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MEETING REPORTS

WORKSHOP ON SOIL EROSION IN SEMI-ARID MEDITERRANEAN AREAS

28-30 October 1993, Taormina, Italy

The aim of the workshop was to examine the past and present state of soil erosion in semi-arid and mediterranean areas and to focus on measures for soil erosion control. The workshop was organized by the ESSC and by CSEI Catania (Centro Studie die Economia applicata all'Ingegneria). About 80 delegates attended from Italy, UK, France, Spain, Germany, Austria, Poland, Czech Republic and The Netherlands. The first two days were dedicated to presentations, subdivided into two sesseions. On the third day there waas an excursion to mount Etna, the highest active volcano in Europe.

The first session (Chairman A. Giordano) was devoted to the assessment of soil degradation and was introduced by R.P.C. Morgan. He showed that the methods used to survey the present extent of erosion range from assessment based on opinion surveys to mapping of erosion features using aerial photographiy and ground surveys with output such as special pupose geomorphological maps. The pointed out that surveys carried out by different researchers for the same area can lead to very different results. He concluded that future work needs to concentrate on developing a satisfactory procedure to validate risk assessment and investigate why different methods yield different results for the same area.

During the first session, 14 presentations were made. The topics covered included the evaluation of topographic, climatic and pedological characteristics, some aspects of the use of imaging spectrometers or DEM, soil degradation, surface runoff, gully processes and wind erosion. The broad spectrum of topics encouraged detailed questions rather than a general discussion of methods and criteria for soil erosion assessment.

The second session (Chairman J. Rubio) was devoted to "Perspectives on measures for soil erosion control" and was introduced by G. Chisci. After discussing the main causes of actual accelerated soil degradation he reviewed the traditional and the innovative technologies that today are available for better soil conservation on agricultural, pastoral and forest land. Morover, he underlined how soil conservation programmes on a watershed basis seem to be an adequate strategy by adopting case by case appropriate combinations of up-to-date erosion control measures.

During the second session there were 12 presentations. A few of them concerned with the political and agronomical methodologies for soil conservation. Many others took into account laboratory or field trials with or without rain simulators.

In the formulation of the main conclusions of the workshop (made by R.P.C. Morgan and G. Chisci) it was stressed that the next efforts in the assessment of soil erosion must consider the following points:

- the problems arising concerning the frequent discrepancy between measured and estimated soil erosion;
- models for soil erosion appraisal used in the same area can give very different results;
- the necessity to understand why fields in the same condition show different behaviour in respect of erosion.

Regarding the perspectives on soil protection measures it was confirmed that soil conservation programmes in a watershed are the basis for a successful strategy if the appropiate combinations of soil erosion control measures are adopted.

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SOIL EROSION AND MANAGEMENT OF AREAS WITH DIVERSIFIED RELIEF

Cracow and Trezmesnia (Poland), 25-27 November 1992

The opening ceremony took place at the Agriculture Academy in Cracow and was attended by Rector, Porf. Dr. (Habil.) B. Skucinska; Academic Vice-Rector Prof. Dr. (Habil.) K. Kosiniak; Dean of the Faculty of Environmental Engineering and Geodesy, Porf. Dr. (Habil.) N. Nowakowsko; and invited guests - professionals from the Bureau of Hydro-Engineering Design and Land Reclamtion, the Provincial Board of Land Reclamation and Water Installation Equipment, and the Cracow Water Mangagement Board. The working phase consisted of lecture sessions with 13 lectures, a poster session during which 16 studies were presented, a meeting of three study commissions (Research, Implementation of Study Results, and Dedactics), and also plenary discussions. All these took place at the training centre in Trzemsnia near Myslenice, Cracow Province. The working sessions took place in the rooms of the Czorsztyn-Niedzica and Sromowce Wyzune complex of water reservoirs in Niedzica, Nowy Sacz Province which are now being built. This phase included also a tour of dam and reservoir construction sites.

The working phase was attended by 59 participants representing the Central School of Rural Management in Warsaw; the Agricultural Academies of Lublin, Poznan, Wroclaw, Szczecin and Cracow; the Agricultural and Technical Academy in Olsztyn; Maria Sklodowska Curie Unviersity in Lublin, the Crop, Fertilizer and Soil Institute in Pulawy; the Institute of Pasture Reclamation (Wroclaw branch); the Teachers' college in Keilce and the Institute of Meteorology and Water Management in Warsaw. The conference was also attended by two representatives of Ceske Vysoke Uceni Technice in Prague (Czechoslovakia).

Forty one of the 54 papers sent to the Organizing Committee were accepted for publication. Thes papers, after approval by two reviewers, were published in the two-volume Zeszyt Naukowy of the Agricultural Academy in Cracow, Nos 271 and 273 of Sesja naukowa Series No 35. The conference Guide, with the names of the members of the Organizing and Scientific Committees, the Conference programme and other materials were published separately.

Intitial conclusions based on the discussions and the lectures delivered, prepared by the three study committees, were approved by the participants. The conclusions, after final editing for publication, are being sent to all participants in the working and general sessions of the conference and to scientific insititutes and administrative bodies involved in these problems.

CONCLUSIONS OF THE SYMPOSIUM
SOIL EROSION AND MANAGEMENT OF AREAS WITH DIVERSIFIED RELIEF

Agricultural Academy in Cracow, November 25-27, 1992

On the basis of lecures, plenary and problem team discussions the Scientific and Organizing Comittees presented the following conclusions:

I. On directions of soil erosion research

1. The evident progressive soil degradation in recent years caused by various new factors demands that eroison studies be more extensive and cover all adverse factors that cause degradation. Studies should also focus more on the destructive influence of areal pollution (i.e. acid rain, use of fertilizers and corp protection chemicals and on soil and water ecosystems). Simulation and projection studies on erosion due to changing climate and human impacts on the natural environment should also be carried out.
2. In the research programme on the efficiency of soil conservation methods, the significance of agricultural and land reclamation should be stressed, including soil cultivation technology on soils in eroded areas, anti-erosion crop rotation, plant ferilization and its effect on areas with different kinds of relief, irrigation of plants cultivated on slopes, and also land-use plannung of grasslands, parcels, fields and roads in agricultural areas, implemented in terms of comprehensive reclamation of particular units (villages) or whole basins.
3. There is urgent need to control the extent of water erosion through local and regional monitoring using standard measurement methods. Also the frequency of measuring water turbulence and suspended sediment should be increased. Studies of transport of suspended and dissolved materials should especially include small basins, where erosion precesses has not been explored.
4. The conference participants express their opinion that the best way to reduce the adverse effects of natural and anthorpogenic factors in soil erosion and in chemical degradation of the soil, so far not applied in Poland, is so-called comprehensive environmental reclamation. This means incorporating it in one of the agricultural environment (soil, water, agricultural land, air) in terms of their rational use and conservation, and also improving living and working conditions in rural areas.
5. The conference participants express their opinion that due to the great diversity of the natural environment in agricultural areas and the associated variety of erosion issues, a state cordinator to monitor studies in respect to their subjects, scope and financing should be appointed. In the present system of research, due to the lack of coordination and insufficient exchange of information on studies in progress, the subjects are extremely varied. If a given form of coordination were restored, study projects could be appraised by reviewers before their approval for implementation, as in a Scientific Research Committee.

