CONTENTS

PAOLA VELLA

Paola Vella died at Addenbrookes Hospital, Cambridge, from leukaemia on 17 August 1994, having been taken ill whilst on a visit to Silsoe College, Cranfield University, to complete a programme of work she had been undertaking jointly with Silsoe staff over the last eighteen months.

Many of us will remember Paola as the highly efficient and vivacious Organising Secretary of the very successful workshop in Taormina in October 1993. None of us knew, not even her, how ill she must have been.

The Italian and European scientific community has lost an exciting and stimulating young researcher who had contributed much, but promised to give so much more, to the field of soil and water conservation. The Society has lost one of its most enthusiastic younger members. All who worked with her will long remember her enthusiasm and thirst for knowledge, her commitment to her subject and, simply, what a nice person she was to be with. Our deepest sympathies go to her husband and her two young children.

R.P.C. Morgan President ESSC

A TRIBUTE TO PAOLA VELLA

Everyone was shocked and saddened when Paola Vella, a young researcher at the Istituto di Idraulica Agraria, University of Catania, passed away on August 17, 1994.

Paola Vella was born in Catania on March 27, 1960.

In 1979 she entered the University of Catania; in 1984 she achieved her degree in hydraulic engineering and in the same year she begun a collaboration with the Istituto di Idraulica Agraria of University of Catania as an assistant in research and teaching activities.

In 1985 she joined the Italian Working Group for the Prevention of Hydro-Geological Disasters.

In 1987 she obtained from the Authorities of Sicily a grant to carry out a 1-year experimental work on the agricultural reuse of municipal wastewater.

In 1990 she accomplished a 3-years Doctorate of Research in "Idronomia" at the University of Padua.

In 1991 she obtained from the Italian Council for Research a 1-year grant for developing a research programme on soil erosion at the Rural Land Use Department of Silsoe College, Cranfield University (Bedford, United Kingdom) under the coordination of Professor R.P.C. Morgan. During that year she begun a collaboration to research activities for the elaboration and validation of the European Soil Erosion Model (EUROSEM).

In 1992 she joined the Italian Working Group on Geotextiles.

In 1992 she obtained from the Italian Council for Research a grant for developing a research programme on the environmental impact of wastewater reuse for irrigation.

In 1990-91 and 1991-92 she gave lectures on Land Reclamation and Agricultural Hydraulics at the University of Reggio Calabria; in 1993-94 she gave lectures on Irrigation and Drainage at the University of Catania.

She was the scientific secretary and a member of the organizing committee of the Workshop on "Soil erosion in semi-arid mediterranean areas" held in Taormina on October 28-30, 1993; on that occasion participants from all Europe appreciated her graceful traits and her enthusiastic commitment.

In July 1994 she passed the examination for a long-deserved position of researcher at the University of Catania.

She was a member of the "Associazione Idrotecnica Italiana", "Associazione Italiana di Genio Rurale", "Gruppo Nazionale di Idraulica" and the "European Society for Soil Conservation".

During 10 years of activity she authored more than 30 scientific papers, published in national and international journals and proceedings of congresses, in the field of soil erosion and conservation, mountain stream restoration, surface hydrology, water resources management and agricultural reuse of wastewater.

Two well-bred little boys have lost the care of their enviable mother. The colleagues and friends deeply regret her departure, which deprives them of her unquenchable, exciting quest for scientific progress and her smiling stimulation.

S.M. Zimbone

ESSC member, Istituto di Genio Rurale, University of Reggio Calabria, Italy

COOPERATION WITH THE COUNCIL OF EUROPE.

A group of Soil Conservation specialists was established in 1991 on behalf of the Council of Europe's Division of Environment and Local Authorities. It consisted of delegates of the member states, headed by ESSC member Prof. Dr. Winfried BLUM, delegate of Austria. Several organisations, among which the ESSC, were invited to send observers. The status of observer implies free participation in discussion, if not in decisions. Two tasks were assigned to the group:

1. To draw up a draft recommendation on soil protection, for the 6th European Ministerial Conference in the Environment in 1990 to the Committee of Ministers of the Council of Europe. This was achieved in 1991.
2. To propose activities in the field of soil conservation to the Steering Committee for the conservation and management of the environment and natural habitat of the Council of Europe.

Amongst the proposal, the Committee of Ministers accepted the drawing up of a **Reference Book** on Soil Protection for European decision-makers. In several meetings, the outlines of the book were discussed; the drawing up of a draft was given to ISRIC in Wageningen and discussed in detail. The book will be issued in near future in English and French ("La resssource sol en Europe"). The summary is reprinted at page 33 and 34 of this isue, with the authorization of the Council of Europe.

Unfortunately, time was too short to organize discussion of the details of the handbook by ESSC members, but the draft of chapters I and II could be circulated amongst Council members, who made valuable suggestions which were at least partly taken info account. I did my best to improve the draft in what I thought could be the spirit of ESSC.

The mandate of the Group of Specialists on Soil Conservation ended on December 2nd 1993. The Council of Ministers decided to initiate no other activities on soil conservation in 1994, in spite of the great need for concerted action and cooperation in this field, especially as concerns the situation in the states of Central and Eastern Europe which have recently joined the Council of Europe.

Before its dissolution, the group proposed following activities for 1995:

a. European standards for the evaluation of soil degradation (physical, chemical, biological).
b. European standards for soil restoration.
c. Standards for soil integrated soil monitoring system in Europe.

Other suggestions coming from ESSC are welcome! Please send me your proposals which will be discussed by the ESSC Council.

The ESSC. Council carried the following resolution at its meeting of April 25th 1994 in Budapest:

"The Council of the European Society for Soil Conservation, sole Paneuropean organization active in soil conservation, learns with disappointment the Council of Europe's decision to suspend its activities in this field, even though it pioneered in a most useful manner as well in the scientific as in the political field. We cannot but stress the outstanding importance of international cooperation in the conservation of soil quality, often but wrongly neglected in respect to air and water quality.

Now that the Council of Europe declared 1995 Year of the Natural Environment outside protected areas, the conservation of the quality of economically used soil should be an outstanding issue".

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MEETING REPORTS

ESSC COUNCIL MEETING AT BUDAPEST

Anton Imeson has laid down his term of office on the ESSC-Council. As new representatives of the Netherlands Ad de Roo and F.J.P.M. Kwaad were elected unanimously to serve on Council.

The ESSC has now 619 members, 487 in the Western, 132 in the Eastern European countries. A leaflet was produced recently, which gives more information on the structure and the activities of the Society. It is mailed with this issue of the newsletter.

The Council discussed the installation of two ESSC awards. The President will include the proposals in a text which will be brought to decision at the next Council meeting in July 1995 on the Canary Islands.

The following general rules for the financial responsibility for expenses which arise in connection with ESSC conferences were agreed unanimously by the Council.

G. Richter, secretary

General rules for the financial responsibility for expenses which arise in connection with ESSC Conferences

1. In general, the financial calculation, the setting of conference fees for members and non-members of ESSC and the financial responsibility (surplus or deficit) is in the hands of the local organizers.
2. The local organizers may ask the Executive Committee for an advance to cover pre-conference expenses.
3. Under exceptional circumstances, the local organizers may request the Executive Committee to share the financial responsibility of a conference one year in advance to the conference date.
4. In this case, the budget of the conference has to be presented to the Executive Committee at least 6 months before the conference.
5. The Executive Committee will then decide whether or not to support the request.
6. In case of agreement, the Executive Committee and the organizers will decide how the surplus or deficit will be shared.

ADAPTATION OF WIND EROSION PREDICTION SYSTEM (USDA-ARS) TO POLISH CONDITIONS

Summary

The aim of this work is to present the possibility of the crushing model's modification. There is a close correlation between unitary tillage energy inputs (E_t) and the range of changes in the soil aggregate structure of light soil (loamy sand) at the low level of soil moisture.

Introduction

Technology currently used for predicting wind erosion is based on the Wind Erosion Equation (WEQ) published by Woodruff & Siddoway (1965). This prediction system produces the average annual estimates of erosion intensity (soil loss) over the year for croplands of the central Great Plains in the USA. Because the WEQ calculation procedure is highly empirical, it is intended to replace it by the wind erosion prediction system (WEPS), which is presently being developed by US Department of Agriculture - Agriculture Research Service (Hagen, 1991).

