc linkage between model and GIS is most common found at this moment.

A partial linkage a GIS is developed around an existing model or a model is developed on alongside an existing GIS.

A full linkage GIS and model are developed in close interaction with each other. The data to be stored in the GIS are well tailored to the demands of the model and visa versa.

The type of the linkage desired is dependant on the problem to be studied. For clear and well defined applications a full linkage is attractive, as it can be more easily adapted to the requirements of the user. In other situations a partial linkage or even an ad hoc linkage between model and GIS might be the only practical solution. In the study presented in this report a partial linkage was used. A GIS was built around the existing physical land evaluation models.

A Geographical Information System is an instrument for storage, retrieval and analysis of spatial data. The overall land evaluation procedure developed for the assessment of the crop production potential in the EC is presented in figure 3.1. The figure shows that the GIS performs a central function in the process of data handling.

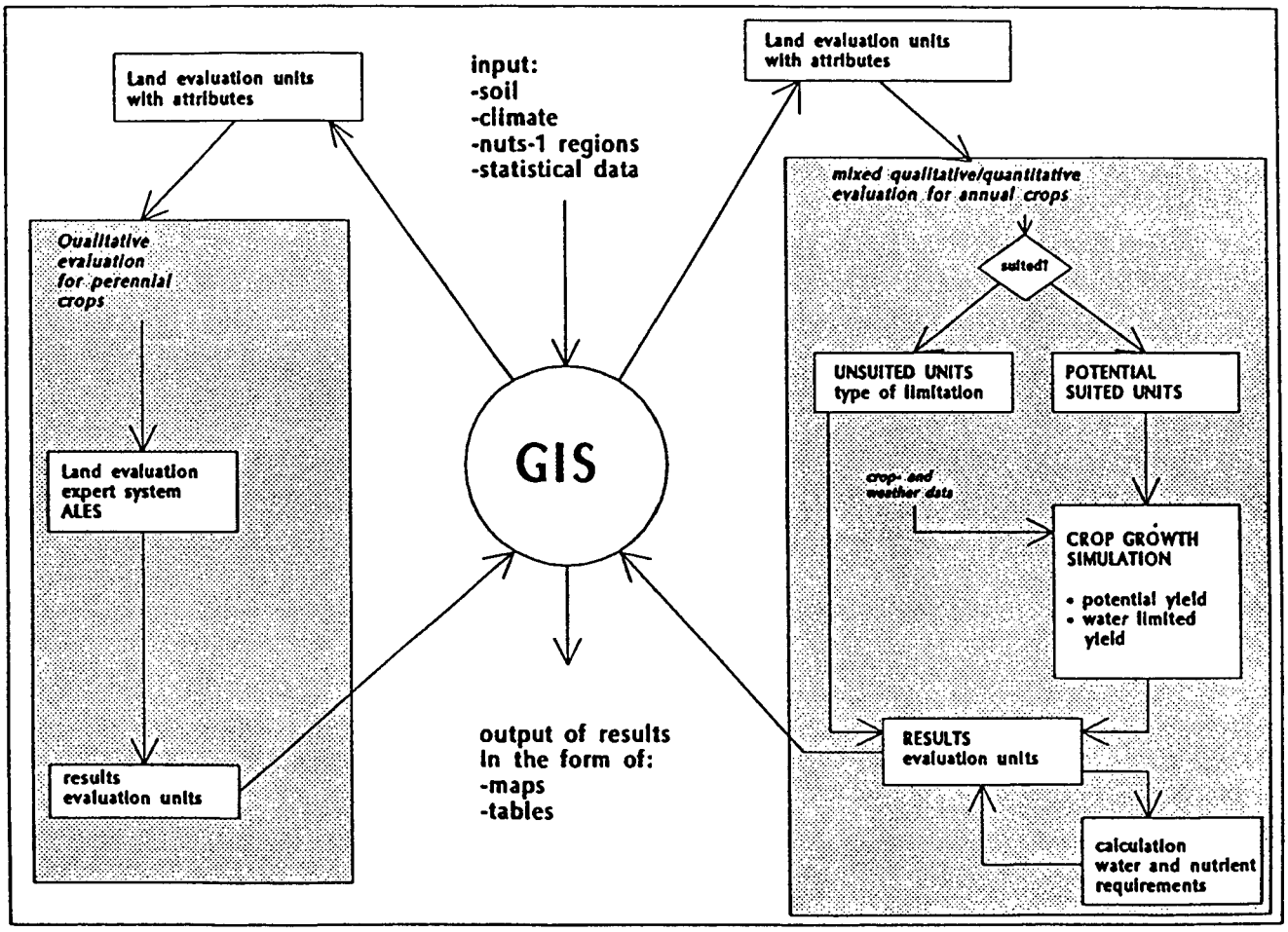


Fig. 3.1 Data flow and processing crop production potential

The GIS has three main functions in the land evaluation procedure, which are shown in figure 3.2. These main functions are:

- Processing model input data. All data needed to run the crop growth simulation model are processed within this function.(chapter 4).
- Processing model output data. Model results are processed in order to make the data easily accessible in the form of tables and maps (chapter 5).
- Data storage. All data were stored in a Relational Data Base Management System, the INFO part of GIS-package ARC/INFO. In the Data Model all relationships are defined (chapter 6).

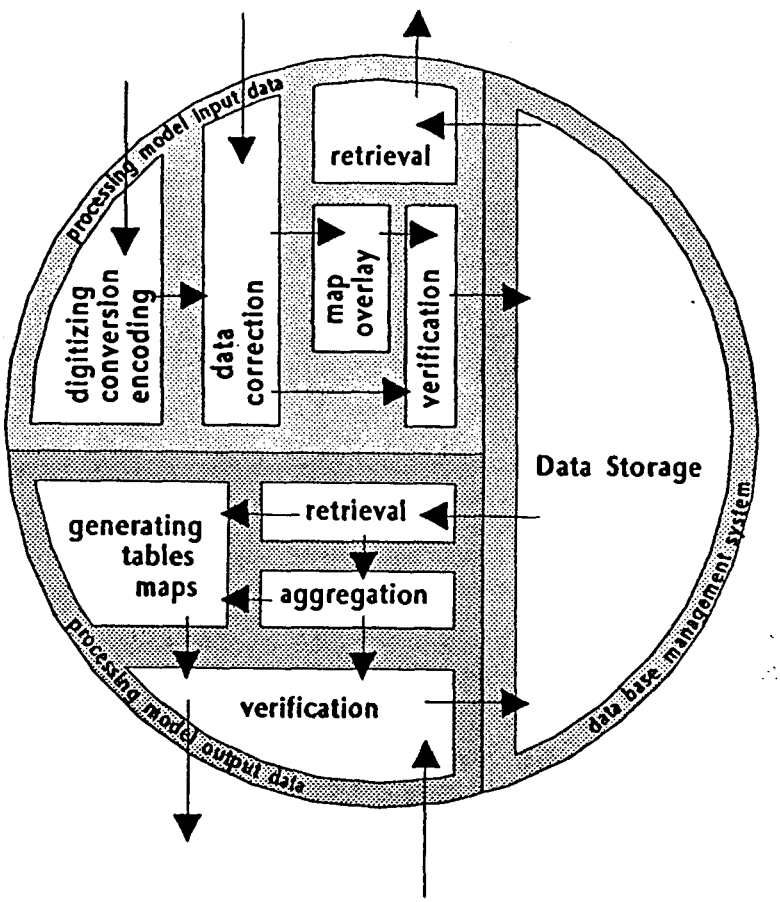


fig.3.2 GIS main and subfunctions

Various sub-functions can be identified within each function. The GIS functions will be discussed in more detail in the following chapters.

4 PROCESSING MODEL INPUT DATA

The first important function of the GIS in the land evaluation procedure is the processing of model input data. This means that the input data needed for running the models were pre-processed in various steps. These steps were digitizing, conversion, encoding and correction of data. Data to be used were available in the form of maps holding information on its geometry and associated attributes. For proper use all maps should match exactly. Maps should have the same projection so that boundary lines such as coastlines fall in line. Besides, the attributes should have the correct dimensions and be presented on the right aggregation level.

4.1 Digitizing, conversion, encoding, correction, verification and retrieval of data.

- Digitizing. The meteorological data were made available as point information and had to be converted to polygon information. Agro-climatic zones were distinguished on a map and subsequently digitized (see section 6.1.3).
- Conversion. Conversions were carried out for incomplete data sets of map attributes. In some cases statistical data were only available on country level. For these countries, data for NUTS-1 level were estimated from data on country level using procedures based on area weighted conversion. Geometric data were converted in such a way that coordinates for all maps were in kilometers.
- Encoding. For linking attributes to certain maps encoding was necessary. Before storing the data in the Data Base they were coded to make them uniquely recognizable. This identifying code, the primary key, is defined in the Data Model (chapter 6).
- Correction. Data correction is needed when errors occur. For data on geometry this means that all polygons for instance, must be closed and labeled. Special attention was required when different maps were subject to spatial analysis such as overlaying techniques. If lines that should fall coincide do not exactly match, then overlaying would create several additional very small polygons. To avoid these erroneously created polygons therefore, all maps must have the same coast and borderlines.
- Verification. To make accurate use of all data it was of vital importance to have removed all errors before they were stored in the Data Base.
- Retrieval. The data are available for the user in many forms. Data can be retrieved in any desired form from INFO, the Data Base Management System, depending on the users demands.

4.2 Map overlay

Map overlay is the process of stacking different map layers, namely the digital representation of various spatial data, on top of each other. From the resulting map each position in the area covered can be analyzed in terms of these data (Burrough, 1986). In this study this technique was used to generate Land Evaluation Units. These units were characterized by soil, climate and administrative aspects. The overlay was performed using three base maps. These were the soil map scale 1 : 1.000.000, the administrative map showing NUTS-1 boundaries and the agro-climatic map. This overlaying process substantially increases the amount of unique mapping units up to 4596 (See also chapter 6). Map 1 shows the process of overlaying the base maps resulting in the land evaluation map.

5 PROCESSING MODEL OUTPUT DATA

The second important GIS function in the land evaluation procedure was the processing of output data. These data were produced for all Land Evaluation Units by the land evaluation models. Most important data were these on yields for different production levels, suitability, nutrient and water use for the specified crops. The data were stored in the Data Base after verification, and can be retrieved and processed to provide the user with the information wanted.

5.1 Aggregation

The GIS provides various tools to manipulate geographic data. Aggregation of data is one of these tools. Because all land suitability assessments in the land evaluation procedure were carried out on the smallest polygons, namely the Land Evaluation Units, the results need to be aggregated to NUTS-1 regions and Agro-climatic regions to be able to discern the evaluation results properly. Also, results on NUTS-1 level allows a comparison with statistical data from Eurostat. However it must not be forgotten that NUTS-1 boundaries are not natural boundaries. Therefore for Agro-climatic regions present aggregation presents a more complete picture because of the use of spatial information about climatic conditions (Reinds & Van Lanen, 1991). One should realize that information was lost during the aggregation of data. The aggregated data were also stored in the Data Base to speed up the process of creating maps. It is noteworthy however that in this way redundancy occurs because the data already exist in the Data Base, be it in another form.

5.2 Presentation

Data can be presented in various ways (e.g. tables graphs and maps). Tables can be produced using the report facilities of the INFO part of the GIS ARC/INFO. Results in the form of maps can also be provided. The GIS is a powerful tool for the drawing of maps. A special Macro, a programme written in the ARC/INFO command language, was designed for this study to easily produce maps. This Macro will be discussed in greater detail in annex III.

6 DATA STORAGE

The storage of data is the third important function of GIS in the land evaluation procedure. The data must be organized and defined according to a specified structure, called the conceptual Data Model. This Data Model forms the base for the Data Base design and implementation, i.e. the actual building of the Data Base. Note that the Data Model is something different than the Data Base design. The design of the Data Base involves the implementation of the Data Model in a specific Data Base Management System (DBMS) for a certain type of hardware, while the Data Model itself is independent on the DBMS and hardware used.
In the Data Model presented here the so-called entity-relationship model was used (Chen, 1983). First, all entities were defined with their relationships. Second, the attributes describing these entities were defined (top-down approach).
An entity is defined as something -either a real object or an abstract feature - that is relevant and about which data are to be collected and stored (Deen, 1977). An attribute can be defined as a property that describes an entity.
In practice the terms entity and attribute are used loosely. Entities sometimes are called objects while in a Data Base Management Systems tables are also often called entities. Similarly synonyms of attributes are variables, properties, columns, elements or items. Here the terms entity and attribute were used in the manner, as we have defined above. It is worth mentioning that an entity in a Data Model is not the same as a table in a Data Base. The decision as to whether the attributes of an entity will be spread over more than one Data Base table has to be made in the stage of Data Base design. This is dependant on the DBMS used and on aspects such as optimal number of attributes per table, user-friendliness and so on.
The data, the Data Model and its entities will be described in the next chapters.

6.1 The Data

Part of the data concerns maps implying geometric data and associated attributes. The maps used were digital stored maps in vector form. A map can be characterized by its projection and by its number of certain map elements. We can distinguish the following map elements:

- segments
- arcs
- polygons
- mapping units

A segment is the smallest map element presented by a straight line between two points. More segments form an arc. A polygon is a closed area containing one or more arcs. Each polygon is labelled by a certain identifying code. Polygons labeled with the same code belong to the same mapping unit.
Accuracy depends on the scale and the manner in which digitizing took place. Three base maps were used for this study. A fourth map, the land evaluation map, was derived by a map overlay of these three maps (see section 4.2).

6.1.1 Soil map

The soil map of the European Community was provided by the CORINE programme, a programme for Gathering and Coordinating Information on the State of the Environment and Natural resources in the European Community. CORINE stands for COoRdinating of INformation on the Environment (CEC, 1989a). For this programme basic soil data was obtained by digitizing 1 : 1.000.000 scale soil maps of the EC member states. The original data was based on nine so called Operational Navigation Charts (ONC) sheets for Europe. Corine used a projection based on ONC sheet E2 (CEC, 1989b). The projection used is the Lambert Conformal Conic. The specifications for this projection are mentioned and shown in map 2.
The soil units on the soil map were defined according to the FAO soil classification (Reinds et al, 1991).

The characteristics of the digital soil map are:

512	map units
15500	polygons
40714	arcs
590000	segments

The mapping units were given a unique code called FULL-CODE. This FULL-CODE is a combination of the map number (MAP-NO) and a phase number (PHASE). There are 312 map numbers and 19 different phase numbers. The map numbers correspond with the legend units on the EC soil map (CEC, 1985). For each MAP-NO the dominant soil unit, the texture of this soil-unit, the slope class, associated soil-units and inclusions were given.
A small fragment of the soil map is shown on map 3.
Although originally coordinates were given in meters for use in this study the coordinates were converted to kilometers.

6.1.2 Administrative map

The administrative map, also provided by CORINE, gives information about administrative boundaries within the European Communities. NUTS stands for "Nomenclature des Unites Territoriales Statistiques". Regions at four different NUTS levels have been defined. These are the standard territorial units used in the EC primarily for statistical purposes. They are arranged according to a hierarchical basis, starting from countries on level 0 followed by regions on level 1, provinces on level 2 and counties or departments on level 3 (CEC, 1989a). For example, the United Kingdom is divided at level 1 into 11 regions, at level 2 into 35 large counties and into 65 local authority regions at level 3. For this study we used the map at NUTS-1 level. The map was digitized from scale 1 : 3.000.000 and used the CORINE projection mentioned before. Because the soil map and the NUTS map were digitized from different scales overlaying would result in the creation of many additional very small polygons due to corresponding lines like coast and borderlines not matching exactly. To avoid these errors the coast and EC borderline from the 1 : 1.000.000 EC soil map was used in all maps.
The original NUTS-1 map contains 64 regions. Some regions however were not evaluated because of lack of data or being agricultural insignificant. The regions left out are Berlin (west), Canarian Islands and Portuguese Islands (Azores, Madeira).

The characteristics of the digital NUTS-1 map are:

61	mapping units
1538	polygons
1892	arcs
150000	segments

The mapping units were given a NUTS region code called NURGCD1 at NUTS-1 level. Region names and boundaries are shown in map 4.
Attribute data collected from Eurostat yearbooks were attached to the NUTS-1 map. Most of these data provided were for NUTS-1 regions. For some countries however data were only available on NUTS-0 level. For these countries data were transformed to NUTS-1 level regions weighted for its area under agricultural use. Most data on crop yields and acreages were available for the years 1982-1985.
Data concerning fertilizer use and animal manure production were difficult to obtain. For fertilizer use costs were known only at NUTS-1 level and on NUTS-0 level the fertilizer use was specified in quantities of nitrogen, potassium and phosphate. Therefore a conversion could be made using ratios for NUTS-1 regions. For animal manure production, data on the numbers of animals were used to effect a conversion.
The actual data were linked to the NUTS-1 map using the NURGCD1 as the relating key. An example of data collected for NUTS-1 regions is given in map 5 which shows the number of pigs for the NUTS-1 regions.

6.1.3 Agro-Climatic map

Meteorological data were used for the qualitative and quantitative land evaluation. These meteorological data were available as historical records of monthly averages for 109 weather stations. This information had to be transformed to agro-climatic zonal information using the land evaluation procedure. For this purpose point information needed to be transformed into polygon information. Interpolation techniques such as constructing Thiessen polygons (see map 6) would only produce a map in which certain agro-climatic aspects, for example altitude effects, would be ignored. Therefore an existing map was used, on which agro-climatic regions were delineated, the Cereal Atlas of Europe (Thran & Broekhuizen, 1965). This map was modified slightly to match the meteorological stations selected and digitized from scale 1:10.000.000 (Reinds et al., 1991). Projection was transformed to CORINE projection to match the other maps.

