

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/368840250>

Share Your Soils User manual

Technical Report · December 2022

CITATIONS

0

READS

651

14 authors, including:



Marcin Świtoniak

Nicolaus Copernicus University

123 PUBLICATIONS 748 CITATIONS

[SEE PROFILE](#)



Cezary Kabala

Wrocław University of Environmental and Life Sciences

180 PUBLICATIONS 3,178 CITATIONS

[SEE PROFILE](#)



Przemysław Charzynski

Nicolaus Copernicus University in Toruń

152 PUBLICATIONS 871 CITATIONS

[SEE PROFILE](#)

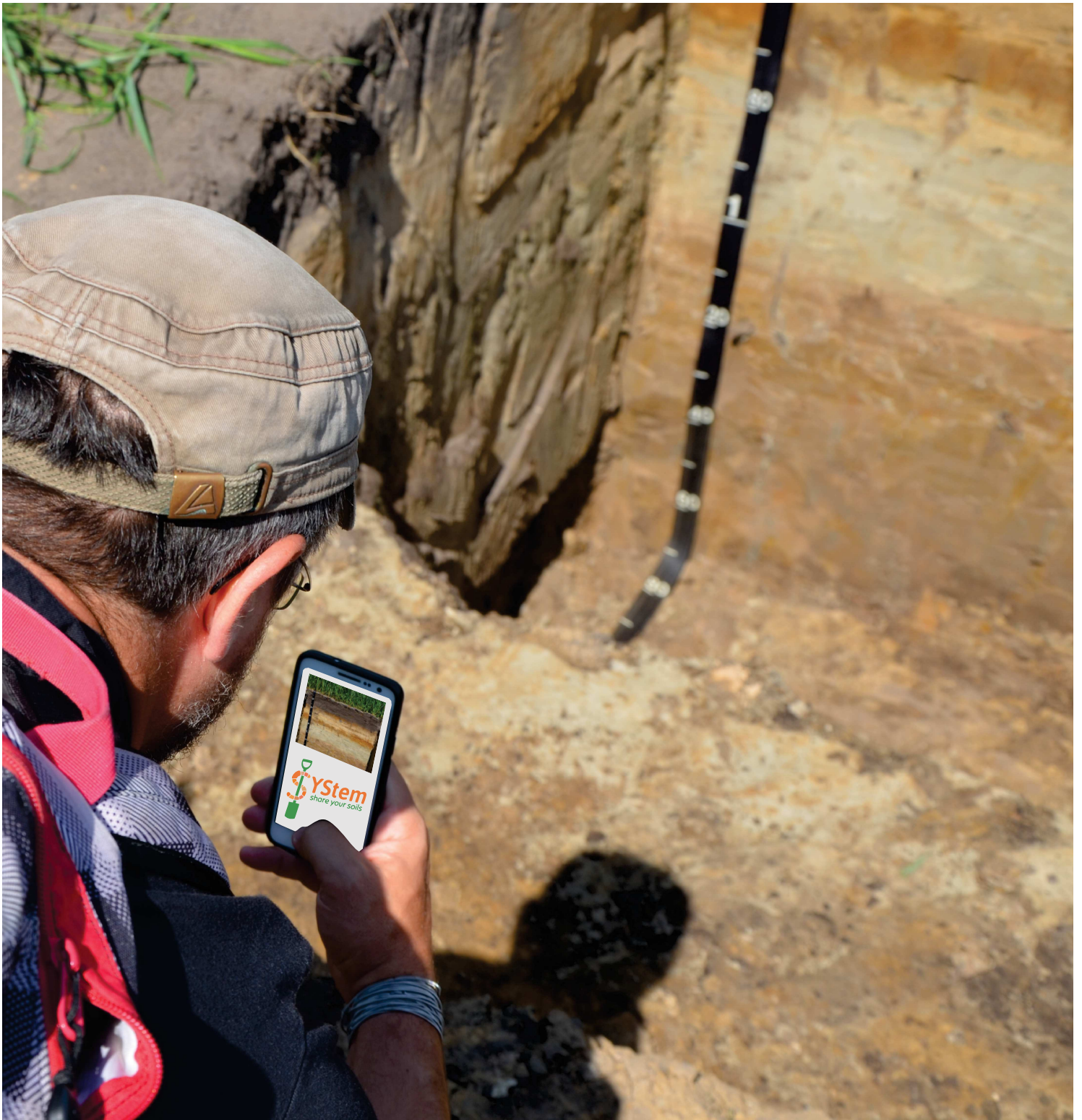
Some of the authors of this publication are also working on these related projects:



Soil cover evolution in the surroundings of drained lakes [View project](#)

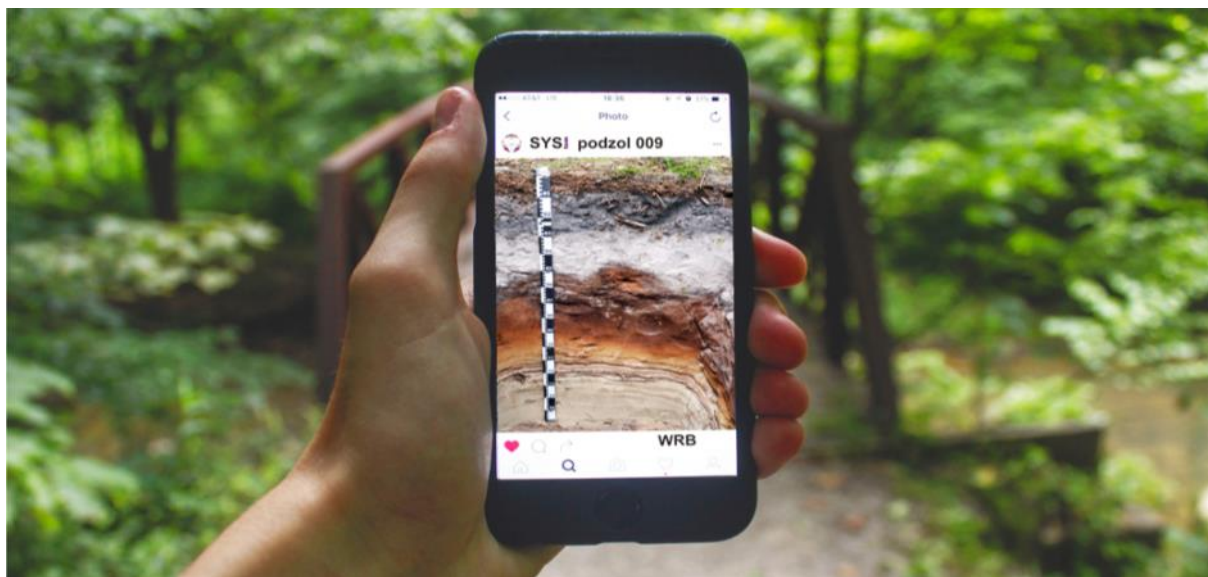


Types of soil cover structure in the young glacial landscape [View project](#)