II. Concerning promulgation and implementation of anti-erosion reclamation

1. As the optimal solution economically, developing and implementing comprehensive management of selected experimental areas threatened with erosion is suggested. The main Polish macro-regions threatened with erosion, such as mountains (the village of Trybsz and the Wierchomla Wielka basin), uplands (Walwonica, Zarzeka) and lakeland (DluskoPodlipce) should be included.

2. The environmental disaster in the Izerhskie Mountains, where forest dieback is occurring, requires immedate implementation of suitable anti-erosion measures, especially in terms of appropriate siting of protective areas (forests and permanent grazings).

3. To improve all field implementation work, suitable guidelines and norms should be worked out, which then will become mandatory. The results of studies conducted thus far will allow implementation standards to be developed concerning:
   - survey rules for:
     a) areas theatened with possible or actual water erosion;
     b) gully erosion;
     c) areas threatened with wind erosion;
   - rules for introductory studies for development of loess ravines;
   - guidelines for reclamation and management of loess ravines, including water-bearing areas;
   - guidelines for landscaping areas with erosion; landforms and rehabilitation of soil of loess origin in highlands;
   - guidelines for designing and engineering farm roads in highlands;
   - guidelines for anti-erosion engineering of mountain streams;
   - guidelines for comprehensive protection of areas threatened with erosion in uplands, foothills and mountains.

4. There is a need for new ways and means of integrating anti-erosion land reclamation with other economic activities in agriculture, e.g. during the current restructuring of state farms and the organization of family farm holdings, and work connected with land use and parcel regrouping.

5. One of the significant tasks is to find the proper place for erosion prevention in the land use planning for regions, *gminas* [local administrative units] and villages threatened with erosion. One cannot agree with the view that work on preventing erosion is only an adjunct to land use planning, as it should be an integral part.

6. It is necessary to develop a method for cost-benefit analysis of erosion prevention measures, incorporating evaluation (appraisal) of benefits which are difficult to calculate.

7. The pariticipation of scientists in evaluating and monitoring anti-erosion measures at all stages - planning, design and implementation - should be ensured by regulations. Also, the flow of information from reasearch to practice should be improved. In our opinion, one of the means to disseminate information on a reciprocal basis is to hold special training courses and meetings with farmers.

8. It is considered appropriate to appoint a state coordinator and regional coordinators for Polish erosion macro-regions (mountains, foothills, highlands and lakelands), responsible for implementation of land reclamation against erosion.

III. Conclusions concerning education about erosion in agricultural colleges

1. A unit covering soil erosion and soil conservation should be included in the minimum curricula for faculties such as environmental engineering and environmental protection, geodesy, agriculture, horticulture and forestry; it could be called e.g. anti-erosion land improvement.

2. New editions of college handbooks on soil erosion should incorporate the results of the latest erosion studies and implementation work.

3. The Ministry of National Education should be obliged to finance, within the framework of general technical activities, preparation of a set of audiovisual aids (slides, video films) on soil erosion and on the means to control it, by a team of researchers from Agricultural Academies in Cracow, Lublin and the Crop, Fertilizer and Soil Institute in Pulawy.

IV General Conclusions

The next meeting on erosion in 1994, should be held by Adam Mickiewicz Institute of Quaternary Studies and the Department of Land and Forest Reclamation in Poznan.

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10ÈME ANNIVERSAIRE DU RÉSEAU EROSION

4 jours de débat sur le thème: „Contribution de l'elevage et de l'agroforesterie a la lutte antiérosive au niveau du terroir villageois et à la restauration de la fertilité des sols"

Les 10èmes journées du Réseau Erosion (Responsables: G. De Noni, E. Roose, Dépt MAA et J.F. Nouvelot, Dépt DEC de l'ORSTOM) se sont déroulées du 15 au 18 septembre 1993 dans la salle de conférence du CNEARC à Montpellier, sous les auspices d'Agropolis. Elle ont réuni 91 participants provenant de 21 pays: 11 pays d'Afrique, 6 d'Europe et 4 d'Amérique latine, parmi ceux-ci 5 pays font partie du bassin méditerranéen. Elles se sont singularisées par le caractère interdisciplinaire des débats où se sont rencontrés hydrologues, pédologues, géographes, agronomes, forestiers, zootechniciens, agro-économistes. La préoccupation majeure des participants a été de souligner l'accélération des phénomènes de dégradation des sols et la nécessité de développer des stratégies visant à une gestion durable des terroirs et à la restauration de la fertilité des sols. 37 communications ont été présentées sur les thèmes suivants:

- 14 exposés sur l'érosion, la dégradation et la restauration des sols,
- 15 exposés sur l'agroforesterie et la restauration des sols,
- 8 exposés sur l'élevage et la restauration des sols.

Il ressort des différentes interventions que l'agroforesterie est compatible avec l'élevage et que ces deux systèmes associés peuvent favoriser la conservation des sols. Cependant, il est nécessaire de prévoir un apport minéral complémentaire pour garantir une restauration effective de la fertilité des sols et une productivité suffisante pour faire face à la pression démographique.

Durant ces mêmes journées, les participants ont bénéficié d'une exposition de livres et de posters, d'une démonstration de simulation de pluies dans les serres du Centre ORSTOM de Montpellier et d'une excursion sur un site d'expérimentation agroforestière de l'INRA (bassin de St Martin de Londres) et en forêt domaniale de l'Aigoual. Au cours de la visite de ce massif, il a été possible de constater l'évolution récente des rapports entre forestiers, éleveurs et agriculteurs décidés à s'entraider dans le cadre de la mise en valeur des forêts méditerranéennes et des terres de déprise agricole (PAC).

Le compte-rendu de ce 10ème anniversaire sera inséré dans le prochain bulletin (n° 14) du Réseau Erosion, à paraître au cours du premier semestre 94.

La prochaine réunion du Réseau sera consacrée à „l'environnement humain de l'érosion et de la lutte antiérosive" et abordera les aspects tant démographiques que socio-économiques et hydrauliques du problème de l'intensification de la production rurale. Elle aura lieu à Paris, en septembre ou octobre 94, en collaboration avec l'Ecole Normale Supérieure de St Cloud.

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SOIL EROSION PROBLEMS IN SERBIA

I. Introduction

An area of 76,354 km², namely 86% of Serbia, is endangered by damaging processes of water erosion.

Approximately 9 million m³ of soil is removed each year a lot of it ending in rivers and reservoirs. Erosion of arable land is not the only consequence of this water activity. Floods, damage and interrupted communication lines, depositing of sediment on agricultural land, river bed filling etc, are a few results of the same phemomenon- water erosion.

As a consequence of erosion in mountain regions, drastic changes occur in the waterways. Therefore water economy and energy are connected with the erosion problem. Removal of soil and other material into the waterways increases with the rate of erosion in the watersheds.

Sedimentation in the river basins, completely changes the regime of runoff and therefore the nature of waterways. Floods created by filling up river basins, are observed more frequently.

II. Basic characteristics of the studied areas

The characteristics of geology, climate, relief and vegetation cover, are given in tables 1, 2, 3, 4, 5. These erosion factors in combination with anthropogenic factors such as deforestation and land use, are the main cause of serious erosion which can be seen in all studied areas.