WEPS is process-based, continuuos daily time-step model, which has a modular structure and simulates erosion via basic wind erosion mechanics processes. It consists of a MAIN (supervisory) program; a user-interface input section seven submodels with their associated data bases (TILLAGE, WEATHER GENERATOR, SOIL, HYDROLOGY, CROP GROWTH, DECOMPOSITION, EROSION); and an output control section. MAIN calls the subroutines that control the preparation of user input files and also controls the sequence of events in the simulation runs. Thanks to a modular structure, the individual model components can be updated and modified. The development of WEPS is an objective of experiments carried out in a great number of research centers. It is also possible to adapt this wind erosion prediction technology to conditions of other countries, including Poland.

The TILLAGE submodel of WEPS simulates the effects of different management practices. The submodel input file includes a list of management operations such as: Tillage, Planting, Harvesting, Irrigation and Other. Any operation is modeled by one or more physical processes such as: Crushing, Modify Soil Bulk Density, Soil Mixing, Soil Layer Inversion and Other. The Tillage submodel uses regression-type equations with three categories of independent variables including initial conditions, Tillage implement parameters and physical soil properties. The Tillage submodel data bases includes tables of parameters for specific farm machines and implements. Studies carried out at the Agricultural University of Poznañ have revealed that the Tillage Operation submodels need to be modified in order to adapt it to Polish conditions. The deciding factor determining wind erosion in Polish conditions is energy transferred into the soil during tillage operations. It is a result of a low mechanical resistance (stability) of the aggregate structure of the erodible loamy sands. On the other hand wind energy is significantly reduced by the shelter belts commonly found in the countryside. Thus, intense wind erosion events happened mostly on cultivated croplands on light soils (Wielkopolska region) and particularly in the periods of pre-sowing treatments (April, August, September) performed at the low level of soil moisture (Kostrzewski, 1988; Podsiad³owski, 1991).

With reference of this, Tillage Operation submodel should include the distinctive characteristic of mechanical cultivation of light soils, performed with various farm implements and machines working with different speed and a tractor wheel slip. And more specifically, it should include the tillage energy flux density which is transferred into the soil by farm machines. We assumed that this modification of the tillage submodel of WEPS (particularly of the aggregate crushing model) will facilitate the prediction of changes in the stability of the aggregate structure for any management operation. It will also allow as to omit expensive research experiments for each type of farm tool (machine) individually and their parameters of work.

Description of Wagner's Model

Processes of change in the aggregate structure of the cultivated soil were described by the model published in Wagner and Ding (1993). It is a two-parameter stochastic model based on a Markov chain model (Bhat, 1984) which can predict the tillage-induce crushing of soil aggregates. A soil aggregate is assumed to consist of many particles each having an infinitesimal unit mass. The soil particles can travel only downward from a larger aggregate size class to smaller aggregate size classes after each tillage pass (crushing of an aggregate). If a size class is called a "state", than the transition of soil particles from one state to another can be treated as a completely random event. A probability matrix, *P[i,j]* can be constructed for all possible transitions occurring in the soil then its aggregate size distribution (mass fraction across different size classes) shifts or transfers from $w_o\ [i]$ to $w_1[k]_{\ (0\ to\ i=1)}$ after one crushing tape (tillage pass). *P [i,j]*, often called a transition matrix, maintains the properties of Markov chain passes but depends on the type of tillage and the specific soil conditions. The mathematical presentation of Markov chain - based crushing model takes the form of:

$$w1\ [i](1 \times n) = w0[i](1xn)\ P[i,j](n \times n) \tag{1}$$

The effectiveness of the model relies on how accurately the transition matrix *P[i,j]* can be estimated. Wagner and Ding (1993) assumed that the transition matrix *P[i,j}* can be presented as allowed triangular matrix, where the states with smaller index values correspond to the smaller aggregate size classes (size intervals) and vice versa.

$$P[i,j] \quad \begin{vmatrix} P_{11} & 0 & & \cdots & & & 0 \\ p_{21} & p_{22} & 0 & \cdots & & & 0 \\ \vdots & & & & & & \\ \vdots & & & & & & \\ p_{i1} & \cdots & p_{ij} & \cdots & p_{ii} & \cdots\ 0\ \cdots & 0 \\ \vdots & & & & & & \\ p_{n1} & p_{n2} & p_{n3} & \cdots & & p_{nn-1} & p_{nn} \end{vmatrix}_{n \times n} \tag{2}$$

Because it is almost impossible to estimate each transition probability, P_i, individually, the authors assumed that the P_i follows binomial distributions and takes the form:

$$P_i = \binom{i-1}{j-1} P_i^{j-1}\left(1-P_i\right)^{i-j} \quad i=1,2,...n,\ j=1,2,...,i \tag{3}$$

In En. (3), p_i is defined as the probability function of breakage of the aggregate from size class "I" and generally can be expressed as an algebraic function of sieve size, x_i, and parameters crushing coefficients α and β. Wagner and Ding (1993) have performed the model identification which including finding a suitable p_i function and then searching for the function's parameters for different agricultural implement and soil conditions. As the results of studies the following function has been chosen:

$$P_i = \frac{1.0}{1.0+\exp\left(-\alpha+\beta gmd_i / gmd_{\max}\right)} \tag{4}$$

where: I = 1,2,3...n sieve size gmd_i are geometric means of x_{i-1} and x_i (geometric mean diameter of aggregates in each size class gmd_{max} is geometric mean of x_n and x_{n+1} (geometric mean diameter of aggregates in largess class). Parameter α reflects the breakage of all soil aggregates regardless of size. As α decreases, the percentage of soil aggregates breaking increases. Parameter β reflects the unevenness of breakage among aggregates in different size class. Large β values mean that crushing mainly affects the large soil aggregates.

Wagner and Ding (1993) have verified the above model for a few typical tillage tools: rotary tiller, offset disk harrow, chisel plow, field cultivator. They obtain relatively small simulation errors. In order to apply the above model widely it is necessary to estimate α and β values for other farm implements and for various types of soil, as the authors pointed out.

The aim of this work is to present the possibility of the crushing model's modification. We have assumed that the tillage - induced crushing process is controlled by the tillage energy transferred into the soil by working farm machines and tractors and does not depend on the technical parameters of the management operation (the type of the tool and a tractor, the wheel's spin and speed). The following thesis was advanced by Podsiadlowski, (1993).

Changes in the soil aggregates structure (aggregate size distribution) depends mainly on the unitary tillage energy inputs (the density of energy flux) along with soil water content and its distribution. They account for aggregate crushing and transport during tillage. There is a boundary value of the unitary tillage energy for every initial physical state of light soil and for tillage depth. Significant changes in the aggregate structure occur when this value is exceeded. At the low level of soil moisture the soil is pulverized and the pulverization erosion happens. The aggregate crushing process in these conditions is determinated by the total tillage energy that includes: the compaction energy of tractor wheels + the tillage energy transmitted by the working elements of farm tools/machines.

Our modification is based on the algorithm for accurate calculation of the tillage energy for any type of farm tractors and machines. The algorithm was developed together with the relevant computer program STAPOD at the Agricultural University of Poznañ.

The procedure for calculating the unitary tillage energy inputs

Energy inputs, to create the tractor wheel track and its subsequent tillage, were formulted:

$$A_{tc} = A_t + A_c \qquad (kJ/m^2) \qquad (5)$$

where:

A_t - unitary tillage energy (kJ/m^2)

A_c - unitary energy of soil compaction (kJ/m^2)

Energy inputs to created wheel track (the unitary tillage compaction energy) takes form of:

$$A_c = \left[A_u - A_t - \frac{(1-E_m)\ P_t}{E_m \quad W_t} - \frac{0.1\ P_{WOM}}{0.9\ W_t} \right] \frac{b}{2\ b_t} \qquad (kJ/m^2) \qquad (6)$$

where:

A_u - the overall energy inputs per area units including energy losses in a tractor mechanical (kJ/m^2)

A_t - the tillage energy inputs per area unit (kJ/m^2)

E_m (propulsive) efficient of wheels' power transmission system

P_t - total driving power at the tractor's driving axle = live axle

P_{WOM} - driving power at the power transmission shaft, kW,

W_t - surface work efficiency m^2/s

b - tillage width m

b_t - wheel track width m

Unitary tillage energy inputs can be concluded according to the following formula:

- Plought

$$A_{t\,(plought)} = a\,(k_1 + k_2 * v^2) \qquad (kJ/m^2) \qquad (7)$$

where:
a - tillage depth — m
k_1 - coefficient of the static resistance — kN/m^2
k_2 - coefficient of a dynamic resistance — $kN * s^2/m^4$
v - working speed — m/s