The characteristics of the digital agro-climatic map are:

109	mapping units
1618	polygons
2146	arcs
150000	segments

The mapping units were coded with the WMO number of the representative weather stations (WMO-NO), or if not available the station number according to Müller (Müller, 1987). Map 7 is the agro-climatic map derived which also shows location and names of the weather stations.

6.1.4 Land evaluation map

In this map all characteristics of the three base maps mentioned before have been brought together.

The characteristics of the digital land evaluation map are:

4596	mapping units
22208	polygons
54714	arcs
615000	segments

The mapping units have been given a code, the LEU-CODE combining the FULL-CODE of the Soil map, the NURGCD1 from the NUTS-1 map and the WMO-NO which is the code used for the Agro-climatic map.

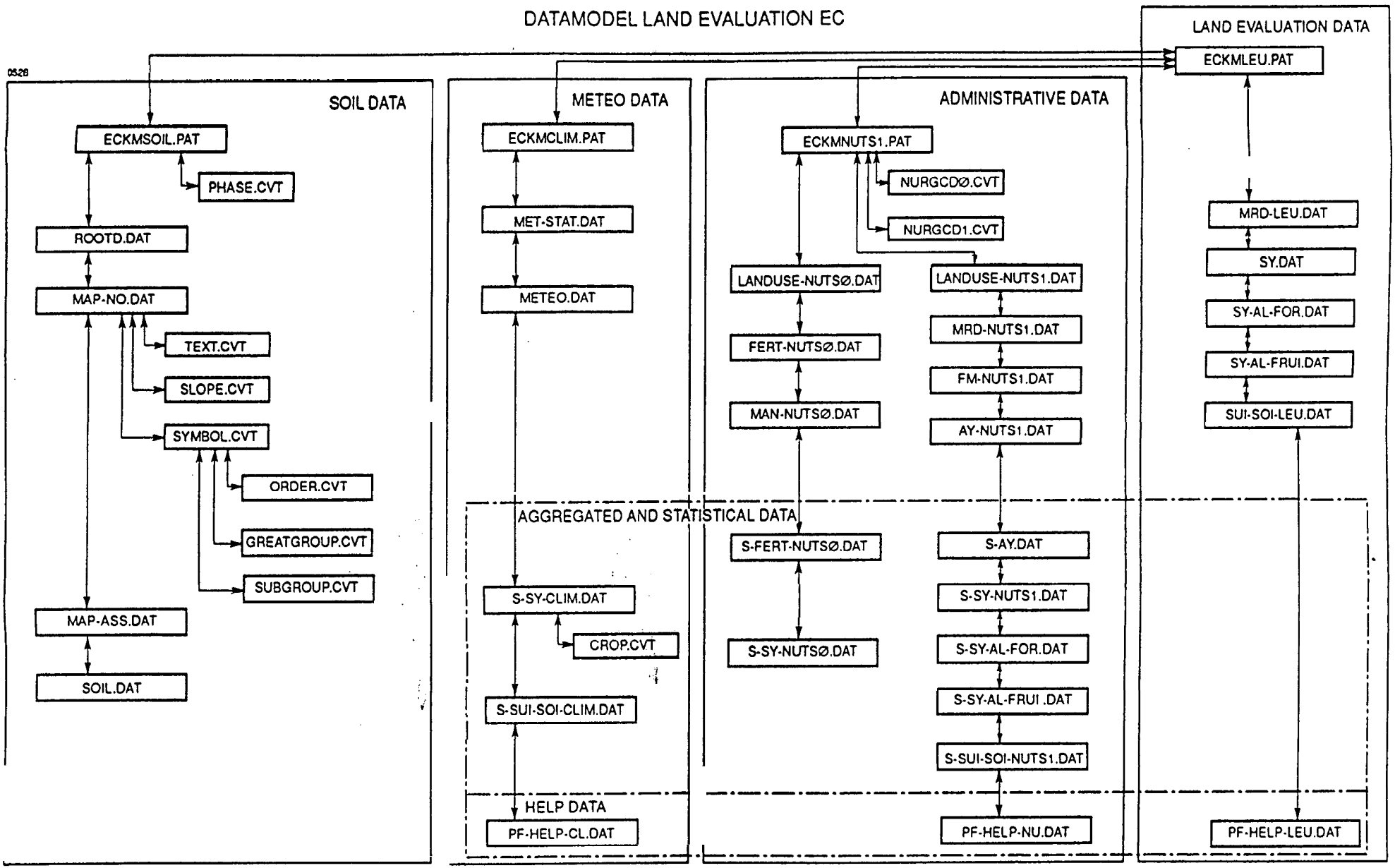
6.2 Data Model

The system includes data on soil, weather, crops and agricultural statistics. Besides data derived need to be stored.
Data analysis produced the Data Model presented in figure 6.1, in which all entities are shown. Attributes belonging to each entity are listed in annex 1.

Normalization took place and all entities were defined so that redundancy was avoided and data independence guaranteed. The resulting relations are in Boyce Codd Normal Form (Date, 1986). The entities named in the dotted box in the lower right part of this figure were derived from other entities. They are not part of the Data Model but shown here because of their use for the production of maps. The help data entities are to be used as scratch tables in which data can be temporary stored.
We have distinguished four main groups with their entities. Each group is represented by a map. Each map has its own entities and attributes.

1. Land Evaluation units.
   - Map polygons
   - Simulated Yields
   - Suitability classes
2. Soil units
   - Map polygons
   - Soil depth
   - Map number
   - Map association
   - Soil parameters
3. Agro-climatic regions
   - Map polygons
   - Weather station data
   - Meteorological data
4. Administrative regions
   - Map polygons
   - Land use
   - Actual yield and used area
   - Nutrient data NUTS-1 level
   - Animal data NUTS-0 level
   - Fertilizer use NUTS-0 level

FIG. 6.1


DATAMODEL LAND EVALUATION EC
0528
SOIL DATA
ECKMSOIL.PAT
PHASE.CVT
ROOTD.DAT
MAP-NO.DAT
TEXT.CVT
SLOPE.CVT
SYMBOL.CVT
ORDER.CVT
GREATGROUP.CVT
SUBGROUP.CVT
MAP-ASS.DAT
SOIL.DAT
METEO DATA
ECKMCLIM.PAT
MET-STAT.DAT
METEO.DAT
S-SY-CLIM.DAT
CROP.CVT
S-SUI-SOI-CLIM.DAT
HELP DATA
PF-HELP-CL.DAT
ADMINISTRATIVE DATA
ECKMNUTS1.PAT
NURGCDØ.CVT
NURGCD1.CVT
LANDUSE-NUTSØ.DAT
LANDUSE-NUTS1.DAT
FERT-NUTSØ.DAT
MRD-NUTS1.DAT
FM-NUTS1.DAT
MAN-NUTSØ.DAT
AY-NUTS1.DAT
AGGREGATED AND STATISTICAL DATA
S-FERT-NUTSØ.DAT
S-AY.DAT
S-SY-NUTS1.DAT
S-SY-NUTSØ.DAT
S-SY-AL-FOR.DAT
S-SY-AL-FRUI .DAT
S-SUI-SOI-NUTS1.DAT
PF-HELP-NU.DAT
LAND EVALUATION DATA
ECKMLEU.PAT
MRD-LEU.DAT
SY.DAT
SY-AL-FOR.DAT
SY-AL-FRUI.DAT
SUI-SOI-LEU.DAT
PF-HELP-LEU.DAT

6.3 Entities

Beside the main entities mentioned in the foregoing section there were also the derived entities containing attributes with aggregated data. These entities were the result of a GIS application and in a way they introduced redundancy. This means that change in original data also necessitates the updating of entities with the aggregated data. Another group of entities not mentioned before is the group used for clarification of used codes, the conversion tables. Slope, for example has four codes (a,b,c,d) representing the dominant slope for the map unit on the soil map. The code 'a' means level, slopes ranging from 0 to 8%, and 'd' means steep, slopes exceeding 25%. In annex I all attributes are listed according to entity. In annex II all attributes are listed alphabetical. In the following sections the main entities will be described in terms of their most important attributes.

6.3.1 Land Evaluation Units

* Map polygons. Each mapping unit was given a code, the LEU-CODE. The other attributes were produced by ARC/INFO and concern spatial information on the polygons like area and perimeter. The primary key in this entity is POLYGON-ID.
* Simulated yields. In the case of the annual crops and grass all land evaluation units were screened for severe limitations. For those mapping units which were evaluated as suited or partial suited, yield, nutrient use and water use was given for the potential and water limited production level. For the mapping units which were found unsuited a so-called excluding factor was given (De Koning, 1991). The primary key for this entity is the LEU-CROP, a combination of LEU-CODE and CROP-NO.
* Suitability classes. This entity describes the suitability of each mapping unit for some perennial crops and tree species (Van Lanen, 1991). The primary key is LEU-CROP again.

6.3.2 Soil

* Map polygons. Each polygon was given a FULL-CODE describing the mapping unit (CEC, 1989b). The primary key is the POLYGON-ID.
* Soil depth. The soil depth was estimated for each mapping unit using the name of the dominant soil and the phase of the mapping unit (Reinds, et al , 1991). The primary key is the FULL-CODE for this entity.
* Map number. This entity describes the name of the soil association, the slope and the inclusions according to the legend of the EC Soil Map 1:1.000.000 (CEC, 1985). The primary key is the MAP-NO.
* Map association. This entity describes the associations in terms of the presence of a certain soil type, its ranking order and the part it occupies in that association. The primary

key is a composite key, a combination of MAP-NO and SOIL-CODE.
• Soil parameters. This entity describes each soil type by means of attributes such as texture (TEXT), cation exchange capacity (CEC) etc.

6.3.3 Agro-climatic regions

• Map polygons. Mapping units were identified by the WMO number of the weather station representing the region. The primary key is the POLYGON-ID.
• Weather station characteristics. The altitude, latitude, longitude and name are given for each station. The primary key is the WMO-NO.
• Meteorological data. Monthly data were stored for each of the weather stations for attributes such as temperature, rainfall, radiation etc.

6.3.4 Administrative regions.

• Map polygons. Each region was given a NUTS region code called NURGCD1 at NUTS-1 level according to the conventions of the EC (CEC, 1989a). POLYGON-ID is the primary key.
• Land use. For each NUTS-1 region the acreages were provided for used agricultural area (UAA), forest (AFOR), etc. These data were obtained from Eurostat. The primary key is NURGCD1.
• Actual yields and acreages. For the selected crops data were collected from Eurostat for the years 1982-1985. The primary key is the combination of the NURGCD1,CROP_NO and YEAR.
• Nutrient data on NUTS-1 level. This entity contains data like the number of animals, used quantities of N, P and K all on NUTS-1 level. The primary key is NURGCD1.
• Animal data on NUTS-0 level. Data on number of animals on country level, that is NUTS-0 level. The primary key is NURGCD0.
• Fertilizer use NUTS-0 level. Data on used fertilizer at NUTS-0 level. The primary key is NURGCD0.

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ANNEX I

LISTING ENTITIES WITH ATTRIBUTES

Introduction

This annex provides a full description of all tables stored in the Data Base. The relational Data Base Management System INFO, which is part of the GIS ARC/INFO, was used to store the data. The INFO data file name is given for each entity and all attributes, called items in INFO, are listed. The following characteristics are provided for all the items :

* COL : starting position attribute
* ITEM NAME : attribute name
* WDTH : Input width of the attribute
* OPUT : Output width of the attribute
* TYP : Type of attribute, Integer, floating point, binary, number or character
* N.DEC : Number of decimals used

In INFO it is possible to redefine items in order to split or combine consecutive items. Redefined items are fixed by means of starting position and length. In the second part descriptions are given for each item and redefined item.
There are three kind of tables. First of all there are the main tables presented in the Data Model. Secondly there are tables derived from these main tables through GIS techniques e.g. aggregation. The last group contains conversion tables to explain codes and classes used for certain attributes.

DATAFILE NAME: AY-NUTS1.DAT

Eurostat data yields 1982-1985

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NUTS1-CROP-YEAR	6	6	C	-
7	AA	9	9	N	1
16	AY	9	9	N	1
25	Y-DATA	1	1	I	-
26	A-DATA	1	1	I	-
	** REDEFINED ITEMS	**			
1	NURGCD1	2	2	C	-
1	NURGCD0	1	1	C	-
3	CROP-NO	2	2	I	-
5	YEAR	2	2	I	-
1	NUTS1-CROP	4	4	C	-

item descriptions

NUTS1-CROP-YEAR	combination of NUTS-1 code; crop number and year,(-)
AA	actual used area for specified crop,(km2)
AY	actual yield,(fresh weight kg/ha)
Y-DATA	availability of data (yes=1; no=0),(-)
A-DATA	data available for actual used area (1=yes;0=no),(-)
** REDEFINED ITEMS	**
nuts	
NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)
CROP-NO	crop number,(-)
YEAR	year,(-)
NUTS1-CROP	combination of NUTS-1 code and crop number,(-)

DATAFILE NAME: FERT-NUTS0.DAT

Fertilizer use for NUTS-0 regions (Countries) for the years 1982-1985. Amount of ECU's used retrieved from Eurostat.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD0	1	1	C	-
2	YEAR	5	6	C	-
7	N	8	9	N	0
15	P	8	9	N	0
23	K	8	9	N	0
31	INT_CON_ECU	8	9	N	0

item descriptions

NURGCD0	NUTS region code on country level (NUTS-0),(-)
YEAR	year,(-)
N	nitrogen use,(kg/ha)
P	phosphate,(kg/ha)
K	potassium,(kg/ha)
INT_CON_ECU	intermediate consumption fertilizer,(million ECU)

DATAFILE NAME: FM-NUTS1.DAT

Fertilizer and manure data for NUTS-1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD1	2	2	C	-
3	INT_CON_ECU	4	5	N	0
7	N-F	5	6	N	0
12	P-F	5	6	N	0
17	K-F	5	6	N	0
22	EQUI	6	7	N	0
28	MAN	12	13	N	1
40	ORG	12	13	N	1
52	N-A	12	13	N	1
64	P-A	12	13	N	1
76	K-A	12	13	N	1
88	BOV-TOT	6	7	N	0
94	PIGS	6	7	N	0
100	SHEEP	6	7	N	0
106	GOATS	6	7	N	0
112	LAY-HENS	6	7	N	0
118	OTH-POUL	6	7	N	0
124	N-TOT	5	6	N	0
129	P-TOT	5	6	N	0
134	K-TOT	5	6	N	0
	** REDEFINED ITEMS	**			
1	NURGCD0	1	1	C	-

item descriptions

NURGCD1	NUTS region code on first NUTS level (NUTS-1), (-)
INT_CON_ECU	intermediate consumption fertilizer, (million ECU)
N-F	nitrogen available from fertilizer use, (kg/ha)
P-F	phosphate available from fertilizer use, (kg/ha)
K-F	potassium available from fertilizer use, (kg/ha)
EQUI	number of equidae, (1000 head)
MAN	manure, (kg/year)
ORG	organic matter from animal manure, (kg/year)
N-A	nitrogen available from animal manure production, (kg/year)
P-A	phosphate from animal manure production, (kg/year)
K-A	potassium from animal manure, (kg/ha)
BOV-TOT	total bovine livestock NUTS-1 level, (1000 head)
PIGS	number of pigs, (1000 head)
SHEEP	number of sheep, (1000 head)
GOATS	number of goats, (1000 head)
LAY-HENS	number of laying hens, (1000 head)
OTH-POUL	other poultry, (1000 head)
N-TOT	nitrogen available from animal manure and fertilizer use, (kg/ha)
P-TOT	phosphate available from animal manure and fertilizer use, (kg/ha)
K-TOT	potassium available from fertilizer and animal manure, (kg/ha)
** REDEFINED ITEMS **	
NURGCD0	NUTS region code on country level (NUTS-0), (-)

DATAFILE NAME: LANDUSE-NUTS0.DAT

Landuse data for NUTS- 0 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD0	1	1	C	-
3	ATOT	8	9	N	1
11	AFOR	8	9	N	1
19	UAA	8	9	N	1
27	AGRASS	8	9	N	1
35	APERM	8	9	N	1
43	ATOTAA	8	9	N	1
51	AFOD	8	9	N	1
59	NON-AGR	8	9	N	1

item descriptions

NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
ATOT	total area,(km2)
AFOR	total area forest,(km2)
UAA	used agricultural area,(km2)
AGRASS	total area grassland,(km2)
APERM	area under permanent crop,(km2)
ATOTAA	total area arable land,(km2)
AFOD	total area used for fodder crops,(km2)
NON-AGR	urban area and lakes,(km2)

** REDEFINED ITEMS **

NURGCD0	NUTS region code on country level (NUTS-0),(-)

DATAFILE NAME: LANDUSE-NUTS1.DAT

Landuse data for NUTS-1 regions

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD1	2	2	C	-
3	ATOT	8	9	N	1
11	AFOR	8	9	N	1
19	UAA	8	9	N	1
27	AGRASS	8	9	N	1
35	APERM	8	9	N	1
43	ATOTAA	8	9	N	1
51	AFOD	8	9	N	1
59	NON-AGR	8	9	N	1
	** REDEFINED ITEMS	**			
1	NURGCD0	1	1	C	-

item descriptions

NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
ATOT	total area,(km2)
AFOR	total area forest,(km2)
UAA	used agricultural area,(km2)
AGRASS	total area grassland,(km2)
APERM	area under permanent crop,(km2)
ATOTAA	total area arable land,(km2)
AFOD	total area used for fodder crops,(km2)
NON-AGR	urban area and lakes,(km2)
** REDEFINED ITEMS	**
NURGCD0	NUTS region code on country level (NUTS-0),(-)