User manual

SHARE YOUR SOILS



USER MANUAL

Authors:

Marcin Świtoniak, Cezary Kabała, Przemysław Charzyński, Gian Franco Capra, Szabolcs Czigány, Manuel Pulido-Fernández, Antonio Ganga, Bartłomiej Glina, Łukasz Mendyk, Tibor József Novák, Vít Penížek, Endla Reintam, Blaž Repe, Marcin Sykuła, Ilze Vircava

Co-funded by



Project: SHARE YOUR SOILS

ERASMUS+ Programme STRATEGIC PARTNERSHIPS

2019-1-PL01-KA203-065101

List of contents

1. Introduction	3
2. Who is SYStem dedicated to?	3
3. Aims of the SYStem application / platform?	4
4. Minimal requirements	4
5. How to get started with the SYStem application / platform?	4
6. Registration	5
7. Main User Panel (dashboard)	6
8. User profile and account settings	7
9. Uploading soil entries	9
10. Soil discussions and collecting points	14
11. Categories of development, ranks and badges	19
12. Soil profiles database – Soil digger	24
13. Authors with affiliation	26
APPENDIX 1 – Allocation of RSGs and qualifiers to categories of development – table	28
APPENDIX 2 – glossary	37



1. Introduction

The internet platform Share Your Soils (SYStem) was created as the world's first social edutainment medium dedicated to the description and categorisation of soils according to the international WRB classification. The platform represents an innovative teaching tool that helps teachers at high school and universities as well as environmental researchers and practitioners. The main tool developed within the project is a mobile and a web application to send photos of soil profiles with a description, a geolocation and a classification proposal. Users have the possibility to exchange and share their knowledge and help less experienced colleagues by commenting and suggesting soil genesis and classification.

Join in, share your soils, discuss their origin and systematic position, collect points in different categories and have fun learning soil classification!

More about the SYStem project: <https://sites.google.com/site/shareyoursoils>

2. Who is SYStem dedicated to?

The online platform and application are dedicated to all people who need to classify soils - both for scientific and didactic purposes, e.g., students of environmental, agricultural, geographic and soil sciences and young (not only young!) researchers all over the world. In addition to being able to submit their "own" soil profile and participate in discussions about its classification, users have the opportunity to earn points, develop levels and badges - thanks to which learning takes place in a friendly, attractive environment for young people!

If you like exploring the environment, digging up soils and learning how to interpret their properties from a classification point of view (or how to "read" and "understand" soil names!), then you have come to the right place!

3. Aims of the SYStem application / platform?

- building a community interested in soil testing and classification;
- communicating one of the most widely used global classification systems - the World Reference Base for Soil Resources (WRB);
- sharing soil data - examples of specific soil profiles from all over the world!

4. Minimum requirements

- personal computer (very basic – e.g., RAM 8GB, CPU speed 1.1 GHz) with the any web browser of your choice (internet based platform) or
- mobile phone with Android operating system (mobile application).

5. How to get started with the SYStem application / platform?

- visit the website: <https://shareyoursoils.umk.pl/>

or download the application from the website and install it on your mobile phone:

<https://sites.google.com/site/shareyoursoils>

- create an account;
- send soil profiles (**soil entries**), comments, have **soil discussions**, learn soil classification, dig into the soil database;
- **collect points** in twelve **categories of development** and get **badges**!

6. Registration

- click on the “Join for free” button in the upper right corner and enter basic information:

- login - text field, unique and required;
- email address - text field, required (verification of email address);
- password - password field, required;
- last name - text field, required;
- first name - text field, required;
- affiliation - text field, e.g., university or other institution;
- biography - text field, if you want to tell other users about yourself
- country - a text field;
- avatar – a graphic file;

You will also be asked to confirm:

- consent to the publication of the profile;
- agree to the rules – required in the check box (and listed Appendix 1 at the end of this guide), required;
- acknowledgement that you have read the rules - listed in the checkbox (and in Appendix 2 at the end of this manual), required;

After registration, you become a **user!**

7. Main User Panel (dashboard)

Most of the basic activities of any **user** start with the control panel – the **dashboard**. The transition to the dashboard is usually done by clicking on your name in the upper left corner (**Fig. 1**).

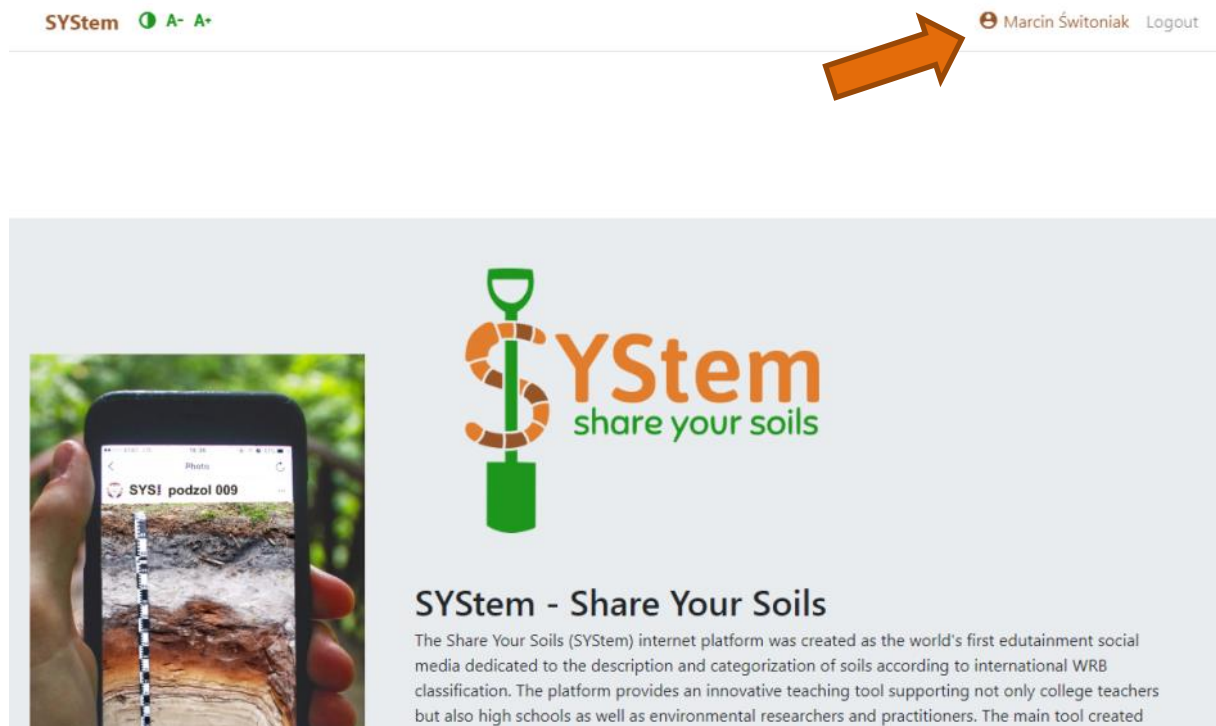


Figure 1. Clicking on your name takes you to the Dashboard

Within the **dashboard**, there are six “buttons” that allow you to perform the most important actions (**Fig. 2**):

- view **Your profile** (chapter 8);
- view Your **Account Settings** (chapter 8);
- **Add new soil** – upload soil profile area - **soil entries** (chapter 9);
- go to the **Soil discussions** (chapter 10);
- view information **About the project**;
- go to **Soil digger – database** (chapter 12).