Region	Total area [km²]	Slope < 5%	Slope > 5%
Serbia	88,361	29.39	70.61
Vojvodina	21,506	79.90	20.10
Kosovo	10,887	14.73	85.27

Table 1: Relief categories in %

Region	Area [km²]	Non-resistant rocks [%]	Resistant-rocks [%]
Serbia	88,361	82.8	17.2
Vojvodina	21,506	99.9	0.1
Kosovo	10,887	82.5	17.5

Table 2: Distribution of water erosion resistant and non-resistant rocks

Region	Mean air temerature per year [°C]	rainfall per year [mm]		
		mean	max.	min.
Serbia	10.1	670	1,998	326
Vojvodina	11.3	625	1,080	356
Kosovo	9.2	785	1,998	401

Table 3: Climatic characteristics

Region	Plough lands & vinyards		Meadows, pastures & orchards		Forests		Other	
	[km²]	[%]	[km²]	[%]	[km²]	[%]	[km²]	[%]
Serbia	39,790	45.0	18,560	21.0	22,697	25.7	7,314	8.3
Vojvodina	16,050	74.6	2,010	9.3	1,173	5.4	2,273	7.8
Kosovo	3,100	28.5	2,630	24.1	4,463	42.0	694	6.4

Table 4: Land use

Region	Good forests	Degraded forests	Maquis	Coppice
Serbia	61.7	26.4	-	11.9

Table 5: Structure of forests in %

III. Extent and type of water erosion

Water erosion extent is shown in table 6. It includes all types and rates of water erosion from weak to extreme. Erosion categories in relation to the quantitiy of soil lost are given in table 7.

Region	Total area [km²]	Water erosion [km²]	Water erosion [%]
Serbia	88,361	76,354.43	86.39
Vojvodina	21,506	15,553.40	72.29
Kosovo	10,887	10,323.12	94.82

Table 6: Extent of water erosion

Erosion category	Description of erosion	Soil loss [$m^3\ km^{-2}\ year^{-1}$]	[km^2]	Serbia [%]
I	extreme	> 3,000	1,027.00	1.16
II	strong	3,000-1,200	11,675.83	13.21
III	moderate	1,200-800	11,198.38	12.67
IV	low	800-400	16,045.87	18.16
V	very low	400-100	36,407.35	41.19

Table 7: Erosion categories and distribution

Soil loss which refers to the actual on-site soil erosion (gross erosion) is given table 8. Sediment yield represents the quantity which definitively leaves the watershed and goes into the rivers and into the Black Sea or into the Mediterranean, as given in table 9. This off-site quantity is always smaller than soil loss on-site because of the sediment transportation losses known as deposition.

Region	Soil loss	
	[$m^3\ year^{-1}$]	[$m^3\ km^{-2}\ year^{-1}$]
Serbia	37,249,974.71	487.86
Vojvodina	1,266,499.03	81.43
Kosovo	2,570,248.12	248.98

Table 8: Soil losses

Region	Sediment yields	
	[$m^3\ year^{-1}$]	[$m^3\ km^{-2}\ year^{-1}$]
Serbia	9,350,764.78	122.46
Vojvodina	97,247.95	6.25
Kosovo	964,998.90	93.48

Table 9: Sediment yields

The most usual water erosion forms in the studied areas are:

a) Sheet erosion and rill and gully erosion with a great number of torrents. The result is a soil loss which leads to off-site effects such as reservoir and lake sedimentation, flooding, excessive siltation of agricultural land, etc.

b) Wind erosion is very significant in Vojvodina. There are real sand areas as the Subotica-Horgos Sands (25,000 ha) and the Deliblato Sands (40,000 ha). The off-site effects are in the form of dunes, sand sheets, sand blasting of vegetative cover, encroachment on roads, buildings and arable land.

IV. Research results

The intensity of water erosion was studied during the period of 1966-1973 in the Republic of Serbia under the project FG-YU-140: "Study of intensity of water erosion", financed by the Ministry of Agriculture of USA, PL-480.

The research was performed by the use of about 200 USLE plots under four cover conditions: corn, vineyards, wheat, grass and forest, and at different slopes such as: 6,12 and 20 degrees. The plots were set up under different natural conditions (four types of soil and three types of climate) representing the studied area of the Republic of Serbia.

On the basis of about 1100 experimental plot-years the results contributed to the better understanding of the phenomenon of soil erosion and also helped to derive mathematical formulas to be used for runoff and soil loss calculation purposes for agriculture and forest lands.

Maximum soil losses were between 70 and 110 t ha^{-1} annually , on slopes of 20 degrees under corn and vineyards.

Areas under good forest and grass cover were usually sufficiently well protected from harmful runoff and erosion losses which were within the erosion tolerance of 2.0 t ha^{-1} $year^{-1}$. The use of arable land was limited in the following way: slopes above 4 degrees for corn and 7 degrees for wheat were not suitable since erosion losses were above the limit of erosion tolerance. However, exclusion of these areas from farming production, for now, cannot be accepted. Therfore, slopes up to 10 degrees can be used, but with application of all protective measures such as, contour strips, strip cropping, terracing, modern agrotechniques and others. Slopes of 10-20 degrees can be used for fruit plantation usually on terraces, but all slopes above 20 degrees should be used for grass and forest cover.

V. Erosion control measures

All erosion control measures could be divided into two groups: the works within the watershed and the works in steep sided gullies.

In the watershed, on sloping land, measures are applied to reduce runoff, to reduce its velocity and to prevent a dangerous concentration of water. The following measures are the most often applied: contour furrows, contour ditches, small walls, terraces, gradones etc. followed by afforestation. On flysch terrains, on gentle slopes, agrotechnical measures such as

contour ploughing, rotation of crops and changing the vegetation cover to grass of forest cover is sometimes practiced.

In the bed of torrents and ravines the following works are common: longitudinal and transverse constructions, dams, stone walls, gabions etc.

In tables 10 and 11 are presented the erosion control works carried out in the period 1954-1968.

Region	River bed works [m³ stone and concrete]	Biological works [ha]
Serbia	622,900	41,327.40
Vojvodina	-	-
Kosovo	41,300	652.60

Table 10: A review of erosion control measures for the period 1954-1968

Comparing the investment in river bed works and in biological works, the ratio is 74.1% vs. 25.9% in favour of the river bed works.

Region	Afforestation [ha]	Grassing [ha]	Terracing [ha]
Serbia	12,018	6,498.4	8,803.8
Vojvodina	-	-	-
Kosovo	411.0	5.0	818,000.0

Table 11: Distribution and type of biological works introduced during the period 1954-1968

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ON THE SYSTEM OF NATIONAL ACCOUNTS

Recently the problem of inclusion of natural resource comsumption in the method of the total national product determination is raised more and more persistently. The system of National Accounts, which has been developed 50 years ago and accepted as a standard, absolutely ignores changes in the environment now in progress. These changes could affect the further development of the world economy (Robert Repetto, 1992).

The foregoing is in complete accordance with the Declaration which has been accepted at the UNO Conference on Environment and Development (Rio de Janeiro, June 1992). In particular, Principle 4 of the Declaration runs, that for the attaining of sustainable development, environmental conservation should be an integral part of a development process and cannot be considered in isolation form it. Further, Principle 8 states, that for attaining of more stable development and higher living quality for all people, states must limit production (Declaration, 1993).

