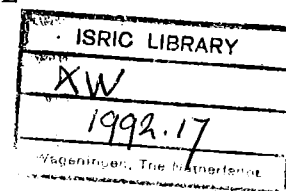


DEVELOPMENT OF AN HOLISTIC APPROACH FOR SOIL SCIENCE

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Introduction

Soil is an important natural resource of the world, an essential component of all terrestrial ecosystems and necessary for the growth of human food, animal fodder, fibre and timber crops. Soils underpin all natural and human-modified ecosystems which they provide with moisture, nutrients and support. It is perhaps all the more surprising that soils are so much taken for granted. Unlike the water we drink and the air we breath, for which there is strict legislation, the sad situation is, that despite the efforts of individual soil scientists, national soil science societies and the International Society of Soil Science, there is no co-ordinated policy for soil protection and conservation. The European Community has published a Soils Charter, but ultimately it is up to individual governments to set the standards of soil care in their own countries.

Since the interest generated in soil erosion in the 1930s, the work done by soil scientists has not caught the imagination of the population at large. Ecology and hydrology have capitalized upon the green politics of recent years but the soil science community has not integrated its findings successfully into the realm of popular science. It has rightly been asked why this has happened. Although the amount of money spent on soil research, compared with the science budget as a whole is minute, questions have been asked about the relevance of what has been done, how effectively the results of research have been applied, and what should be done in the future. As a result, in March 1992, a meeting took place at Rennes, France, to assess the situation and to examine the way forward. This meeting was supported by the Directorate General XII for Science Research and Development of the European Commission's Life Sciences and Technologies for Developing Countries (STD 3). The purpose of the meeting was to discuss a prepared document entitled "Pedological Research for Developing Countries: attempting a holistic approach". At the conclusion of their discussions the soil scientists who met at Rennes issued their findings in a booklet *New Challenges for Soil Research in Developing Countries: a holistic approach* (Anon, 1992).

Points discussed at Rennes

A major consideration of delegates at the Rennes meeting was that soil was more than just a natural component of the biosphere; it is a complex entity with political, social, economic, financial and legal implications. Although it is possible to take soil out of its natural context and study it, research into its problems and the provision of advice for land-users cannot be given in a scientific vacuum. This feeling resulted in the proposal to adopt an **holistic approach** for future studies in pedology and soil science as a whole, especially when related to the countries of the Developing World.

Another consideration which was discussed in Rennes was the urgency with which soil research is carried out and implemented. Complaints have been made that soil science in many tropical countries was concerned only with "fire-fighting" - trying to provide immediate solutions for problems - and this means using decisions based on inadequate research. Inevitably, experts from the industrialised countries saw short-term solutions whereas long-term remedies were needed based on the conditions prevailing locally. In future, it was considered necessary to incorporate the experience and knowledge of local people and their attempts to solve pedological problems into the research programmes of the future. Attempts should be made to provide an assessment of the priorities for soil research into the sustained use of soil, soil management, soil vulnerability and indeed the development of a national soil policy for every country.

Using an example drawn from Tunisia, it was noted that there was a need to retain an overview of land use in the whole river catchment area when problems are being studied, not just of the particular site under consideration. Participants were aware of the considerable benefit soil knowledge and research could provide in the solving problems of erosion, soil and water conservation, salinization, changes in organic matter content and

its behaviour, soil fertility status and the estimation of the health risks where soil contamination has occurred. A second example discussed was the problem of pressure on soils of the peri-urban areas of all large cities, both in the Developed and the Developing worlds. There are of course many other problem areas which could be mentioned, but these two examples were used to develop the concepts behind the holistic approach. From its discussions, the Rennes workshop members thought it necessary to pay close attention to the following points:

1. The need to make the most of scientific knowledge, indigenous empirical know-how and skills.
2. The need to assess priorities for research, where it should be done and for whom.
3. The urgent need to obtain sound and significant research results.
4. The need for continuity in soil research in both developed and developing countries.
5. The need for soil research to reveal how best to achieve an efficient and sustainable use of the land.
6. The need to involve local partners in soil research.
7. The desirability of using an holistic approach.

One of the cornerstones of STD policy is to go into partnership with Developing Countries to strengthen the research capabilities of nations and to assist them in the development of sustainable policies for soil use and management. This would, of course, include investigating agricultural systems and their impact on soils; the aim being to encourage a viable form of sustainable agriculture with low inputs and the ability to maintain productivity without degrading the soil and despoiling the environment. Where land can no longer support people, the reasons why should be investigated, and the methodology of how that land could be made productive again should be explored. The stimulus for research should come from the local beneficiaries, and not always from visiting "experts".

There is little point in carrying out soil research unless the results of that research are used for the benefit of the people in whose name the research was commissioned. Here perhaps we have learnt the lesson that, although some esoteric branches of research are often of great scientific interest and provide great satisfaction to the researcher, they may have little immediate practical application. Where research does produce information of practical use, it should be presented in terms which are user-friendly, especially to farmers, administrators, politicians and policy-makers. After all, these are the people who work the land and control the purse-strings, and to whom we should present a clear case for a fuller understanding of the soil component of the environment and the need for continuing research in soil science.

Points discussed at Harare

Areas where soil science ought to be able to make a significant impact, and where many problems urgently need to be solved, have been shown on the recently produced World Map of the Status of Human-induced Soil Degradation (Oldeman *et al.*, 1991). The most suitable place to prove the viability of the holistic approach would be in countries where soil problems are being experienced. This reasoning led to a second meeting of the international group interested in developing an holistic approach for soil science, held in Harare, Zimbabwe. At this meeting in November, 1993, the holistic approach was used in an attempt to verify its application as a means to move towards sustainable use of the soil in southern African countries. However, in most cases, it was found that the problems were not simply with the soil itself, so research strictly within the realm of soil science would not solve them. For these reasons, the Harare meeting strongly recommended that an holistic approach be adopted in future studies. The proceedings were published by the European Commission under the title of *A Holistic Approach to Sustainable Soil Use in SADC Countries* (Catizzone and Muchena, 1993).

Discussions ranged across soil degradation and its impact upon the environment and social conditions, problems of soil fertility decline, better management of soil and water, erosion control, indigenous techniques, food security and improvement of advice given to farmers. The Zimbabwe workshop concluded that the problems of soils are not isolated phenomena but are integral parts of an intricate web of interactions between human beings and the natural environment. There is an urgent need to identify problem soils which are difficult to manage and strategies must be developed for their successful management. Soils which are vulnerable to particular land uses must be protected and those which are resilient equally must be carefully used to enable sustainable use to be achieved as urged by the 1992 Rio de Janeiro UNCED conference.

Conclusions

This is the background to our meeting here in Bologna and I am sure my colleagues, some of whom participated in both the Rennes and Harare meetings, would be prepared to confirm and amplify my brief account of the discussions which took place. My task in this paper has been to link the past with the present, and I hope that after reading the documents and listening to my summary, you will have a clear idea of why we are gathered here today. In this meeting, through the generosity of the European Commission, we are able to explore the wider implications of adopting a holistic approach in soil science. Soil scientists cannot do this by themselves, and so we have asked those of you who are not soil scientists, but who have come into contact with soils in your working lives, to join us in what we hope will be fruitful and constructive talks about how we can achieve greater impact and wider acceptance of soil studies to the benefit of all mankind.

References

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