- Field cultivator

$$A_{t\,(cultivator)} = a\,(k_3 + k_4 * v) \qquad (kJ/m^2) \qquad (8)$$

where:
k_3 - coefficient of a static resistance — kN/m^2
k_4 - coefficient of a dynamic resistance — $kN * s/m^3$

- Harrow

$$A_{t\,(harrow)} = k_5 + k_6 * v \qquad (kJ/m^2) \qquad (9)$$

where
k_5 - coefficient of a static resistance — kN/m
k_6 - coefficient of a dynamic resistance — $kN * s/m^2$

- Rototiller

$$A_{t\,(rototiller)} = \frac{a\,(P_1 + P_2 * v^2) * v_t/v_n}{v} \qquad (kJ/m^2) \qquad (10)$$

where:
P_1 - power coefficient related to static resistance — $kN/(m * s)$
P_2 - power coefficient related to dynamic resistance — $kN * s/m^3$
v_t - tangential velocity of tractor's wheels — m/s
v_n - nominal speed — m/s

The proposed direction of modification for the Wagner and Ding' crushing model

The proposed direction of the aggregate crushing model's modification is based on the results of our studies. We found that there is a close correlation between unitary tillage energy inputs (E_t) and the range of changes in the soil aggregate structure of light soil (loamy sand) at the low level of soil moisture. Figure1 presents the results of our studies which included tillage at 5cm depth. The experiments were carried out on two types of soil: light loamy sand, silty light loamy sand. The average soil moisture of the topsoil layer (0-10cm) was 4.3%. The tillage operations were performed with: cultivator, a harrow and a rototiller at the whole range of tillage speed. We determinated unitary tillage energy inputs for all combinations with the assistance a tractor, board computer and STAPOD program. Changes in the aggregate structure (the aggregate size distribution) were expressed by the GMDexp /GMDcntr ratio (Geomertic Mean Diameter), the so called disintegration ratio. Correlations presented in Figure1 indicate that changes in the quantitative distribution of the aggregate structure depend both on the unitary tillage energy input (E_t) and the type of soil. (Detailed characteristics, of both soils, is included in the report of Hagen et al and the clear relationship encourages us to introduce the unitary tillage energy into the crushing model. Considering the different characteristic of aggregate crushing in soil with a better aggregate stability (loamy soils) we decided to determine how much the unitary tillage energy inputs affect the crushing process of aggregates in different size class in this type of soil. We used the results of Wagner and Ding studies (1993) completed with the values of tillage energy inputs. The energy input was calculated by STAPOD program. Figure 2 indicates that also in this case the tillage energy is an important factor which determines the probability of aggregate breakage of each size class. Thus , it is proved that the Wagner and Ding model can be modified - including the unitary tillage energy factor and applied for loamy soils as well. This modification will be the objective of our next studies.

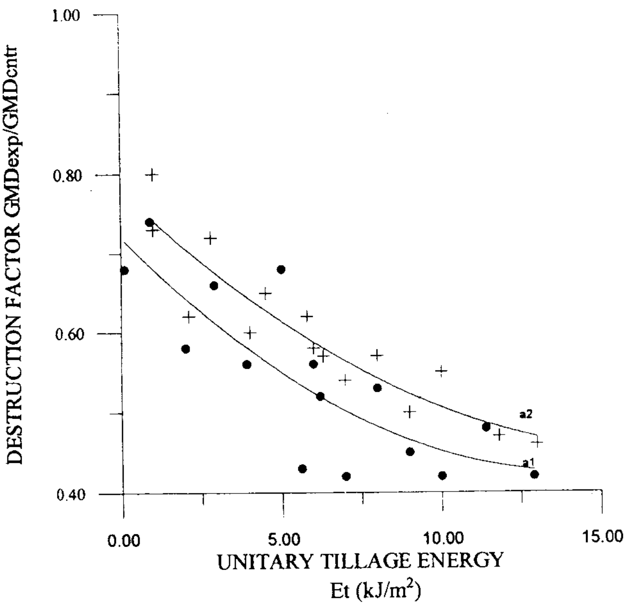

Fig. 1: The aggregate structure of top soil layer (0-5 cm) as influenced by the tillage energy. Depth of tillage 5 cm.

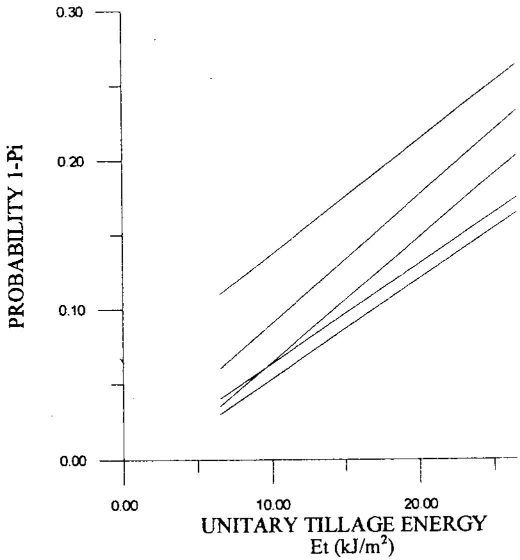

Fig. 2: The probability of aggregates breakage of each size class as influenced by tillage energy; 1 - fraction 2.0-6.35 mm, 2 - fraction 6.35-19.05 mm, 3 - fraction 19.05-44.45 mm, 5 - fraction 76.20-101.6 mm.

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Poland

SOIL EROSION AT THE PERIOD OF SNOWMELT ON THE ARABLE LAND OF RUSSIA

Soil losses through erosion processes leads to a reduction in soil fertility an arable lands. The most intensive processes are found at the period of a spring snowmelt forming from 80% to 90% of annual soil losses.

To study real soil losses there data were summarised from 35 constant and temporary stations where ploughed tests were carried out land (contour tillage with 22cm depth) and under winter crops, stubble and perennial grasses (Gerasimenko, 1987, 1992, 1993). The length of the experiments on 12 stations was 5 years and less, at the next 12 stations it was 6-10 years and at the last 10 it was 11-12 years. The optimum length of observation was important for the calculation of average long-term soil loss.

To determinate the minimum experimental period the intercommunications between mathematically smoothing rows of soil loss and Wolf numbers were investigated. The mathematical smoothing was carried out by use of

linear $$M = W_0(t) + W_1(t) + \lambda(t) \quad (1)$$

constant $$M = W_0(t)\ \lambda(t) \quad (2)$$

and quadratic models $$M = W_0(t) + W_1(t)\ 0{,}5\ W_2 t^2 + \lambda(t) \quad (3)$$

where M, W_0, W_1, W_2 are soil loss values and Wolf numbers; t is time in years; $\lambda(t)$ is an accidental component of a time row.

The interconnections between the smoothed by the equations (1-3) massive data and Wolf numbers for March and April of the synchronous year ($\tau = 0$) and at the row displacement by $\tau = 1$; 2; 3 and 4 years were established with a computer. The closest connections (coefficients of the normalized correlation equalled from 0.76 to 0.97) out of 5,085 variants were stated at $\tau = 0$. Taking into account the solar activity cycles to be 11; 22; 44 years (Kalianov, 1981), the minimum period of the average long-term soil loss may be 11 years. Physically it means that the whole range of water erosion intensity equilibrium has to be revealed during this period from "zero" to maximum.

For the stations of 5 years or less observations the reduction to 11 years period, was made by two methods: analogy and constructing of space-time soil loss rows with a previous evaluation of homogeneity and independency of selections. The selection independency was checked up by Neyman criterion, and the evaluating of experiments homogeneity with V (T, T_k) function and comparison of the latter with the theoretical χ^2 was made by the distribution equalled 6.635.