Let us try to develop this thesis for the Ukraine, more precisely for its main natural resource - the soil cover. It is known that in the former USSR the Ukraine had the highest level of agricultural production. About 1 t of grain, 100 kg of sugar, 19 kg of vegetable oil, 79 kg of meat, 437 kg of milk, etc. was produced per capita annually (Sozinov, 1993).

Obviously the young independent state of the Ukraine will continue to develop distinct plans for restoration and consolidation of the agrarian-industrial complex. Its production of goods occupies and will occupy a prominent place in the domestic gross output of the Republic. Estimation of the efficiency of agricultural production which is based on the old model of national accounts permits us to develop an optimistic prognosis. Moreover, the analysis of shortcomings in its functioning, aims at the more intensive use of natural resources and of the soil cover first of all. Their value is not taken into consideration at all but is asumed as something valueless.

In reality there are indications that ecological catastrophe has started on most Ukrainian territory. About 500 mln t of soil is washed from arable land yearly; 24 mln t of humus, 964 thou t of nitrogen, 676 thou t of phosphorus, 9.7 mln t of potassium is lost from the soil. Average annual soil lost in the Republic accounts for 15 t/ha, from 7.7 to 27 t/ha in various regions. Catastrophic erosion when during one rainstorm 200 t /ha of soil and more is lost is not infrequent. The level of organic and inorganic fertilizer application which has been

achieved in the Republic replaces only 60-80% humus loss caused by erosion, and 40-50% of nutrients. In 1985 30.7% of agricultural land was erodible for including 29.2% arable land.

Erodible land increases each year by more than by 80 thou ha, which is 0.25% of the total sowing area. Disappearance of small rivers could be noted as a direct consequence of intensive erosion processes. Big rivers and reservoirs are already in a terrible condition and it must be kept in mind that more than ten very dangerous processes besides erosional degradation of the soil cover have been revealed in the Republic. Therefore, only a fragment of the whole condition of Ukrainian soils is outlined here.

How will the above mentioned picture of erosion processes look and economic cost indices be used for its construction? According to some estimates a ton of humus costs 150-200 dollars (Bulygin, 1987, 1991). It comes out that about 5 mlrd dollars must be spent for compensation of humus loss from erosion of arable land in the Ukraine. This is the so-called direct damage from erosion. The indirect damage, i.e. lowering of crop yields on eroded soil, has caused a drop in agricultural productivity by at least 15-20%, which in terms of money exceeds 1 mlrd dollars. Besides that, it is conventional to distinguish so-called "external" damage, i.e. damage that is done to land and water bodies outside the agricultural land, from where the chernozem is lost. According to many investigators this damage substantially exceeds the direct one. In particular, erosion scientists in the USA arrived at such a conclusion (Clark, 1985).

Thus, there are reasons for the presentation of an account of the loss of the soil cover due to erosion. Hence it follows, that one could speak of 10-15 mlrd dollars yearly, without any risk of overestimation. This figure is comparable with the cost of the Ukrainian total yearly agriculture production. This is the sum we borrow from nature yearly. And is it to be paid, if not by the contemporary generation, but by its descendants!

A purely practical aspect of the activity of the state in the conservation of nature is followed by such a formulation of the problem. Until the System of National Accounts is changed, effective ecological policies of the state and ecologically "clean" technologies will remain good wishes, moreover there are no precedents for this problem in the world. An almost identical situation is observed in the most developed countries including USA and West European countries. The intensification of agricultural production only conceales the consequences of destruction of natural resources.

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MAXIMUM ALLOWABLE EROSION RATE

Science and engineering developments allow soil to be protected from any kind of erosional processes including catastrophic ones but the cost of such protection is still very high (Mirtskhoulava 1970, 1978, 1989). Therefore, at present we reconcile ourselves to soil erosion observation until eroison becomes critical in spite of well-known fundamental investigations given for example in Kirkby and Morgan (1984).

In our opinion there is a need for quanatitative limits of permissible erosion using such indices as service life and effective thickness of soil cover i.e. the difference beween full initial thickness of soil cover and maximum permissible one $\left(H - H_{per}\right)$ here what is meant by maximum permissible thickness is enough soil to create the conditions for both plant growth and work of agricultural machines and mechanisms. In this case the decrease (due to erosion) of soil thickness below permissible level leads to economic consequences.

$H_o - H_{per}$, taking into account permissible erosion rate J_{per} [mm/year] can be expressed by the following relation

$$J_{per} = \frac{H_o - H_{per}}{C_c} = \frac{H_{oe}}{C_c} \tag{1}$$

where H_{oe} is effective thickness of soil cover [mm], C_c is service life of soil cover, per year.

When erosion reduces on soil cover during a period of time the failure (Mirtskhoulava, 1987) will take place at thickness of soil cover *H(t)* decreasing gradually during time *(t)* being equal or less than permissible H_{per}.

The normal law of distribution can be used for the description (Mirtskhoulava, 1987)

$$P = \int_0^{\infty} \frac{1}{\sigma_H \sqrt{2\pi}} \exp\left[-\frac{1}{2}\left(\frac{H(t) - H_{per}}{\sigma_H}\right)\right] dH \tag{2}$$

Equation (2) can be written as equation of bond (nonexceedance equation) when using the table of normal distribution function:

$$Z = \frac{H(t) - H_{per}}{\sqrt{\sigma_H^2 - \sigma_{H_{per}}^2}} \tag{3}$$

where *H(t)* initial thickness of soil cover, H_{per} is permissible maximum fixed level of soil cover thickness at which soil normally functions and below this value the normal conditions are disturbed (the failure begins).

Thickness of soil *H(t)* at a moment of *t*, as a result of erosion influence, can be considered as a random quantity the value of which is decreasing in time *t*. The thickness may be assumed to decrease according to the law

$$H(t) = H_o - Jt \tag{4}$$

where H_o is soil initial thickness; J is mean total annual intensity (rate) of erosion, the linear dimension of which is taken according to values H_o and H, i.e. if the thickness is in millimetres the demensionality J is taken in mm/year t is time in years.

Standard deviation σ_H and $\sigma_{H_{per}}$ is established by observation data on analogous areas or by the use of Taylor series expansion. When lacking the necessary data for aproximate and the calculations one may use the "three-sigma" rule (Mirtskhoulava, 1987).

We will illustrate the solution of the problem with a hypothetic numerical example.

The initial thickness of soil cover H_o = 95 cm and maximum allowable thickness H_{per} = 25.5 cm. It is required to establish maximum allowable annual erosion intensity at a given probability of failure-free operation P = 0.975 that corresponds to value Z = - 1.96. Time of soil functioning t = 600 years.

Using "three-sigma" rule and tolerances (for the simplification of designs) equal to 20% of a mean value of parameter, σ_H and σ_{per} are $\sigma_H = 0.2\,H_o/\sigma$; $\sigma_{H_{per}} = 0.2\,H_{per}/\sigma$.

