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Editorial

Very best wishes to all members of the Society for the coming year. The year is an important one because it sees our Second Congress which will be held in Weihenstephan, 1-7 September. I hope to see you all there for what promises to be an exciting programme and a well-organized affair. You should also come to see the new Council elected which will oversee our activities to the year 2000. The request for nominations for the new Council is contained in this Newsletter.

You will also see in the Newsletter, the announcement of an agreement between the Society and CABI International for publication of future ESSC titles. The details of the agreement were agreed by Council at its meeting in Tenerife and are the results of about a year's negotiations with three different publishing houses. I hope that members will take advantage of the agreement and help to promote the Society through the development of a publications list of high quality and interest.

The Treasurer informs me that of those members who are not exempted from subscription, only 27 per cent paid their dues for 1995. The income is not sufficient to cover the costs of producing and mailing our Newsletter. A thriving and active Society requires the support of all its members. You will receive a statement on your membership dues in March. Will you please check this with your records and pay any outstanding subscriptions as well as the one for the coming year, if you want to take advantage of the discount, for 1996-1998.

I hope that you will all contribute something to the development of the Society in the coming year. We always need items for the Newsletter on activities and events of interest. Please remember though the Newsletter is not an academic journal. Whilst short reports on research are welcome, they should be only two or three pages in length and not a fully fledged article. As always, we need your suggestions on how to improve the Society. I look forward to receive them.

R P C Morgan
President

Proposals for Institutional Consolidation of Demands for Soil Information at a European Union Level

Over the last few decades, through the Directives and Resolutions of the European Council, both the Member States of the European Union and the European Commission are committed to activities which require information on soil characteristics. In parallel fashion, several Directorate Generals of the Commissions have had the need to implement programmes for the collection of soil information in the course of their work to date. Thus far, however, these activities have been carried out by individual bodies in relative isolation, both from one another and from other sections of the Commission where the resultant data sets could have been useful. It would be more productive and efficient for all parties concerned to bring these activities together in a coherent programme to build up a comprehensive resource base of comparable and reliable soil information. Apart from technical problems of data format conversion, it is often difficult to combine or compare data sets from different sources for scientific reasons. One of the primary long-term requirements of the Commission, and of any other soil data users who are working on pan-European applications, is for fully comparable and reliable data. Continental (and global) activities, such as climate change research, also require a truly consistent database.

These phrases have been taken from the document entitled "*Soil Information for Europe*" [1]. It is natural to assume that, like any other scholars of soils and their conservation problems, all ESSC members will agree with these comments. Can the situation change in the immediate future? It would seem so as a result of two initiatives recently proposed for setting up European soil information centres.

1. A possible European Soil Topic Centre

The European Environmental Agency (EEA) (headquartered in Copenhagen) was set up by Regulation EEC/1210/90 which came into force on 30/10/93. This decentralised Community agency was created with the purpose of providing the EU and its Member States with objective, reliable and comparable information necessary to implement European Environment Policy. The EEA is basically structured as follows:

i. Executive Director
ii. Management Board
iii. Scientific Committee
iv. National Focal Points
v. European Topic Centres
vi. Multiannual Work Programme

The European Topic Centres – ETCs – will assist the agency in environmental issues where it has authority for the overall EU. On the other hand, the National Focal Points will defend the interests of each of the Member States. Initially, one Member State may only set up one ETC in its territory. Moreover, the number of ETCs will certainly be less than the number of Member States. At the

present time, the EEA is selecting and distributing the European Topic Centres by countries. The EEA intends to set up the following ETCs although it is possible that some modifications will be made during this process.

POSSIBLE EUROPEAN TOPIC CENTRES

Air quality	Fresh Water	Marine Water	Forest
CDS & Thesaurus	Emission & Wastes	Integrated Assessment	Chemicals
Coastal Regions	Polar Regions	Alpine Region	Nature
Land Cover	Soils		

As can be seen, the EEA is intending to set up a **Soil Topic Centre**. What would be its function? Initially, the tasks to be performed by the ETCs over the next four years are described in the EEA-Multiannual 1994-1999 Work Programme. These are as follows:

Project MS1: Soil Quality and Degradation
Project MS2: Soil Characteristics Monitoring and Mapping
Project MS3: Methodologies for Inventories of Contaminated Sites
Project MS4: Emissions to Land and Soils -General Approach Assessment

The Soil Topic Centre would be responsible for contracting those European centres it deems fit for each topic or for proposing and financing Groups of Experts who will undertake to perform the task with which they are commissioned. Obviously, ETCs can also propose to the EEA those topics of high environmental interest not included in the Multiannual Work Programme which they deem important. In any event, as we shall see later, it is highly likely that Project MS2 will fall outside of the future Soil-ETC remit.

Even though the EU-Soil Topic Centre is still not a reality, it is expected to be so in a few months time which is good news for all of us interested in soil conservation. At last there may well be a European Centre which will centralize and homogenise soil information, will monitor soil conservation, will alert the EU authorities with respect to initiatives to be undertaken for getting to know the status of our soils better and, finally, will coordinate different countries' activities with a view to making available compatible, comparable information.

In the light of the ETCs proposed, it is a great pity to see the lack of an ETC on **Semi-arid and Arid Regions**. In view of the serious erosion and desertification problems that southern Europe is suffering (which may well be aggravated by foreseeable climate changes), setting up such an ETC is more than justified. I am of the opinion that the ESSC should draw the EEA's attention to this gap (or is it discrimination?). Once again it would seem that the environmental problems of the EU's

Mediterranean countries are not analyzed with the same interest as those of the central and north European countries.

2. A possible Soil Bureau

Simultaneous to and irrespective of the proposal for setting up a EU-Soil Topic Centre, an initiative is being undertaken for creating an EU-Soil Bureau. In my opinion, the best way of explaining the role this initiative could play on a European level is to go back to its origins and follow its course.
A Meeting of European Heads of Soil Survey was held in 1989 [2]. The following was stated amongst the seven conclusions and recommendations sent to the appropriate EEC authorities:

i. "It was agreed that the 1.1M Soil Map of Europe (1985) should be revised to incorporate new knowledge accrued since its publication ....".
ii. "It was agreed that a group be formed with a coordinator from each country to achieve the aim in "i" above and funding should be actively sought".
iii. "It was agreed that a database be set up specifically to support interpretation of the 1:1M map..".
iv. "... It was agreed to recommend all member countries to build up soil database systems that would eventually be capable of supporting a map at 1:250,000 scale".

The Soil & GIS Support Group was set up in 1990 under the sponsorship of the MARS project (DG VI). This Working Group (coordinated from the Joint Research Centre (JRC) with headquarters in ISPRA) was formed to define the various tasks to be carried out in order to improve the 1:1M Soil Map of Europe and draw up an EU-Soil Information System (the computerization of this map took place in 1986 within the CORINE program - DG-XI). This system includes three related modules: the first concerns the characteristics of the representative pedological profiles of the EU (soil morphological and analytical database); the second, the description and delimitation of the main EU pedological landscapes (soil geographical database: improvement of the previously digitalized soil map); and the third, the list of pedological maps published in each country (metadatabase). In other words, the Soil & GIS Support Group (recommended in point "ii"), undertook to perform the tasks recommended in points "i" and "iii". A working group led by Professor R. Dudal subsequently prepared the document called "*Feasibility Study of the Creation of a Soil Map of Europe at a Scale of 1:250,000*" [4]. That is to say, the recommendation given in point "iv" was addressed.
After performing most of the tasks commissioned, the Soil & GIS Support Group was wound up at the beginning of 1994. This was followed in April that year by the Institute for Remote Sensing Applications (IRSA) of the JRC (Ispra, Italy) being upgraded to establish a Soil Information Focal Point (SIFP) charged with addressing the broader needs of the Commission in soil information [1]. Following consultation with various DGs of the Commission, who are the primary soil data base producers or users, it was agreed that the first necessary action was the preparation of the document entitled "*Soil Information for Europe*" [1]. The JRC is presently providing the basic funding for the SIPF. The latter is also commissioned with the mission of developing and providing advice regarding

the use of the MARS European Soil Database.