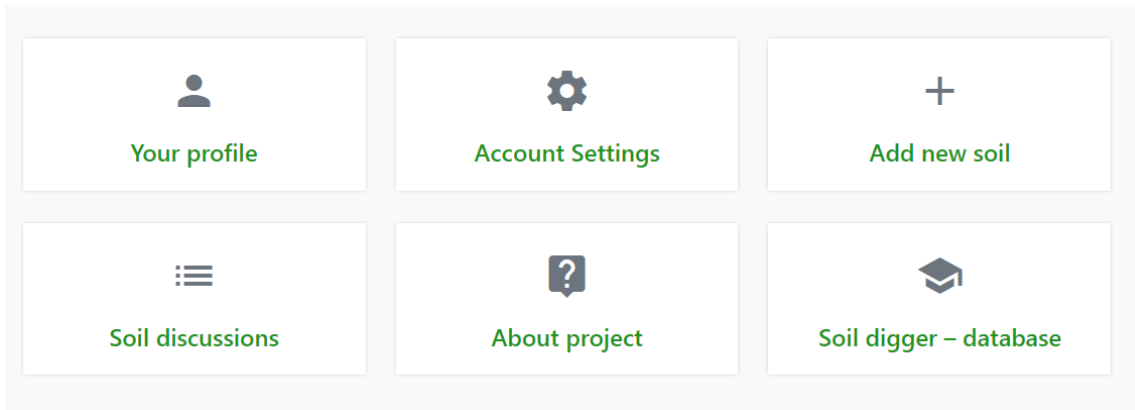


Figure 2. Main actions in Dashboard

8. User profile and account settings

Each of the **users** has their own unique profile which consisting of **(Fig. 3)**:

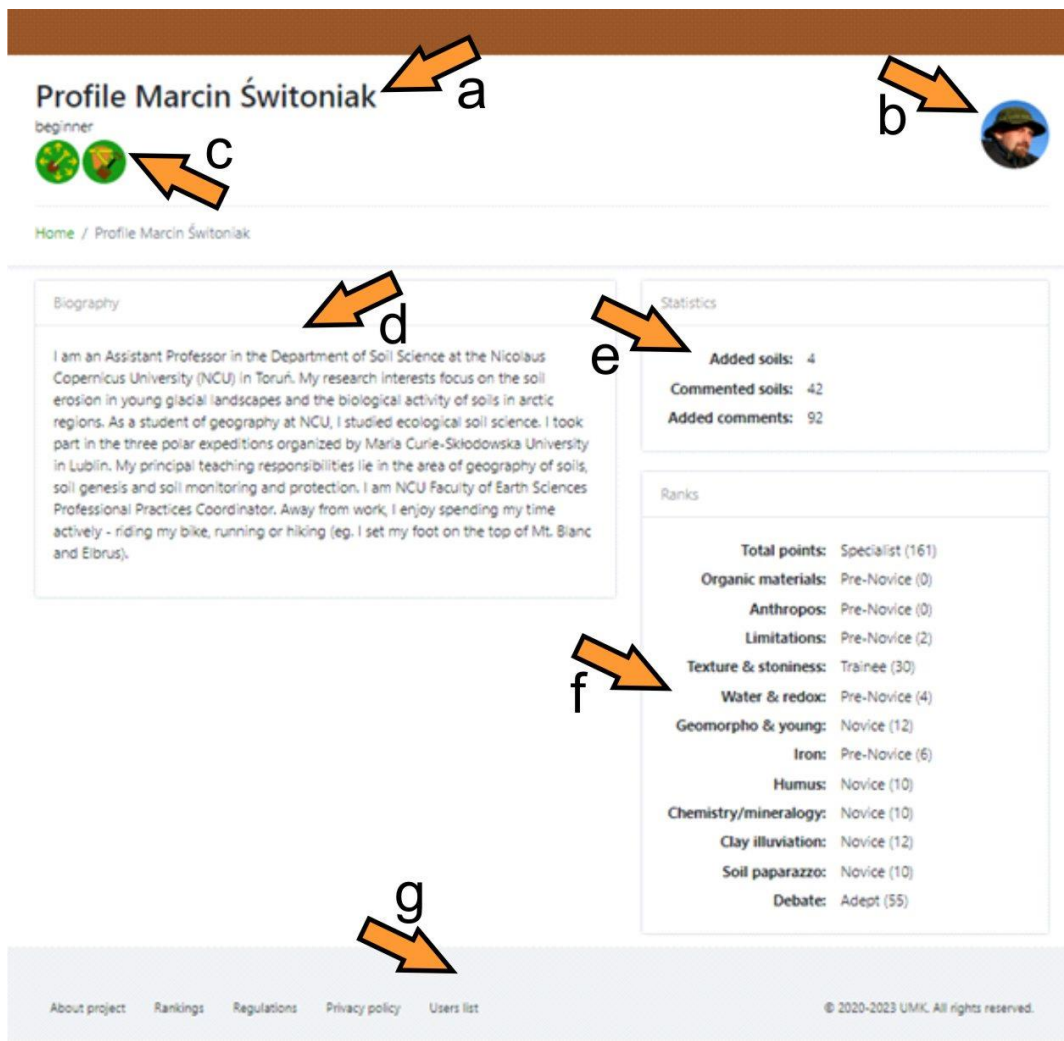
- a) **Name** (e.g., first name, last name, nickname);
- b) **Avatar** (optional);
- c) **Badges**;
- d) **Biography**;
- e) **Statistics**;
- f) **Ranks** (and points) in specific **categories of development**.

The **user profile** is visible to all **users** - they can be searched through the **Users list** button **(g)** in the bottom panel of the page.

The personal data (name, photo in avatar or biography) do not have to be a “real” and can be changed by the user in **account settings** section. Entering real data (and a real photo in avatar) can be useful for people building their social network (outside the application) in the soil research community.

Statistics show how active the user is in the application - how many soil entries he/she has added, how many soil entries commented and how many comments he/she has made in total. One of the main goals of every user is to **collect points**. Points can be earned by creating soil entries and commenting on them or by commenting the soil entries of other users. Points can be earned in 12 different **categories of development** (*Organic materials, Anthropos, etc.*). The number of points determines the user's rank in each category (pre-novice 0-9 points, novice 10-

29 points, trainee 30-49 points, adept 50-99 points, specialist 100-199 points, master 200 and more). Combining ranks in different **categories of development**, allows you to receive special **badges**. For example, the badge *Aquartificialist* means that the user has a specialist rank (or higher) in the categories *Anthropos* and *Water&Redox*.