The above stated methodology has allowed computing of the average long-term soil erosion intensity on the arable lands and for the first time an isolines mapping on the scale

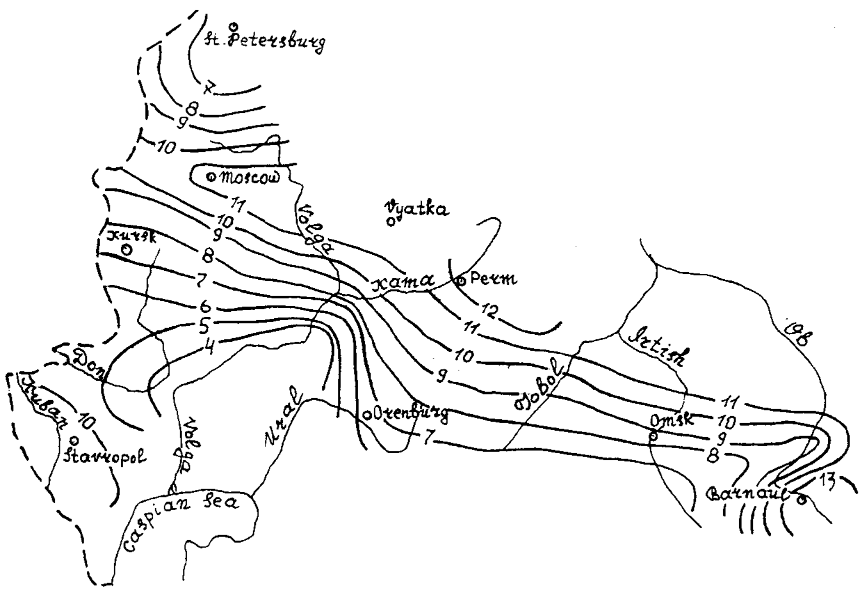

Figure 1: Average long-term soil loss from arable lands, t/ha

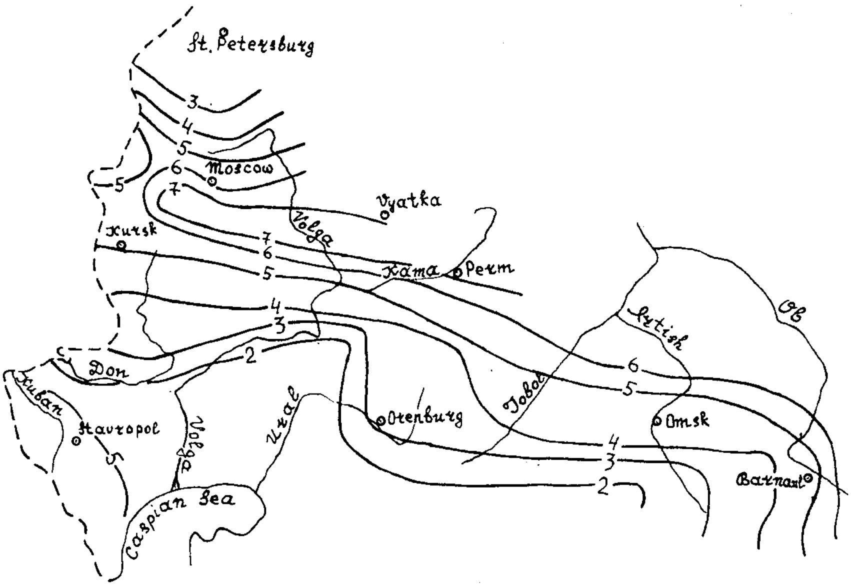

Figure 2: Average long-term soil loss from the lands under winter crops, stubble and perennial grasses, t/ha

1 : 5,000,000 of soil loss from fall-ploughed (Fig. 1), under winter crops, stubble, and perennial grass lands (Fig. 2). Submition of a soil loss distribution to the latitude zoning lae is a common space regularity on different agricultural backgrounds. The present soil erosion state shows that the most severe losses take place in a forest zone possessing a great energy capacity due to spring runoff and on soddy podzolic and grey soils with a poor humus horizon of weak erosion resistance, the podzolic row particularly. In the Non chernozemic Zone the poor structure and water permeability of the upper horizons and the dissection promote soil erosion. Reduction of the average long-term arable soil erosion intensity is traced from north to south and south-east. In a number of places this state is broken because of thawing water formation and the soil particle-size composition (Pre-Urals, Trans-Urals, Altai Territory, the northern part of Daghestan). In the forest-steppe, steppe, and arid steppe zones different chernozems are characterized by a stronger erosion resistance as compared with soddy podzolic and grey forest soils. These circumstances together with the decreasing thawing runoff promote soil loss decrease in the places of transition from the forest to the forest-steppe and the steppe zones.

Figure 1 and 2 show that the lowest soil losses are in the south-east: from 4 to 5 t/ha (fall ploughed lands), from 2 to 4 t/ha (lands under winter crops, stubble, perennial grass), but maximum in the Non-chenozemic zone: from 8 to 12 t/ha (fall ploughed lands), from 6 to 7 t/ha (lands under winter crops, stubble, perennial grass), and in the West Sibiria and Altai Teritory: from 9 to 14 t/ha (fall ploughed lands), and from 3 to 6 t/ha (lands under winter crops, stubble, perennial grass).

Under the present agricultural production conditions the average long-term soil loss changes from 4 to 14 t/ha on fall ploughed lands and from 2 to 7 t/ha on the lands under winter crops, stubble, perennial grass, this is 2-6 times the adopted tolerance for erosion (2-5 t/ha). This fact points to the need for water erosion control on arable lands.

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STATE AND PERSPECTIVES OF SOIL SALINITY IN EUROPE

Among environmental hazards, salinity is remarkable and occurs in all continents. In comparison with Asia, Africa or Australia, the salinization of soils and waters is less extended in Europe. Nevertheless, it represents a growing hazard, making it necessary to continue the study of this problem in numerous European countries (SZABOLCS, 1987).

The total territory of salt affected soils exceeds 10% of the total surface of the continents (this percentage is somewhat lower in Europe). Soil salinity is closely related to the salinity of waters which also impairs the possibility of utilizing water for irrigation and drinking purposes. The salinity of soils and waters exceeding the given threshold values can be considered as toxic for plants, animals and humans (KOVDA, 1947; ALEKSEEVSKY, 1981). The territory covered by salt affected soils is growing rapidly due to natural, but mainly to man-made factors, like irrigation, deforestation, overgrazing, desertification, etc. (SZABOLCS, 1979).

Based on recent estimates of research organizations as well as affiliated UN organizations the extent of potential salt affected soils exceeds at least 2 to 3 times the acreage of existing saline soils. The rate of man-made salinization is accelerating due to intensive agriculture, domestic water use and other reasons (DREGNE, 1976). Among the human-induced effects resulting in salinization, apart from irrigation, the climatic changes of late years caused by the increasing CO_2 concentration of the air and atmosphere play an increasing role.

In Europe, as on all of the continents, salt affected soils occur in different places. The total extension of salt affected soils in Europe surpasses 50 million hectares which is quite remarkable considering the total territory of this continent. Salt affected soils occur to a considerable extent in Austria, Bulgaria, Slovakia, France, Greece, Hungary, Italy, Portugal, Rumania, Spain, Russia, Ukraine, Serbia, Croatia, Macedonia, Bosnia-Hercegovina. Hungary, Spain, Russia and Ukraine are the four European countries where more than three quarters of all salt affected soils of this continent occur. Apart from the 16 countries listed above, in at least ten other European states different types of salt affected soils can be found to a limited extent. Among these countries those should be mentioned which have a seashore strip with a steady accumulation of sodium chloride from the sea water. Other sources of soil salinization also occur. The greatest part of European salt affected soils can be found in the semiarid steppe and forest steppe regions of Russia and Ukraine, on the second and third lowlands of the Danube in the territories of Slovakia, Rumania, Hungary, Croatia, Serbia, and in Spain. Nevertheless, as far as annual temperatures, precipitation and local altitudes are concerned, the conditions of occurrence of salt affected soils may be quite different (SZABOLCS & RÉDLY, 1989).

In Europe salt affected soils occur both in semiarid and semihumid climatic conditions and they can be found on altitudes as low as less than 100 m above the sea level and as high as over 500 m above the sea level as well.

Figure 1 demonstrates the present status of soil salinity in Europe.