DATAFILE NAME: MAP_ASS.DAT

File with map associations for each mapping unit according to the legend of the soil map

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	MAP_NO	4	4	I	-
5	SOIL_CODE	3	3	C	-
8	PART_ASS	3	3	I	-
11	SEQ_NO	2	2	I	-

ITEM DESCRIPTIONS

MAP_NO	map number according to the CORINE soil map 1 : 1000000,(-)
SOIL_CODE	code for soil unit.(-)
PART_ASS	percentage of soil unit in soil association,(%)
SEQ_NO	sequence number of soil unit in soil association,(-)

DATAFILE NAME: METEO.DAT

File with monthly meteo data

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	WMO-YEAR-MONTH	9	9	C	-
10	T-MIN	4	12	F	2
14	T-MAX	4	12	F	2
18	VAP	4	12	F	2
22	RAD	4	12	F	0
26	RAINF	4	12	F	0
30	WINDV	4	12	F	2
34	RAIND	4	12	F	0
	** REDEFINED ITEMS	**			
1	WMO-NO	5	5	I	-
6	YEAR	2	2	I	-
8	MONTH	2	2	I	-

ITEM DESCRIPTIONS

WMO-YEAR-MONTH	Combination of WMO number year and month, (-)
T-MIN	Minimum temperature, (degrees Celsius)
T-MAX	Maximum temperature, (degrees Celsius)
VAP	Vapour pressure, (kPa)
RAD	Radiation, (kJ/m/day)
RAINF	Rainfall, (mm)
WINDV	Wind velocity, (m/s)
RAIND	Rain days, (days)
WMO-NO	wmo number or number according to Muller of weather station, (-)
YEAR	year, (-)
MONTH	Month, (-)

DATAFILE NAME: MRD-LEU.DAT

Area and maximum rainfall deficit for Land Evaluation Units.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CASE#	4	5	B	0
5	FREQUENCY	4	5	B	0
9	LEU-CODE	15	16	C	-
24	AREA	4	12	F	3
28	MAXNT	4	12	F	3
	** REDEFINED ITEMS **				
9	FULL-CODE	6	6	I	-
9	MAP_NO	4	4	I	-
13	PHASE	2	2	I	-
16	NURGCD1	2	2	C	-
16	NURGCD0	1	1	C	-
19	WMO-NO	5	5	I	-

item descriptions

CASE#	item generated by ARC/INFO,(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
LEU-CODE	code for land evaluation unit (FULL-CODE NURGCD WMO-NO),(-)
AREA	area,(km2)
MAXNT	maximum rainfall deficit,(mm/year)
** REDEFINED ITEMS **	
FULL-CODE	combination of map number and phase,(-)
MAP_NO	map number according to the CORINE soil map 1 : 1000000,(-)
PHASE	phase according to EC soil map 1 : 1000000,(-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)
WMO-NO	wmo number or number according to Müller of weather station,(-)

DATAFILE NAME: MAN-NUTS0.DAT

Manure data for NUTS-0 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD0	1	1	C	-
2	COWS	6	7	N	0
8	AN_0-1	6	7	N	0
14	AN_1-2	6	7	N	0
20	OTHER-BOV	6	7	N	0
26	MAT-SOWS	6	7	N	0
32	NMAT-SOWS	6	7	N	0
38	OTH-PIGS	6	7	N	0
44	LAY-HENS	6	7	N	0
50	OTH-POUL	6	7	N	0
56	SHEEP	6	7	N	0
62	EQUI	6	7	N	0
68	MAN	12	13	N	1
80	ORG	12	13	N	1
92	N-A	12	13	N	1
104	P-A	12	13	N	1
116	K-A	12	13	N	1
128	UAA	8	9	N	1
136	GOATS	6	7	N	0
142	BOV-LI	6	7	N	0
148	PIGSTOT	6	7	N	0
154	AV-CO-MAN	12	13	N	2
166	AV-CO-ORG	12	13	N	2
178	AV-CO-N	12	13	N	2
190	AV-CO-P	12	13	N	2
202	AV-CO-K	12	13	N	2
214	AV-PI-MAN	12	13	N	2
226	AV-PI-ORG	12	13	N	2
238	AV-PI-N	12	13	N	2
250	AV-PI-P	12	13	N	2
262	AV-PI-K	12	13	N	2

item descriptions

NURGCD0	NUTS region code on country level (NUTS-0), (-)
COWS	number of cows, (1000 head)
AN_0-1	bovine animals 0-1 year old, (1000 head)
AN_1-2	bovine animals 1-2 years old, (1000 head)
OTHER-BOV	other bovine, (1000 head)
MAT-SOWS	number of mated sows, (1000 head)
NMAT-SOWS	number of not mated sows, (1000 head)
OTH-PIGS	other pigs, (1000 head)
LAY-HENS	number of laying hens, (1000 head)
OTH-POUL	other poultry, (1000 head)
SHEEP	number of sheep, (1000 head)
EQUI	number of equidae, (1000 head)
MAN	manure, (kg/year)
ORG	organic matter from animal manure, (kg/year)
N-A	nitrogen available from animal manure production, (kg/year)
P-A	phosphate from animal manure production, (kg/year)
K-A	potassium from animal manure, (kg/ha)
UAA	used agricultural area, (km2)
GOATS	number of goats, (1000 head)
BOV-LI	total bovine livestock NUTS-0 level, (1000 head)
PIGSTOT	total number of pigs, (1000 head)
AV-CO-MAN	manure production for an average cow used for conversion, (kg/year)
AV-CO-ORG	organic matter production for an average cow used for conversion, (kg/year)
AV-CO-N	nitrogen production for an average cow used for conversion, (N kg/year)
AV-CO-P	phosphate production for an average cow used for conversion, (P2O5 kg/year)
AV-CO-K	potassium production for an average cow used for conversion, (K2O kg/year)
AV-PI-MAN	manure production for an average pig used for conversion, (kg/year)
AV-PI-ORG	organic matter production for an average pig used for conversion, (kg/year)
AV-PI-N	nitrogen production for an average pig used for conversion, (N kg/year)
AV-PI-P	phosphate production for an average pig used for conversion, (P2O5 kg/year)
AV-PI-K	potassium production for an average pig used for conversion, (K2O kg/year)

DATAFILE NAME: MAP_NO.DAT

Data for map numbers used on the CORINE soil map 1 :1.000.000

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	MAP_NO	4	4	I	-
5	DOM_SOIL	3	3	C	-
8	TEXT	6	6	C	-
14	SLOPE	6	6	C	-
20	DOM-PERC	10	10	C	-
30	GWATER	1	1	I	-
31	ASS_SOILS	15	15	C	-
46	INCL	15	15	C	-
	** REDEFINED ITEMS	**			
5	ORDER	1	1	C	-
6	GREAT_GROUP	1	1	C	-
7	SUBGROUP	1	1	C	-

item descriptions

MAP_NO	map number according to the CORINE soil map 1 : 1000000,(-)
DOM_SOIL	dominant soil in legend unit EC soil map,(-)
TEXT	texture according to EC soil map,(-)
SLOPE	slope class according to EC soil map,(-)
DOM-PERC	percentage for presence of the dominant soil in the legend unit,(%)
GWATER	groundwater class,(-)
ASS_SOILS	associated soils according to the legend units on the EC soil map,(-)
INCL	inclusions in soil association according legend unit EC soil map,(-)
** REDEFINED ITEMS **	
ORDER	soil order according FAO soil classification,(-)
GREAT_GROUP	great group according FAO soil classification,(-)
SUBGROUP	subgroup according to FAO soil classification,(-)

DATAFILE NAME: MET-STAT.DAT

Data for the selected meteorological stations of the EC

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	WMO-NO	5	6	I	-
6	STAT_DESC	32	33	C	-
38	LAT	8	9	N	1
46	LONG	8	9	N	1
54	ALTITUDE	8	9	N	0
62	MUL	8	9	I	-
70	Y/N-MUL	1	2	I	-
71	X-COOR	16	17	N	4
87	Y-COOR	16	17	N	4
103	MAXNT	4	12	F	3
107	PSUR	8	16	F	6
115	PDEF	8	16	F	6
123	STRAJA	8	16	F	6
131	AREA	4	12	F	3

item descriptions

WMO-NO	wmo number or number according to Müller of weather station,(-)
STAT_DESC	name weather station,(-)
LAT	latitude,(degrees)
LONG	longitude,(degrees)
ALTITUDE	altitude,(m)
MUL	number according to Müller,(-)
Y/N-MUL	WMO-NO is number according to Müller (yes=1;no=0),(-)
X-COOR	x-coordinate in CORINE projection,(-)
Y-COOR	y-coordinate in CORINE projection,(-)
MAXNT	maximum rainfall deficit,(mm/year)
PSUR	precipitation surplus,(mm/year)
PDEF	precipitation deficit,(mm/year)
STRAJA	radiation,(MegaJoule/m2/year)
AREA	area,(km2)

DATAFILE NAME: MRD-NUTS1.DAT

Maximum rainfall deficit for NUTS-1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD1	2	2	C	-
3	FREQUENCY	4	5	B	0
7	MAXNT	8	16	F	6
	** REDEFINED ITEMS **				
1	NURGCD0	1	1	C	-

item descriptions

NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
MAXNT	maximum rainfall deficit,(mm/year)
** REDEFINED ITEMS **	
NURGCD0	NUTS region code on country level (NUTS-0),(-)

DATAFILE NAME: ROOTD.DAT

rooting depth data for soils on the EC soil map 1:1.000.000

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	FULL-CODE	6	6	I	-
7	ROOTD	9	8	N	2
	** REDEFINED ITEMS **				
1	MAP_NO	4	4	I	-
5	PHASE	2	2	I	-

item descriptions

FULL-CODE	combination of map number and phase,(-)
ROOTD	rooting depth,(cm)
** REDEFINED ITEMS **	
MAP_NO	map number according to the CORINE soil map 1 : 1000000,(-)
PHASE	phase according to EC soil map 1 : 1000000,(-)

DATAFILE NAME: SOIL.DAT

File with decription of characteristics for each soil unit

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	SOIL_CODE	3	3	C	-
4	TEXT	2	2	I	-
6	CEC	4	12	F	3
10	BASE_SAT	4	12	F	3
14	ORG_MAT	4	12	F	3
18	CAL	4	12	F	3
22	SAL	4	12	F	3
26	GIP	4	12	F	3
30	DRAIN	3	3	I	-

ITEM DESCRIPTIONS

SOIL_CODE	code for soil unit, -
TEXT	texture according to EC soil map, -
CEC	Cation Exchange Capacity, -
BASE_SAT	base saturation, %
ORG_MAT	Organic matter content of the topsoil, -
CAL	presence of free CaCo3, -
SAL	presence of salinity, -
GIP	presence of gypsium, -
DRAIN	drainage condition, -

DATAFILE NAME: SUI-SOI-LEU.DAT

Soil suitability for the specified crops for the Land Evaluation Units.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	LEU-CROP	18	18	C	-
19	UN-SUI	7	7	N	4
26	AREA-SUI	4	12	F	3
	** REDEFINED ITEMS	**			
1	FULL-CODE	6	6	I	-
1	MAP_NO	4	4	I	-
5	PHASE	2	2	I	-
8	NURGCD1	2	2	C	-
8	NURGCD0	1	1	C	-
11	WMO-NO	5	5	I	-
17	CROP-NO	2	2	I	-
17	CROP-UN-SUI	9	9	C	-
11	WCUS	14	14	C	-
1	LEU-CODE	15	15	C	-

item descriptions

LEU-CROP	combination of land evaluation unit code and crop number, (-)
UN-SUI	unsuited part of unit, (-)
AREA-SUI	suited area, (km2)
** REDEFINED ITEMS **	
FULL-CODE	combination of map number and phase, (-)
MAP_NO	map number according to the CORINE soil map 1 : 1000000, (-)
PHASE	phase according to EC soil map 1 : 1000000, (-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1), (-)
NURGCD0	NUTS region code on country level (NUTS-0), (-)
WMO-NO	wmo number or number according to Müller of weather station, (-)
CROP-NO	crop number, (-)
CROP-UN-SUI	combination of crop number and unsuited factor, (-)
WCUS	wmo number; crop number and unsuited part of unit, (-)
LEU-CODE	code for land evaluation unit (FULL-CODE NURGCD WMO-NO), (-)

DATAFILE NAME: SY-AL-FRUI.DAT

Suitability classes for specified fruit crops resulting from ALES for Land Evaluation Units.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	LEU-CROP	18	18	C	-
19	NUTS1	2	2	C	-
21	AREA	8	16	F	6
29	CL-1	8	16	F	6
37	CL-2	8	16	F	6
45	CL-3	8	16	F	6
53	CL-4	8	16	F	6
	** REDEFINED ITEMS	**			
1	MAP-NO	4	4	I	-
5	PHASE	2	2	I	-
8	NURGCD0	1	1	C	-
8	NURGCD1	2	2	C	-
11	WMO-NO	5	5	I	-
17	CROP-NO	2	2	I	-
1	LEU-CODE	15	15	C	-
17	CROP-NUTS1	4	4	C	-

item descriptions

LEU-CROP	combination of land evaluation unit code and crop number, (-)
NUTS1	NURGCD1, (-)
AREA	area, (km2)
CL-1	ales suitability class 1: no limitations, (%)
CL-2	ales suitability class 2: moderate limitations, (%)
CL-3	ales suitability class 3: severe limitations, (%)
CL-4	ales suitability class 4: severe limitations, (%)
** REDEFINED ITEMS	**
MAP-NO	map number according to the CORINE soil map 1 : 1000000, (-)
PHASE	phase according to EC soil map 1 : 1000000, (-)
NURGCD0	NUTS region code on country level (NUTS-0), (-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1), (-)
WMO-NO	wmo number or number according to Müller of weather station, (-)
CROP-NO	crop number, (-)
LEU-CODE	code for land evaluation unit (FULL-CODE NURGCD WMO-NO), (-)
CROP-NUTS1	combination of crop number and and NUTS-1 code, (-)

DATAFILE NAME: SY-AL-FOR.DAT

Suitability classes for specified trees species resulting from ALES for Land Evaluation Units.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	LEU-CROP	18	18	C	-
19	NUTS1	2	2	C	-
21	AREA	8	16	F	6
29	CL-1	8	16	F	6
37	CL-2	8	16	F	6
45	CL-3	8	16	F	6
53	CL-4	8	16	F	6
	** REDEFINED ITEMS	**			
1	MAP-NO	4	4	I	-
5	PHASE	2	2	I	-
8	NURGCD0	1	1	C	-
8	NURGCD1	2	2	C	-
11	WMO-NO	5	5	I	-
17	CROP-NO	2	2	I	-
1	LEU-CODE	15	15	C	-
17	CROP-NUTS1	4	4	C	-

item descriptions

LEU-CROP	combination of land evaluation unit code and crop number,(-)
NUTS1	NURGCD1,(-)
AREA	area,(km2)
CL-1	ales suitability class 1: no limitations,(%)
CL-2	ales suitability class 2: moderate limitations,(%)
CL-3	ales suitability class 3: severe limitations,(%)
CL-4	ales suitability class 4: severe limitations,(%)
** REDEFINED ITEMS	**
MAP-NO	map number according to the CORINE soil map 1 : 1000000,(-)
PHASE	phase according to EC soil map 1 : 1000000,(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)
NURGCD1	NUTS region code on first NUTS level (NUTS-I),(-)
WMO-NO	wmo number or number according to Müller of weather station,(-)
CROP-NO	crop number,(-)
LEU-CODE	code for land evaluation unit (FULL-CODE NURGCD WMO-NO),(-)
CROP-NUTS1	combination of crop number and NUTS-1 code,(-)