The screenshot shows a user profile for Marcin Świtoniak. The profile includes a header with the name and rank (beginner), a biography section, a statistics section, and a ranks section. Annotations a through g point to various elements: a points to the name, b to the profile picture, c to the badges, d to the biography text, e to the statistics table, f to the ranks table, and g to the footer navigation links.

Biography: I am an Assistant Professor in the Department of Soil Science at the Nicolaus Copernicus University (NCU) in Toruń. My research interests focus on the soil erosion in young glacial landscapes and the biological activity of soils in arctic regions. As a student of geography at NCU, I studied ecological soil science. I took part in the three polar expeditions organized by Maria Curie-Skłodowska University in Lublin. My principal teaching responsibilities lie in the area of geography of soils, soil genesis and soil monitoring and protection. I am NCU Faculty of Earth Sciences Professional Practices Coordinator. Away from work, I enjoy spending my time actively - riding my bike, running or hiking (eg. I set my foot on the top of Mt. Blanc and Elbrus).

Statistics:

Added soils:	4
Commented soils:	42
Added comments:	92

Ranks:

Total points:	Specialist (161)
Organic materials:	Pre-Novice (0)
Anthropos:	Pre-Novice (0)
Limitations:	Pre-Novice (2)
Texture & stoniness:	Trainee (30)
Water & redox:	Pre-Novice (4)
Geomorpho & young:	Novice (12)
Iron:	Pre-Novice (6)
Humus:	Novice (10)
Chemistry/mineralogy:	Novice (10)
Clay illuviation:	Novice (12)
Soil paparazzo:	Novice (10)
Debate:	Adept (55)

Footer: About project | Rankings | Regulations | Privacy policy | Users list | © 2020-2023 UMK. All rights reserved.

Figure 3. User profile

In the **account settings** section (Fig. 2), **user** can change their personal data – login, e-mail, biography, avatar photo, etc. The **user** can also mark which types of notifications about new soil entries or comments interest him/her.

9. Uploading soil entries

One of the main activities of all **users** is the **submission of soil profiles** with their descriptions and proposed classification positions (according to WRB classification system). All elements related to the description of one soil are referred to as **soil entry**. The **user** who enters a **soil entry** is called the **author** of that **soil entry**. To insert a new **soil entry**, go to your **dashboard** or **Soil discussions** section and press the **Add new soils** button (**Fig. 2**).

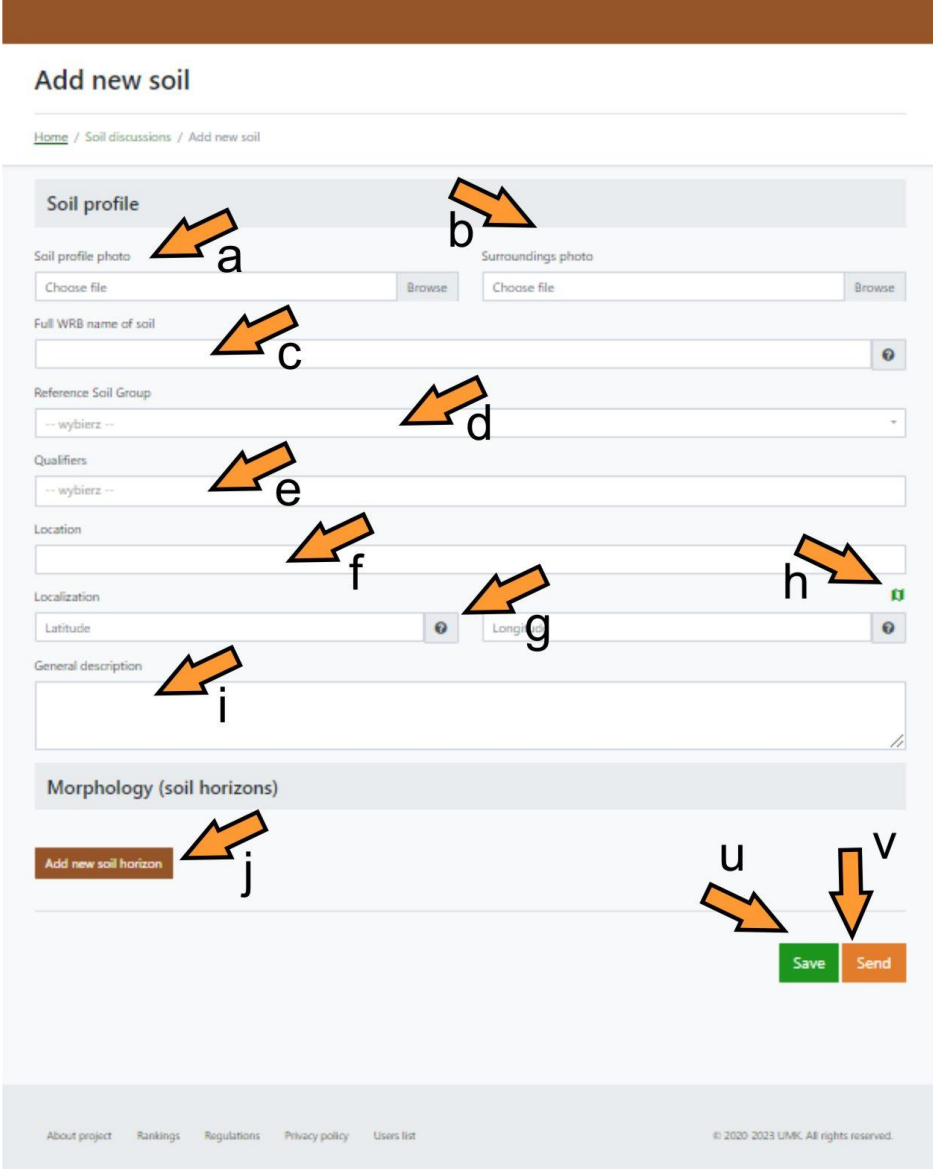
The form for entering a new **soil entry** (**Fig. 4**) contains general data for the whole soil profile; and detailed information about morphology of individual soil horizons.

General information on the soil profile

The **soil profile photo (a)** should be taken in such a way that all genetic horizons of the soil are clearly visible. Portrait orientation is preferred. There should also be a tape measure on the wall of the profile to determine the depth of occurrence of individual genetic horizons. The **environment photo (b)** is taken in such a way that all important characteristics of the environment that may influence the current development of soil processes can be seen. Orientation to the landscape is preferred.