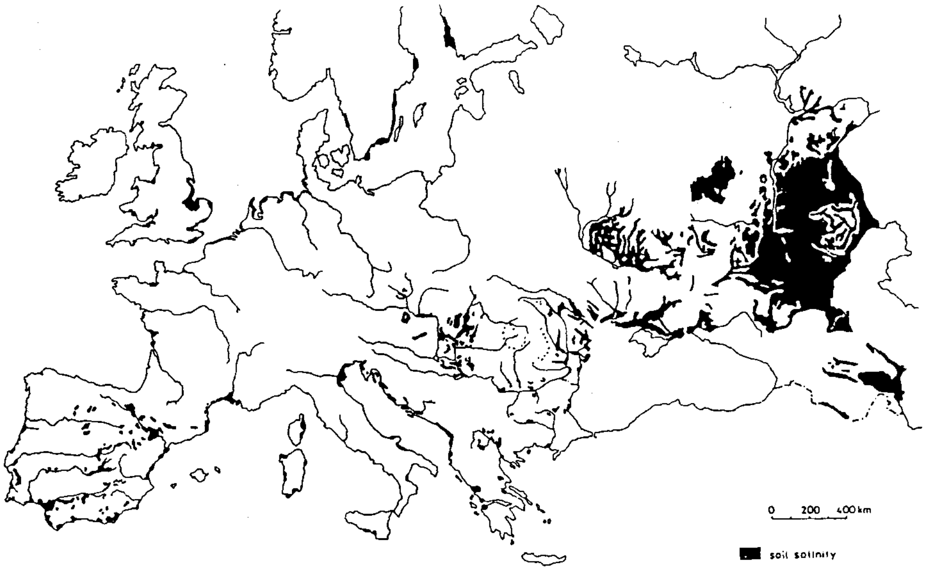


Figure 1: Present situation of soil salinity in Europe

For the studies of potential soil salinity in Europe caused by the predicted climate changes we selected the following three scenarios which represent the most important processes of potential salinization in different parts of our continent:

1. Potential increase in soil salinity caused by the extension of irrigation (Scenario 1)
2. Potential increase in soil salinity caused by climatic changes (Scenario 2)
3. Potential increase in soil salinity caused by sea-level rise (Scenario 3).

For Scenario 1 regions with continental and semiarid climate of the continent were chosen where the main hazards of secondary salinization are present and irrigation is extending. For Scenario 2 the Mediterranean region of Europe was selected where possible changes in the climate, like increasing temperature and decreasing precipitation (due to the changes in the CO_2 balance of the atmosphere) may result in secondary salinization. For Scenario 3 certain coastal areas of north-western Europe were chosen where possible sea-level elevation (in consequence of the same phenomenon mentioned in connection with Scenario 2) may cause remarkable soil salinity.

The location of the territories for the three scenarios are shown in Figure 2.

The three scenarios cover a major part of Europe as well as most of the areas with potential salinity, caused by different direct or indirect man-made salt accumulation processes.

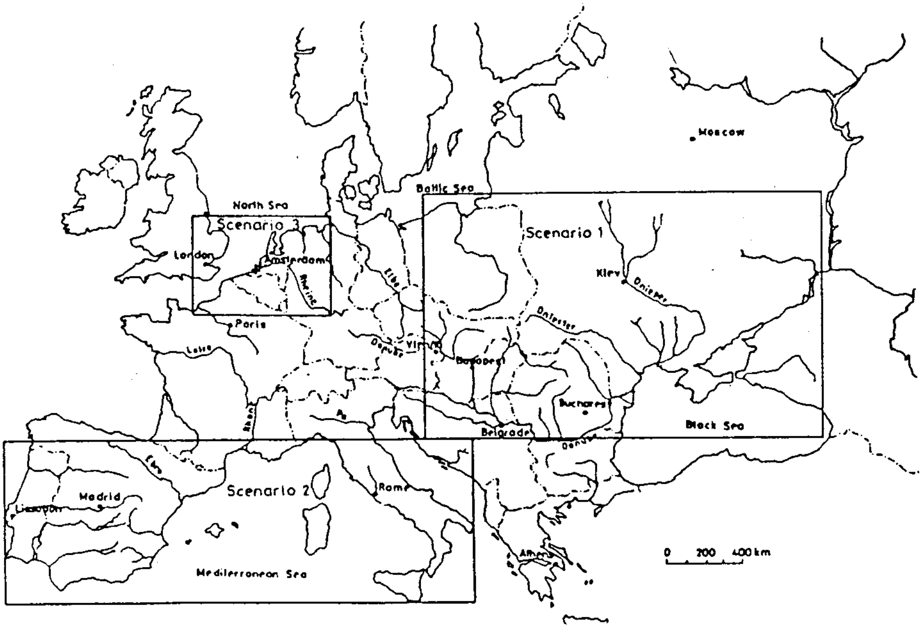


Figure 2: Location and territory of Scenarios 1, 2 and 3 in Europe

Scenario 1: Existing and potential soil salinity caused by irrigation

For Scenario 1 we selected a part of Europe (See Fig. 2) where, in consequence of both climatic and economic conditions, irrigation has been practised for a long time. More than half of all irrigated areas in Europe are situated in the territory of Scenario 1. As can be seen from Figure 1, salt affected soils are extensive in countries indicated in Scenario 1. A great part of existing salt affected soils is situated in the vicinity of irrigation systems or even within their territories.

In nearly all countries included into Scenario 1 the further extension of irrigation has been envisaged. In countries where the precipitation is low, a greater increase has been planned (e.g. Russia, Ukraine, Bulgaria, Rumania) than in countries which do not suffer from aridity (Austria, Poland).

In Scenario 1, taking into consideration the above described circumstances, we assumed that up by middle of the 21st century the irrigated territories will double as a maximum and calculations were made according to such aspect.

There are two main processes of salinization caused by irrigation:

1. Salt accumulation in soil layers from the salt content of irrigation water;
2. Salt accumulation in soil layers from the salt content of rising salty groundwater.

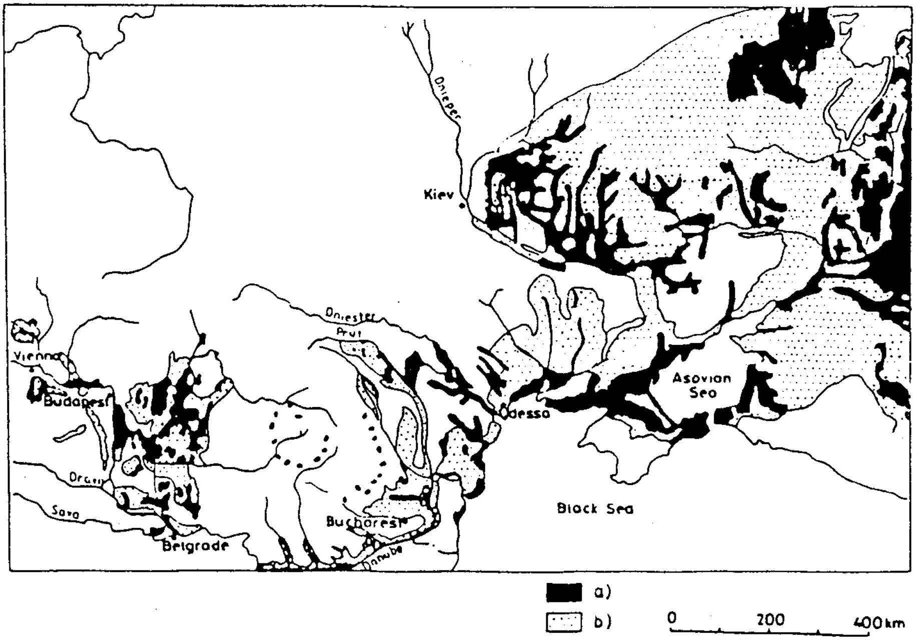


Figure 3: Territory of salt affected soils and potential soil salinity as a consequence of extended irrigation (Scenario 1) a) existing salinity b) potential salinity

Considering climatic, physico-geographic, hydrological, agricultural and pedological aspects, we have made a map demonstrating the hazard of soil salinity for the territory of Scenario 1 with the following assumptions:

1. Until 2050 the present irrigated areas will increase, but be doubled as a maximum.
2. There will not be substantial changes in climate and no elementary disaster will occur.
3. The present quality requirements for applied irrigation water will remain.
4. The present riverbeds and major hydrological constructions will remain.

Figure 3 demonstrates the extension of existing and potential soil salinity in the area of Scenario 1, according to the above described conditions.

As it can be seen from Fig. 3, the territory of potential soil salinity in the given scenario exceeds that of existing salinization and is nearly two-times more.

The figures are as follows:

- Total territory of Scenario 1
  (excluding the surfaces of the Black Sea and the Azovian Sea) .... 2 079 840 km^2
- Territory of existing salinization
  (10.5% of the total territory) .... 218 383 km^2

- Territory of potential salinization
  (20.1% of the total territory) .... 418 047 km^2

It is also clear from the Figure that potential salinity may develop surrounding the present salt affected soils and may threaten fertile areas which are covered by non-salt affected soils at present.