These values are introduced into (3): $$Z^2 = \frac{H^2 - 2HH_{per} + H_{per}^2}{\sigma_H^2 + \sigma_{H_{per}}^2}.$$

After simpification we obtain quadratic equation $J_2 - 0.2317J + 0.0130 = 0$. $J_1 = 0.1365$ cm, $J_2 = 0.0953$cm respectively.

Thus, for soil the intial thickness of which H_o = 95 cm and maximum allowable one 25.5 cm at soil service life of 600 years it may be allowed $J_{per} = 1.365$ mm/years (minimum value from square root of the equation). At such erosion intensity the failure-free soil functioning of probability 0.975 (Z = 1.96 corresponds to P = 0975) will be provided for 600 years.

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A MODEL FOR PREDICTING EFFICIENCY OF SOIL AND WATER CONSERVATION PRACTICE

Introduction

All known methods of evalutating soil control measures have failed to take into account the stochastic nature of soil water erosion. This report describes a model for predicting soil and runoff control efficiency of agro-, hydrotechnical and forest reclamation measures. The model enables us:

- to define soil loss and runoff of various frequencies
- to calculate soil conservation efficiency
- to predict the conservation role of single and complex measures to prevent severe erosion.

Conception

An evaluation of soil conservation practice efficiency by the theory of probability is needed to increase the reliability of farming systems. It would take 11 or more years of field experiments to calculate the data and such a long period is hardly practicable. The most practical one is from 2 to 4 years but a rainfall or a drought may affect the results.

The proposed model uses short test periods of soil conservation procedure obtained at various sites of similar nature and agricultural conditions, yielding spatial and temporal data for controls and trials, each taken separately.

Information homogeneity is evaluated by the function

$$V(T_s T_k) = \frac{n_s + n_k - 1}{n_s n_k (n_s + n_k)} \sum_{1}^{m} \frac{\left(n_k \sum X_{ii} - n_s \sum X_{ii}\right)^2}{\sum X_{ii}^2 - \frac{1}{n_s + n_k}\left(\sum X_{ii}\right)^2} \qquad (1)$$

and by the comparison with the theoretic $\chi^2_{1-\alpha}(m)$-distribution, where $(T_s T_k)$ is a function on the plural T_{sk}, X_{ii} is equivalent to i of a t-test, n_{sk} is the number of experiment years $(n_{sk} \geq 2)$, m is a number of indices, α is a significane level.

If $(T_s T_k)$ is $\leq \chi^2_{1-\alpha}(m)$, all the united rows are homogeneous according to runoff or soil loss. Soil conservation procedure efficiency is evaluated by comparing absolute ordinates of theoretic frequency curves of runoff with that of soil loss from the test and control sites. If empirical data are approximated by a three-parameter gamma distribution, then an efficiency coefficient is calculated by the fourmula

$$K_p = \frac{X_o \lambda_{op}}{X_k \lambda_{kp}} \qquad (2)$$

In the case of a binomial distribution

$$K_p = \frac{X_o\left(C_{vo}\Phi_{op}+1\right)}{X_k\left(C_{vk}\Phi_{kp}+1\right)} \tag{3}$$

where X_o and X_k are homogeneous sites averaging of runoff or soil loss respectively, λ_{op} and λ_{kp} are ordinates of three-parameter gamma distribution curves determined by the frequency of $P\%$, coefficients of variation (C_v) and asymmetry, Φ_{op} and Φ_{op} are normalized deviations from the mean ordinate of the binomial curve depended on $P\%$ and asymmetry coefficient.

The integral efficiency coefficient of serveral soil conservation measure ΠK was computed by the equation

$$\prod_1^z K = K_{p1}K_{p2}\ldots K_{pz} \tag{4}$$

Soil and water conservation practice efficiency is predicted using the following relationship

$$Y = X_p \prod_1^z K \tag{5}$$

where $K_{p1}\ldots K_{pz}$ are coefficients of efficiency defined by the formulas (2) and (3), Y is runoff or soil loss with the $P\%$ frequency as a result of soil conservation measures, X_p is runoff or soil loss on the control plot, z is the number of treatments.

The model parameters

input data:

- runoff and soil loss on control and test plots for the experimenta period
- coefficients of variation and asymmetry of runoff and soil loss
- empirical and theoretic frequency of runoff and soil loss

output data

- homogeneity indices of control and treatments of runoff and soil loss
- soil conservation efficiency coefficients
- predicted indices of runoff and soil loss under conditions of combined soil conservation measures.

An example

The table shows the predicted soil and water conservation role of single and combined afforestation, agrotechnical and hydrotechnical measures at 10% frequency erosion in the Central Chernozemic Zone

N	Treatment	Coefficient of efficiency		Predicted	
		Runoff	Soil loss	Snowmelt [mm]	Soil loss [t/ha]
1.	Surface tillage before winter, wheat seeding + slitting	0.79	0.93	96.9	4.0
2.	1. + strip seeding	0.70	0.06	85.3	0.3
3.	Spring subsoil tillage + slitting	0.55	0.51	46.5	2.5
4.	3. + strip seeding	0.48	0.04	40.9	0.2
5.	Subsurface tillage before winter wheat seeding + slitting	0.77	0.79	95.2	3.1
6.	5. + strip seeding	0.68	0.06	83.8	0.2
7.	Moldboard tillage + slitting	0.81	0.89	68.4	4.4
8.	Moldboard tillage + 3 forst shelterbelts	0.93	0.85	55.0	3.1
9.	Terraces, spacing 43.2 m	0.24	0.01	19.8	0.1

Note: Soil tillage depth: surface 8 cm, non-moldboard, subsurface, moldboard 22 cm, slitting form 50 to 60 cm, strip width 54 m.

References

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ANNOUNCEMENTS

International Symposium and workshop on
DESERTIFICATION IN DEVELOPED COUNTRIES:
WHY CAN'T WE CONTROL IT?

Tucson (Arizona), 24-28 October 1994

Registration information. The symposium and workshop will be held October 25-28, 1994 at the Hotel Park Tucson and Conference Center, Tucson, Arizona. Registration information will be distributed by June 1, 1994.

Objective and scope. The symposium is to capture experience gained in the world's developed countries in dealing with the full range of desertification processes and to address mechanisms for managing degradation problems. Concentration will be on (1) social, economic, political and institutional factors that determined the success of interventions, (2) desertification assessment and systematic observations (monitoring), and (3) specific techniques that have been tried to halt or reverse various desertification processes.

The workshop will draw from the symposium input and attendees will have an opportunity to participate in small groups to discuss lessons learned and to help develop long-term strategies and programs.

Tours (optional) will provide opportunities to see first-hand several management efforts and research that are underway to improve degraded areas and combat desertification in the southwestern portion of the United States.

Papers presented at the symposium will be published as formal proceedings, an edited book by a respected press, or as a special issue of an appropriate journal.

This symposium and workshop is expected to be the first of two such events. The second is intended to focus on the experiences of developing countries. A time in 1997, the twentieth anniversary of the 1977 United Nations Conference on Desertification, is currently being considered for the second symposium and workshop.

An opportunity is being provided on October 24, 1994, immediately before the symposium, for a formal meeting of the North Atlantic Treaty Organization Committee on Challenges to a Modern Society (NATO CCMS) and other organizations that may request it.

Poster. Poster presentations will be available for viewing during the entire session and will provide additional information to the participants. An evening poster session on October 26 will provide an opportunity for the presenter of the poster to answer questions and discuss the content of the poster with those interested.