Full WRB name of soil (c) should be entered descriptively by the user - exactly as it corresponds to the rules for naming soils in the WRB (e.g., Albic Endostagnic Luvisol (Anoloamic, Endoclayic, Cutanic, Ochric). In addition to the descriptive **full WRB name of the soil**, the **author** of the entry also selects the corresponding **Reference Soil Group (d)** and **Qualifiers (e)** from the drop-down lists. These lists contain an up-to-date list of all possible RSG (32) and qualifiers (284) applicable in the WRB. In the case of a subqualifier (e.g., Anoloamic) the author selects the appropriate qualifier from the list (in this case - Loamic). At the stage of entering a **soil entry**, it is of course possible that the name of the soil is not correct (in relation to the RSG and qualifiers proposed by the **author** of the **soil entry**) - it will then be corrected during the **soil discussion** led by the **moderator** and other **users**. It is important to note that only the **user** who is the first (on the stage of creating **soil entry** or **soil discussion**) to suggest the correct RSG and qualifier(s) will receive points for doing so.

Place (f) - name of the place where the soil profile is located. It can be from a town, village, region, etc.



The screenshot shows the 'Add new soil' form with the following annotated fields:

- a**: Soil profile photo upload button
- b**: Surroundings photo upload button
- c**: Full WRB name of soil input field
- d**: Reference Soil Group dropdown menu
- e**: Qualifiers dropdown menu
- f**: Location input field
- g**: Localization input fields (Latitude and Longitude)
- h**: Map icon for localization
- i**: General description text area
- j**: Add new soil horizon button
- u**: Save button
- v**: Send button

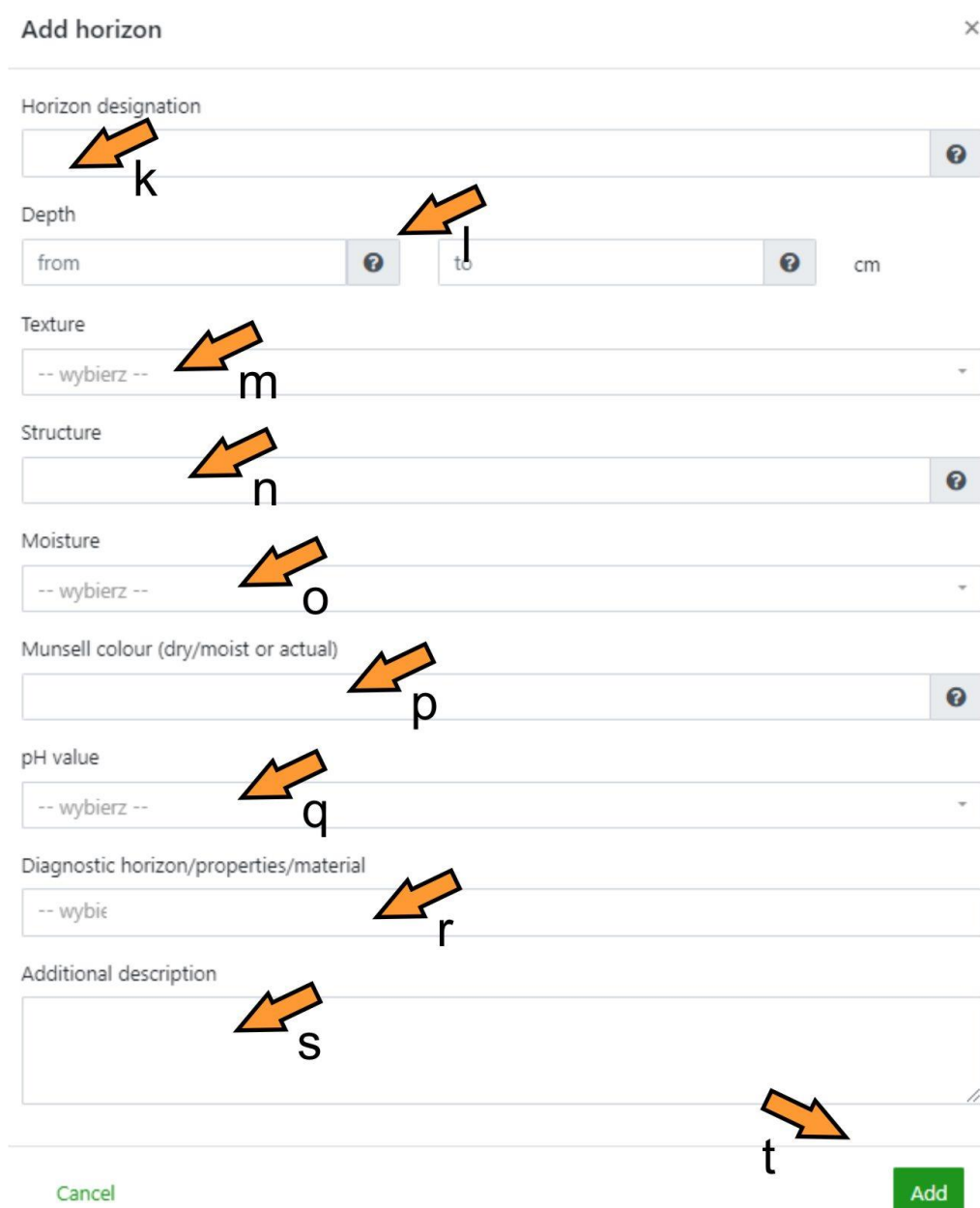
Figure 4. Description of the soil - creating the soil entry

Localization (g) - geographical coordinates in latitude and longitude as decimal fractions of a degree (DD). This format is used in many geographic information systems (GIS), web mapping applications such as OpenStreetMap, Google Maps and GPS devices. The localization of the soil profile can also be marked directly via Google Maps - by opening it with the **map icon (h)**.

General description (i) - here you can (and should) specify all information relevant to the origin of the soil - e.g., type of parent material, description of the topography of the area, the particular conditions of soil development.

Detailed data on soil horizons

To start entering detailed soil horizon data, click on the **Add new soil horizon** button (Fig. 4 - j). For each horizon (and layer) a set of characteristics should be entered which are necessary for the correct classification of the soil (Fig. 5):



The screenshot shows a web form titled "Add horizon" with a close button (x) in the top right corner. The form contains several input fields, each with an orange arrow pointing to it and a letter label:

- k**: Points to the "Horizon designation" text input field.
- l**: Points to the "to" input field in the "Depth" section, which also includes a "from" field and a "cm" unit label.
- m**: Points to the "Texture" dropdown menu, which currently shows "-- wybierz --".
- n**: Points to the "Structure" text input field.
- o**: Points to the "Moisture" dropdown menu, which currently shows "-- wybierz --".
- p**: Points to the "Munsell colour (dry/moist or actual)" text input field.
- q**: Points to the "pH value" dropdown menu, which currently shows "-- wybierz --".
- r**: Points to the "Diagnostic horizon/properties/material" text input field, which currently shows "-- wybić".
- s**: Points to the "Additional description" text area.
- t**: Points to the "Add" button at the bottom right of the form.

At the bottom left of the form is a "Cancel" button.