The potential salinity of soils not only diminishes the ecological potential of the given area but often entirely prevents agricultural production. Besides, drinking water for animals and humans may also be salinized and the toxicity of herbs and other native plants may develop.

Scenario 2: Potential soil salinity caused by climatic changes

For Scenario 2 we selected the major Mediterranean areas of Europe (see Fig. 2), where at present salt affected soils are extended mainly in the Iberian Peninsula and only to a smaller extent in Southern France, Italy, Sicily, Sardinia and Corsica, as well as the Dalmatian coast of the Balkan Peninsula. The total area of this scenario is 1 979 959 km^2, with 885 826 km^2 land surface. In comparison with the salinity conditions of Scenario 1, the extension of salt affected soils in Scenario 2 is much lower, it is nearly half of the percentage.

We assumed that due to the possible climatic changes, as a consequence of CO_2 accumulation and other causes, the average annual temperature of the territory will increase by about 1 °C in the next 50-70 years. Consequently, the aridity index will also increase, which creates progressive salinity on those marginal territories where at present salinity does not exist or can be found only in latent form in the ground or in water. The following assumptions were taken into consideration:

1. The currently irrigated areas will not change substantially.
2. No natural disaster or tectonic changes will happen.
3. The present riverbeds and major hydrological constructions will remain.

In Fig. 4 the territory of salt affected soils and potential salinity as a consequence of climatic changes are demonstrated for Scenario 2.

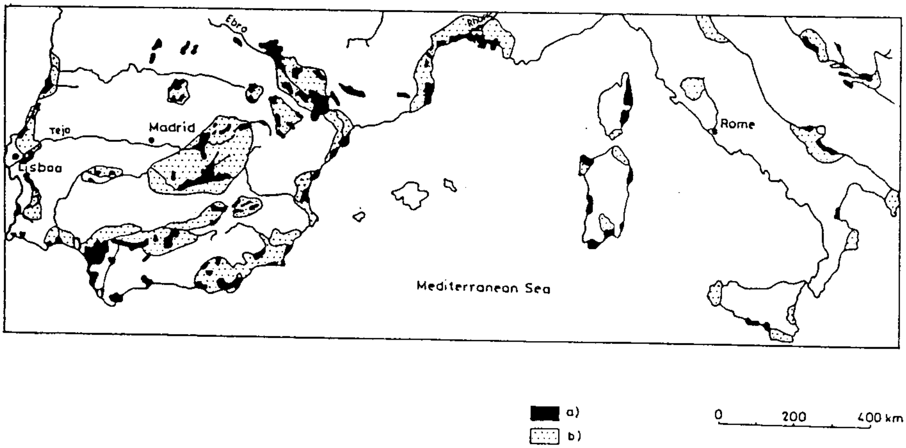
As it can be seen from Fig. 4, the territory of potential salinity (as was shown on Fig. 3) substantially surpasses that of existing salinity in all affected areas. While at present the total area of salt affected soils in Scenario 2 is 56 168 km^2 (6.34% of the total land surface), which is twice as much as existing salinity. The dry areas of the Iberian Peninsula (like Castilia, the Ebro Valley, south-western France) and also several areas in the Italian and Balkan Peninsulas are particularly exposed to potential salinity due to the increasing aridity.

For the areas demonstrated in Scenario 2, we made a calculation of "aridity factor" values based on the precipitation factor according to Lang. The Lang-factor gives fairly good information of aridity-humidity conditions by the application of a simple quotient of average annual precipitation and average annual temperature (Table 1).

Our calculations for selected places of Scenario 2 clearly show that in case of one Celsius centigrade increase in the annual mean temperature the R/F index changes substantially by about 10%, which means a considerable increase of aridity, and, consequently, the hazard of soil salinity.

It is interesting to note that in all of the eight locations approximately the same degree of decrease in the R/F value (which means increasing aridity) can be observed.

Such phenomenon is a consequence of the similarity of ecological and particularly soil conditions in the whole Mediterranean region selected for the study in Scenario 2.



Figurre 4: Territory of salt affected soils and potential salinity as a consequence of climatic changes (Scenario 2) a) Existing b) potential salinity.

Table 1: "Precipitation factor" according to Lang in Scenario 2 (Mediterranean region of Europe)

Location	**Present R/F**	**R/F ***
1. Middle part of the Iberian Peninsula (Madrid)	31.27	29.18
2. Southern part of the Iberian Peninsula (Jaen)	35.22	33.27
3. Southern France (Nimes)	50.76	47.46
4. Corsica (Ajaccio)	46.10	43.14
5. Sardinia (Sassari)	37.27	35.17
6. Italy (Terni)	61.27	57.42
7. Southern Italy (Catanzaro)	60.22	56.63
8. Yugoslavia (Dubrovnik)	79.00	74.38

R/F = (average annual precipitation, mm) / (annual mean temperature °C)

* if annual mean temperature increases by 1 °C

Scenario 3: Potential soil salinity caused by sea-level elevation

For Scenario 3 we selected a part of north-western Europe (See Fig. 2) where the following two conditions are favourable for the study):

a) Measurable extension of salt affected soils at the present time;
b) Good probability of sea-level elevation due to global climatic changes in the next 50 years.

The total territory of Scenario 3 is 344 942 km², with 226 393 km² land surface, including the south-eastern part of England, the Western part of the Netherlands, Belgium and the north-eastern part of France bordered by the North Sea, the Atlantic Ocean and the English Channel. In this scenario mainly coastal saline soils with high sodium chloride content occur in several seashores and nearby territories.

The territory of existing and potential salinity in Scenario 3 is demonstrated in Fig. 5.

It was assumed that - due to global climatic changes - the expected sea-level elevation will be 1 cm per year on average and consequently, the effect of sea water on land will provoke further salinization.

As it can be seen from Fig. 5, the territory of potential salinity caused by sea-level elevation substantially surpasses that of existing salinity. This is also valid for the two other scenarios, proving that all over Europe potential salinity constitutes a much greater hazard than existing salinity.

In Scenario 3 salinity caused by sea water is essential (10 520 km²) and constitutes 4.65 % of the total land surface. At the same time, the area of potential salinity is 24 977 km², which is 11.03 % of the total land surface.

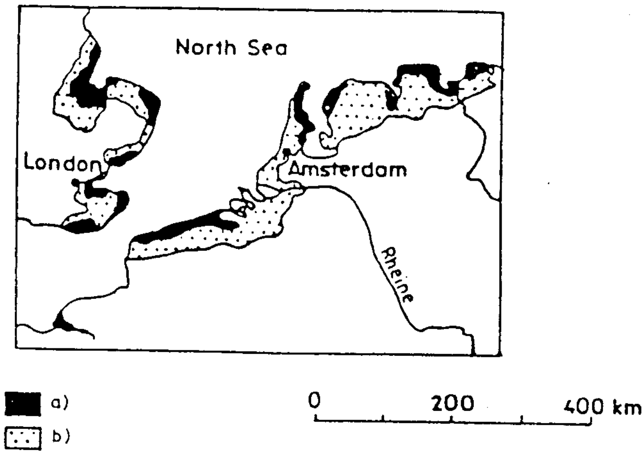


Figure 5: Territory of salt affected soils and potential salinity as a consequence of sea level elevation (Scenario 3). (This map was prepared with the contribution of E. MOLNÁR). a) Existing, b) potential salinity.

Scenario 3: Potential soil salinity caused by sea-level elevation

For Scenario 3 we selected a part of north-western Europe (See Fig. 2) where the following two conditions are favourable for the study):

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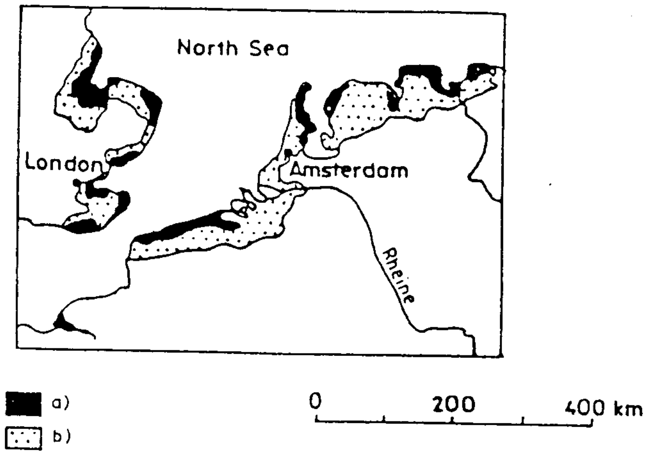

Figure 5: Territory of salt affected soils and potential salinity as a consequence of sea level elevation (Scenario 3). (This map was prepared with the contribution of E. MOLNÁR). a) Existing, b) potential salinity.