DATAFILE NAME: SY.DAT

Simulated yield data for the specified crops resulting from WOFOST for Land Evaluation Units.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	LEU-CROP	18	18	C	-
19	NUTS1	2	2	C	-
21	UN-SUI	7	7	N	4
28	AREA-SUI	4	12	F	3
32	EF-TEX	3	3	I	-
35	EF-SAL	3	3	I	-
38	EF-ALK	3	3	I	-
41	EF-ROD	3	3	I	-
44	EF-SLO	3	3	I	-
47	EF-DRA	3	3	I	-
50	EF-PHA	3	3	I	-
53	EF-CLI	3	3	I	-
56	PY	8	16	F	6
64	VAR-PY	8	16	F	6
72	TRC-PY	8	16	F	6
80	WUSE-PY	8	16	F	6
88	WL	8	16	F	6
96	VAR-WL	8	16	F	6
104	TRC-WL	8	16	F	6
112	WUSE-WL	8	16	F	6
120	STE-WL	8	16	F	6
128	LEA-WL	8	16	F	6
136	ORG-WL	8	16	F	6
144	N-PY	8	16	F	6
152	P-PY	8	16	F	6
160	K-PY	8	16	F	6
168	N-WL	8	16	F	6
176	P-WL	8	16	F	6
184	K-WL	8	16	F	6
	** REDEFINED ITEMS **				
1	LEU-CODE	15	15	C	-
1	FULL-CODE	6	6	I	-
1	MAP_NO	4	4	I	-
5	PHASE	2	2	I	-
8	NURGCD1	2	2	C	-
8	NURGCD0	1	1	C	-
11	WMO-NO	5	5	I	-
17	CROP-NO	2	2	I	-
17	CROP-NUTS1	4	4	C	-
11	WMO-CROP	8	8	C	-
17	CROP-NUTS0	3	3	C	-

item descriptions

LEU-CROP	combination of land evaluation unit code and crop number, (-)
NUTS1	NURGCD1, (-)
UN-SUI	unsuited part of unit, (-)
AREA-SUI	suited area, (km2)
EF-TEX	excluding factor is texture (yes=1; no=0), (-)
EF-SAL	excluding factor is salinity (yes=1; no=0), (-)
EF-ALK	excluding factor is alkalinity (yes=1; no=0), (-)
EF-ROD	excluding factor is rooting depth (yes=1; no=0), (-)
EF-SLO	excluding factor is slope (yes=1; no=0), (-)
EF-DRA	excluding factor is drainage (yes=1; no=0), (-)
EF-PHA	excluding factor is phase (yes=1; no=0), (-)
EF-CLI	excluding factor is climate (yes=1; no=0), (-)
PY	potential yield, (dry matter kg/ha)
VAR-PY	variance potential yield, (-)
TRC-PY	respiration coefficient potential yield, (-)
WUSE-PY	water used for potential yield level, (m3/ha/growing period)
WL	water limited yield, (dry matter kg/ha)
VAR-WL	variance water limited yield, (-)
TRC-WL	respiration coefficient water limited yield, (-)
WUSE-WL	water used for water limited yield level, (m3/ha/growing period)
STE-WL	dry matter stems water limited yield, (kg.ha)
LEA-WL	dry matter leaves water limited yield, (kg/ha)
ORG-WL	dry matter storage organs water limited yield, (kg/ha)
N-PY	nitrogen needed for potential yield level, (kg/ha)
P-PY	phosphate needed for potential yield level, (kg/ha)
K-PY	potassium needed for potential yield level, (kg/ha)

N-WL	nitrogen needed for water limited yield level, (kg/ha)
P-WL	phosphate needed for water limited yield level, (kg/ha)
K-WL	potassium needed for water limited yield level, (kg/ha)

** REDEFINED ITEMS **

LEU-CODE	code for land evaluation unit (FULL-CODE NURGCD WMO-NO), (-)
FULL-CODE	combination of map number and phase, (-)
MAP_NO	map number according to the CORINE soil map 1 : 1000000, (-)
PHASE	phase according to EC soil map 1 : 1000000, (-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1), (-)
NURGCD0	NUTS region code on country level (NUTS-0), (-)
WMO-NO	wmo number or number according to Müller of weather station, (-)
CROP-NO	crop number, (-)
CROP-NUTS1	combination of crop number and and NUTS-1 code, (-)
WMO-CROP	combination of wmo number and crop number, (-)
CROP-NUTS0	combination of crop number and and NUTS-0 code, (-)

********** AGGREGATED TABLES **********

DATAFILE NAME: S-AY.DAT

Average actual yield data for NUTS-1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NUTS1-CROP	4	4	C	-
5	NUTS1	2	2	C	-
7	FREQUENCY	4	5	B	0
11	MEAN-W-AA	8	16	F	6
19	SUM-Y-DATA	1	1	I	-
20	MEAN-W-AY	8	16	F	6
28	MIN-AY	9	9	N	1
37	MAX-AY	9	9	N	1
46	AY	4	12	F	3
50	STE-AY	4	12	F	3
54	LEA-AY	4	12	F	3
58	STO-AY	4	12	F	3
62	N-AY	4	12	F	3
66	P-AY	4	12	F	3
70	K-AY	4	12	F	3
74	WUSE-AY	4	12	F	3
	** REDEFINED ITEMS **				
1	NURGCD1	2	2	C	-
3	CROP-NO	2	2	I	-
3	CROP-NUTS1	4	4	C	-
1	NURGCD0	1	1	C	-

item descriptions

NUTS1-CROP	combination of NUTS-1 code and crop number,(-)
NUTS1	NURGCD1,(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
MEAN-W-AA	weighted mean actual used area for specified crop, (km2)
SUM-Y-DATA	number of years with available data,(-)
MEAN-W-AY	weighted mean actual yield,(fresh weight kg/ha)
MIN-AY	minimum actual yield for years with data available, (kg/ha)
MAX-AY	maximum actual yield for years with available data, (kg/ha)
AY	actual yield,(fresh weight kg/ha)
STE-AY	dry matter stems actual yield,(kg/ha)
LEA-AY	dry matter leaves actual yield,(kg/ha)
STO-AY	dry matter storage organs actual yield,(kg/ha)
N-AY	nitrogen needed for actual yield level,(kg/ha)
P-AY	phosphate needed for actual yield level,(kg/ha)
K-AY	potassium needed for actual yield level,(kg/ha)
WUSE-AY	water used for actual yield level, (m3/ha/growing period)
** REDEFINED ITEMS **	
NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
CROP-NO	crop number,(-)
CROP-NUTS1	combination of crop number and and NUTS-1 code,(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)

DATAFILE NAME: S-FERT-NUTS0.DAT

Mean fertilizer use for NUTS-0 regions

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD0	1	1	C	-
2	FREQUENCY	4	5	B	0
6	MEAN-N	8	16	F	6
14	MEAN-P	8	16	F	6
22	MEAN-K	8	16	F	6
30	MEAN-INT_CON_ECU	8	16	F	6

item descriptions

NURGCD0	NUTS region code on country level (NUTS-0),(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
MEAN-N	mean nitrogen,(kg/ha)
MEAN-P	mean phosphate,(kg/ha)
MEAN-K	mean potassium,(kg/ha)
MEAN-INT_CON_ECU	mean intermediate consumption fertilizer, (million ECU)

DATAFILE NAME: S-SUI-SOI-CLIM.DAT

Total area with suitable soils for specified crops for agro-climatic regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	WCUS	14	14	C	-
15	FREQUENCY	4	5	B	0
19	SUM-AREA-SUI	4	12	F	3
	** REDEFINED ITEMS	**			
1	WMO-NO	5	5	I	-
7	CROP-NO	2	2	I	-
9	UN-SUI	6	6	N	3

item descriptions

WCUS	wmo number; crop number and unsuited part of unit,(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
SUM-AREA-SUI	sum of suited area for specified crop,(km2)
** REDEFINED ITEMS	**
WMO-NO	wmo number or number according to Müller of weather station,(-)
CROP-NO	crop number,(-)
UN-SUI	unsuited part of unit,(-)

DATAFILE NAME: S-SY-AL-FRUI.DAT

suitability classes for the specified fruit crops resulting from ALES aggregated for NUTS 1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CROP-NUTS1	4	4	C	-
5	FREQUENCY	4	5	B	0
9	MEAN-W-CL-1	8	16	F	6
17	MEAN-W-CL-2	8	16	F	6
25	MEAN-W-CL-3	8	16	F	6
33	MEAN-W-CL-4	8	16	F	6
	** REDEFINED ITEMS **				
1	CROP-NO	2	2	I	-
3	NURGCD1	2	2	C	-
3	NURGCD0	1	1	C	-

item descriptions

CROP-NUTS1	combination of crop number and and NUTS-1 code,(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
MEAN-W-CL-1	weighted mean suitability according ales class 1: no limitations,(%)
MEAN-W-CL-2	weighted mean suitability according ales class 2: moderate limitations,(%)
MEAN-W-CL-3	weighted mean suitability according ales class 3: severe limitations,(%)
MEAN-W-CL-4	weighted mean suitability according ales class 4: severe limitations,(%)
** REDEFINED ITEMS **	
CROP-NO	crop number,(-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)

DATAFILE NAME: S-SY-AL-FOR.DAT

Suitability classes for the specified tree species resulting from ALES aggregated for NUTS 1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CROP-NUTS1	4	4	C	-
5	FREQUENCY	4	5	B	0
9	MEAN-W-CL-1	8	16	F	6
17	MEAN-W-CL-2	8	16	F	6
25	MEAN-W-CL-3	8	16	F	6
33	MEAN-W-CL-4	8	16	F	6
	** REDEFINED ITEMS	**			
1	CROP-NO	2	2	I	-
3	NURGCD1	2	2	C	-
3	NURGCD0	1	1	C	-

item descriptions

CROP-NUTS1	combination of crop number and and NUTS-1 code,(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
MEAN-W-CL-1	weighted mean suitability according ales class 1: no limitations,(%)
MEAN-W-CL-2	weighted mean suitability according ales class 2: moderate limitations,(%)
MEAN-W-CL-3	weighted mean suitability according ales class 3: severe limitations,(%)
MEAN-W-CL-4	weighted mean suitability according ales class 4: severe limitations,(%)
** REDEFINED ITEMS	**
CROP-NO	crop number,(-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)

DATAFILE NAME: S-SY-CLIM.DAT

Simulated yield data for the specified crops resulting from WOFOST aggregated for agro-climatic regions

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	WMO-CROP	8	8	C	-
9	FREQUENCY	4	5	B	0
13	MEAN-W-UN-SUI	8	16	F	6
21	MEAN-W-PY	8	16	F	6
29	MEAN-W-VAR-PY	8	16	F	6
37	MEAN-W-TRC-PY	8	16	F	6
45	MEAN-W-WUSE-PY	8	16	F	6
53	MEAN-W-WL	8	16	F	6
61	MEAN-W-VAR-WL	8	16	F	6
69	MEAN-W-TRC-WL	8	16	F	6
77	MEAN-W-WUSE-WL	8	16	F	6
85	MEAN-W-STE-WL	8	16	F	6
93	MEAN-W-LEA-WL	8	16	F	6
101	MEAN-W-ORG-WL	8	16	F	6
109	MEAN-W-N-PY	8	16	F	6
117	MEAN-W-P-PY	8	16	F	6
125	MEAN-W-K-PY	8	16	F	6
133	MEAN-W-N-WL	8	16	F	6
141	MEAN-W-P-WL	8	16	F	6
149	MEAN-W-K-WL	8	16	F	6
	** REDEFINED ITEMS	**			
1	WMO-NO	5	5	I	-
7	CROP-NO	2	2	I	-

item descriptions

WMO-CROP	combination of wmo number and crop number, (-)
FREQUENCY	frequency; item generated by ARC/INFO, (-)
MEAN-W-UN-SUI	weighted mean unsuited part of unit, (%)
MEAN-W-PY	weighted mean potential yield, (kg dry matter/ha)
MEAN-W-VAR-PY	weighted mean variance potential yield, (-)
MEAN-W-TRC-PY	weighted mean respiration coefficient water potential yield, (-)
MEAN-W-WUSE-PY	weighted mean water use for potential yield level, (m3/ha)
MEAN-W-WL	weighted mean water limited yield, (kg dry matter/ha)
MEAN-W-VAR-WL	weighted mean variance water limited yield, (-)
MEAN-W-TRC-WL	weighted mean respiration coefficient water limited yield, (-)
MEAN-W-WUSE-WL	weighted mean water use for water limited yield level, (m3/ha)
MEAN-W-STE-WL	weighted mean dry matter stems water limited yield, (kg/ha)
MEAN-W-LEA-WL	weighted mean dry matter leaves water limited yield, (kg/ha)
MEAN-W-ORG-WL	weighted mean dry matter storage organs water limited yield, (kg/ha)
MEAN-W-N-PY	weighted mean nitrogen needed for potential yield level, (kg/ha)
MEAN-W-P-PY	weighted mean phosphate needed for potential yield level, (kg/ha)
MEAN-W-K-PY	weighted mean potassium needed for potential yield level, (kg/ha)
MEAN-W-N-WL	weighted mean nitrogen needed for water limited yield level, (kg/ha)
MEAN-W-P-WL	weighted mean phosphate needed for water limited yield level, (kg/ha)
MEAN-W-K-WL	weighted mean potassium needed for water limited yield level, (kg/ha)
** REDEFINED ITEMS **	
WMO-NO	wmo number or number according to Müller of weather station, (-)
CROP-NO	crop number, (-)

DATAFILE NAME: S-SY-NUTS0.DAT

Simulated yield data for the specified crops resulting from WOFOST aggregated for NUTS-0 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CROP-NUTS0	3	3	C	-
4	FREQUENCY	4	5	B	0
8	MEAN-W-PY	8	16	F	6
16	MEAN-W-WL	8	16	F	6
	** REDEFINED ITEMS	**			
1	CROP-NO	2	2	I	-
3	NURGCD0	1	1	C	-

item descriptions

CROP-NUTS0	combination of crop number and and NUTS-0 code, (-)
FREQUENCY	frequency; item generated by ARC/INFO, (-)
MEAN-W-PY	weighted mean potential yield, (kg dry matter/ha)
MEAN-W-WL	weighted mean water limited yield, (kg dry matter/ha)
** REDEFINED ITEMS	**
CROP-NO	crop number, (-)
NURGCD0	NUTS region code on country level (NUTS-0), (-)

DATAFILE NAME: S-SY-NUTS1.DAT

Simulated yield data for the specified crops resulting from WOFOST aggregated for NUTS-1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CROP-NUTS1	4	4	C	-
5	FREQUENCY	4	5	B	0
9	MEAN-W-UN-SUI	8	16	F	6
17	MEAN-W-PY	8	16	F	6
25	MEAN-W-VAR-PY	8	16	F	6
33	MEAN-W-TRC-PY	8	16	F	6
41	MEAN-W-WUSE-PY	8	16	F	6
49	MEAN-W-WL	8	16	F	6
57	MEAN-W-VAR-WL	8	16	F	6
65	MEAN-W-TRC-WL	8	16	F	6
73	MEAN-W-WUSE-WL	8	16	F	6
81	MEAN-W-STE-WL	8	16	F	6
89	MEAN-W-LEA-WL	8	16	F	6
97	MEAN-W-ORG-WL	8	16	F	6
105	MEAN-W-N-PY	8	16	F	6
113	MEAN-W-P-PY	8	16	F	6
121	MEAN-W-K-PY	8	16	F	6
129	MEAN-W-N-WL	8	16	F	6
137	MEAN-W-P-WL	8	16	F	6
145	MEAN-W-K-WL	8	16	F	6
	** REDEFINED ITEMS **				
1	CROP-NO	2	2	I	-
3	NURGCD1	2	2	C	-
3	NURGCD0	1	1	C	-

item descriptions

CROP-NUTS1	combination of crop number and and NUTS-1 code, (-)
FREQUENCY	frequency; item generated by ARC/INFO, (-)
MEAN-W-UN-SUI	weighted mean unsuited part of unit, (%)
MEAN-W-PY	weighted mean potential yield, (kg dry matter/ha)
MEAN-W-VAR-PY	weighted mean variance potential yield, (-)
MEAN-W-TRC-PY	weighted mean respiration coefficient water potential yield, (-)
MEAN-W-WUSE-PY	weighted mean water use for potential yield level, (m3/ha)
MEAN-W-WL	weighted mean water limited yield, (kg dry matter/ha)
MEAN-W-VAR-WL	weighted mean variance water limited yield, (-)
MEAN-W-TRC-WL	weighted mean respiration coefficient water limited yield, (-)
MEAN-W-WUSE-WL	weighted mean water use for water limited yield level, (m3/ha)
MEAN-W-STE-WL	weighted mean dry matter stems water limited yield, (kg/ha)
MEAN-W-LEA-WL	weighted mean dry matter leaves water limited yield, (kg/ha)
MEAN-W-ORG-WL	weighted mean dry matter storage organs water limited yield, (kg/ha)
MEAN-W-N-PY	weighted mean nitrogen needed for potential yield level, (kg/ha)
MEAN-W-P-PY	weighted mean phosphate needed for potential yield level, (kg/ha)
MEAN-W-K-PY	weighted mean potassium needed for potential yield level, (kg/ha)
MEAN-W-N-WL	weighted mean nitrogen needed for water limited yield level, (kg/ha)
MEAN-W-P-WL	weighted mean phosphate needed for water limited yield level, (kg/ha)
MEAN-W-K-WL	weighted mean potassium needed for water limited yield level, (kg/ha)
** REDEFINED ITEMS **	
CROP-NO	crop number, (-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1), (-)

DATAFILE NAME: S-SUI-SOI-NUTS1.DAT

Total area with suited soils for the specified crops aggregated for NUTS-1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CROP-NUTS1	4	4	C	-
5	FREQUENCY	4	5	B	0
9	SUM-AREA-SUI	4	12	F	3
	** REDEFINED ITEMS	**			
1	CROP-NO	2	2	I	-
3	NURGCD1	2	2	C	-
3	NURGCD0	1	1	C	-

item descriptions

CROP-NUTS1	combination of crop number and and NUTS-1 code,(-)
FREQUENCY	frequency; item generated by ARC/INFO,(-)
SUM-AREA-SUI	sum of suited area for specified crop,(km2)
** REDEFINED ITEMS	**
CROP-NO	crop number,(-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)

********** HELP TABLES **********

DATAFILE NAME: PF-HELP-CL.DAT

Help table for temporary storage of data for agro-climatic regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	WMO-NO	5	5	I	-
6	WMO_DESC	25	25	C	-
31	HELP_ITEM	8	16	F	6

item descriptions

WMO-NO	wmo number or number according to Müller of weather station,(-)
WMO_DESC	name weather station,(-)
HELP_ITEM	hulp item used for making maps,(-)