Figure 5. Horizon description – creating the soil entry

Horizon designations (k) - consists of an upper letter (master symbol), followed in most cases by one or more lowercase letters (suffixes) – e.g., Ap in case of humus horizon modified by cultivation (e.g., ploughing) or Bt in case of *argic horizon*.

Depth (l) - depth (cm) of occurrence of the upper and lower boundaries (limits) of the described horizon.

Texture (m) - soil texture class selected from drop-down list (e.g., sandy loam, loam or silty clay) refers to the proportion of sand, silt and clay fractions that make up the mineral material of the soil.

Structure (n) - the way in which soil particles combine to form aggregates (or peds). The grade (weak, moderate, strong), type (granular, platy, prismatic, rock, wedge-shaped, cloddy, stratified, single grain, massive, porous massive, angular blocky, angular and subangular blocky, subangular blocky, worm casts, lenticular, flat-edged, pseudosand, pseudosilt) and size (very fine, fine, medium, coarse, very coarse, extremely coarse, mixed of previous sizes) should be specified by the author. NOTE: Please to not use the word "structure" at the end of the description e.g., "strong granular structure", as it is automatically added by the application

Moisture (o) – water content, selected from drop-down list (from very dry to very wet).

Munsell colour (p) – designation with hue, value and chroma (e.g., 10YR 4/5). If author only has actual colour in the field, only one notation is given. If dry and moist values are available, two notations should be given: first dry –and second wet (e.g., 10YR 4/5; 10YR 2/5).

pH value (q) – measured in the field with the colorimetric or potentiometric method, chosen from drop-down list (from less than 2 to more than 9).

Diagnostic horizon/properties/material (r) - selected from drop-down list, which contains an up-to-date list of these diagnostic elements in according to the WRB.

Additional description (s) - all essential, diagnostic features of the soil material recorded in a descriptive form.

After entering all the elements of the genetic horizon description, you can finish editing (press **Add** button **(t)**) and move on to the description of the next genetic horizon (**Fig. 4 - j**).

Albic Podzol (Arenic, Hypoendostagnic)


Home / Soil discussions / Albic Podzol (Arenic, Hypoendostagnic)

Albic Podzol (Arenic, Hypoendostagnic)
2549W

Reference Soil Group: PODZOL
Qualifiers: Albic, Arenic, Stagnic

date: 02.12.2022 Discussion

Location




Latitude: 57.56412
Longitude: 27.19348


Description

Dunes, hummock, middle slope - inclination 50, pine forest under nature protection, 81 m a.s.l.

Soil surroundings



Morphology



- O_e** 5 cm; organic material; slightly moist; pH 5.0; moderately decomposed organic material; abrupt and wavy boundary;
- E** 0-8 cm; albic material; fine sand; weak subangular blocky fine structure; slightly moist; 5YR 5/1; pH 5.5; very few medium and few fine roots; clear and wavy boundary;
- D_{hs}** 8-12 cm; spodic horizon; fine sand; moderate subangular blocky fine structure; slightly moist; pH 4.5; very few medium and few fine roots; gradual boundary;
- B_s** 12-30 cm; fine sand; weak subangular blocky fine structure; moist; 5YR 4/6; pH 4.5; few fine roots; gradual boundary;
- BC** 30-58 cm; fine sand; single grain structure; moist; 7.5YR 6/3; pH 4.5; very few fine roots; gradual boundary;
- BC(g)** 58-80 cm; fine sand; single grain structure; moist; 7.5YR 6/4 mottles 5YR 4/6; moist; pH 4.3; gradual boundary;
- C** 80-120 cm; fine sand; single grain structure; moist; 7.5YR 6/5; moist; pH 5.0;

[About project](#) [Rankings](#) [Regulations](#) [Privacy policy](#) [Users list](#)

© 2020-2023 UIMK. All rights reserved.

Figure 6. Example of a soil entry with all description elements after being accepted for soil discussion

When the entire soil description is ready, **author** can save the **soil entry** for further editing by pressing the **Save** button (**u**) or send it to the **moderator** for approval - **Submit** button (**v**).

After sending by the **author**, the **moderator** approves (accepts) or rejects the **soil entry**. In case of rejection, the **moderator** gives the reason for rejection and sends it (automatically) to the **author**. The reason for rejection may be significant gaps in the description, a poor quality photo, etc. When a **soil entry** is approved by the **moderator**, it appears on the **Soil discussion** list. Then any **user** can see this soil entry (**Fig. 6**) and start a discussion about it!

10. Soil discussions and collecting points

All **soil entries**, after being introduced by the **author** and approved by the **moderator**, are subject to a **soil discussion**.

To start a **soil discussion**, go to the **dashboard** and press the appropriate button (**Fig. 7**).

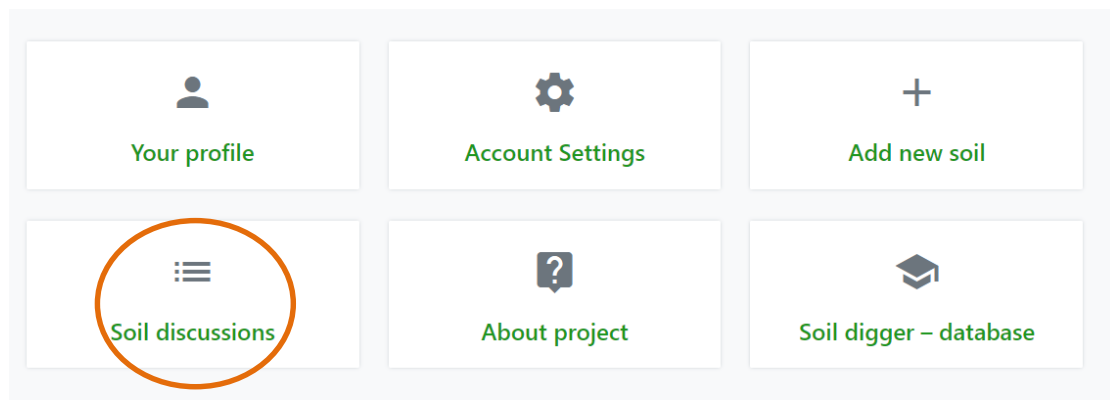


Figure 7. Soil discussion button in the dashboard

In the **soil discussion panel** (**Fig. 8**) you can select the soil currently under discussion:

- a)** the soil entry you entered yourself (my soil),
- b)** soils that have already been commented on,
- c)** all soil entries currently under discussion.