The SIFP has already created the Soil Information System Development Working Group, which will propose a detailed work plan for addressing the European needs on soil information. Additionally, this Working Group has been commissioned with the task of finalizing the work previously assigned to the Soil & GIS Support Group (version 3 of the European Soil Database is now in preparation). Finally, in order to implement various long term projects and to support production of the required soil information, the creation of a *European Soil Bureau* has been proposed by the SIFP and its Soil Information System Development Working Group.

A "Meeting of Heads of Soil Surveys and Soil Data Centres of EU countries" took place in Orléans on 8 and 9 December, 1994. The following can be seen in the Conclusions and Recommendations of this Meeting:

iii. "It has been agreed to support the establishment of the Soil Information Focal Point's Working Group on Soil Information System Development which is charged with the proposition projects and examining whether the kind of information available is sufficient to answer the Commission's needs. It will work out a proposal to define data accessibility of the 1:1M spatial and analytical data sets to the EU .....".

iv. "It has been agreed that there is a need to emphasise a more detailed data base taking up some conclusions of the Feasibility Study on the Creation of Soil Inventories at a scale of 1:250,000 (CEC DG XI-EEA Task Force). This objective shall follow the aim to define typical soil regions and/or catchment areas. Those regions or areas could be the basis for a network of reference areas for harmonisation of models and rules and for long-term soil monitoring".

vi. "It has been agreed to recommend the creation of a **European Soil Bureau**. The European Soil Bureau shall be a formal association of soil data producers in the Member States of the European Union as well as other European Countries within the cadre of the European Commission. ....."

"The European Soil Bureau shall have the following structure:

a. A Secretariat.....
b. Committee of National Representatives....
c. Working Groups.....".

The Soil Bureau would be located in the JRC headquarters. The EU's reaction to this initiative is still not known. In any event, a final decision is not expected in the short term.

Concluding Remarks

A further problem could appear if a conflict of functions were to occur between both proposals. The 2nd. Meeting of the Soil Information Focal Point's Working Group on Soil Information System Development, held in Rome (29-30-31 May 1995) was attended by representatives of the EEA with the purpose of debating possible overlaps between the proposed Soil-ETC and the Soil Bureau. Initially, it would seem that this type of problem should not occur. The two bodies could be complementary. Thus, the Soil Bureau would essentially undertake to produce Community scale soil data (e.g. soil mapping, soil databases, soil monitoring, soil information systems), whilst the Soil-

ETC would, amongst other things, take on the task of addressing studies on the soil status of the Community's member countries as well as drawing up standards for harmonizing the collection of such information. Initially, studies on soil conservation would depend more on the Soil-ETC than the Soil Bureau. Nevertheless, soil information produced by the Soil Bureau would be a great help towards assessing soil degradation over large territories on a small scale.

Initiatives such as this have not occurred in pedological information matters (including the soil degradation problem) since the European Community was set up. Their absence has brought negative consequences for recognizing the enormous importance soils have in the context of natural resources and European environmental problems. As a corollary, it has also influenced the appraisal of our profession. Let us therefore welcome both initiatives and hope that they both achieve their aims. We shall all benefit.

The European Society for Soil Conservation should give strong backing to these initiatives (if thus called on), both on a Society level and on the part of each of its members. It would be a serious mistake for us, as professional people, to wage superfluous wars to locate the Soil-ETC headquarters in one or another country. It would also be damaging for us to strengthen one of the initiatives to the detriment of the other in order to promote personal or national egoisms. What we should all be interested in now is reaching agreement on how best to represent the interests of our profession on an institutional level. If we appeal to rationality and collaboration, two institutions are better than one.

References

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Factors Affecting Spatial and Temporal Variations of the Infiltration Rates in Mediterranean Ecosystems

Infiltration is a key process in both the hydrological cycle and the geomorphological system due to the control it exerts on mechanisms of runoff, discharge volumes and erosion rates. Moreover, soil biological, physical and chemical processes are clearly influenced by the amount of infiltrated water, all of which in turn, through feedback processes, influence infiltration. This has repercussions for soil development.

In spite of its importance, most studies of infiltration have been theoretical. Perhaps this is because of the difficulties in making measurements and the complexity of infiltration behaviour. Particularly for Mediterranean ecosystems, there have been, until recently, very few experimental field studies that enable the variability of infiltration rates to be analysed.

Against this background, a study was undertaken to investigate spatial and temporal variations in infiltration rates under semi-natural conditions in Southern Spain. Measurements of soil infiltrability were made by means of rainfall simulation (Figure 1) and infiltrometer ring experiments, for a very large range of conditions and soil types.

The data collected confirmed the very high spatial and seasonal variability of infiltration rates in Mediterranean Ecosystems. At a *regional scale*, soils developed on sandstone and limestone, as expected, have high infiltration rates. On these lithologies, the vegetation is usually a mosaic of different covered surfaces. The patchy distribution of these surfaces determines the spatial pattern of infiltration. Shrub covered patches of vegetation (*Quercus coccifera*, *Pistacia lentiscus*, etc.) had infiltration rates higher than the design rainfall intensity (55 mm h^{-1}), whereas interpatch surfaces had lower vegetation cover (*Thymus vulgaris*, *Brachypodium retusum*, *Globularia alypum*, etc.) and intermediate infiltration rates (30-40 mm h^{-1}). On marl and clay lithologies, the spatial pattern of infiltration is greatly influenced by the condition of the lower part of the slope. Where, due to the incision of the thalweg or to the construction of agricultural terraces, a degraded zone exists, infiltration rates are low. On the middle and upper slopes, in contrast, the high vegetation cover (*Brachypodium retusum* and other herbs associated with the scrubland) promote high infiltration rates. Only areas of badlands on the marls and clays have very low infiltration rates.

At a *slope scale,* on slopes with a semi-natural vegetation cover, high infiltration rates generally result in very low amounts of runoff and erosion. Only where the vegetation has been disturbed and degraded surfaces are found, for example on the lower slope areas of the marls and clays (badland), does runoff

contribute directly to the streams, and consequently lead to an important loss of soil and water resources. In other cases, on limestone and sandstone, the runoff generated in the inter-shrub areas is reinfiltrated in the shrub areas, where the infiltration rate is higher. Also sediment is deposited on the more vegetated zones, favouring the development of the soil and the vegetation, increasing the infiltration and reinforcing the contrast between the vegetated and bare areas.