DATAFILE NAME: PF-HELP-LEU.DAT

Help table for temporary storage of data for Land Evaluation Units.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	LEU-CODE	15	15	C	-
16	UN-SUI	7	7	N	4
23	HELP_ITEM	8	16	F	6
	** REDEFINED ITEMS	**			
1	FULL-CODE	6	6	I	-
1	MAP-NO	4	4	I	-
5	PHASE	2	2	I	-
8	NURGCD1	2	2	C	-
8	NURGCD0	1	1	C	-
11	WMO-NO	5	5	I	-

item descriptions

LEU-CODE	code for land evaluation unit (FULL-CODE NURGCD WMO-NO),(-)
UN-SUI	unsuited part of unit,(-)
HELP_ITEM	hulp item used for making maps,(-)
** REDEFINED ITEMS	**
FULL-CODE	combination of map number and phase,(-)
MAP-NO	map number according to the CORINE soil map 1 : 1000000,(-)
PHASE	phase according to EC soil map 1 : 1000000,(-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
NURGCD0	NUTS region code on country level (NUTS-0),(-)
WMO-NO	wmo number or number according to Müller of weather station,(-)

DATAFILE NAME: PF-HELP-NU.DAT

Help table for temporary storage of data for NUTS-1 regions.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD1	2	2	C	-
3	NURGCD1_DESC	25	25	C	-
28	HELP_ITEM	8	16	F	6
	** REDEFINED ITEMS	**			
1	NURGCD0	1	1	C	-

item descriptions

NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
NURGCD1_DESC	region name,(-)
HELP_ITEM	hulp item used for making maps,(-)
** REDEFINED ITEMS	**
NURGCD0	NUTS region code on country level (NUTS-0),(-)

********** CONVERSION TABLES **********

DATAFILE NAME: CROP.CVT

Crop number conversion table.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CROP-NO	2	2	I	-
3	WAT-CON	4	4	N	2
7	CROP_DESC	25	25	C	-

item descriptions

CROP-NO	crop number,(-)
WAT-CON	water content crop (for conversion fresh to dry matter weight),(-)
CROP_DESC	crop description,(-)

```
================================================================================

DATAFILE NAME: GREATGROUP.CVT

Soil unit Great group conversion table

================================================================================

COL  ITEM NAME          WDTH OPUT TYP N.DEC
   1  GREAT_GROUP          1    1  C    -
   2  GREAT_GROUP_DESC    35   35  C    -


 item descriptions
--------------------------------------------------------------------------------

GREAT_GROUP               great group according FAO soil classification,(-)
GREAT_GROUP_DESC          description great group,(-)

================================================================================
```

DATAFILE NAME: NURGCD0.CVT

NUTS-0 region code conversion table.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD0	1	1	C	-
2	NUTS0_DESC	25	26	C	-

item descriptions

NURGCD0	NUTS region code on country level (NUTS-0),(-)
NUTS0_DESC	country name,(-)

DATAFILE NAME: NURGCD1.CVT

NUTS-1 region code conversion table.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	NURGCD1	2	2	C	-
3	PB	1	1	I	-
4	NUTS1_DESC	25	26	C	-
	** REDEFINED ITEMS **				
1	NURGCD0	1	1	C	-

item descriptions

NURGCD1	NUTS region code on first NUTS level (NUTS-1),(-)
PB	item used for page breaks in reports,(-)
NUTS1_DESC	NURGCD1_DESC,(-)
** REDEFINED ITEMS **	
NURGCD0	NUTS region code on country level (NUTS-0),(-)

DATAFILE NAME: PHASE.CVT

File with phase description

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	PHASE	2	2	I	-
3	PHASE_DESC	25	25	C	-

ITEM DESCRIPTIONS

PHASE	phase according to EC soil map 1 : 1000000 , -
PHASE_DESC	Description of phase code, -

DATAFILE NAME: TEXT.CVT

texture conversion table

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	CLASS	3	3	C	-
4	TEXT_DESC	25	25	C	-
29	TEXT_DEF	55	55	C	-

ITEM DESCRIPTIONS

CLASS	class, -
TEXT_DESC	description of texture class, -
SLOPE_DEF	definition of slope class, -

DATAFILE NAME: SLOPE.CVT

slope conversion table

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	SLOPE	3	3	C	-
4	SLOPE_DESC	18	18	C	-
22	SLOPE_DEF	35	35	C	-

ITEM DESCRIPTIONS

SLOPE	slope class according to EC soil map, -
SLOPE_DESC	description slope class' -
SLOPE_DEF	definition of slope class, -

DATAFILE NAME: SUBGROUP.CVT

Soil unit subgroup conversion table

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	SUBGROUP	1	1	C	-
2	SUBGROUP_DESC	35	35	C	-

item descriptions

SUBGROUP	subgroup according to FAO soil classification,(-)
SUBGROUP_DESC	description of subgroup,(-)

DATAFILE NAME: ORDER.CVT

Soil unit order conversion table.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	ORDER	1	1	C	-
2	ORDER_DESC	15	15	C	-

item descriptions

ORDER	soil order according FAO soil classification,(-)
ORDER_DESC	description of soil order,(-)

DATAFILE NAME: SYMBOL.CVT

Soil map EC Symbol conversion table.

COL	ITEM NAME	WDTH	OPUT	TYP	N.DEC
1	DOM_SOIL	3	3	C	-
4	LEG-NAME	50	50	C	-
	** REDEFINED ITEMS **				
1	ORDER	1	1	C	-
2	GREAT_GROUP	1	1	C	-
3	SUBGROUP	1	1	C	-

item descriptions

DOM_SOIL	dominant soil in legend unit EC soil map,(-)
LEG-NAME	legend name from EC soil map 1 : 1000000,(-)
** REDEFINED ITEMS **	
ORDER	soil order according FAO soil classification,(-)
GREAT_GROUP	great group according FAO soil classification,(-)
SUBGROUP	subgroup according to FAO soil classification,(-)

ANNEX II

Alphabetic list of attributes

A-DATA	data available for actual used area (1=yes; 0=no), (-)
AA	actual used area for specified crop, (km2)
AFOD	total area used for fodder crops, (km2)
AFOR	total area forest, (km2)
AGRASS	total area grassland, (km2)
ALTITUDE	altitude, (m)
AN_0-1	bovine animals 0-1 year old, (1000 head)
AN_1-2	bovine animals 1-2 years old, (1000 head)
APERM	area under permanent crop, (km2)
AREA	area, (km2)
AREA-SUI	suited area, (km2)
ASS_SOILS	associated soils according to the legend units on the EC soil map, (-)
ATOT	total area, (km2)
ATOTAA	total area arable land, (km2)
AV-CO-K	potassium production for an average cow used for conversion, (K2O kg/year)
AV-CO-MAN	manure production for an average cow used for conversion, (kg/year)
AV-CO-N	nitrogen production for an average cow used for conversion, (N kg/year)
AV-CO-ORG	organic matter production for an average cow used for conversion, (kg/year)
AV-CO-P	phosphate production for an average cow used for conversion, (P2O5 kg/year)
AV-PI-K	potassium production for an average pig used for conversion, (K2O kg/year)
AV-PI-MAN	manure production for an average pig used for conversion, (kg/year)
AV-PI-N	nitrogen production for an average pig used for conversion, (N kg/year)
AV-PI-ORG	organic matter production for an average pig used for conversion, (kg/year)
AV-PI-P	phosphate production for an average pig used for conversion, (P2O5 kg/year)
AY	actual yield, (fresh weight kg/ha)
BASE_SAT	base saturation, (%)
BOV-LI	total bovine livestock NUTS-0 level, (1000 head)
BOV-TOT	total bovine livestock NUTS-1 level, (1000 head)
CAL	presence of free CaCo3, (-)
CASE#	item generated by ARC/INFO, (-)
CEC	Cation Exchange Capacity, (-)
CL-1	suitability according to ales class 1: no limitations, (%)
CL-2	suitability according to ales class 2: moderate limitations, (%)
CL-3	suitability according to ales class 3: severe limitations, (%)
CL-4	suitability according to ales class 4: severe limitations, (%)
CLASS	class, (-)
COWS	number of cows, (1000 head)
CROP-NO	crop number, (-)
CROP-NUTS0	combination of crop number and NUTS-0 code, (-)
CROP-NUTS1	combination of crop number and NUTS-1 code, (-)
CROP-UN-SUI	combination of crop number and unsuited factor, (-)
CROP_DESC	crop description, (-)

DOM-PERC	percentage for presence of the dominant soil in the legend unit, (%)
DOM_SOIL	dominant soil in legend unit EC soil map, (-)
DRAIN	drainage condition, (-)
EF-ALK	excluding factor is alkalinity (yes=1; no=0), (-)
EF-CLI	excluding factor is climate (yes=1; no=0), (-)
EF-DRA	excluding factor is drainage (yes=1; no=0), (-)
EF-PHA	excluding factor is phase (yes=1; no=0), (-)
EF-ROD	excluding factor is rooting depth (yes=1; no=0), (-)
EF-SAL	excluding factor is salinity (yes=1; no=0), (-)
EF-SLO	excluding factor is slope (yes=1; no=0), (-)
EF-TEX	excluding factor is texture (yes=1; no=0), (-)
EQUI	number of equidae, (1000 head)
FREQUENCY	frequency; item generated by ARC/INFO, (-)
FULL-CODE	combination of map number and phase, (-)
GIP	presence of free CaSo4, (-)
GOATS	number of goats, (1000 head)
GREAT_GROUP	great group according to FAO soil classification, (-)
GREAT_GROUP_DESC	description great group, (-)
GWATER	groundwater class, (-)
HELP_ITEM	help item used for making maps, (-)
INCL	inclusions in soil association according legend unit EC soil map, (-)
INT_CON_ECU	intermediate consumption fertilizer, (million ECU)
K	potassium, (kg/ha)
K-A	potassium from animal manure, (kg/ha)
K-AY	potassium needed for actual yield level, (kg/ha)
K-F	potassium available from fertilizer use, (kg/ha)
K-PY	potassium needed for potential yield level, (kg/ha)
K-TOT	potassium available from fertilizer and animal manure, (kg/ha)
K-WL	potassium needed for water limited yield level, (kg/ha)
LAT	latitude, (degrees)
LAY-HENS	number of laying hens, (1000 head)
LEA-AY	dry matter leaves actual yield, (kg/ha)
LEA-WL	dry matter leaves water limited yield, (kg/ha)
LEG-NAME	legend name from EC soil map 1 : 1000000, (-)
LEU-CODE	code for land evaluation unit (FULL-CODE NURGCD WMO-NO), (-)
LEU-CROP	combination of land evaluation unit code and crop number, (-)
LONG	longitude, (degrees)
MAN	manure, (kg/year)
MAP-NO	map number according to the CORINE soil map 1 : 1000000, (-)
MAP_NO	map number according to the CORINE soil map 1 : 1000000, (-)
MAT-SOWS	number of mated sows, (1000 head)
MAX-AY	maximum actual yield for years with available data, (kg/ha)
MAXNT	maximum rainfall deficit, (mm/year)
MEAN-INT_CON_ECU	mean intermediate consumption fertilizer, (million ECU)
MEAN-K	mean potassium, (kg/ha)
MEAN-N	mean nitrogen, (kg/ha)
MEAN-P	mean phosphate, (kg/ha)

MEAN-W-AA	weighted mean actual used area for specified crop, (km2)
MEAN-W-AY	weighted mean actual yield, (fresh weight kg/ha)
MEAN-W-CL-1	weighted mean suitability according ales class 1: no limitations, (%)
MEAN-W-CL-2	weighted mean suitability according ales class 2: moderate limitations(%)
MEAN-W-CL-3	weighted mean suitability according ales class 3: severe limitations, (%)
MEAN-W-CL-4	weighted mean suitability according ales class 4: severe limitations, (%)
MEAN-W-K-PY	weighted mean potassium needed for potential yield level, (kg/ha)
MEAN-W-K-WL	weighted mean potassium needed for water limited yield level, (kg/ha)
MEAN-W-LEA-WL	weighted mean dry matter leaves water limited yield, (kg/ha)
MEAN-W-N-PY	weighted mean nitrogen needed for potential yield level, (kg/ha)
MEAN-W-N-WL	weighted mean nitrogen needed for water limited yield level, (kg/ha)
MEAN-W-ORG-WL	weighted mean dry matter storage organs water limited yield, (kg/ha)
MEAN-W-P-PY	weighted mean phosphate needed for potential yield level, (kg/ha)
MEAN-W-P-WL	weighted mean phosphate needed for water limited yield level, (kg/ha)
MEAN-W-PY	weighted mean potential yield, (kg dry matter/ha)
MEAN-W-STE-WL	weighted mean dry matter stems water limited yield, (kg/ha)
MEAN-W-TRC-PY	weighted mean respiration coefficient water potential yield, (-)
MEAN-W-TRC-WL	weighted mean respiration coefficient water limited yield, (-)
MEAN-W-UN-SUI	weighted mean unsuited part of unit, (%)
MEAN-W-VAR-PY	weighted mean variance potential yield, (-)
MEAN-W-VAR-WL	weighted mean variance water limited yield, (-)
MEAN-W-WL	weighted mean water limited yield, (kg dry matter/ha)
MEAN-W-WUSE-PY	weighted mean water use for potential yield level, (m3/ha)
MEAN-W-WUSE-WL	weighted mean water use for water limited yield level, (m3/ha)
MIN-AY	minimum actual yield for years with data available, (kg/ha)
MUL	number according to Müller, (-)
MONTH	month, (-)
N	nitrogen use, (kg/ha)
N-A	nitrogen available from animal manure production, (kg/year)
N-AY	nitrogen needed for actual yield level, (kg/ha)
N-F	nitrogen available from fertilizer use, (kg/ha)
N-PY	nitrogen needed for potential yield level, (kg/ha)
N-TOT	nitrogen available from animal manure and fertilizer use, (kg/ha)
N-WL	nitrogen needed water limited yield level, (kg/ha)
NMAT-SOWS	number of not mated sows, (1000 head)
NON-AGR	urban area and lakes, (km2)
NURGCD0	NUTS region code on country level (NUTS-0), (-)
NURGCD1	NUTS region code on first NUTS level (NUTS-1), (-)
NURGCD1_DESC	region name, (-)
NUTS0_DESC	country name, (-)
NUTS1	see NURGCD1, (-)
NUTS1-CROP	combination of NUTS-1 code and crop number, (-)
NUTS1-CROP-YEAR	combination of NUTS-1 code; crop number and year, (-)
NUTS1_DESC	see NURGCD1_DESC, (-)
ORDER	soil order according FAO soil classification, (-)
ORDER_DESC	description of soil order, (-)
ORG	organic matter from animal manure, (kg/year)

ORG-WL	dry matter storage organs water limited yield, (kg/ha)
ORG_MAT	Organic matter content of the topsoil, (-)
OTH-PIGS	other pigs, (1000 head)
OTH-POUL	other poultry, (1000 head)
OTHER-BOV	other bovine, (1000 head)
P	phosphate, (kg/ha)
P-A	phosphate from animal manure production, (kg/year)
P-AY	phosphate needed for actual yield level, (kg/ha)
P-F	phosphate available from fertilizer use, (kg/ha)
P-PY	phosphate needed for potential yield level, (kg/ha)
P-TOT	phosphate available from animal manure and fertilizer use, (kg/ha)
P-WL	phosphate needed for water limited yield level, (kg/ha)
PART_ASS	percentage of soil unit in soil association, (%)
PB	item used for page breaks in reports, (-)
PDEF	precipitation deficit, (mm/year)
PHASE	phase according to EC soil map 1 : 1000000, (-)
PHASE_DESC	phase description, (-)
PIGS	number of pigs, (1000 head)
PIGSTOT	total number of pigs, (1000 head)
PSUR	precipitation surplus, (mm/year)
PY	potential yield, (dry matter kg/ha)
RAD	radiation, (kJ/m/day)
RAINF	rainfall, (mm)
RAIND	raindays, (days)
ROOTD	rooting depth, (cm)
SAL	presence of salinity, (-)
SEQ_NO	sequence number of soil unit in soil association, (-)
SHEEP	number of sheep, (1000 head)
SLOPE	slope class according to EC soil map, (-)
SLOPE_DEF	definition of slope class, (-)
SLOPE_DESC	description slope class, (-)
SOIL_CODE	code for soil unit, (-)
STAT_DESC	name weather station, (-)
STE-AY	dry matter stems actual yield, (kg/ha)
STE-WL	dry matter stems water limited yield, (kg.ha)
STO-AY	dry matter storage organs actual yield, (kg/ha)
STRAJA	radiation, (MegaJoule/m2/year)
SUBGROUP	subgroup according to FAO soil classification, (-)
SUBGROUP_DESC	description of subgroup, (-)
SUM-AREA-SUI	sum of suited area for specified crop, (km2)
SUM-Y-DATA	number of years with available data, (-)
T-MIN	minimum temperarure, (degrees Celsius)
T-MAX	maximum temperature, (degrees Celsius)
TEXT	texture according to EC soil map, (-)
TEXT_DEF	definition of texture class, (-)
TEXT_DESC	description of texture class, (-)
TRC-PY	respiration coefficient potential yield, (-)

TRC-WL	respiration coefficient water limited yield, (-)
UAA	used agricultural area, (km2)
UN-SUI	unsuited part of unit, (-)
VAP	vapour pressure, (kPa)
VAR-PY	variance potential yield, (-)
VAR-WL	variance water limited yield, (-)
WAT-CON	water content crop (for conversion fresh to dry matter weight), (-)
WCUS	wmo number; crop number and unsuited part of unit, (-)
WINDV	wind velocity, (m/s)
WL	water limited yield, (dry matter kg/ha)
WMO-CROP	combination of wmo number and crop number, (-)
WMO-NO	wmo number or number according to Müller of weather station, (-)
WMO_DESC	name weather station, (-)
WMO-YEAR-MONTH	combination of WNO number year and month, (-)
WUSE-AY	water used for actual yield level, (m3/ha/growing period)
WUSE-PY	water used for potential yield level, (m3/ha/growing period)
WUSE-WL	water used for water limited yield level, (m3/ha/growing period)
X-COOR	x-coordinate in CORINE projection, (-)
Y-COOR	y-coordinate in CORINE projection, (-)
Y-DATA	availability of data (yes=1; no=0), (-)
Y/N-MUL	WMO-NO is number according to Müller (yes=1; no=0), (-)
YEAR	year, (-)

ANNEX III

Presentation of data; ARC/INFO macro

The GIS ARC/INFO can be applied by programming in Arc Macro Language (AML). A Macro was developed for the presentation of the data, stored in the GIS. This Macro is a menu structured programme which allows the user to decide on certain map choices. A map is created by a sequence of ARCPLOT draw commands which will finally result in a plot file to be used for certain specified output devices. The Macro discussed here will create the plot stepwise. In the first step map choices are made resulting in a command file, that is also a Macro. In the second step this Macro, the 'command file' is executed producing the plot file. In the last step the plot file is sent to the specified output device. (fig III.1).