Call for Papers and Posters. Individuals interested in presenting a paper or poster at the symposium are invited to submit the title, author(s), and a 250-300 word abstract in English of the proposed paper or poster. Abstracts must be received by December 15, 1993, to be considered for inclusion in the program. The program committee will screen the abstracts and inform you whether your proposed paper is accepted by February 1, 1994. Acceptance will be based on the quality and relevance to the conference objectives, with consideration being given to providing for geographic distribution. Papers and posters must relate to work done in a developed country. Draft papers must be received by May 1, 1994. These drafts will be reviewed by the Symposium Subcommittee for Papers and Posters and returned to the author for any needed revisions. Final manuscripts must be ready for publication and received by October 28, 1994. Manuscripts will be peer reviewed by January 15, 1995, and subsequently published.

All papers accepted will be printed in the proceedings. Depending on the number and subject matter of papers submitted, the program committee may ask authors to present their paper either orally or as poster paper at conference. Papers and presentations will be in English.

Abstracts should be submitted to: *Dr. Charles Hutchinson, Office of Arid Lands Studies, University of Arizona, 845 N. Park Avenue, Tucson, AZ 85719, T: (602)621-7896*

For any other information, please contact: *Beau McClure, United States Department of the Interior, Bureau of Land Management, Arizona State Office, P.O. Box 16563, Phoenix, Arizona 85011, T: (602) 650-0505*

Sponsored by: *Bureau of Land Management and Environmental Protection Agency*
in collaboration with: *U.S. Forest Service, Desert Research Institute, University of Arizona, The Nature Conservancy, Jornada Experimental Range, European Society for Soil Conservation*

BULGARIAN SOIL SOCIETY 7, Shosse Bankya, Sofia, Tel. 22 93 51, Bulgaria

Fifth National Conference of Soil Science
SCIENCE PROBLEMS AND STRATEGY FOR SUSTAINABLE AGRICULTURE
Sofia (Bulgaria), 10-13 May 1994

First Announcement

The conference is organized by the Bulgarian Soil Science Society, the N. Pushkarov Institute of Soil Science and Agroecology and the Agricultural Academy, in May, 1994. The programme of the conference includes plenary meetings with basic reports, and presentation of reports by the commissions. A 2-day scientific trip in the Sofia area is planned.

The Conference will take place in the N. Poushkarov Institute of Soil Science and Agroecology, Sofia. The participation fee is US $ 120. Applications must be sent to Dr. Raina Dilkova, Organizing Secretary of the Conference.

Additional information will be provided in a second announcement.

Application Form
for participation in the
5TH NATIONAL CONFERENCE OF SOIL SCIENCE, Sofia, 10-13 May 1994

First name, Patronymic, Surname: .....
Title: .....
Organization: .....
Address: .....

I wish to participate in the Conference with/without a report.
Title of the report: .....
.....
.....

I wish to participate in the scientific trip: .....yes/no.

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

EUROPEAN SOCIETY OF SOIL CONSERVATION
2nd International ESSC Conference:
DEVELOPMENT AND IMPLEMENTATION OF SOIL CONSERVATION STRATEGIES FOR SUSTAINABLE SOIL USE

First Announcement

In spite of a strong public awareness of environmental problems, soil conseravation is still not realised in politics, administration and practical soil use. Old threats like soil erosion continue to challenge even as new problems arise, such as the emission of atmospheric trace gases. Knowledge about the processes involved and appropriate protection measures should be gathered and shared among all responsible for soil conservation to ensure sustainable soil use.

The ESSC will hold its 2nd International Conference from the 1st to the 7th of September 1996 at the Faculty of Agricultural and Nutritional Sciences of the Technische Universität München in Freising, Germany.

The presentations will cover:

- Soil compaction and structure deteroration
- Soil contamination (heavy metals, acidification, xenobiotics)
- Strategies to minimize soil erosion and ecological side-effects
- Soil consumption (use of peat, loam etc., construction site losses)

Congress Tours:

- Pre-Conference Tour to the Danube area (140 km)
  - Land reconsolidation with consideration of farming, wildlife and erosion
  - copper enrichment, erosion and compaction in hop gardens
  - Agricultural use, regeneration and protection of peat soils
- Mid-Conference Tour to the Scheyern Experimental Farm (70 km)
  - Heterogeneity of soil properties: implications for measurement, modelling and conservation practices
  - Landscape planning for ecologically and economically sustainable land use
  - Monitoring loss of water, soil and agrochemicals under different land use
  - Soils as sources and sinks of atmospheric trace gases
  - Influence of land use on soil fauna
  - Strategies to reduce soil compaction and erosion.
- Post-Conference Tour to the Alps (350 km)
  - Problems (soil compaction, soil eutrophication, forest decline, erosion) related to land use in high mountain areas (agricultural/recreational areas)
  - soil consumption in the mountain valleys

A first circular with further information will be mailed in 1994 to all members of the ESSC. Non-members may request a copy from *Lehrstuhl für Bodenkunde, TU München, D-85350 Freising, Germany.*

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

First Announcement

The ***main objective*** of the meeting is to evaluate the processes of soil degradation and the possible measures for its protection in those ecosystems where the soil can be considered to be a strategic resource.

In these ecosystems, which are mainly insular, both the soil and the water are the main natural resources sustaining the population. Thus, knowledge of the degradation processes affecting these resources and putting into effect policies for the conservation of soil and water are a prioritary for the sustainable social and economic development of these territories.

In line with the aims of the European Society for Soil Conservation (ESSC), to deal with all the topics related to soil conservation at its Congresses, Meetings and Workshops, this meeting is organized in the Canary Islands, which constitute a limited and fragmented terrain with grave problems of qualitative and quantitative degradation of soils and water, leading to an increasing process of desertification, but where important conservation methods are traditionally employed by farmers.

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.

Organisation

The meeting will be held in two parts:

1) ***Technical sessions:*** Two days of paper and poster sessions. There will be four technical sessions, one devoted to each of the above-mentioned subjects. Each session will be introduced by a keynote paper or lecture by an invited speaker and will be presided over by a chairman and secretary.
2) ***Field trips:*** Field trips will be arranged to three islands. *Tenerife:* Experimental plots for measuring water erosion (Andisols and Aridisols); *Lanzarote:* Conservation agriculture in arid zones; *Fuerteventura:* Soil degradation processes due to erosion and salinization.

The meetings of the Executive Committee and of the Plenary Assembly of the ESSC will take place in Tenerife, while the Closing Session, and Conclusions will be organized in Fuerteventura or Lanzarote.

Additional Information

1) The technical sessions will take place at the University of La Laguna (Tenerife) or at the conference rooms of a hotel in Puerto de la Cruz where accommodation is arranged for participants.
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. The possibility of organizing charter flights with the main European cities is being explored for this meeting.
4) A scientific committee, under the auspices of the ESSC, has been constituted to select the works to the 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.

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 October 15, 1994.