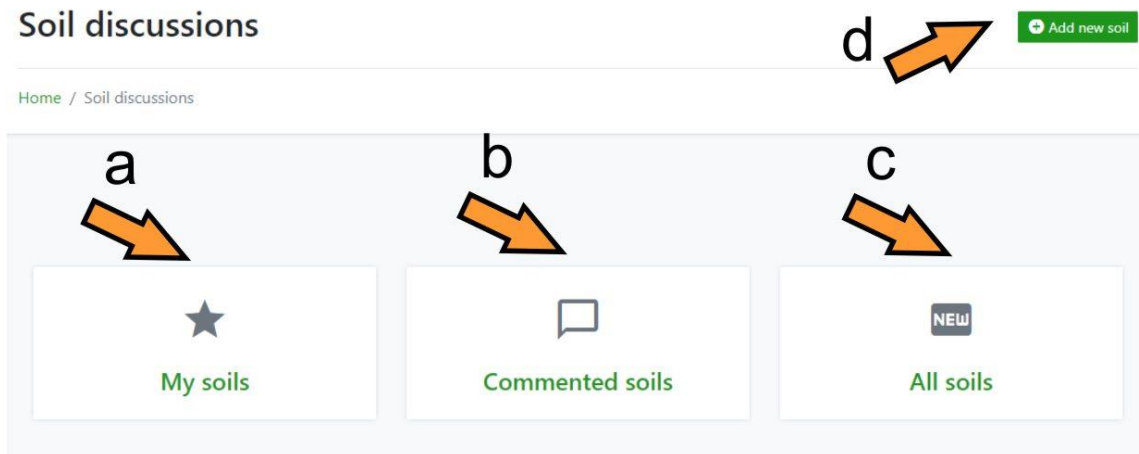


Figure 8. Soil discussion panel

In this panel you can also add (upload) new **soil entries** (Fig. 8 - d) - see: Chapter 8.

After clicking on the selected button, a list of the currently active **soil discussions** appears (Fig. 9). Here you can sort this list by author name, RSG or date of upload (a) and select a **soil entry** for further discussion. On the left side you can see general information (b) about specific **soil entries**: the soil name suggested by the **author**, the date of their addition and the name of the author of the **soil entry** (from this level you can access the **author profile**). On the right side there is an individual, five-character soil entry code (a so-called short code, e.g. # AAB76) and buttons that allow you to switch to the **soil entry** description view or to the **soil discussion**.

Once you are familiar with the **soil entry** data, you can deal with the name of the soil i.e. choosing the correct RSG and soil qualifiers if the **author's** suggested name of the soil does not seem appropriate.

Soil discussions:

Home / Soil discussions / Soil discussions: new

sort: date







	Stagnic Endocalcaric Phaeozem (Abruptic, Aric, Episiltic, Endoclayic)	# 0DM89
add date: 02-12-2022	author: Endla Reintam	<input type="checkbox"/> <input type="checkbox"/>
	Albic Podzol (Arenic, Hypoendostagnic)	# Z5J9W
add date: 02-12-2022	author: Endla Reintam	<input type="checkbox"/> <input type="checkbox"/>
	Calcaric Luvisol Phaeozem (Albic, Loamic)	# X6NDJ
add date: 01-12-2022	author: Endla Reintam	<input type="checkbox"/> <input type="checkbox"/>
	Dystric Cambisol (Arenic, Aric, Colluvic, Protospodic, Stagnic)	# T7NYB
add date: 30-08-2022	author: Szabolcs Czigany	<input type="checkbox"/> <input type="checkbox"/>
	Dystric, fluvic, leptic, skeletal, stagnic Cambisol (aric, colluvic, geoabruptic, raptic, siltic)	# IO6W5
add date: 30-08-2022	author: Szabolcs Czigany	<input type="checkbox"/> <input type="checkbox"/>
	Vitric Andosol (Colluvic, Tephric)	# JIXSM

Figure 9. Soil discussion list

During **soil discussions**, all **users** may submit proposals to change the classification of soils by suggesting changes to the name of the Soil Reference Group or to individual qualifiers. Each proposed change should be supported by an interpretation of the description of the soil under discussion. **Users** propose changes by entering comments and selecting appropriate RSGs or qualifiers from drop-down lists. Only one change (one RSG + one qualifier) can be proposed in one comment, but during the soil discussion each user can propose an unlimited number of changes (in separate comments).

The **soil discussion** is supervised and encouraged by a **moderator**. He/she guides the participants of the discussion on different topics relevant to the soil classification. When the **moderator** decides that all important statements on changing the soil name have already appeared in the debate – he/she decides to close the **soil discussion**. At this stage, the moderator enters the correct, final name of the soil

into the application. Then the users participating in the discussion receive points on their account - 10 points for the correctly given name of the Soil Reference Group, 2 points for the correctly proposed qualifier. These points are divided into one of 10 **categories of development** (see **Table 1** – appendix 1). Note - only the **user** who first suggested the correct element of the name will receive points! The **moderator** can also award 5 points to the person who contributed the most to the discussion (in the *Debate* category). The **author** of the **soil entry** will also receive 5 points for the photo of the soil profile (*Soil paparazzo* category). It should be remembered that points for RSG and qualifiers are only calculated automatically by application after the end of the discussion if the **author** when entering the name of the soil and the **users** in the **soil discussion** not only suggest the elements of the soil name (**Fig. 10**) in the descriptive part of comments (**a**), but also select them from the drop-down lists (**b**).

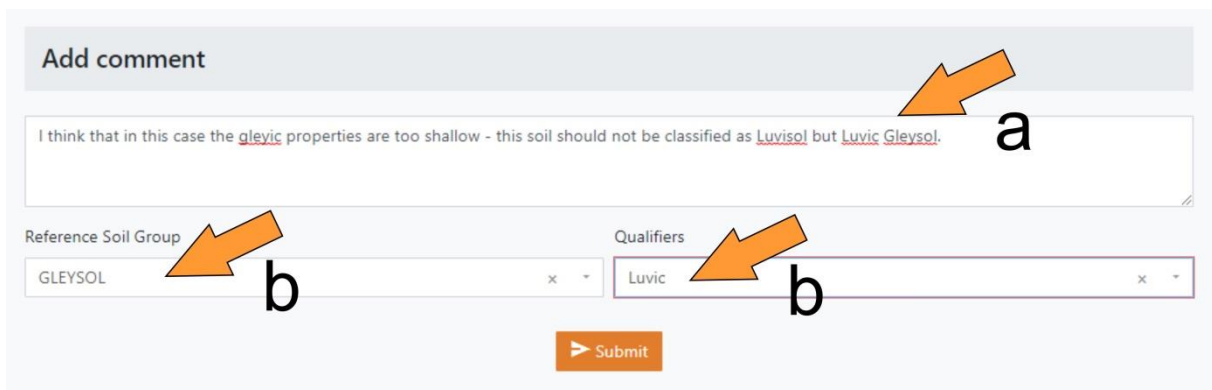


Figure 10. Comment – changes in name are shown in the window of description (a) and by selecting RSGs and/or qualifiers from the drop-down lists (b)

EXAMPLE DISCUSSION

User One is the **author** of **soil entry** with the proposed descriptive name: **Katogleyic PHAEOZEM (Pantosiltic, Aric, Pachic)**. The author has chosen the following parts of the name when entering the soil entry: **PHAEOZEM, Gleyic, Siltic, Aric, Pachic**.