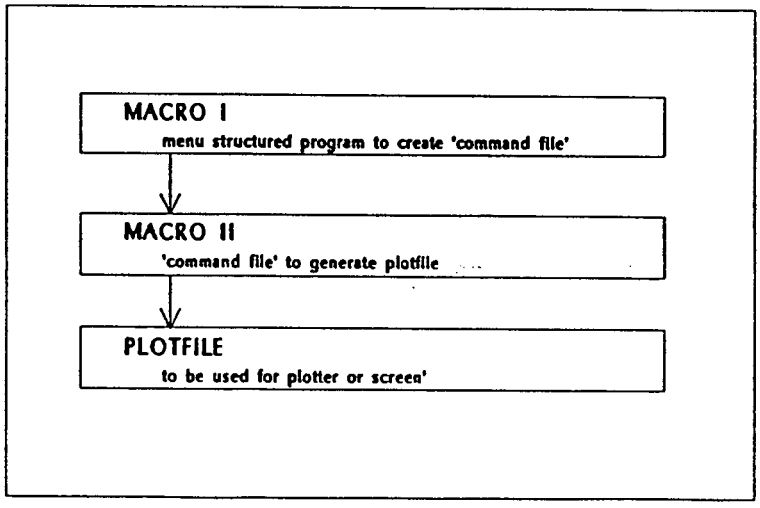


fig. III.1 Process of generating maps

It is possible to fit more then one map in a plot file depending on the size of each map. With this Macro the user defines the scale, titles, colors, symbols and so on. A map is built up of certain map components which are drawn step by step. This process is schematically shown in figure III.2.

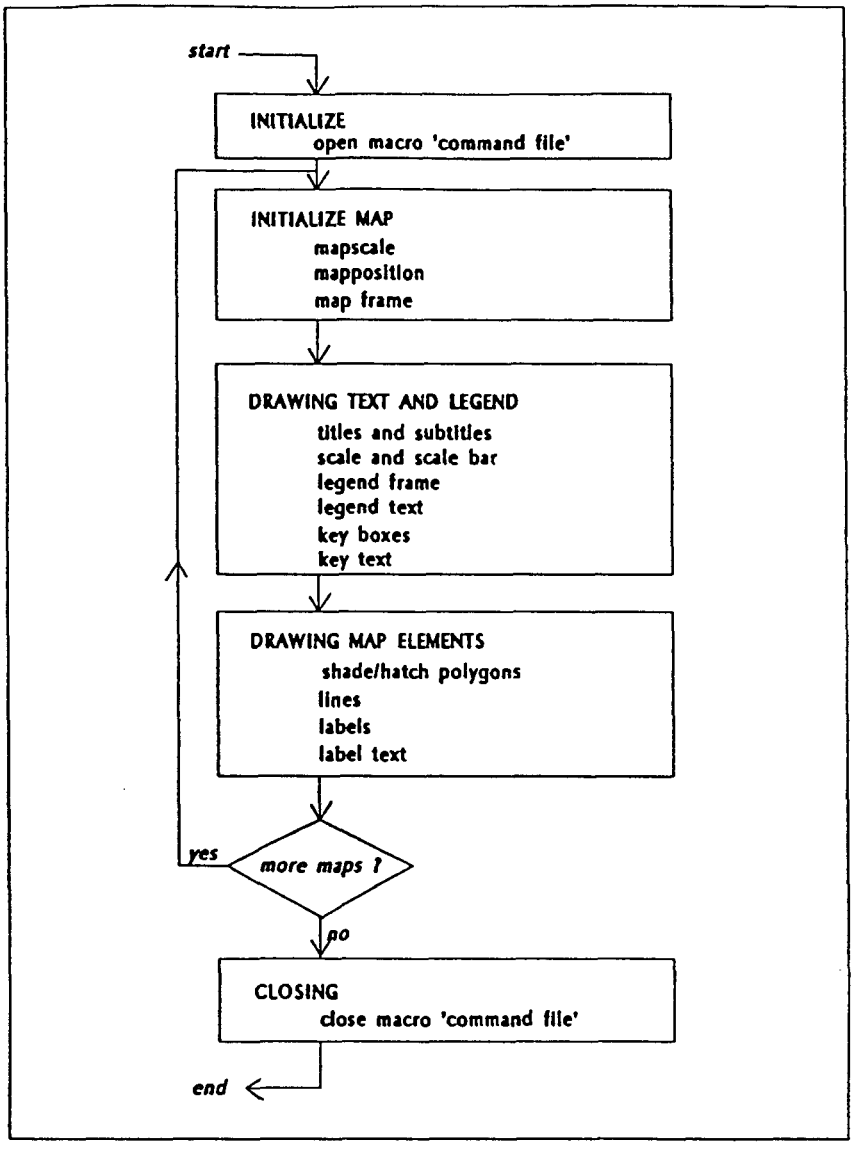
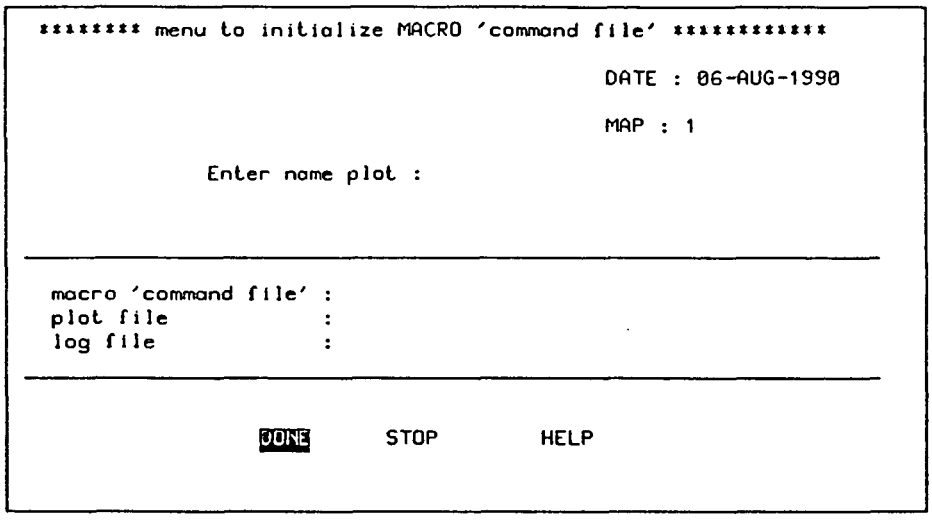


fig. III.2 Program structure for creating maps

For each step one or more menus are shown allowing the user to a make choice. Each step is completed by writing part of the 'command file' . The reader should know some ARC/INFO commands to be able to understand the choices allowed within the menus. The modules shown in figure III.2 will be discussed briefly in the next sections.

Initialize

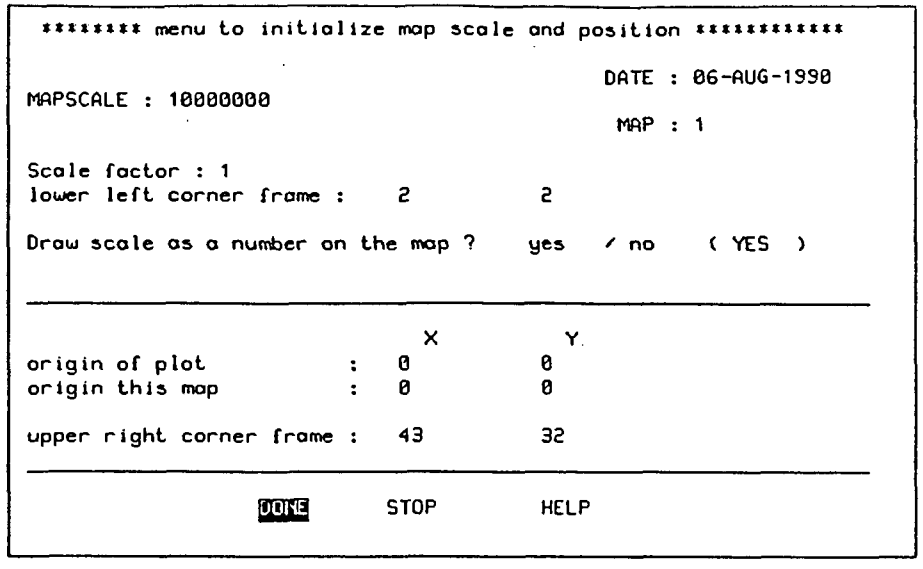
The 'command file' is initialized in this module. First file names are given (menu 1). If a name already exists a warning appears. The user can decide to change the name or overwrite the existing file. Next, the output device for which the plot file is to be created must be specified. The command file will be created and commands for initial plot file characteristics like TEXTFONT, SHADESET, PENTABLE, MAPUNITS and PAGEUNITS are set up.



menu 1

Initialize map

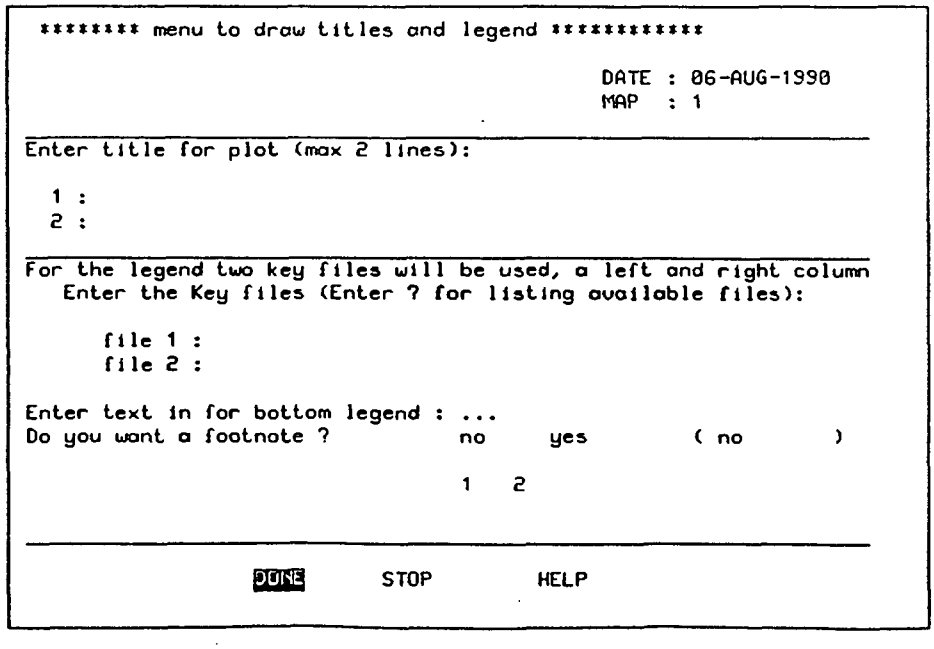
The map characteristics are initialized in this module . These are the map extend, the map position and the map scale. The map scale is default set to 1:10.000.000. On this scale the whole of the EC can be fitted on an A-3 sized paper. It is possible to change the map scale by giving a scale factor by which the default map scale will be multiplied. Map position can be altered by giving new page coordinates for the lower left corner for the map frame (menu 2).



Menu 2

Drawing text and legend

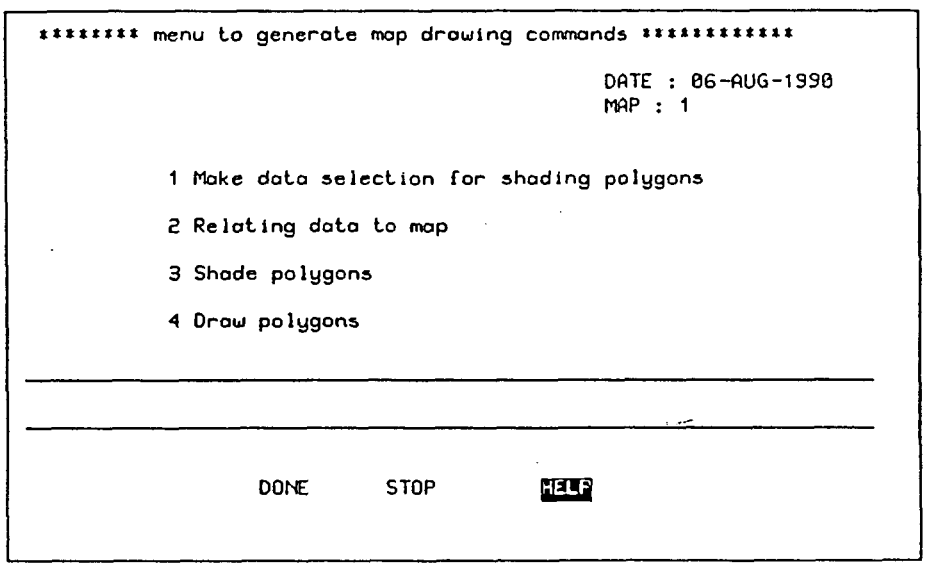
The user can enter map titles and legend text. The key box color and text are defined in key-files. These are pre-defined files which will be listed on the screen if a question mark is entered. At the bottom of the legend box a subscript and if necessary a footnote can be given (menu 3).



Menu 3

Drawing map elements

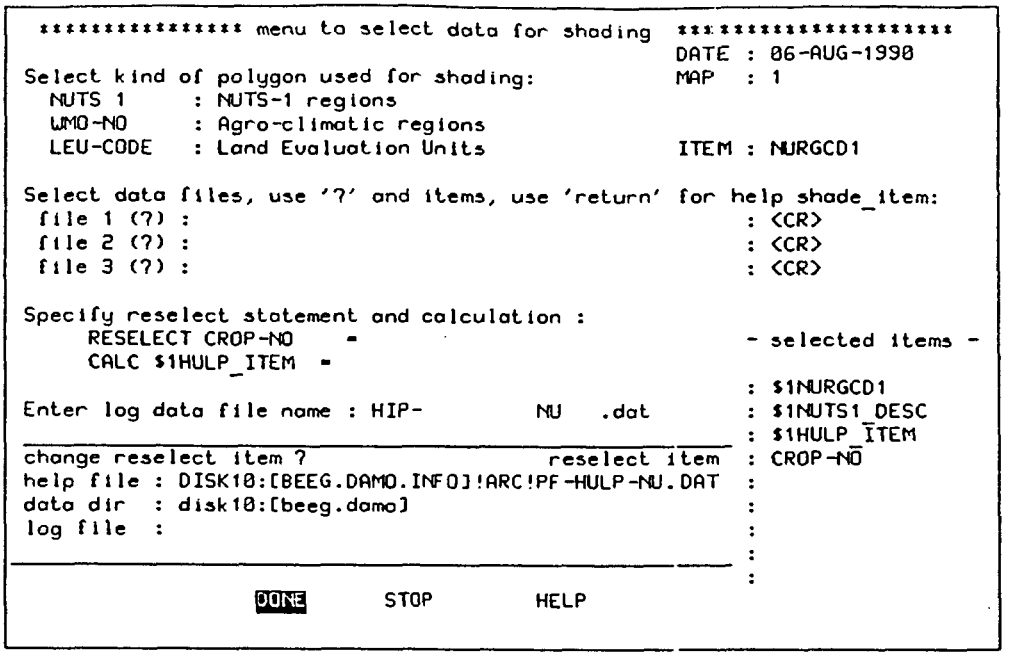
In this module, the user defines the map elements to be drawn. It is possible to reselect map elements, relate INFO tables to maps, shade and draw polygons (menu 4).
For shading, a temporary file will be created in INFO in which a shade item (HELP_ITEM) is defined derived from one or more existing items and if necessary converted to the right dimensions. In a menu all files needed, items and calculations have to be specified (menu 5). The file created in INFO can be related to the map to be used (menu 6). For shading, a look-up table will be used. These are pre-defined files in INFO in which ranges for certain classes and corresponding shade colors are specified. All available look-up tables will be listed on the screen (menu 7). To draw polygons a particular color and map can be specified (menu 8).