Organizing Committee: A. RODRÍGUEZ RODRÍGUEZ (President), J.M. HERNANDEZ MORENO (Vice-President), C.C. JIMENEZ MENDOZA (Secretary), M. ESPINO MESA (Treasurer), C.D. ARBELO RODRIGUEZ, M.C. GONZALEZ SOTO, L.A. HERNANDEZ HERNANDEZ, M.J. ORTEGA GONZALEZ, P.A. PADRON PADRON, J.M. TORRES CABRERA, G.E. VARGAS CHAVEZ.

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.

DEGRADATION AND CONSERVATION OF SOILS IN THE CANARY ISLANDS

Owing to their geographical situation, the Canary Islands are, in many respects, similar to the Sahara Desert. Increasing desertification has been observed for some time in these islands, particularey acting on the more fragile insular ecosystems, which are highly sensitive to environmental degradation and which are often subjected to pressures by human activities.

The Canary Islands are situated in the northeast Atlantic Ocean between latitude 27°37'N and 29°25'N and and longitude 13°20'W and 18°10'W (of Greenwich), only 100 km from the north-western edge of the African continent. The total area of the archipelago, which consists of seven main islands and several smaller ones, is 7501 km². There is a population of 1 600 000 inhabitants, mainly concentrated in the two large urban areas: Las Palmas de Gran Canaria-Telde and Santa Cruz de Tenerife-La Laguna. To what is already "overpopulation" must be added approximately 6 000 000 tourists who visit annually.

Western and central islands.- Like all the Canary Islands, these are of volcanic origin, consisting of Miocene and Holocene formations, together with more recent deposits. The rocks are varied and complex in nature and include lava flows and pyroclastics, basalts, trachytes and salic volcanics. The relief is rugged, with land rising above 1000 m and steep slopes excceding 30 % over more than half of the island.

The archipelago is affected by the tradewinds, which originate from the Azores antyciclone. There are altitudinal bioclimatic zones because of the Canary Islands barrier effect on the circulation of air masses; this also causes considerable differences between the windward and leeward flanks of the island.

Eastern islands.- These are low altitude islands (<800 m) characterized by gentle slopes and wide plains, U-shaped valleys and abundant glacis. The climate of the main eastern islands is extremely arid, with annual rainfall seldom greater than 100 mm, irregularly distributed and generally intense when it falls. There are no forests at present and the natural vegetation is herbaceous or shrubby and sparse; it does not cover the entire soil surface.

The land use is different in each of the two eastern islands. Livestock raising is the main occupation in Fuerteventura, where large herds of goats roam extensively with little control maintained over their culture, and is pursued using traditional techniques involving sand and lapilli that preserve the soil pollution by intensive agricultural use.

Although several processes and factors contribute to soil degradation in the Canary Islands, two have been found to a exert a greater qualitative influence: (a) accerleated erosion (water and eolian), salinization-sodification (natural and induced by agricultural use), both accompanied by soil acidification and soil pollution by intensive agricultural use.

Approximately 40 % of the Canary Islands' land is undergroing rapid erosion. The factors involved may be grouped into: natural erosion-torrential rainfall, sparse vegetation, high soil erodibility, rugged relief; and erosion due to human activities-unsuitable management of arable soils on the steep slopes, overgrazing and deforestation. About 60 % of the surface of the archipelago, including areas given over to intensive agriculture, is affected by salinization. The main factors responsible are: natural- and arid climate and a regime of oceanic winds; and human activities- overexploitation of the aquifers, irrigation with water having a high salt/or sodum content, intensive monoculture, and excesive and indiscriminate use of chemical fertilizers and other agrochemicals.

The rapid environmental degradation observed over last 40 years has been caused by the abrupt change in the economic and social bahaviour of the inhabitants due to tourism that began during the 1960s.

Conservation agriculture

The discussions will be centred fundamentally on the problems presented by the islands of Lannzarote and Fuerteventura, the closest to the African continent, where soil degradation processes are more intensive.

Agricultural activities have almost totally declined at the present time in Fuerteventura. Only a few glasshouses are maintained for tomato crops, and alfalfa is grown as fodder. This island was considered until relatively recent times to be the "granary" of the Canary Islands, because of its high production of dryland cereals.

In recent years, a lack of rationality in the application of agriculture and livestock policies, particularly in the extensive breeding of goats, has accelerated the desertification process in this island.

Environmental conditions in the island of Lanzarote closely resemble those of Fuerteventura although the agricultural potential of the farmer is still significant, not only because of pyroclasts (lapillis and ash) but also because water and soil resources have been protected in a rather hostile environment.

The most noteworthy of the agricultural conservation practices include: natural and artificially created fields or terraces employing lapilli or sand as moisture-retaining surface layers, known locally as "gerias", "jables", "gavias", etc. according to their location.

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Spain

NOTICE RECEIVED

POLISH NATIONAL CONFERENCE ON SOIL EROSION AND PROTECTION IN FARMLAND AREAS

On 20-22 September 1994 the *Polish National Conference on Soil erosion and protection in farmland areas* will be held.

Conferences on soil erosion have been held in Poland regularly every two years since 1986. This year's conference is being organised by the Department of Dynamic Geomorphology, Adam Mickiewicz University, Poznan (head: Prof. Dr. Andrzej Kostrzewski) together with the Chair of Soil and Forest Amelioration, Agricultural Academy, Poznan (head: Prof. Dr. Andrzej Kostrzewski). It will take place in Poznan (the plenary and poster sessions) as well in field stations at Storkowo (AMU), Wierzonka and Mokronosy (Wielkopolska and Pomerania), in hilly or flat morainic landscape within the limit of the Last Pleistocene Glaciation, where out on-site multi-year studies of water and wind erosion are carried out (Storkowo, Mokronosy and Wierzonka).

The conference will have the following scope:

- natural controls of water and wind erosion
- soil erosion as a geomorphological process
- argrotechnical practices and soil erosion
- soil and plant amelioration in preventing soil erosion
- modelling and forecasting the processes of water and wind erosion
- spatial planning and farming implements used to protect soil resources
- advances in the methods of soil erosion study (field and laboratory techniques).

The organisers intend to publish conference materials including the papers, notes and posters in Polish together with detailed summaries in English.

The address of the organising committee: *Dr Alfred Stach, Quaternary Research Institute, Adam Mickiewicz University, ul. Fredry 10, PL-61-701 Poznan, Poland, tel.: 0-04861-529-327, fax: 0-04861-530-234*

Proceedings ESSC Conference

SOIL EROSION AND DEGRADATION AS A CONSEQUENCE OF FOREST FIRES

Sala, M. & Rubio, J.L., (Eds.) Geoforma Ediciones, Logroño

Preface: SALA, M. & RUBIO, J.L.

Introduction: J. DE PLOEY (from Excursion Guide)

Fire Impact

IMESON, A.: The effects of forest fires on the soil moisture and hillslope runoff.

DIMITRAKOPOULOS, MARTIN & PAPAMICHOS: A simulation model of soil heating during wildland fires.

DIMITRAKOPOULOS, MARTIN & PAPAMICHOS: Effect of moisture content on soil heating during a simulated wildland fire conditions.

MARTIN, D., CHEVALIER, Y. & BECH, J.: Results of the first year of post-forest fire hydrochemical measures on the Rimbaud Stream.

BELILLAS: Fire effect on particulate matter outputs in a heathland watershed (NE Spain).

BALLAIS & BOSC: The ignifracts of the Sainte-Vitoire mountain (Lower Provence, France).