At a *plot scale* (55 cm diameter) the infiltration process is spatially very variable (Figure 1). The more developed the soil, the more heterogeneous is the wetting front due to infiltration through macropores. On the other hand, very bare soil has a very low macropore flux, which results in a very homogeneous wetting front. Moreover, in the first case, the soils absorb all of the rainfall, favouring deep wetting fronts; in the second the large proportion of runoff results in shallow wetting fronts. In addition the vegetation cover is very important in the infiltration process due to its effect on soil characteristics such as aggregate stability, porosity, organic matter content, etc.

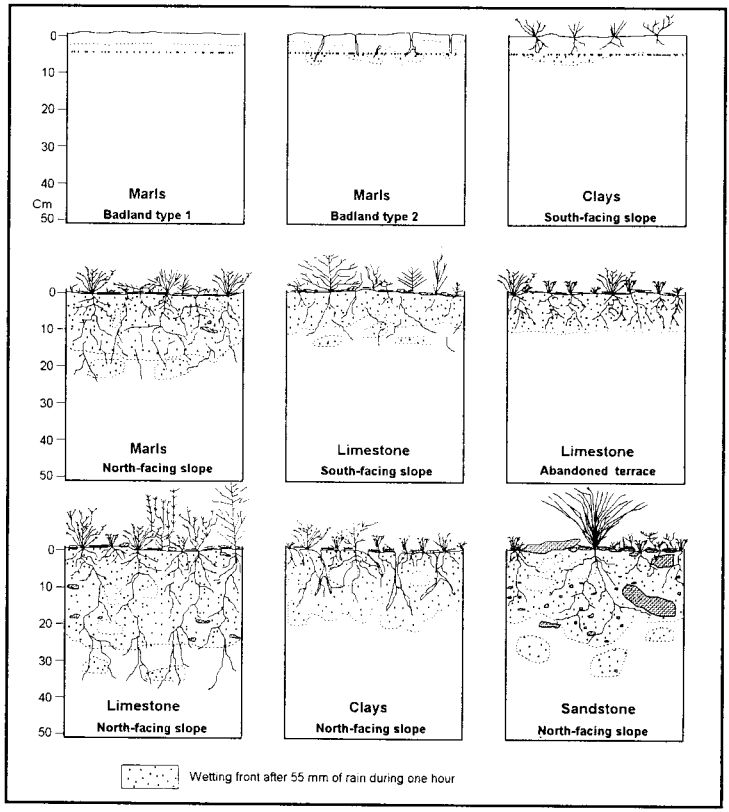

Figure 1: Wetting front after 55 mm of rain during one hour.

Amongst the factors that control the infiltration processes the most important are the vegetation cover, the soil organic matter content and the porosity. The surface crust has a negative effect on infiltration, as also does the soil moisture, which explains the seasonal changes in the infiltration rates. Aspect is another important factor but its influence is different for each soil type. Interlinkages between the different factors controlling the infiltration process occur.

There is a clear seasonal cycle in the soil infiltrability. In summer the infiltration rates are much higher than at other seasons, when soils can have very high soil moisture contents and hence minimum infiltration rates.

The results are of interest in answering several scientific questions. One of these concerns the effect of the land degradation processes (desertification) on infiltration. It was found that the lower the infiltration rate (more degraded), the greater is its spatial variability. Ecosystem degradation implies, therefore, an increase ecosystem variability. Analogous results have been found for the seasonal changes; the lower is the infiltration rate, is the greater its seasonal variability.

An interesting implication of the research relates to runoff production models. It is often assumed that in semiarid Mediterranean areas Hortonian overland flow is the main runoff producing mechanism. This research casts doubt on this assumption, since even during thunderstorms of more than 10 years return period, high infiltration rates prevented overland flow from occurring. Runoff must arrive to the thalweg by subsurface flow or as a consequence of the saturation of the lower slope positions.

It is concluded that overland flow is very low and spatially non-continuous because of the locally high infiltration rates under vegetated surfaces where water reinfiltres. The badland areas are an exception due to the low infiltration rate.

Two other very important environmental problems that receive attention, in terms of their effects on infiltration, are forest fires and the abandonment of agricultural land. Fires have a negative impact on infiltration but post-fire regeneration is very rapid. During the first weeks following burning, ash improves the infiltration rates.

The abandonment of agricultural terraces is followed by a regeneration of the vegetation and by an increase in the infiltration rates. During the cultivation, due to the influence of ploughing, the infiltration is very high. The first year after the abandonment infiltration rates are lower due to the crust development and the low vegetation cover. The influence of the lithology also is important. Terraces under marls have a lower infiltration rate than on limestone or clays.

The more than one thousand measurements, made over four years, show that infiltration rates determined by means of the cylinder infiltrometer are about 8 times higher than those measured with the rainfall simulator at 55 mm h^{-1}.

A large amount of experimental data on the infiltration process under different landscapes, conditions and seasons in the Mediterranean Ecosystems of the SE Spain have been obtained. The research was carried out from a geomorphological perspective but the results have important ecological implications for the understanding of slope and soil processes under semiarid conditions.

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A Introduction to Pedodiversity Analysis

1. Introduction

The notion of diversity has been used widely in ecological studies, whereas the diversity of the abiotic landscape has had little impact on researchers (Ibañez et al., 1990, 1995a and 1995b; MacBratney 1992). Yet the characterization and quantification of pedodiversity, it being a non renewable natural resource, should be taken into account when estimating a territory's ecological value. Using this approach an optimal national soil reserves policy could be established (MacBratney 1995). At the same time, it may be one of the ways to explore, quantify and compare the complexity of soilscapes in different areas and environments. This note endeavours to show how indices used for estimating biodiversity may be employed to determine the diversity of soil landcapes.

2. The concept of diversity and its measurement

The different ways of measuring diversity may be grouped into three classes (Magurran, 1988):

1.) indices of richness
2.) object abundance models and
3.) indices based on proportional abundance of objects.

2.1 Pedorichness

For many scientists the concept of diversity is restricted to an inventory of the number of different objects (e. g. organisms, pedotaxa) present in a certain natural system (e. g. ecosystem, soilscape).

When there exists a possibility of delimiting the study area in space and time, as well as recognizing all the objects present, estimating richness proves of value. If, on the contrary, only a sample and not the entire population can be obtained, it is necessary to distinguish between "numerical richness" and "species density". In soil surveys, the former are defined as the ratio between the number of different soil taxa found and that of the soil profiles analyzed. The "species density" refers to the number of soil taxa per sampling area.

2.2 Abundance models or distributions

Abundance models or distributions offer the most complete mathematical description of data. Although there are numerous models, most studies are based on four only. These are the geometric series, the logarithmic series, the logarithmic normal distribution and the broken stick model (Magurran 1988). There is a sequential order of distributions starting with the geometric series which is the least equitable (a few objects are dominant whilst the rest are very rare or infrequent), continuing with the logarithmic series and the log normal distribution (where objects with intermediate abundance are most common) and ends with the broken stick model (the most

equitable). According to the latter, the species abundance within a community is similar to a stick broken randomly and simultaneously into S units (MacArthur and Wilson,1967). The behaviour of these distributions is usually analyzed on a rank/abundance plot (objects are placed in order according to their decreasing degree of abundance).

Most communities studied by ecologists display a log normal species abundance distribution (Magurran, 1988). Nevertheless, adjustments to geometric and logarithmic distributions have been found in communities poor in species (generally subjected to heavy environmental stress) or in the first stages of ecological succession. On the other hand, the broken stick model is rare, although it has been asserted to fit some animal communities (Magurran, 1988).

