

POPULARISATION OF SOIL SCIENCE: ITS NECESSITY AND POSSIBILITIES

S. Brożek

Forest Soil Department, Agricultural University of Cracow
Al. 29 Listopada 46, 31-425 Kraków, Poland

A b s t r a c t. The author points to the necessity of propagating knowledge on the soil and suggests ways to do it. Firstly, he emphasises shortage of didactic aids for comprehensive teaching of soil science. He discusses this problem in comparison to other natural sciences far better known. As there are no useful teaching aids, the author draws our attention to the importance of the soil monolith, soil displays, posters and atlases. Moreover, he emphasises the role of Internet in education. Finally, he proposes to found a soil profile museum for educational purposes.

K e y w o r d s: Soil education, soil monolith, soil profile exhibition, soil popularisation.

INTRODUCTION

The basic aim of soil education boils down to teaching about its structure, functions, and most of all preservation as the Earth's layer which conditions existence of our civilisation. Relation between soil structure and its ability to feed plants, which in turn feed animals and humans, is an example of various soil functions in the environment. This aspect is widely accepted also in the societies that are not professionally linked to nature.

Nowadays, soil education is performed on various levels. However, teacher training, syllabus reform, and promotion of soil science among scientists are its chief problems [3]. Institutions of higher education in such disciplines as forestry, agriculture, geography, biology include elementary soil education in their curricula. Similarly, primary and secondary schools introduce some aspects of soil science. The aim of this article is not the analysis of education in the field of soil science on different levels, but to throw light on the problem of teaching aids for schools and other institutions.

The present authors extensive experience has shown that in society, in the broad sense of the word, soil is often an appreciated, but at the same time unknown element of the environment. According to the author, one of the reasons for the above is lack of efficient education on the soil. Entering premises of any institutions dealing with environmental preservation, we notice numerous collections of posters, tables, and photographs. They include, almost exclusively, protected species of plants and animals. However, there are no materials related to the soil even though it conditions existence of both plant and animals. This means not only the lack of soil promotion materials, but rather a significant hole in the picture of our environment. Hence, the society tends to identify nature with plants and animals only. Soil seems to exist in our notion of the environment. Performance of soil scientists in popularisation of their branch is worse than what botanists, ornithologists, or entomologists do in this respect. Today the only possible aid are didactic tables [5] prepared by the Polish Soil Science Society and the Album of Polish Soils long out of print [1]. However, all this is far below what is necessary.

It is therefore obvious that soil scientists should devote more energy to popularisation work, especially among general public. It is possible through the intensification of teaching about soil as one of the elements of environmental education. The target phase would include publication of maps, albums, posters showing the most common types of Polish soils. They should be distributed in primary and secondary schools, and institutions of higher education. Such materials should find place in the buildings of local administration, in every national and landscape park, in ecological institutions, forest inspectorates, as well as any institutions propagating natural sciences or using natural resources. One of the promotional elements should be presentation of soil profiles typical for a given region.

SOIL MONOLITH

It constitutes the basis for the promotion of teaching on the soil. Its production is no longer a problem. The chemicals used as soil glue are now available which solves technical problems [2,6]. A ready-made soil monolith can be kept for a long time. It is easy to transport even at long distances or photographed. Such a soil monolith is always a better object for photography than a monolith pit in the field conditions. It offers a more accurate picture, particularly in the soil structure and rooting. It is therefore an important teaching aid in ecology. During pit digging, many roots, and especially the smallest ones, are destroyed. Their reconstruction in the profile to take an accurate picture, is very strenuous and often impossible. Preparing a soil monolith is also a laborious task. However, it preserves even the smallest roots.

The production method of a glued profile enables preservation of the natural soil structure. In the case of the mountain soil, its skeleton is most important. During digging, it is cut and levelled with the monolith surface. Such a procedure often results in the false assessment of the skeleton amount. The profile photograph, taken without any pre-preparation of the rock pieces leads to false assessments. However, a monolith of the soil skeleton, even its production is longer, provides an accurate photograph (Photo 1). Soil structure, rooting, and skeleton content make the soil monolith more accurate than the field pit. The only difference between a well-prepared monolith and a field pit is lack of natural moisture in the former. However all the resulting features (spots, colouring) are preserved. For instance, there is a didactic collection of soil monoliths in the Forest Soil Department of the Agricultural University in Kraków. They were made in 1980 but all spots from gleying processes have been well visible for the last 20 years. They look exactly like on the first day they were displayed.

Functions of soil monoliths in promoting soil science are numerous. They are faithful reflections of the soil taken from the field and brought indoors where there are better conditions for soil observation. Young people do not have to dig in bad weather. A collection of a few soil profiles exhibited in one place enables comparative studies of different soil types. Such a presentation makes specific features clearer and easier to grasp. It is significant for the beginners in the field of natural science

SOIL PROFILE EXHIBITION

Monoliths representing a given region (a national park, forest, forest inspectorate, local administrative units) gathered in one place constitute a soil exhibition. It is one of the best ways for promoting soil science. All the above advantages of a soil profile refer also to a few or more profiles presented together. Either a small or comprehensive display of various soils in one building enables an easy identification of differences between the types of soil. Combination of soils with plant groups or soil usage in agriculture or forestry makes such a presentation more clear and complete. Descriptions of individual profiles can resemble those from a map or poster. The length depends on the aim and space available. Soil profiles presented in an exposition, either in natural museums or ecological institutions, should be placed in showcases that suit the general character of the place.