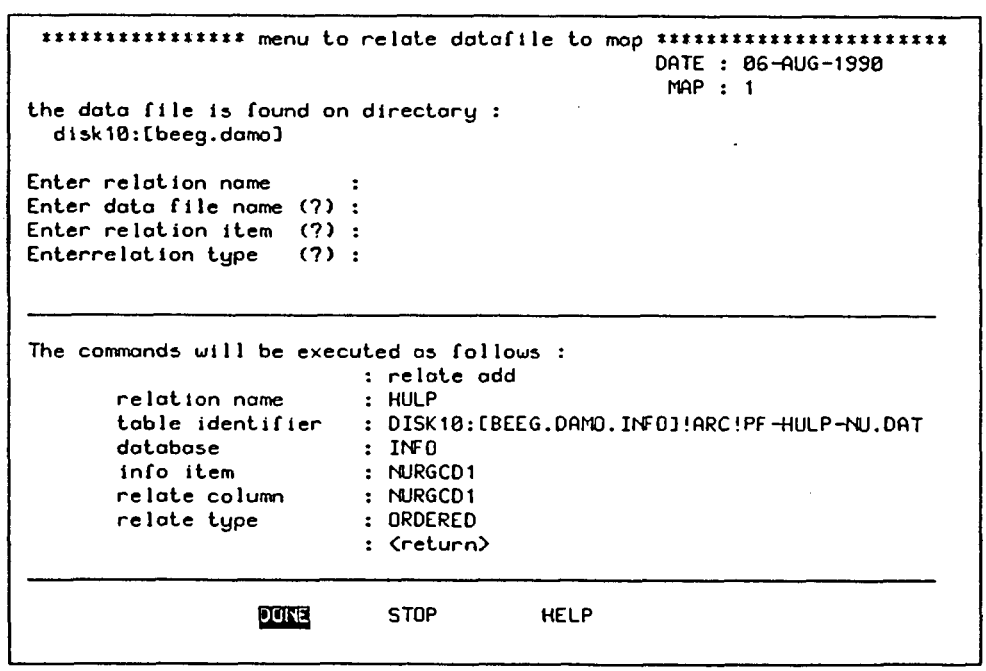
menu 4

Closing the file

The last module to close the command file is displayed if the user has specified that there are no more maps to be drawn in the same plot file. Closing commands for the plot file will be written in the 'command file' and the Logo will be drawn in the lower right corner. After leaving the Macro it is possible to run the 'command file', create the plot file and send it to the chosen output device.


********** menu to select data for shading **********
DATE : 06-AUG-1990
Select kind of polygon used for shading:
MAP : 1
NUTS 1 : NUTS-1 regions
WMO-NO : Agro-climatic regions
LEU-CODE : Land Evaluation Units
ITEM : NURGCD1
Select data files, use '?' and items, use 'return' for help shade_item:
file 1 (?) :
: <CR>
file 2 (?) :
: <CR>
file 3 (?) :
: <CR>
Specify reselect statement and calculation :
RESELECT CROP-NO =
- selected items -
CALC $1HULP_ITEM =
: $1NURGCD1
Enter log data file name : HIP- NU .dat
: $1NUTS1_DESC
: $1HULP_ITEM
change reselect item ? reselect item
: CROP-NO
help file : DISK10:[BEEG.DAMO.INFO]!ARC!PF-HULP-NU.DAT
data dir : disk10:[beeg.damo]
log file :
DONE
STOP
HELP

Menu 5


********** menu to relate datafile to map **********
DATE : 06-AUG-1990
MAP : 1
the data file is found on directory :
disk10:[beeg.damo]
Enter relation name :
Enter data file name (?) :
Enter relation item (?) :
Enterrelation type (?) :
The commands will be executed as follows :
: relate add
relation name : HULP
table identifier : DISK10:[BEEG.DAMO.INFO]!ARC!PF-HULP-NU.DAT
database : INFO
info item : NURGCD1
relate column : NURGCD1
relate type : ORDERED
: <return>
DONE
STOP
HELP

menu 6

```
****************** menu to write polygonshades command ******************
                                                    DATE : 06-AUG-1990
                                                     MAP : 1

the coverages are found on directory:              COVER : ' '
  disk10:[BEEG.47098000.BULENS.KM]
Select coverage (?):


the shade item data file is found on directory :
  disk10:[beeg.damo]
shade item datafile (?):                                  shade item (?):
  DISK10:[BEEG.DAMO.INFO]!ARC!PF-HULP-NU.DAT              : HULP_ITEM

the look up tables are found on directory :
  disk10:[beeg.lut]                                       : OK
Select look up table (?):

_____________________________________________________________________

the command runs as follows:
POLYGONSHADES ... HULP//HULP_ITEM ...
_____________________________________________________________________

                  DONE        STOP        HELP
```

Menu 7

```
****************** menu to write polygons command ************************
                                                    DATE : 06-AUG-1990
                                                     MAP : 1

the coverages are found on directory:              COVER : ' '
  disk10:[BEEG.47098000.BULENS.KM]
Select coverage (?):


the linecolor number :   1

_____________________________________________________________________

the command runs as follows:
LINECOLOR 1 ; POLYGONS ...
_____________________________________________________________________

                  DONE        STOP        HELP
```

Menu 8

ANNEX IV

LIST OF WORKING DOCUMENTS OF PROJECT ON 'CROP PRODUCTION POTENTIAL OF RURAL AREAS WITHIN THE EUROPEAN COMMUNITIES' (1992)

1. Crop production potential of rural areas within the European Communities. I: GIS and datamodel.
J.D. Bulens and A.K. Bregt

2. Crop production potential of rural areas within the European Communities. II: A physical land evaluation procedure for annual crops and grass.
G.J. Reinds and H.A.J. van Lanen

3. Crop production potential of rural areas within the European Communities. III. Soils, climate and administrative regions.
G.J. Reinds, G.H.J. de Koning and J.D. Bulens

4. Crop production potential of rural areas within the European Communities. IV. Potential, water-limited and actual crop production.
G.H.J. de Koning, C.A. van Diepen, G.J. Reinds, J.D. Bulens and H.A.J. van Lanen.

5. Crop production potential of rural areas within the European Communities. V: Qualitative suitability assessment for forestry and perennial crops.
H.A.J. van Lanen, C.M.A. Hendriks and J.D. Bulens

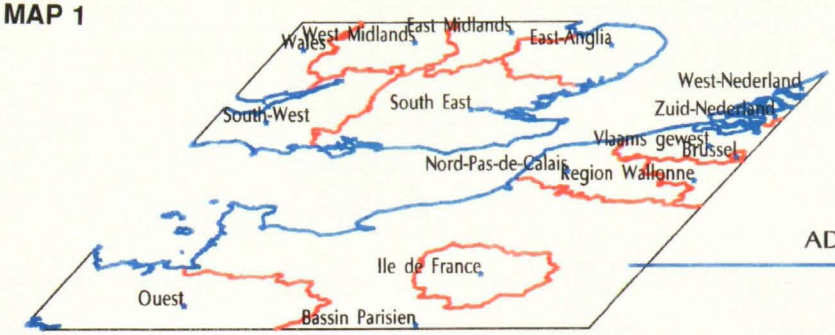
MAP 1

MAP OVERLAY PROCEDURE PART OF THE EC

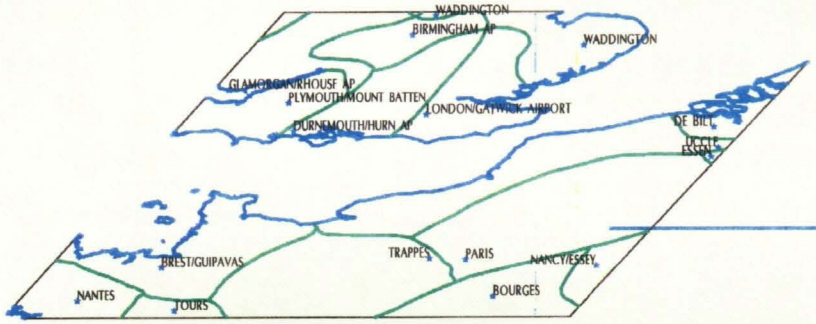
SCALE 1 : 5000000

kilometers

0 300

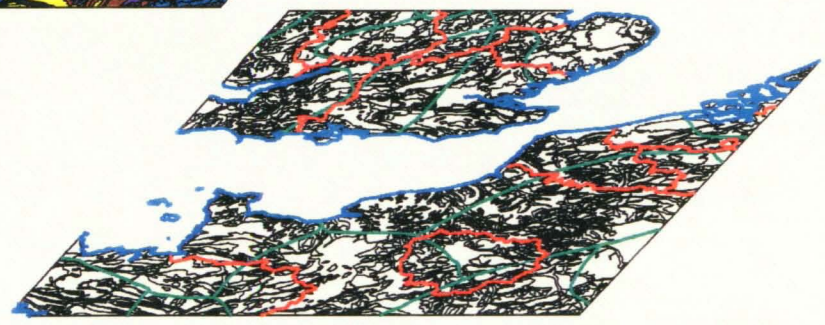


ADMINISTRATIVE MAP (NUTS-1)



AGRO-CLIMATIC MAP

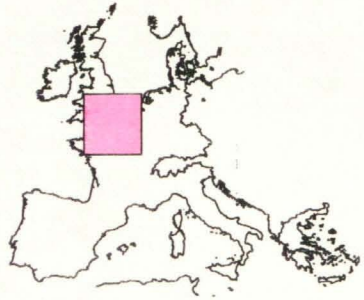
SOIL MAP



LAND EVALUATION MAP

LEGEND

ARENOSOLS	PODZOLUVISOLS
CAMBISOLS	RANKERS
ANDOSOLS	PHAEOZEMS
FLUVISOLS	PLANOSOLS
GLEYSOLS	REGOSOLS
HISTOSOLS	RENDZINAS
LITHOSOLS	SOLONCHAKS
LUVISOLS	VERTISOLS
PODZOLS	XEROSOLS
nuts bounderies	agro-climatic bounderies
coast line	



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The WINAND STARING CENTRE
for integrated land, soil and water research
WAGENINGEN THE NETHERLANDS

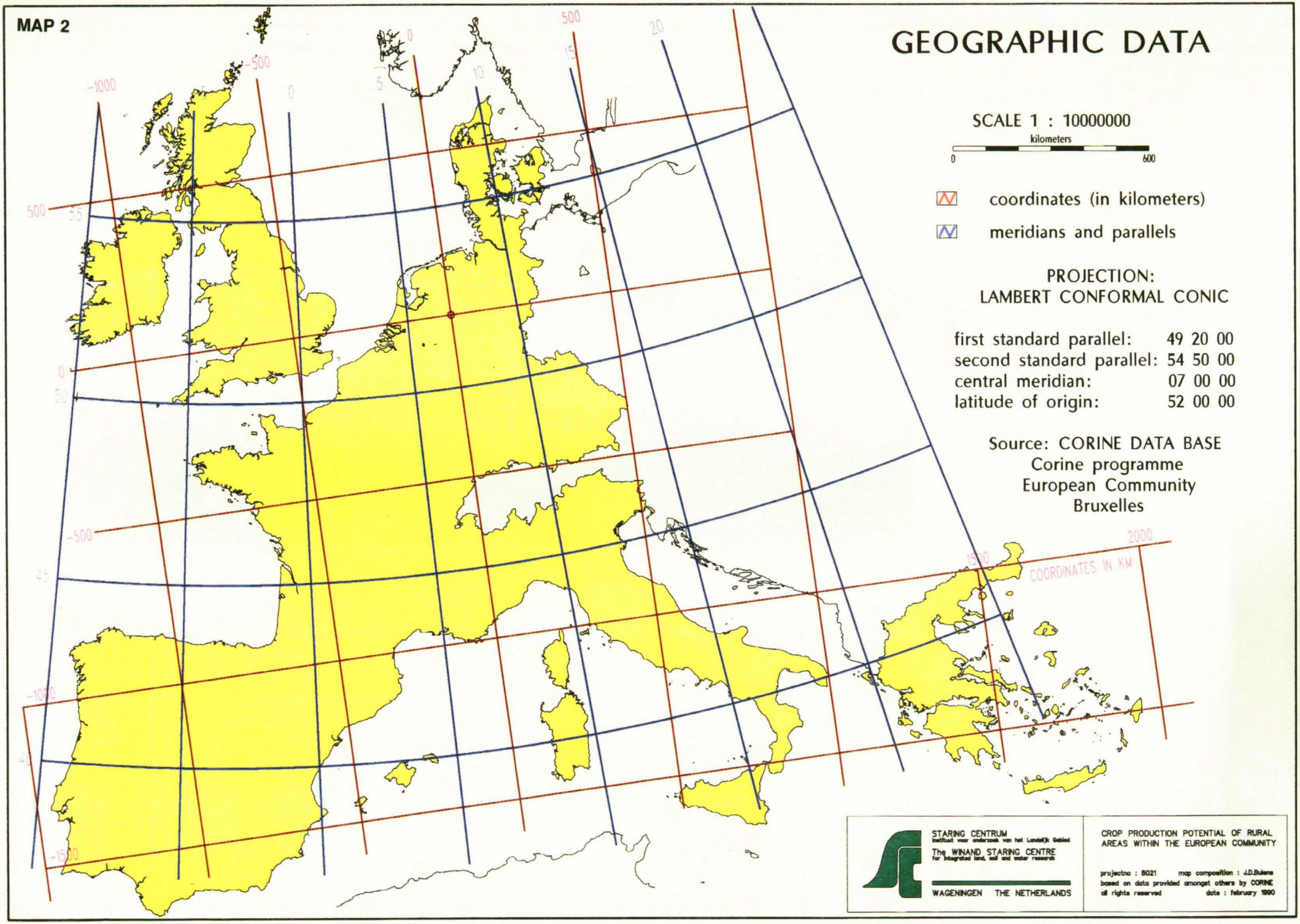
CROP PRODUCTION POTENTIAL OF RURAL AREAS WITHIN THE EUROPEAN COMMUNITY

projectno : 8021 map composition : J.D.Bakema
based on data provided amongst others by CORINE

date : february 1990

MAP 2

GEOGRAPHIC DATA



SCALE 1 : 10000000

kilometers

0 600

coordinates (in kilometers)

meridians and parallels

PROJECTION:
LAMBERT CONFORMAL CONIC

first standard parallel:	49 20 00
second standard parallel:	54 50 00
central meridian:	07 00 00
latitude of origin:	52 00 00

Source: CORINE DATA BASE
Corine programme
European Community
Bruxelles

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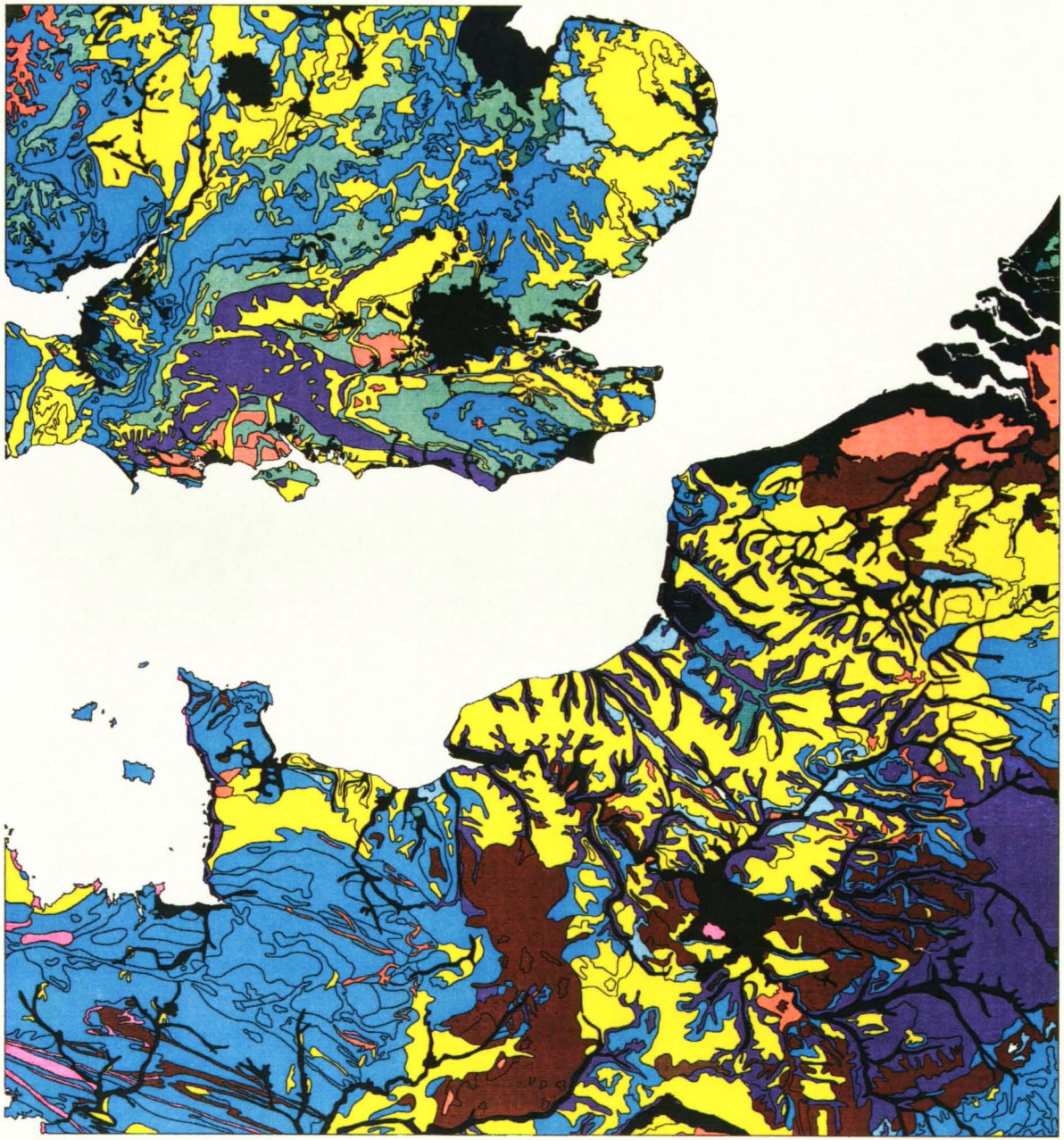
MAP 3