2.3 Indices based on the proportional abundance of objects.

The proportional abundance of objects is the most frequent way of estimating diversity. From this point of view, diversity may be divided into two elements. The first relates to "richness". The second is "evenness". This distinction is logical, since for two different pieces of land with the same area and identical richness, the most diverse will be that where the different types occupy equal area and are equally probable therefore. To this effect, indices of diversity may be classified in keeping with the importance or weight each gives to richness and evenness. Although, there is a plethora of diversity indices in the literature, Magurran (1988) shows how most of them are highly correlated.

Diversity indices most used in ecology come from the Theory of Information. These are the Shannon Index and the Brillouin Index. In view of the fact that both indices give similar and correlated estimates, only Shannon's Index will be analyzed.

Moreover, Shannon's Index has very close mathematical connections with that developed by Boltzmann to determine the entropy of thermodynamic systems. This is why Shannon called it an Entropy Index. Its mathematical expression is as follows:

$$H' = \sum_{i=1}^{i=n} p_i \times \ln p_i \qquad (1)$$

where H' is the negative entropy (negentropy) or diversity of the population, and p_i is the proportion of individuals found in the ith object. In fact, the true value of p_i is unknown, and it is estimated by n_i/N, where n_i is the number of individuals of the object considered, and N the total number of individuals collected (it may also be the percentage of surface area occupied by this ith object). In calculating Shannon's Index, any logarithmic base can be adopted. The units of H' are the same as in the Theory of Information. Thus, the value of H' is the sum of the proportions of the individual objects multiplied by the negative logarithm of the proportion. It ranges from 0 (ln of 1), if all of the individuals are of one object to ln N, if the number of objects equals the number of individuals. The index is maximum for any S (richness) if all objects have equal numbers of individuals and minimum if the individuals are maximally concentrated in one object.

The value of the Shannon Index is usually between 1.5 and 3.5 and rarely exceeds 4.5 (Margalef, 1972).

Although the Shannon index considers evenness as a measure of heterogeneity, it is also possible to calculate other measures which evaluate this separately. Thus, for example, the maximum possible negentropy H_{max} for certain conditions of richness occurs in situations where all objects are equiprobable; i.e., in mathematical terms, if the following condition is fulfilled:

$$H' = H_{max} = \ln S \qquad (2)$$

where S is richness in objects. The relation between negentropy observed and maximum negentropy may be used, therefore, as a measure of evenness E and be mathematically expressed by the algorithm:

$$E = H'/H_{max} = H'/\ln S \qquad (3)$$

The E index can take any value between 0 and 1, where 1 represents the situation in which all species or objects are equiprobable (e.g. when they occupy the same area) and will tend to 0 when there is a highly non-uniform distribution of relative abundance (i.e. where one object dominates over all others). Nevertheless, there are other ways to calculate the evenness. Different evenness indices tend to be closely correlated with each other if they are calculated for many sets of samples (Magurran, 1988).

3. Inventory diversity and differentiation diversity

Depending on the type of spatial entity surveyed, or on the size of the area prospected, different types of diversity can be distinguished. These types of diversity can be measured by any of the indices outlined above. Whittaker (1977) distinguishes four levels of inventory diversity. Thus, in pedology, we can recognize: point scaling diversity (polypedon), α scaling diversity (soil association), γ scaling diversity (landscape or drainage basin) and ε scaling diversity (soil region) (Ibáñez *et al.* 1995b).

"Differentiation diversity" is essentially a measure of how different (distance measures) or similar (similarity indices) a range of spatial entities are in terms of the variety and/or abundance of objects (e.g. biological species, pedotaxa) found in them. One common approach to differentiation diversity is to compare the pedotaxa composition of different soilscapes.

3.1 Diversity-area relationships

The area-species relationship (species-area curve) has become one of the topics most widely addressed in biodiversity studies. Such curves have been used to define the community and to indicate the minimum area required for adequate representation of species of a community. Most studies endeavour to analyze richness, whilst avoiding other, more complex indices. The increase in

the number of species of a certain taxon is graphically represented against the area sampled, and linear relations have been found between both variables. In most cases, an increase of 10 times the area approximately indicates a doubling of the number of species detected (exponential function diminishes as the reduction of species in the area diminishes). MacArthur and Wilson (1967) propose a power law of species-area relations: that the number of species encountered is proportional to a power of the area sampled.

$$S = C \cdot A^z \qquad (4)$$

where S is the number of species encountered, A is the area sampled, C is an empirical constant, and z is the slope of the curve of the log of the number of species in a sample against the log of sample size. Thus, C and z would vary from one taxon to another and from one site to another. The z values of the whole world's fauna and flora vary between 0.15 and 0.35 (Wilson, 1992). Thus, the smaller the z value, the more the number of species is reduced on the area which is reducing too. Large z values are also usually correlated with great topographical heterogeneity (Pianka, 1983). Probably, on many occasions, the area in itself is not the main factor responsible for the increase in the number of species. Thus, as the area increases, new types of lithologies, landforms, soils and bioclimates are included.

An increase in sample size can change the pattern of species abundance models (i. e. from geometric series to log normal or from log normal series to broken stick model) (Magurran, 1988).

There is a clear relationship between this approach and pedometrics research. Thus, a common working model in pedometrics shows that the variance increases as the log of distance (MacBratney, 1995).

3.2 Pedodiversity and pedometrics research

The preceding discusssion concerned measurement of diversity relative to soil classes which might be termed *taxonomic pedodiversity*. This approach can be improved by knowing the relative taxonomic distances between classes (MacBratney, 1995). However, as this author points out: "If we consider the soil to be a collection of attributes then we can use the variogram of individual attributes as a measure. This allows the calculation of the variance within a region of any specified size or shape (it should not be forgotten that geostatistics provides useful tools for quantifying pedodiversity). If we need to consider a range of attributes then a variogram of their linear combination might provide a useful approach. Moreover, as well as the variance the gradient of this log-linear relationship may be useful measure of the diversity in different locations".

3.3 Functional Pedodiversity

Another way of looking at and measuring pedodiversity is to consider what the soil does. In a sense this is what the notion of land capability does – at a single point. Thus, MacBratney (1995) states: "*Functional pedodiversity* may be measured by the within-block variance of land capability (to a wide range of alternatives uses or to the support of a diverse biological community)".

4. Soil diversity, soil survey and soil patterns

Ibáñez et al. (1990) show how the evolution of fluvial systems induces an increase in complexity of soilscapes. They show how an hierarchical organization of drainage basins leads to an increase in the richness and negentropy of soil associations. Making use of a Shannon Index, they demonstrated how first order basins possess an average of 1.6 soil map units and a negentropy of 1.36 bits, whilst in order 4, values of 8.8 and 2.80 respectively are observed. Evidently, in intermediate ranking basins, intermediate estimates are obtained.

Ibáñez et al. (1995a) analyzed the potentialities of diversity estimation methodologies in the soil survey and in the development of Soil Information Systems. They showed how the richness of soil patterns increases as the area sampled increases. Nevertheless, more data are necessary to prove whether the species-area power law of MacArthur and Wilson (1967) is obeyed for soils. They also show that in fourteen of the fifteen European Union countries soil data (at a scale of 1.1M) conform better to the logarithmic normal distribution than to the other three models.