In Scenario 3 the same rule can be observed as in the other two scenarios, namely, that potential salinity may be expected in territories surrounding the existing salt affected soils.

The three scenarios, which have been elaborated and demonstrated above, represent the main processes leading to the hazard of secondary salinization in Europe. However, they do not exhaust all the possibilities of this phenomenon, which may develop due to other factors, such as: changes in the cropping pattern, intensive use of chemicals, changing farming management, etc.

In order to predict the adverse salinization processes more detailed and more exact, appropriate methods of special survey should be elaborated. We are in the possession of a number of such methods, as well as methods for the prevention of salinization mainly in irrigated agriculture. In the following part of this study such experiences and recommendations will be described and discussed.

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I. Szabolcs
Research Institute for Soil Science and
Agricultural Chemistry of the
Hungarian Academy of Sciences
Budapest, Hungary

AIM - ANNOUNCEMENTS, INFORMATION, MEETINGS

ANNOUNCEMENTS

EUROPEAN SOCIETY OF SOIL CONSERVATION

Meeting on

THE SOIL AS A STRATEGIC RESOURCE: DEGRADATION PROCESSES AND CONSERVATION MEASURES

Tenerife-Fuerteventura-Lanzarote (Canary Islands, Spain), 11-15 July. 1995

2nd Circular. November 1994

The ***main subject*** to be discussed at this meeting will be the Conservation of the Soil as a Strategic Resource in relation to:

a) Water and eolian erosion processes and other processes of physical degradation as a consequence of the abandonment of traditional agricultural practices.
b) Salinization-sodification processes related to irrigation agriculture and the use of low-quality water.
c) Chemical pollution and acidification (chemical time bomb) as a consequence of the intensification of agriculture.
d) Measures of environmental protection and of soil and water conservation in fragile ecosystems.

Host institution: University of La Laguna at Tenerife (Canary Islands).

Official Language: The official languages of the Meeting are English and Spanish, only for the presentations. The printed material will be in English. Translations will be provided.

Preliminary Programme:

July 10 (Monday):	Arrival of participants to Tenerife Airports. 10 am - 20 pm Registration and documentation.
July 11 (Tuesday):	Opening Ceremony and scientific sessions (paper and poster) on subjects a-b.
July 12 (Wednesday):	Scientific sessions (paper and poster) on subjects c-d. ESSC Executive Council Meeting.
July 13 (Thursday):	Field trip in Tenerife: Experimental plots for measuring water erosion (Andisols and Aridisols).
July 14 (Friday):	Departure to Lanzarote or Fuerteventura. Field trip in Lanzarote (Conservation agriculture in arid zones) or Fuerteventura (Soil degradation processes due to erosion and salinization).
July 15 (Saturday):	Field trip in Fuerteventura or Lanzarote.

Call for Papers and Posters

⇨ Individuals interested in presenting a paper or a poster are invited to submit the title, author(s) and a 200-300 word abstract before FEBRUARY 28, 1995. Contributions are invited in English.

⇨ The Organizing Committee will try to find possibilities to publish the full text of the selected presentations.

⇨ All details in this respect will be given directly to the participants.

⇨ Meeting Abstracts will be available at the moment of registration on July-10.

General information

1) The scientific sessions will take place at the University of La Laguna (Tenerife) or at the conference rooms of a hotel in Puerto de la Cruz.
2) Tenerife-Lanzarote and Fuerteventura-Tenerife transfers will be by air, while Lanzarote-Fuerteventura transfers will be by ferry.
3) Tenerife is connected by air with the main European capitals by the Reina Sofia (Tenerife South) International Airport.
4) Travel and accommodation. - Details will be included in the booking form of a Travel Agency directly to the participants.

A ***scientific committee***, under the auspices of the ESSC, has been constituted to select the works to be published in the Proceedings of the Meeting, as follows:

R.P.C. MORGAN. Silsoe College, U.K.
N. MISOPOLINOS. Thessaloniki, Greece
J.L. RUBIO. IATA, Valencia, Spain
D. GABRIELS. Ghent, Belgium
J. POESEN. Louvaine, Belgium
G. RICHTER. Trier, Gemany.

Expected Registration Fees

- Registration fee for ESSC members: 235 US $ (360 DM / 30.000 ptas.)
- Registration fee for non-ESSC members: 315 US $ (480 DM / 40.000 ptas.)

Registration fee covers:
* Publications (Meeting Abstracts and others)
* Lunches during all the Meeting
* Evening banquet
* Field trip within Tenerife, Lanzarote, Fuerteventura.

For further information please contact: Prof. Dr. Antonio Rodríguez Rodríguez, President of the Organizing Committee, Dpto. Edafología y Geología, Fac. Biología, c/Astrofísico Francisco Sánchez s/n. 38204, Universidad de La Laguna, Tenerife, Canary Islands, Spain. Telephone: 34-22-603741. Fax: 34-22-253344. E-mail: ARODRIGUEZ@ULL.ES

✂ ....

Registration Form

Family name: ______________________ Name: ______________________

Organization: ____

Address: ____

Postal Code: ________ City: ________________ County: __________

Fax: ____________ Phone: ________________ E-mail: __________

ESSC member: ❑ YES ❑ NO

Please indicate as appropriate: ❑ I will to present a paper
❑ I will to present a paper.

Title of the paper/poster: ____________________________________

____

Date: ________________ Signature ____________________________

Please return the registration form to: *Prof. Dr. Antonio Rodríguez Rodríguez.*

EUROPEAN SOCIETY OF SOIL CONSERVATION

Academy of Natural Sciences of Russian Federation

Soil Science Society of Russia, Moscow State University

Workshop on

PROBLEMS AND MANAGEMENT OF SOIL CONSERVATION IN EUROPE.

Moscow (Russia), 18-24 September 1995

The ***main objective*** of the workshop is to strengthen discussion on the problems and management of soil conservation in Europe.

The ***main topics*** of the workshop are:

(a) Causes of soil erosion in different countries.

(b) Prediction of soil degradation and conservation planning.

(c) Organisation of soil conservation in European and other countries.

Host institute: Faculty of Soil Science, Moscow State University.

Venue of the workshop: Holiday Hotel "Kultyshevo", Moscow region
(40 km to the west of Moscow, 30 km from the airport Sheremetyevo).

Main Programme

September 18 (Monday)	Arrival and registration of participants. ESSC Executive Committee meeting.
September 19 (Tuesday)	Opening ceremony and paper session.
September 20 (Wednesday)	Paper session.
September 21 (Thursday)	Bus trip to Dmitrov (60 km from Moscow): Erosion and degradation affected soils.
September 22 (Friday)	Bus trip to Puschiono (120 km from Moscow): Visit at the Institute of Soil Science and Photosythesis. Field excursion: ancient and modern gully erosion. Visit to biosphere reserve.
September 23 (Saturday)	Paper session. Closing ceremony.
September 24 (Sunday)	Departure of Participants.

Evening programme

September 18 (Monday)	Visit to the Moscow State Circus perfomance.
September 19 (Tuesday)	Visit to the Bolshoy Theatre perfomance.
September 20 (Wednesday)	Visit to the Moscow Kremlin and the Diamond Fund.
September 21 (Thursday)	Visit to the TretiakovPictureGallery and symphony concert.
September 23 (Saturday)	Views of Moscow - bus excursion. Banquet.

Language of the workshop - English. The Abstracts volume will be avalable for Participants during Registration. Full text of paper presentations after revision will be published in the Russian magazine *POCHVOVEDENIJE* (Soil Science).

EUROPEAN SOCIETY OF SOIL CONSERVATION

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Expected *costs of the workshop*: Regestration fees:

- for ESSC members and accompanying persons .... 130 US $
- for non-members .... 180 US $
- for students .... 90 US $

This includes: services of the workshop secretariat, workshop facilities, book of abstracts, coffee breaks.

Accomodation: Single and double rooms with individual toilet facilities and bathrooms: 25-30 US $ per day. Telephones for making and receiving calls are available. Medical services are available. Breakfast, lunch and dinner in the hotel: 20 - 30 US $ per day.