PART OF THE SOIL MAP OF THE EC

SCALE 1 : 2500000

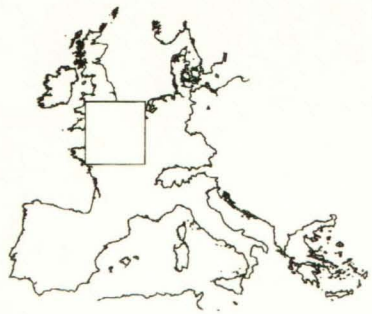
kilometers

0 150



LEGEND

- ARENOSOLS
- CAMBISOLS
- ANDOSOLS
- FLUVISOLS
- GLEYSOLS
- HISTOSOLS
- LITHOSOLS
- LUVISOLS
- PODZOLS
- PODZOLUVISOLS
- RANKERS
- PHAEOZEMS
- PLANOSOLS
- REGOSOLS
- RENDZINAS
- SOLONCHAKS
- VERTISOLS
- XEROSOLS



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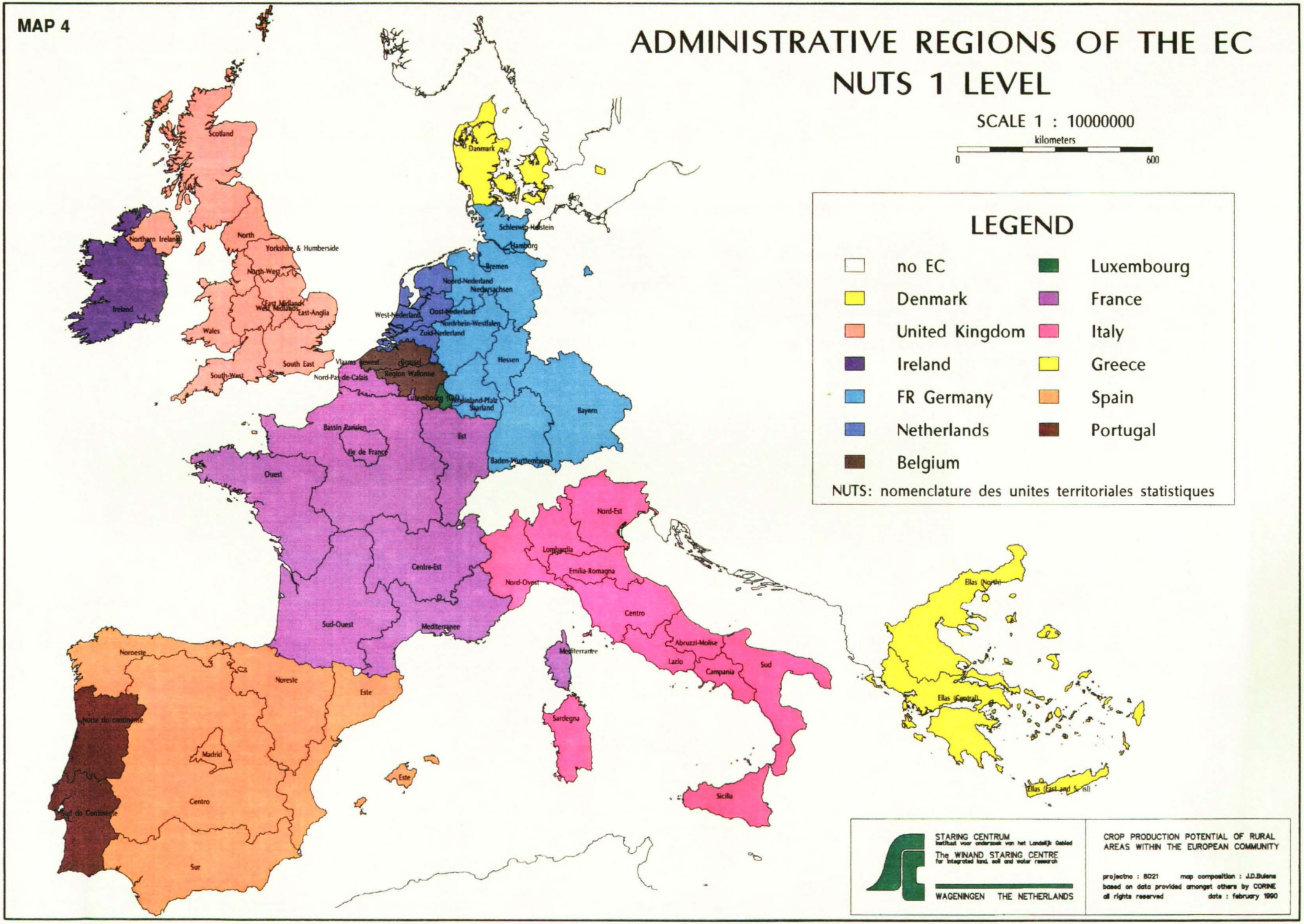
MAP 4

ADMINISTRATIVE REGIONS OF THE EC
NUTS 1 LEVEL

SCALE 1 : 10000000

kilometers

0 600



LEGEND

no EC	Luxembourg
Denmark	France
United Kingdom	Italy
Ireland	Greece
FR Germany	Spain
Netherlands	Portugal
Belgium	

NUTS: nomenclature des unites territoriales statistiques

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MAP 5

NUMBER OF PIGS

SCALE 1 : 10000000

kilometers

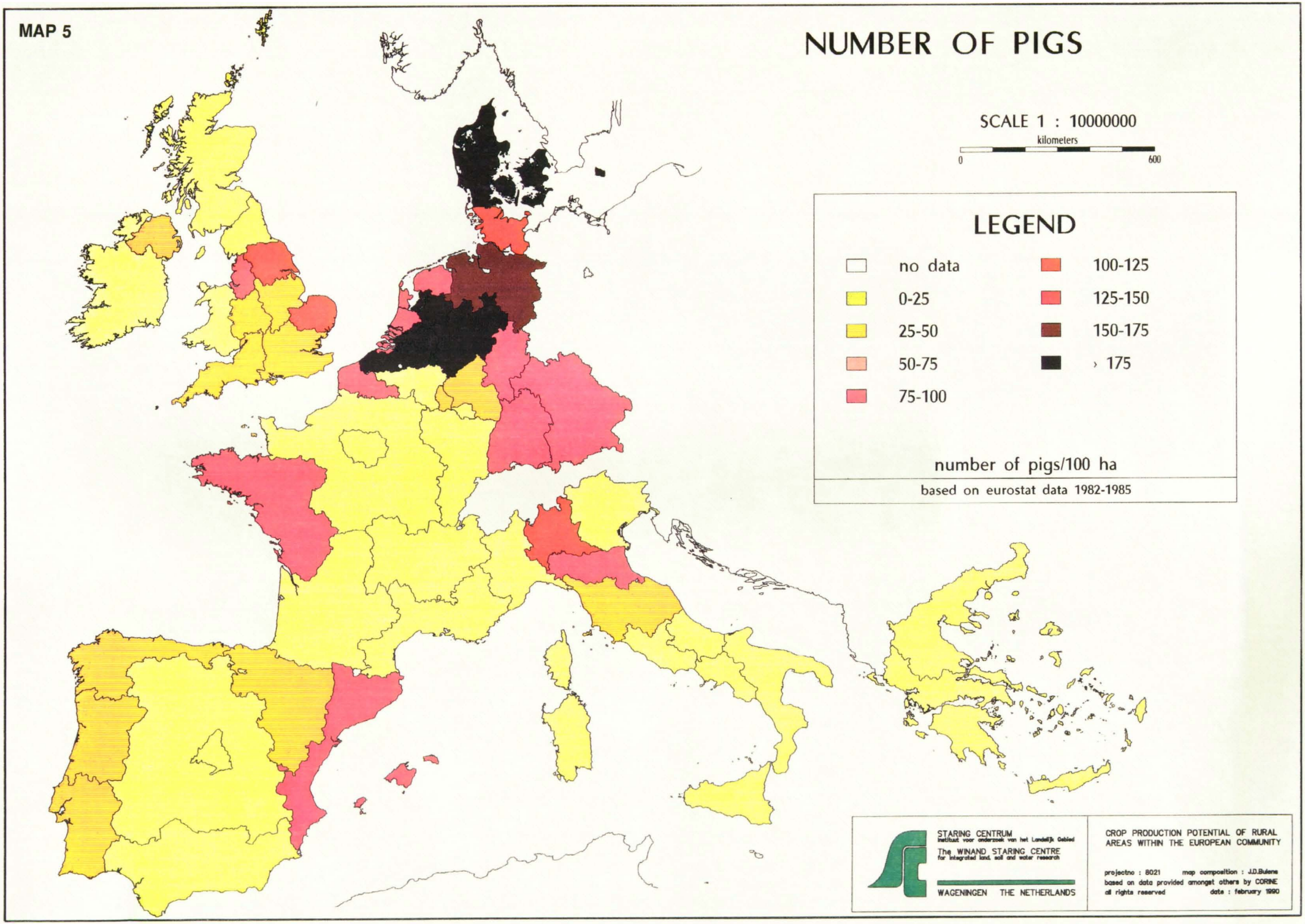
0 600

LEGEND

- no data
- 0-25
- 25-50
- 50-75
- 75-100
- 100-125
- 125-150
- 150-175
- › 175

number of pigs/100 ha

based on eurostat data 1982-1985



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MAP 6

CLIMATIC ZONES OF THE EC USING THIESSEN POLYGONS

SCALE 1 : 10000000

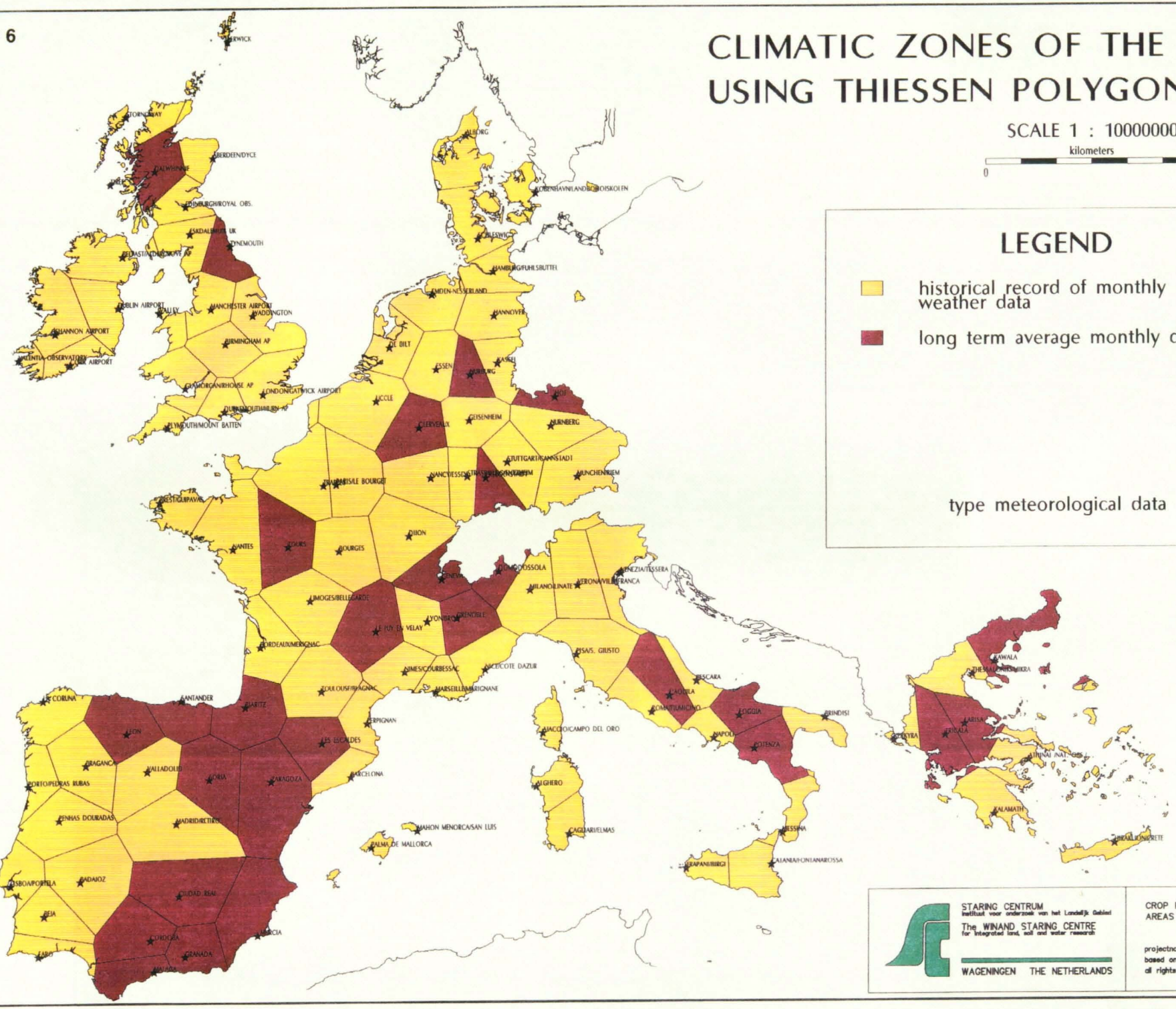
kilometers

0 600

LEGEND

- historical record of monthly weather data
- long term average monthly data

type meteorological data



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MAP 7

AGRO-CLIMATIC ZONES OF THE EC

SCALE 1 : 10000000

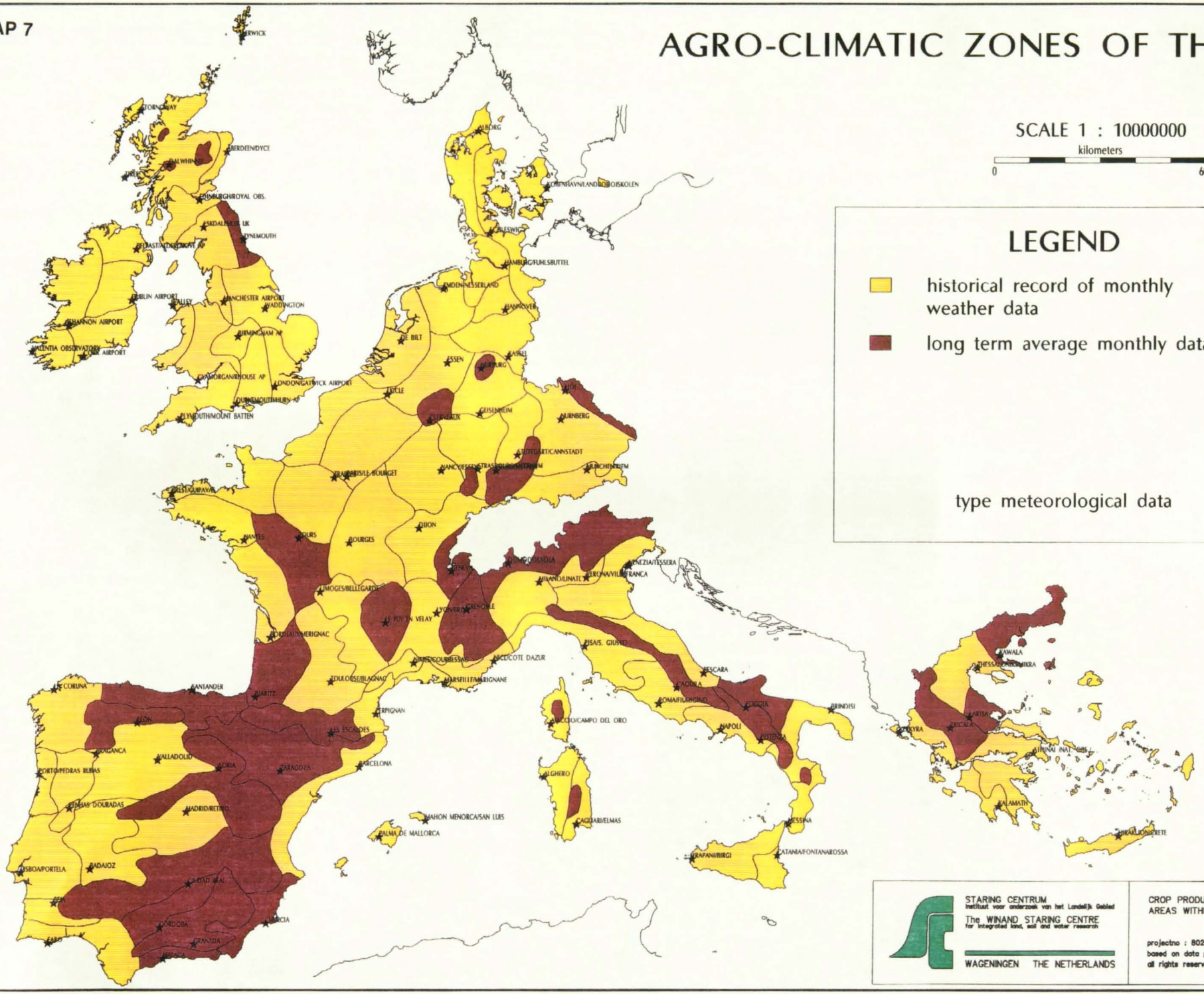
kilometers

0 600

LEGEND

- historical record of monthly weather data
- long term average monthly data

type meteorological data



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