Ibáñez et al. (1995c) have analysed the diversity of the pedosphere's soilscapes by continents and climate zones on the basis of data compiled by the FAO at a scale of 1:5M. The distribution of soil types at a continental and global level would seem to follow more equitable patterns than those established for soilscapes at greater resolution levels. Thus, on a world scale, fragmentation in the pedosphere's major soil groups fit the broken stick model with a high significance level. This is equivalent to saying that splitting the pedosphere space into soil units would be similar to a stick broken randomly and simultaneously into N type units.

Soil richness, evenness and negentropy are very similar on all continents. Thus, on a continental level, the diversity of pedosphere is characterized by similarities rather than differences. Differences in the pedodiversity of climatic zones are more marked. Evenness and negentropy tend to be higher in the climate zones of intermediate latitudes than in circumequatorial and circumboreal latitudes. The climatic zones closest to the poles (boreal and cold) also have the lowest pedorichnesses, demonstrating that these are the most uniform soilscapes of the planet at small scales. Mountain areas are those with the highest pedorichness figures. The density of the major soil groups per area is highest in the mountain and Mediterranean regions.

the number of species of a certain taxon is graphically represented against the area sampled, and linear relations have been found between both variables. In most cases, an increase of 10 times the area approximately indicates a doubling of the number of species detected (exponential function diminishes as the reduction of species in the area diminishes). MacArthur and Wilson (1967) propose a power law of species-area relations: that the number of species encountered is proportional to a power of the area sampled.

$$S = C \cdot A^z \qquad (4)$$

where S is the number of species encountered, A is the area sampled, C is an empirical constant, and z is the slope of the curve of the log of the number of species in a sample against the log of sample size. Thus, C and z would vary from one taxon to another and from one site to another. The z values of the whole world's fauna and flora vary between 0.15 and 0.35 (Wilson, 1992). Thus, the smaller the z value, the more the number of species is reduced on the area which is reducing too. Large z values are also usually correlated with great topographical heterogeneity (Pianka, 1983). Probably, on many occasions, the area in itself is not the main factor responsible for the increase in the number of species. Thus, as the area increases, new types of lithologies, landforms, soils and bioclimates are included.

An increase in sample size can change the pattern of species abundance models (i. e. from geometric series to log normal or from log normal series to broken stick model) (Magurran, 1988).

There is a clear relationship between this approach and pedometrics research. Thus, a common working model in pedometrics shows that the variance increases as the log of distance (MacBratney, 1995).

3.2 Pedodiversity and pedometrics research

The preceding discusssion concerned measurement of diversity relative to soil classes which might be termed *taxonomic pedodiversity*. This approach can be improved by knowing the relative taxonomic distances between classes (MacBratney, 1995). However, as this author points out: "If we consider the soil to be a collection of attributes then we can use the variogram of individual attributes as a measure. This allows the calculation of the variance within a region of any specified size or shape (it should not be forgotten that geostatistics provides useful tools for quantifying pedodiversity). If we need to consider a range of attributes then a variogram of their linear combination might provide a useful approach. Moreover, as well as the variance the gradient of this log-linear relationship may be useful measure of the diversity in different locations".

3.3 Functional Pedodiversity

Another way of looking at and measuring pedodiversity is to consider what the soil does. In a sense this is what the notion of land capability does – at a single point. Thus, MacBratney (1995) states: "*Functional pedodiversity* may be measured by the within-block variance of land capability (to a wide range of alternatives uses or to the support of a diverse biological community)".

4. Soil diversity, soil survey and soil patterns

Ibáñez et al. (1990) show how the evolution of fluvial systems induces an increase in complexity of soilscapes. They show how an hierarchical organization of drainage basins leads to an increase in the richness and negentropy of soil associations. Making use of a Shannon Index, they demonstrated how first order basins possess an average of 1.6 soil map units and a negentropy of 1.36 bits, whilst in order 4, values of 8.8 and 2.80 respectively are observed. Evidently, in intermediate ranking basins, intermediate estimates are obtained.

Ibáñez et al. (1995a) analyzed the potentialities of diversity estimation methodologies in the soil survey and in the development of Soil Information Systems. They showed how the richness of soil patterns increases as the area sampled increases. Nevertheless, more data are necessary to prove whether the species-area power law of MacArthur and Wilson (1967) is obeyed for soils. They also show that in fourteen of the fifteen European Union countries soil data (at a scale of 1.1M) conform better to the logarithmic normal distribution than to the other three models.

Ibáñez et al. (1995c) have analysed the diversity of the pedosphere's soilscapes by continents and climate zones on the basis of data compiled by the FAO at a scale of 1:5M. The distribution of soil types at a continental and global level would seem to follow more equitable patterns than those established for soilscapes at greater resolution levels. Thus, on a world scale, fragmentation in the pedosphere's major soil groups fit the broken stick model with a high significance level. This is equivalent to saying that splitting the pedosphere space into soil units would be similar to a stick broken randomly and simultaneously into N type units.

Soil richness, evenness and negentropy are very similar on all continents. Thus, on a continental level, the diversity of pedosphere is characterized by similarities rather than differences. Differences in the pedodiversity of climatic zones are more marked. Evenness and negentropy tend to be higher in the climate zones of intermediate latitudes than in circumequatorial and circumboreal latitudes. The climatic zones closest to the poles (boreal and cold) also have the lowest pedorichnesses, demonstrating that these are the most uniform soilscapes of the planet at small scales. Mountain areas are those with the highest pedorichness figures. The density of the major soil groups per area is highest in the mountain and Mediterranean regions.

Indices of diversity based on the proportional abundance of soil types may be used with various aims in soil survey and in Soil Information Systems as follows (Ibáñez et al., 1995a).

- Determining an index of macromorphological heterogeneity or negentropy of soil profiles (considering the number and thickness of genetic horizons).

- Quantification of the pedological negentropy and pedorichness of landscapes, natural regions or administrative territories, via the inspection and analysis of their soil maps.

- Determining the heterogeneity of a soil association or mapping unit.

- Estimation of the loss of information occurring in map generalization.

- Quantification of horizon's heterogeneity into a certain pedotaxa.

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Soil Erosion on Agricultural Land in Central Spain
A Experimental Field Station

This short communication describes the design of an experimental field station for the study of soil erosion processes on agricultural drylands. The installations are integrated within the framework of a research project funded by the Agrarian Service of the Castilla-La Mancha Regional Government.

The study area is located in the central region of the Tajo river basin. The climate is semi-arid continental Mediterranean with average annual precipitation around 400 mm. The geology is characterised by non-consolidated Miocene materials, mostly arcosics. The area has low relief and gentle slopes, generally less than 15%. The experimental field station is located in La Higueruela Experimental Farm, belonging to the Centro de Ciencias Medioambientales (CSIC), in the province of Toledo.

On a hillslope with a Typic Haploxeralf (USDA, 1990) soil, and a uniform 9% slope, four bounded experimental plots with different soil management systems were installed. Two of them have a crop rotation with barley and sunflower under two different cultivation techniques: conventional tillage (with a first deep mouldboard plough tillage and a shallow secondary one) and no-till. The third plot is kept permanently as fallow with conventional tillage and the last one is abandoned agricultural land with natural re-vegetation.

The experimental plots have a runoff concentration area of 125 m^2 (25 m long downslope by 5 m wide) and two lateral sections, 25 m long and 2.5 m wide, reserved for periodic soil sampling, installation of measurement instruments and destructive experiments (e.g. rainfall simulations).