Vegetation recovery

DIAZ-FIERROS, F., BENITO, E. & SOTO, B.: Action of the forest fire on vegetation cover and the soil erodibility.

LUCCHESI, S., ANSALDI, M. & GIOVANNINI; G.: Regeneration of Mediterranean maquis after the passage of an experimental fire.

HERRERO-BORGOÑON, J.J., RUBIO, J.L. & HERNANDEZ, J.A.: Pedological effects of reforestation in forest burned areas.

Soil degradation

GIOVANNINI, G.: The effect of fire on soil quality.

JOSA, R., ARIAS, X. & SOLE, A.: Effect of slash burning on some soil physical properties in an holm oak coppice.

SANCHEZ, J.R., MANGAS, V.J., ORTIZ, C. & BELLOT, J.: Forest fire effect on soil chemical properties and runoff.

MOLINA, M.J., GARCIA FAYOS, P. & SANROQUE, P.: Study of aggregate stability after fire on calcareous Mediterranean forest soils in Valencia.

Soil erosion

DIAZ-FIERRROS, F., BENITO, E. & SOTO, B.: Soil erosion and forest fires.

SHAKESBY, R.A., COELHO, O.A., FERREIRA, A.D., TERRY, J.P. & WALSH, R.P.D.: Fire, post-burn land use and soil erosion response curves in eucalyptus and pine forest, Portugal.

SOTO, B., BENITO, E., BASANTA, R. & DIAZ-FIERROS, F.: Influence of antecedent soil moisture on pedological effects of fire.

SOTO, B., BENITO, E., BASANTA, R. & DIAZ-FIERROS, F.: Alterations in surface runoff due to forest fires.

TERRY, J.P.: Soil loss erosion plots of differing post-burn forest cover, Portugal.

RUBIO, J.L., ANDREU, V., FORTEZA, J. & CERNI, R.: Long term effects of forest fires on soil erosion and nutrient losses.

PRADAS, IMESON & MULLIGEN: comparing the infiltration and runoff characteristics of burnt soils in NE Catalonia.

CALVO, A. & CERDA, A.: changes in the hydrological and erosional response of soil after a forest fire.

Soil conservation

VELEZ, R.: How to prevent the risk of fire-erosion sequences.

General conclusions of the conference.

To be published next June

Geoforma Ediciones; Apda. Correos, 1293; 26080-Logroño (Spain)

CORINE - SOIL EROSION RISK AND IMPORTANT LAND RESOURCES IN THE SOUTHERN REGIONS OF THE EUROPEAN COMMUNITY

This report EUR 13233 outlines the CORINE project on the assessment and mapping of soil erosion risk and important land resources in southern regions of the European Community.

The project represents a number of studies undertaken within the framework of the CORINE programme of the Commission of European Communities. This programme was initiated in 1985 for the purpose of "gathering, coordinating and ensuring the consistency of information on the state of the environment and natural resources in the Community" as a basis for supporting Community policy development. Within this context, one of its aim was to build, and test the application of a prototype Geographical Information System, linked to a consistent database. Soil erosion risk and important land resources were specified as two of the priority areas for application of this system in southern areas of the Community.

The report commences by describing the aims and objectives of the project, the framework within which it was carried out, and the methods used. It is noted that - for reasons of time and cost, and to provide a realistic simulation of potential future applications - the project needed to use as far as possible pre-existing data, and to build upon established methods of analysis and evaluation. The need for consistency in the data and results is also emphasized. Within this context, the project commenced by bringing together a team of international experts in soil erosion and land resources, under the direction of a project leader, and in close liaison with other organizations involved in these fields (notably the Directorate-General for Agriculture of the European Commission and the FAO). This team then devised methods of analysis and evaluation appropriate for the data available and the geographic scale of operation (1:1 million) which these data implied. These methods were deliberately conceived as simplifications of existing procedures, namely the Universal Soil Loss Equation (USLE) in the case of soil erosion risk, and the FAO guidelines on land suitability evaluation in the case of important land resources. Following testing and refinement of these methods in a series of pilot areas, a methodological manual was then compiled to act as a working guide for the project.

The assessment methods devised by the project team required five main sets of data: soils, climate, slope angle, vegetation cover and irrigation. These data were compiled and interpreted by the project team, in collaboration with other agencies and other teams working on the CORINE programme. Data on soils were obtained primarly by digitization of the 1:1 million soil map on the European Community; climatic data were obtained largely from national meteorological institutes; data on slope angle were obtained either by manual analysis of contours from topographic maps or through the use of Digital Terrain Models (DTMs); data on vegetation cover and irrigation were derived mainly from available maps, although in Portugal results from the CORINE land cover project were used. All these data were collated in a predefined format, checked centrally for accuracy and consistency, and converted to machine readable form.

Overlay and analysis of these data sets was carried out using GIS procedures in accordance with the appropriate assessment methods devised by the project team. Thus, maps and digital data sets of both potential and actual soil erosion risk were generated by overlaying data on soil erodibility, climatic erosivity, slope angle and vegetation cover. Assessments of important land resources were made by overlaying data on soil quality, climatic quality, slope angle and irrigation. Results were plotted at a variety of scales and checked and validated by members of the project team.

This report summaries these results and presents examples of the output obtained. It considers the limitation of the data and methods used, lays down guidelines for the use and interpretation of the results, and outlines the need for further development and research. It also reviews some of the potential applications of both the raw data and the aggregated results for policy purposes. In particular, it emphasizes the opportunities to combine these results with data from other CORINE projects and other sources, as a means of identifying potential pressures on land resources in southern areas of the Community, and as a basis for evaluating the effects of Community policies.

The project has thus produced a wide range of outputs. It has brought together of a pool of expertise; it has compiled a series of data sets on land resources which have been integrated into the CORINE database; it has developed methods of assessing soil erosion risk and important land resources at a regional scale; and it has provided maps and digital information on the distribution and magnitude of soil erosion risk and land quality in southern areas of the Community in a form appropriate for policy applications. In the process, it also demonstrated many lessons of wider significance for such broad-scale, policy-related studies. It highlighted the problems of ensuring consistency and compatibilitity in the methods used and results obtained, and showed clearly the need for clear working procedures, rigorous documentation of sources and analytical procedures, strong central control and monitoring, and repeated testing of the results. It illustrated, equally, the power of GIS techniques in handling and processing this type of information. Above all, it emphasized the essential role of coordination and cooperation between all the agencies concerned. In these ways, the project lays the foundations for improved understanding and management of land and other environmental resources in the European Community in the future.

The full report includes two maps illustrating the main results of the project (Price = 10 Ecu). It can be obtained by writing directly to the Office for Offical Publications of the European Communities in Luxembourg or to the different national sales places.

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FARM LAND EROSION
in Temperate Plains Environments and Hills

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During the last twenty years, changes within agricultural systems in France and Europe have brought on a spectacular worsening of soil erosion and degradation. This volume, contributed to by scientists from 25 countries, discusses how this risk can be evaluated, and which solutions should be adopted without radically disturbing the socio-economic orientation of major agricultural regions. It is an excellent starting point for the development of new research themes, and will be of great value to soil and environmental scientists, and to all those involved in land irrigation and drainage.

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