Banquet: on September, 23 (Saturday) in the hotel: 15 US $

Bus services: Mean European prices for public transport, depending on number of participants. All participants will be picked up at the airport and delivered directly to the hotel. Return to the airport is also guaranteed.

Action required: Please complete and return the attached form by ***31 December, 1994*** if you wish to recieve further information.

Organizing committee:

Chairman:	Prof. M.S. Kuznetsov.
Sekretary:	Dr. W.M. Goncharov.
Treasure:	Prof. Dr. G.P. Glazunov
Scientific programme organizers:	Prof. I.I. Sudnitzin; Prof. E.V. Shein.
Scientific bus trips organizers:	Prof. A.I. Pozdnjakov; Dr. V.V. Demidov.

✂ ....

EUROPEAN SOCIETY OF SOIL CONSERVATION

Academy of Natural Sciences of Russian Federation

Soil Science Society of Russia, Moscow State University

Workshop on

PROBLEMS AND MANAGEMENT OF SOIL CONSERVATION IN EUROPE.

Moscow (Russia), 18-24 September 1995

Prof./Dr./Mr./Mrs.: .... ESSC member ❑

Address: .... Non member ❑

.... Student ❑

....

❑ I wish to attend the workshop.

❑ I wish to attend the workshop and to present a paper

Title of the paper: ....

....

Date: .... Signature: ....

To: Prof. M.S. Kuznetsov; 119899 Moscow, Russia; Moscow State University, Fac. of Soil Science; Tel.: (095) 939-59-29, Fax: (095) 939-09-89

NOTICE RECEIVED

Award to Young Scientists: The "Jan de Ploey Prize"

In March 1993 the Jan de Ploey Prize was established to further research in the field of process geomorphology.

The prize is awarded every two years to a young scientist (under the age of 35 years) who has made a significant contribution to research in the field of geomorphological processes. In 1993 an international Jury awarded the Jan de Ploey Prize for the first time at the General Assembly of the International Association of Geomorphologists in Hamiltion, Canada. In May 1995 this Prize will be awarded for the second time at the International IGU-GERTEC Conference on Geomorphic Response of Mediterranean and Arid areas to Climate Change, Israel.

The recipient will be expected to deliver a memorial lecture at the Laboratory for Experimental Geomorphology, Leuven, Belgium. The prize will pay the expenses of the visit to Leuven and the residual sum may be used to support attendance at an appropriate international conference.

Nominations should consist of a brief statement and any supporting materials (C.V., list of publications), including at least a copy of one critical published paper.

Please send your nomination before January 1, 1995 to

The Jan de Ploey Prize Selection Committee
Laboratory for Experimental Geomorphology
Catholic University of Leuven
Redingenstraat 16 bis
B-3000 Leuven, Belgium.

PUBLICATIONS

New publication about soil erosion:

SOIL EROSION AS A CONSEQUENCE OF FOREST FIRES

M. Sala & J.L. Rubio Eds. Geoforma Ediciones. Logroño (SPAIN). 1994. 275 pp.

One important phenomenon that is increasing now in the evolution of the Mediterranean ecosystem is forest fires. As natural phenomenon they have occurred centuries and their effects have been restored by Nature. The fires produced by natural causes shows adequate periods of resilience that allow the recuperation of the environment. Nevertheless, in the last decades human action has become the primordial cause of their occurrence, multiplying their number and, in a very important way, their frequency. As a result of these changes, the resilience period has been reduced impeding the regeneration of the vegetation and leaving unprotected extensive areas to the erosive agents.

Given the serious problems that this phenomenon causes, such as soil degradation and loss of natural resources, the European Society of Soil Conservation (ESSC) organized in September 1991 an International Conference about the topic of soil erosion as a gathering of the forest fires. This conference took place in Barcelona and Valencia, congregating important experts in this field. The problem was studied from different perspectives, such as:

Changes in soil properties
Erosion
Effects on infiltration
Runoff yield
Soil degradation
Interaction between vegetation and erosion

The importance of the problem and the interest in it, has given rise to this publication. In it, have been selected the most relevant contributions on the different topics, including in a final chapter, the summary of the General Discussion and the conclusions of the Conference.

Orders to:

Geoforma Ediciones, Apdo. 1293, Logroño (SPAIN)

Dr. V. Andreu
Department of Desertification
IATA-CSIC (Spain)

Summary of the handbook on soil conservation in Europe, shortly to be edited by the Council of Europe.

In this report the current situation in Europe with regard to human-induced soil degradation and soil protection is examined. The Global Assessment of the Current Status of human-induced Soil Degradation (GLASOD), prepared by ISRIC in cooperation with UNEP in 1990, is taken as a basis for this review.

The **Introduction** is a review of past and present trends and developments in soil conservation and soil protection, as well as a brief explanation of the methodology and sources used as given.

In **Chapter I** the most frequently used terms and some important principles are explained. Then the current situation with regard to soil degradation in Europe is assessed, using thematic maps derived from the GLASOD map. The processes, causes and effects of the various degradation types are examined. Subsequently, a summary is presented of existing databases and monitoring systems related to soil problems in Europe. Finally a range of measures taken (or to be taken) to prevent or repair damage from human-induced soil degradation are presented. This involves both technical, legal and "economic" measures.

Chapter II evaluates the existing criteria and threshold values used in European soil protection policies. The complexity of fixing values is addressed with specific reference to three types of soil degradation, namely pollution, erosion and salinization/sodification. A brief overview per country is given.

Chapter III and IV evaluate and correlate the information presented in the preceding chapters.

The major **conclusions** are summarized herewith :

a) Soil degradation is a serious problem in Europe, in particular erosion by water and (to a lesser extent) by wind, pollution, compaction and perhaps urbanisation, both in terms of their severity and (ir)reversibility.
b) Research is most of all focused at soil erosion and soil pollution. Monitoring programmes also exist either as part of an overall environmental programme or as a single theme. There appears to be no integrated research or monitoring programme into soil degradation at a European level.
c) Technical measures are mostly being taken on a short term basis and are aimed at repairing damage rather than at prevention. Also, a sectorial rather than an integrated approach prevails.
d) Legislation on soil protection and economic measures are common, but in many different forms. Some laws are preventive, others rehabilitative. Some countries put more emphasis on law enforcement and taxes, others on codes of practice and incentive measures, but combinations of both are quite common.
e) Criteria and standard values are relatively common with respect to soil pollution, but less so or even non-existent for other types of soil degradation. Both values and terminology are far from standardized between countries.

In the second part of Chapter III some recommendations for a pan-European approach to the problem of soil degradation and soil protection are given. These can be summarized as follows :

a) A detailed assessment of all aspects of current soil degradation in Europe should be made, including trends shown by recent past rates. Objective values should be obtained as to how critical the situation is, since its perception may vary from country to country.
b) A detailed assessment should be made of soil vulnerability to all aspects of soil degradation in Europe, and the most sensitive areas to soil degradation should be identified.
c) An extensive review of existing measures, techniques, legislation and economic measures to counter soil degradation should take place.

These three projects should be carried out more or less simultaneously and in relation to each other. The fulfilment of three objectives involves an immense task, but some initiatives that partly cover one or more of the three modules have already been proposed or are now in state of development. A project proposal for a European GLASOD, with particular emphasis on soil pollution (EUSOPOL) has recently been submitted by ISRIC to potential donors. At an international workshop in Wageningen in November 1991 procedures and methodology were outlined for a project to assess and map the vulnerability of soils to specified chemical compounds in Europe at a scale of 1:5 million and based on computerized soil and terrain data (SOVEUR). Finally, the World Association of Soil and Water Conservation has recently made a start with the development of a World Overview of (soil) Conservation Activities and Techniques (WOCAT) in the form of a GIS/database and accompanying map, a compendium and an expert system. However, more funds are required for a full-scale development of WOCAT.

These effort could be combined and coordinated with other similar projects to achieve the aforementioned goals.

A Soil Protection Database would provide essential elements for the formulation of appropriate national soils policies on the basis of sound scientific information. For several countries assessments have been made at a national scale. If the information were gathered in an agreed form and combined into an European database, more detailed and more quantitative information on human-induced soil degradation on a pan-European basis would become available. This would allow the development of international policies to combat the problems.

In general other measures that can be taken at a European level will concern matters like coordination of monitoring and research and to some extent of legislation and economic measures.

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