The runoff and sediment yield are collected in three tanks (350 l capacity) connected by multi-pipe divisors. The divisors are an adapted version of the original GEIB type with three outlets. They are fitted with stabilization systems of new design, which suppress water agitation inside the tanks and secure uniform fractionating rates.

The field station is equipped with an electronic sensor network for automatic monitoring of meteorological variables, runoff and sediment production. Construction of the electronic station involved designing and making the different hardware modules, as well as drawing up the various control, communications and data processing programs. Figure 1 shows a diagram of the station's structure and the field sensor network.

In each plot, the instrumentation connected to an autonomous data-logger includes: a tipping bucket type runoff flow gauge; three sensors (arm-type stage sensors), one per tank, which register the accumulated runoff volume; four units of a new sensor development for detecting the beginning of waterlogging or runoff over the plot surface; and, four soil temperature sensors placed at different depths (5, 15, 30 and 45 cm).

The weather station, connected to the datalogger for one of the plots contains sensors for measuring: rain volume and intensities with a 0.2 mm resolution tipping bucket rain gauge, located at 130 cm

above the ground; air temperature at 5 and 130 cm height; air humidity at 5 and 130 cm height; wind speed and direction at 450 cm height.

The network is connected to a central unit (a microcomputer) through a RS232 line, which stores periodically (every four hours) all the data collected at four data-loggers, synchronises the network with the same time reference, tests the correct working of the system and enables remote access through a telephone modem. The remote functions include: a) check and reprogram of the system on the levels of both the central unit and the different dataloggers; b) real time readings of all parameters measures; c) request for data dumping from each of the substations; and, d) transfer of files from the central unit.

Weather and soil parameters are read at intervals of 2 or 10 minutes depending on whether rain is falling at that moment or not, whilst the onset of runoff and the tank water volumes are only read during rainfall periods, but with different intervals of time as shown in Table 1. Using rain gauge recordings, the central unit switches the operating modes of the four substations depending on whether rain is falling or not.

Table 1. Datalogger operating modes and sensor reading intervals.

	Datalogger operating modes	
	Dry periods	Rainfall and additional periods
Weather station		
Air temperature	10 min	2 min
Air humidity	10 min	2 min
Wind speed	10 min	2 min
Wind direction	10 min	2 min
Rain gauge	—	Continuously (each 0.2 mm rain)
Plot substations		
Waterlogging and start of runoff	—	Continuously *
Runoff flow gauge	—	Continuously (first tip and each 1 L)
Runoff volume	—	2 min
Soil temperature	10 min	2 min

* The datalogger records the time when a sensor reading is changed and which sensors are activated or deactivated (beginning or end of waterlogging or runoff).

In addition, the station has an uninterruptible power supply or UPS (ON-LINE system) providing it with full battery protection up to 40 hours should there be a failure in the Farm's electric supply. The central unit has a memory capacity of 40 Megabytes, providing the system with a potential self-operation of more than 24 months.

For monitoring the spatial and temporal variability of the soil moisture, time domain reflectometry (TDR) is used. Some 64 TDR probes, 150 mm long, at eight soil profiles (at the top and bottom of each plot) and placed horizontally at eight different depths (7.5, 15, 20, 30, 40, 50, 60 and 70 cm) were installed. Another 40 probes at four longitudinal transects along the erosion plots were set up. Each transect has five control points with two TDR probes, at the crest and valley of a furrow.

The DTR signal is registered with the use of a Tektronix Cable Tester 1502 C. The used probes correspond with a two parallel rods model, with rods of stainless steel, 3 mm in diameter, 150 or 200 mm in length and 30 mm of separation between them. Concerning the temporal monitoring of soil water content, the TDR probes are measured both monthly and after major rainfall events.

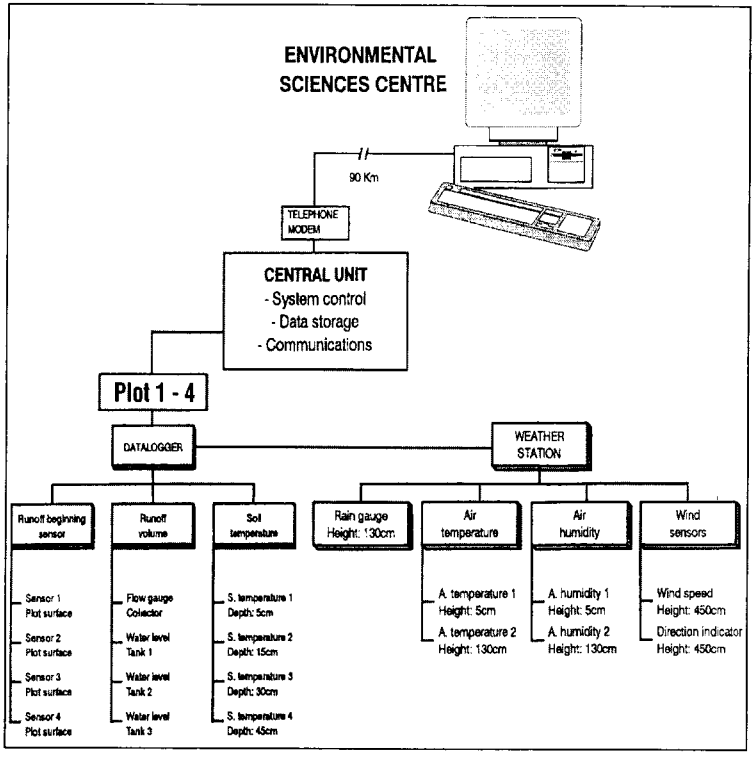

Figure 1: Field sensor network for automatic monitoring of soil erosion plots and weather station

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Report on the ESSC Executive Committee Meeting at Trier, 6th January 1996

Members present: Kertész, Morgan, Poesen, Richter
Apologies: Misopolinos, Rubio, Vogt
Guest: Tetzlaff

The President welcomed the members and also B. Tetzlaff, who entered the service on ESSC at 1st January 1996 and will be responsible for bookkeeping and for preparation of the Newsletter for printing.

Present State of the Society

The Secretary reported that the Society continues to grow.
The number of members is now 674 in total. The balance of 1995 has been negative as consequence of printing expenses of 1994 which had to be paid in 1995 and because too few of the members have paid their subscription. It is nescessary urgently to send out letters of reminder for payment in spring 1996.

Newsletter

The planning of the next editions is the following:

1/96: General issue, Preparation for the forthcoming Council elections
2/96: Theme issue
3 + 4/96: Report on the ESSC Congress, on the elections and the new Council. Membership list.
1/97: General issue
2/97: Country reports of the Council members. The President will call for contributions in June 96
3 + 4/ 97:Theme issue

Preparation for the forthcoming Council elections

The Executive Committee discussed the text of the rules for elections, which were first elaborated and published for the elections of 1992. The updated text will form the basis for the elections of 1996 and is published in this issue of the Newsletter (see pages 23-24). Following the decision of the Council Meeting at Tenerife 1995 Poland will be represented on the new Council with one seat.

Nomination of six members of the existing Council to serve on the new Council

This regulation was first decided by the Council 1988 - 92 to ensure a certain continuity between successive Councils.
The nomination by the Council was not made during the meeting at Tenerife 1995. In this case the Executive Committee acts as representative of the Council. It nominated the following Council members to serve on the new Council: Bergman - Åkerman, Dazzi, Kertész, Misopolinos, Morgan and Richter. The Council members have been informed by writing.