SOIL POSTER

A colourful photo of a profile is the basis for any promotional materials. It can be taken in the field, however a photograph of a ready-made soil monolith offers

more advantages. Traditional photography is still considered to be more effective than a digital for presenting details of a soil profile. However, a digital photo is more useful for the electronic preparation of pictures. A soil poster should include photographs of soil profiles, landscape or plants with captions. A collection of a few or more profiles can represent a given region, providing a local poster of a certain national park. Such a poster can also present the main soil types of the whole country. Finally, a poster can present the same type of soil generated by a different rock specific to a given geomorphologic unit. For instance acidic brown soils (*Dystric Cambisol*), developed from granite in the Tatra Mts. or Sudety Mts., from sandstones in the Beskidy Mts., from fluvioglacial sands in the Janów Forests, or from boulder clays in the Puszcza Bukowa etc. The captions should provide information on the soils type and subtype, its granulation and parent rock, forest type, plant group and characteristic plants and location. Rare or valuable soils should be presented in separate posters. A poster model of the soils from the Beskid Śląski Mts is presented in photograph 1. The main element is a monolith photograph. Another photograph presents a tree stand surrounding the pit. At the end of the soil profile description there is a typological diagnosis. It includes soil type, subtype, kind of granulation and parent rock, forest type, and forest plant group. Geochemical characteristics should be of interest for the advanced student of natural sciences. It should include soil granulation, organic carbon content and total nitrogen, reaction, acidity, CEC, base saturation. A geochemical characteristics should be supplemented by a percentage content of primary and secondary minerals.

SOIL ATLAS

It constitutes an important teaching aid in soil science. As in the case of posters, quality photographs are the first step in creating such a collection. However, it should provide more extensive information about the soil profile. Each of the presented sites should be given a soil photograph with characteristic groups of plants, standard soil profile description including genetic levels, and a geochemical description. A new edition of the Atlas of Polish Soils (Atlas Gleb Polski), which has been long out of print, should be prepared as soon as possible. Moreover, it is necessary to supplement it with more detailed texts for forestry. An excellent example can be the Atlas of Soils WRB [4] with photographs of the main units together with landscape pictures and soil usage. A synthetic commentary provides the origin of names, morphology, properties, geographical occurrence, relation to other similar soil units, and type of usage.

SOIL PROFILE MUSEUM

Soil monoliths are undoubtedly of great profit to soil education. But due to their laborious and expensive production, there are only few institutions which can afford a greater amount of such monoliths. Collecting and maintaining soil monoliths is worthwhile also because of their long service life. Preservation of these monoliths for dozens of years does not change their appearance. This is an argument for establishing a collection in the form of a museum. We should consider setting up a museum of soil profiles which would provide didactic help for university teaching and propagation work. The Forest Soil Institute in Kraków could supervise such a project. We can offer space, 60 monoliths, as well as scientific guidance in enlarging the collection. The Polish Soil Science Society (Polskie Towarzystwo Gleboznawcze) could become the patron of this project.

THE ROLE OF THE INTERNET IN THE SOIL PROMOTION CAMPAIGN

Traditional soil photographs converted into digital pictures or photographs are easily adjusted, stored and transmitted electronically, or presented through the Internet. This system opens a wide range of possibilities for soil promotion. Soil photographs with appropriate description and references accessible through the Internet can be used worldwide. At present, the Internet provides profiles representing the main units of the Soil Taxonomy and WRB. We can also look at the national collections of Canada, the USA or Germany. Teachers looking for extra help will certainly benefit from the Internet.

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Soils of the promotional unit „Beskid Śląski Forests” – regional poster



1. PODZOL
(*Skeleti-Haplic Podzol*)
The Istebna sandstone
Plagiothecio-Piceetum
tatricum
High-mountain coniferous
forest
Fi: Wisła, Fd: Przystup,
Fc: 127b

2. PODZOL
(*Haplic Podzol*)
The Istebna sandstone
Abieti-Piceetum
montanum
Mountain spruce-fir forest
Fi: Wisła, Fd: Biale,
Fc: 76c

3. ACID BROWN, TYPIC
(*Skeleti-Dystric Cambisol*)
The Godula sandstone
Luzulo nemorosae-Fagetum
Carpathian acidophilous
beech forest
Fi: Bielsko, Fd: Bila,
Fc: 96a

4. LEACHED BROWN
(*Eutric Cambisol*)
The Magura sandstone
Dentario glandulosae-
Fagetum
Eutrophic Carpathian beech
forest
Fi: Wegierska Górka,
Fd: Żabnica, Fc: 44f

Fi = Forest inspectorate, Fd = Forest district, Fc = Forest compartment;

Plant communities according to Dr. W. Róžański

Soils of the promotional unit „Beskid Śląski Forests” – regional poster



5. GRAY BROWN
(Skeleti-Mollic Cambisol)
 The Godula sandstone
Lunario-Aceretum
 Eutrophic sycamore-beech
 forest
 Fi: Bielsko, Fd: Wielka Łąka,
 Fc: 139d

6. MUD GLEY
(Mollic Gleysol)
 Local mud deposit
Caltho-Alnetum
 Mountain alder swamp forest
 Fi: Wegjerska Górka,
 Fd: Żabnica,
 Fc: 36d

7. RIVER ALLUVIAL
(Skeleti-Entic Fluvisol)
 Stony alluvial material
Alnetum incanae
 Carpathian alder forest
 Fi: Bielsko, Fd: Ostre,
 Fc: 69b

**8. PARARENDZINAS,
 PROPER**
(Skeleti-Haplic Calcisol)
 Claystone and marl,
 Cieszyn shale
Hacquetio-Fraxinetum
 Oak-hornbeam forest
 Fi: Ustroń, Fd: Dębowiec,
 Fc: 75

Fi = Forest inspectorate, Fd = Forest district, Fc = Forest compartment;

Plant communities according to Dr. W. Róžański