Nominations for ESSC Awards

Following the decision of the Council at Tenerife 1995, the Executive Committee acts as the Award Committee. Until 20th December 1995, the deadline for nominations to the ESSC Congress 1996, one nomination was made. The Award committee came unanimously to a decision on its recipient. The President will inform the recipient so as to ensure his/her attendance at the Congress. In the case of the second award for young scientists no nomination was made. It was decided to extend the deadline to 31st May 1996 (see this page)

ESSC links with publishers

The President reported on the results of the negotiations with three publishing houses. Among the publishers CAB International has offered the most favourable and flexible contract, initially for three years. After discussion the Executive Committee authorized the President unanimously to sign the contract (see page 25).

G. Richter

Secretary

ESSC Awards 1996

Extension of deadline

Further to the announcement in the ESSC Newsletter 3/95, nominations were received for the Award for Outstanding Contributions to Soil Conservation and Protection within Europe. The Executive Committee has agreed on the recipient of this Award.

No nominations were received for the Award for a Contribution by a Young Person to the Understanding and Promotion of Soil Conservation in Europe. The Executive Committee has agreed that, rather than not make an award, the deadline for nominations should be extended to 31 May 1996.

Nominations should be sent by this date to the President of the ESSC (address in front of Newsletter). The Award is for a member of the Society, aged 35 years or under, who over the previous four years has made an important contribution to soil conservation in Europe through research, practice, policy-making or any other activity deemed appropriate.

Any member of the Society may propose a person. Individuals may propose themselves. Nominations must contain the name and address of the person being proposed and a 500-1000 word statement describing the contribution on which the nomination is based.

Elections of the Council 1996 - 2000

The following regulations are based on the ESSC Statutes, on the rules laid down by the first ESSC Council (published in Newsletter 2/1991) and on the updating by the ESSC Executive Committee on its meeting on 6th January 1996.

I) Regulations

A General Meeting of ESSC members will be held during the Second International Congress of the ESSC, September 1st-7th 1996 at Technische Universität München Weihenstephan, Germany. Our statutes require that the General Meeting receives the business report of the Council and elects the menbers of the Council for the next four years. Every European country with members of the ESSC should be represented with no more than four members per country (Section 10.1, Section 11.2).

Those countries with 20 or more members of the ESSC may be represented by two Council members. Countries at present with 20 or more members are: Belgium, France, Germany, Great Britain, Greece, Italy, Netherlands, Poland, Portugal, Russia and Spain.

The Executive Committee of the ESSC hereby publishes the call for candidates. Every ESSC member may nominate either him/herself or other members as a candidate. Nominations must be sent in writing to the Secretary/Treasurer by May 31st 1996. No nominations will be accepted after this date. The list of nominated candidates for each country will be published in the Newsletter 2/1996, which is expected to appear in July 1996.

Elections for the Council will be organized at the General Meeting in Weihenstephan, Tuesday 3rd September 1996 in the following way:

1) The Council members for each country will be elected by the ESSC members of that country who are present at the Meeting.
2) If only one candidate has been nominated as a country's representative on Council, that candidate will be the elected member.
3) If no members from a country are present at the Meeting, the General Meeting will elect a representative for that country from the list of nominated candidates.
4) In addition to the country representatives on Council, the former Council will nominate up to six members to serve on the new Council.
5) After the country elections have been held, the complete list of members for the new Council will be presented to the General Meeting for ratification. The General Meeting will decide to accept or reject the new Council in its entirety by a simple majority of votes.
6) The Council has the right to coopt additional representatives on Council in the period between General Congresses.

II) Duties of members of Council

The duties of Council members are to:

1) contribute to the collective wisdom of Council in reaching decisions on matters relating to the Society;
2) promote the Society within their country, e.g. encouraging new members, publishing its activities;

3) report to the President on activities within their country which are of interest to the Society and its members; and
4) attend Council meetings.

Before standing for Council, candidates should ensure that they have sufficient time to undertake these activities and can command sufficient resources to attend the majority of the Council meetings. It is very important that the Societyy has an active Council.

III) A first list of candidates

In November 1995 the Secretary of the Society asked the members of the present Council by writing, if they wish to stand for the candidature to serve on the new Council 1996-2000. As result of this survey a first list of candidates per country includes the following names:

Country	number of seats in the present Council	candidates
Austria	1	Nestroy
Belgium	2	Gabriels, Poesen
Denmark	1	Schjønning
France	2	Le Bissonnais
Germany	3	Auerswald, Richter
Greece	2	Misopolinos
Hungary	1	Kertész
Italy	2	Dazzi, Torri
Netherlands	2	Kwaad, De Roo
Norway	1	Vagstad
Poland [x)]	-	
Portugal	2	Coelho, Madruga
Russia	2	Glazunov, Kuznetsov
Spain	3	Ibañez, Rubio
Sweden	2	Bergman-Åkerman
Switzerland	1	Schulin
United Kingdom	2	Morgan
	29	

[x)] The present Council has decided at Teneriffe 1995, that Poland should be represented in the new Council by one seat.

The final number of seats per country will be fixed by the present Council, when it convenes at the beginning of the ESSC-Congress at Weihenstephan in September 96. The ESSC-statutes only provide that the number of seats in the Council should not exceed 20-25 and that no country should be represented by more than four Council members.

Please make further proposals for candidates. The deadline for this call for candidates is

May 31, 1996.

G. Richter
Secretary

R.P.C. Morgan
President

ESSC Publication Agreement with CAB international (CABI)

The Society has signed an agreement with CAB International for publication of future ESSC titles.

The aim of the agreement is to enable the Society to enhance its international reputation through the development of a coherent publication list and to gain an income through royalties.

CABI will draw up a design to be applied to all ESSC books and will promote the books through its catalogues and an individual marketing plan for each volume. CABI has also agreed to advance the Society, £ 300 to support the expenses of a Publications Officer. The duties of the Publication Officer will be to encourage Society members to publish appropriate titles, assist them in developing publication ideas and to act as the liaison between the Society and CABI.

The agreement is for three years in the first instance.

The Executive Committee commends the agreement to the Society because it provides the opportunity for the following:

1) Organisers of conferences, workshops and other activities will no longer have to search around for potential publishers. A publication possibility will already exist.
2) Working Groups will have a potential publication outlet for their activities.
3) Any members of the Society who are considering publication ventures will have a potential publication outlet.

The agreement is very flexible and does not represent a commitment that the Society will offer all its conference activities for publication or that CABI will automatically publish everything which is offered. Where conference themes are too specific to make a commercial publication or it is more appropriate to consider publication in journals, conference organizers will be free to continue to publish as at present. However, there may well be scope for books to be developed around the themes of some of the Society's conferences, even if the proceedings of the conferences are not published as such. Also, more importantly, there is scope to consider publication ventures outside the conference activities.

Members should also note that CABI is interested in all forms of publication. In addition to books, it produces material in CD ROMs.

The Executive Committee has agreed that R.P.C. Morgan should be co-opted as the Society's first Publication Officer. He would be pleased to receive any ideas members may have for future publications. He will also be contacting some Society members in the near future on possible ventures.

This is a great opportunity for the Society and it is hoped that members will take advantage of it.

New Books

1) J.J. IBÁÑEZ AND C.MACHADO (editores, 1995):
Análisis de la Variabilidad Espacio-Temporal y Procesos Caóticos en Ciencias Medioambientales.
Geoforma Ediciones, Logroño, 308 pp.

2) M. ÁLVAREZ-COVELAS AND F.CABRERA (editores, 1995):
La Calidad de las Aguas Continentales Españolas: Estado Actual e Investigación.(Spanish Inland Water Quality. Current State and Research).-
Geoforma Ediciones, Logroño, 307 pp.

3) BALABANIS, P., FANTECHI, R.., PETER, D., RUBIO, J.L. (Editors, 1995):
Desertification in a European context: Physical and socio-economic Aspects.-
Luxembourg, Office for Official Publications of the European Communities. 1995. XV, 635 pp. EUR 15415. ISBN 92-827-4163-X.

4) BERNSDORF, B., RICHTER, G., SCHMIDT, R.-G. (1995):
Die Kartierung der Schneeschmelz-Erosion - Probleme und Möglichkeiten der Felderhebung.-
14. Heft: Forschungsstelle Bodenerosion - Universität Trier, ISBN: 3-927079-12-X, 80 pp., 24,- DM

5) CERDÀ, A. (1995):
Factores y Variaciones Espacio-Temporales de la Infiltración en los Ecosistemas Mediterraneos.
Editorial Geoforma, Monografías cientificas n°5, Logroño, 151 p. ISBN 84-87779-18-2 ; Deposito legal: Z.281-1995
Price: 2500 pts (20$) - Editorial Geoforma. Apartado de Correos 1293. 26080-Logroño, Spain.

6.) Bulletin de l'Association de Géographes Français (1992):
Changes in rural structures and soil erosion..-
69^2 année, Avril, 184 p., Association de Géographes Français, C.C.P. Paris, 291.03.P, 191 rue Saint-Jacques, 75005 Paris.

7.) The proceedings of the workshop on "Soil Erosion in Semi-arid Mediterranean Areas" held in Taormina, 28-30 October 1993, Centro Studi di Economia Applicata all'Ingegneria, Via Cifali 27, 95123 Catania (Italy), Tel.: ++39-95-439181 Fax.: ++39-95-437671

8.) MIRTSKHOULAVA, TS.YE.:
Basic physics and mechanics of channel erosion.- Content: I) Erosion of cohesionless channels, II) Erosion of cohesive (clayey) channels and III) Laws of local channel erosion, 256 p., $30,-
Prof. Ts.Ye. Mirtskhoulava, Director, Georgian Institute of Water Management and Enginieering Ecology of Georgian Academy of Sciences; 380062, I.Chavchavadze Av. 60; Tbilisi, Republic of Georgia.

Announcements of Meetings

● **IECA - First European Conference & Trade Exposition on Erosion Control**
29-31 May 1996, Sitges, Barcelona, Spain
Contact: TECHNICAL SECRETARIAT, Valencia, 333 3°, 08009 Barcelona, Spain
☎ (34) 3 459-35-65, 🖷 (34) 3 459 44 68

● **ISCO - CONFERENCE: Towards Sustainable Land Use**
26-30 August 1996, Bonn, Germany
Contact: Mr. A. Klein, Federal Environmental Agency
FG. II 3.2/Soil Quality, P.O. Box 33 00 22, D-14191 Berlin, Germany
🖷 ++49 30 229 3096 ; e-mail 100434.1121@Compuserve.com

● **ESSC - Second International Congress: Development and Implementation of Soil Conservation Strategies for Sustainable Land Use**
1-7 September 1996, Weihenstephan/München, Germany
Contact: PD Dr. K. Auerswald
Institut f. Bodenkunde, Technische Universität München, Hohenbachernstraße, D-85354 Freising-Weihenstephan, Germany
☎ ++49 8161 713915; 🖷 +49 8161 714466

● **Workshop on Physically Based Soil Erosion Models**
25-27 September 1996, Freiberg, Germany
Contact: Prof. Dr. J. Schmidt, Technical University Freiberg, Soil and Water Conservation
Agricolastraße 22, D-09599 Freiberg, Germany
☎ ++49 3731 39-2681 ; 🖷 ++49 3731 39-2502

● **International Symposium and Workshop: "Combating Desertification: Connecting Science with Community Action"**
12-16 May 1997, Tucson, Arizona, USA ; supported by ESSC
Contact: Mr. B. McClure, United States Department of the Interior, Bureau of Land Management, Arizona State Office, 3707 N. 7th Street, P.O. Box 16563, Phoenix, Arizona 85011-6563, U.S.A.
☎ 602-650-0513 ; 🖷 602-650-0452 ; e-mail: bmcclure@attmail.com
Call for Papers and Posters: Abstracts must be received by 1 April 1996, to be considered for inclusion in the program.

● **GERTEC - Workshop on Badland Processes and Significance in Changing Environments**
23-27 August 1997, Florence, Italy
Contact: Dr. Dino Torri, Prof. Giuliano Rodolfi
c/o CNR Soil Genesis, Classification and Cartography Res. Centre, p.le delle Cascine 15, I-50144 Firenze, Italy
☎ ++39 55 360517 ; 🖷 ++39 55 321148 ; e-mail: csgccs@csgccs.fi.cnr.it

Announcement and Call for Papers and Posters for an International Symposium and Workshop

"Combating Desertification: Connecting Science with Community Action"

May 12-16, 1997 in Tucson, Arizona ; Optional Training Package: May 17-23, 1997

Sponsored by the United States Department of the Interior, Bureau of Land Management and International Arid Lands Consortium
in collaboration with The University of Arizona, USDA Agricultural Research Service, U.S. Environmental Protection Agency, Centro de Investigaciones Sobre Desertificacion
Supported by European Society for Soil Conservation

Objective

The objective of this Symposium and Workshop is to provide for a significant exchange of ideas between 1) the developers of science and technology related to combating desertification, and 2) the community-level decision-makers who must deal with the problems of desertification and drought on a day-to-day basis.

Symposium and Workshop Topics

- Stressors, indicators and processes related to land degradation operating at local to global scales.
- Effective techniques for monitoring and assessing desertification.
- Lessons learned at the community level in combating desertification and mitigating the effects of drought.
- Socioeconomic / human dimensions of desertification and its control.
- Linking science to community action through knowledge sharing.
- Motivation techniques proven successful at various (individual, community, national, subregional, regional) levels that create the environment and support for effective sustainable local action.

Call for Papers and Posters

Scientists, land managers, nongovernment organisations and men and women working at the local level (as well as those developing techniques and strategies) to combat desertification are invited to participate.
Individuals interested in presenting a paper or poster at the Syposium should contact:

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Bureau of Land Management
Arizona State Office
P.O. Box 16563
Phoenix, Arizona 85011-6563
☎ 602-650-0206 🖷 602-650-0398
E-Mail (Internet): bmcclure@attmail.com

Abstracts must be received by 1 April 1996, to be considered for inclusion in the program.

Registration Information

The Symposium and Workshop will be held 12-16 May 1997 at The Doubletree Hotel, 445 South Alvernon Way, Tucson, Arizona, U.S.A. An optional training package is being developed in conjunction with the Symposium and Workshop, which may include travel to Sierra Vista and Safford, Arizona and Las Cruces, New Mexico trough May 23. Registration information will be distributed by October 1996.