In the soil description you will find information: Soil formed from fluvioglacial sandy deposits with high influence of groundwater. Arable farming. Almost flat terrain with peatland in the south. Two horizons were distinguished with the following characteristics:

- Ap 0-30 cm; loamy sand; weak fine subangular structure; slightly moist; 10YR 4/2;
10YR 3/2; pH 5.5; ploughed horizon;
- Cr 30-150 cm; *gleyic properties*; sand; single grain structure; moist; 5Y 7/2; 5Y 6/2;
pH 5.5;



Figure 11. Photo of soil profile an surrounding – example discussion

Comment from **User 2**: *"The gleyic properties are very shallow (high influence of ground water) – so the soil should be reclassified as **GLEYSOL**".* User 2 also selected **GLEYSOL** from the drop-down list;

Comment from **User 3**: *"Agree, it should be classified as **GLEYSOL**"* - and **GLEYSOL** has been selected from the drop-down list;

Comment from **User 2**: *"I disagree with using of **Pachic** qualifier. It can be seen from the soil morphology that the humus horizon is shallower than 50 cm. Instead of this **Humic** qualifier would be fine! (I think that average organic carbon content from 0 to 50 cm is at least 1%)"* – and selected **Humic** from drop-down list.

Comment from **User 1 (author)**: *"Yes, the organic carbon content was more than 2% at the depth from 0 to 30 cm (averaged to 50 cm - higher than 1%) , so **Humic** is good".*

Comment from **User 2**: *"And of course humus horizon fulfils criteria of the mollic horizon – **Mollic** qualifier is needed!"* – and **Mollic** has been selected from the drop-down list.

Moderator comment: "What do you think of qualifier connected with texture? Is it okay?"

User 1 (author) comment: "Sorry, my mistake – it should be **Arenic** (sand) not **Siltic**".
– and **Arenic** was selected from the drop-down list.

Moderator comment: "I think there is still a qualifier missing that express the base saturation of the soil? Do you have any idea which one?"

Since no one responded to this question for many days, the moderator decided to end this soil discussion.

Moderator comment: "The qualifier **Aric** is correct – this soil looks like it has been ploughed, the only qualifier we missed is **Eutric**. The soil pH values indicate that its addition is necessary here".

Moderator decision: "The final full name of the soil according to WRB 2022 is: **Eutric Mollic GLEYSOL (Arenic, Aric, Humic)**."

At the end of the discussion, points were allocated to the users:

- **User 1 (author)** – **2 points** for **Aric** in the *Anthropos* category, **2 points** for **Arenic** in the *Texture & Stoniness* category and **5 points** for **soil profile photo** in the *Soil Paparazzo* category;
- **User 2** – **10 points** for **GLEYSOL** in the *Water & Redox* category, **4 points** for **Mollic** and **Humic** in the *Humus* category, 5 points for best comment(moderator decision) in the *Debate* category;
- **User 3** – **no points**, the proposal of **GLEYSOL** was repeated after User 2.

11. Categories of development, ranks and badges

CATEGORIES OF DEVELOPMENT

Earning points is not the only gamification element of the app. To enable and encourage participation in **soil discussions** (and thus develop users' skills as a soil classifiers!), the points earned by users are divided into 14 **categories of development**. Twelve of these are associated with correctly proposed RSGs and qualifiers:

Organic materials - the category includes organic soils (HISTOSOLS) and qualifiers related to the properties of organic horizons (e.g., Hemic, Histic, Folic, Murshic). There are also qualifiers describing the activity of edaphone - plants and soil animals (e.g., Arenicolic, Biocrustic, Isopteric) or the specific combination of organic material with mineral components of soils (e.g., Mineralic, Skeletohistic).

Anthropos – class

of soils (ANTHROSOLS and TECHNOSOLS) or horizons, features or materials (e.g., Anthric, Archaic, Ekranic, Mahic, Spolic) that have been created or strongly influenced by humans. Qualifiers expressing high anthropic pressure in the environment of the classified soils are also found here (e.g., Drainic, Escalic).

Limitations – group of soils (CRYOSOLS, LEPTOSOLS, SOLONETZ, SOLONCHACKS) and materials or soil properties (e.g., Cryic, Duric, Evapocrustic, Glacic, Leptic) that significantly limit biological activity – like shallow ice, rocks, salts.

Texture & Stoniness – category with soils highly determined by texture (VERTISOLS, PLANOSOLS, ARENOSOLS) and qualifiers expressing texture classes (e.g., Arenic, Loamic, Clayic, Siltic) or content of coarse fragments (e.g. Skeletic).

Water & Redox – all elements of the designation of soils that are due to result from high influence of water – groundwater (e.g., GLEYSOLS, Gleyic), rainwater (STAGNOSOLS, Gelistagnic, Stagnic) or even water bodies (e.g., Subaquatic, Tidalic).

Iron – soils with diagnostic horizons characterised by high concentration of iron compounds (e.g., PODZOLS, PLINTHOSOLS, NITISOLS and FERRALSOLS, Limonic, Tsitelic, Spodic, Plinthic, Rubic, Rustic) or zones depleted in this element (e.g., Albic).

Geomorphology & Young soils - soils in an early stage of development (ANDOSOLS, CAMBISOLS, FLUVISOLS, REGOSOLS) and qualifiers indicating relatively immature stage of pedogenic transformation of soil horizons (eg., Cambic, Neocambic, Brunic) or materials, or active geomorphological processes (e.g., Aeolic, Solimovic (Colluvic in previous versions of WRB), Fluvic, Nudiyermic).

Humus – category of RSGs or qualifiers defined by very well-developed humus horizons (CHERNOZEMS, KASTANOZEMS, PHAEZOZEMS, UMBRISOLS, Mollic, Umbric, Chernic, Humic, Pachic) and qualifiers related to humus accumulation and

characteristics of humic horizons in general (e.g., Ochric, Carbic, Greyzemic, Nechic, Pellic).

Clay illuviation – clay-illuvial soils of RSGs (RETISOLS, ACRISOLS, LIXISOLS, ALISOLS, LUVISOLS) to soils with an argic horizon (e.g., Luvic, Acric, Lixic, Retic) and features indicate clay illuviation (e.g. Cutanic, Lamellic).

Chemistry/mineralogy – broad spectrum of soils and soil characteristics characterised by a particular mineral composition or pedogenic or lithogenic accumulation of chemical substances (e.g. CALCISOLS, GYPSISOLS, DURISOLS, Calcic, Chloridic, Dolomitic). Qualifiers expressing base saturation (e.g. Dystric, Eutric) also belong to this category.

The assignment of all RSGs and qualifiers to specific **categories of development** is shown in **Table 1 (Appendix 1)**.

In addition to the 12 **categories of development** mentioned above, which are linked to the names of the soils (RSGs or qualifiers) connected with names of soils (RSGs or qualifiers), there are two others:

Soil Paparazzo - each author of the photo of the soil profile of the approved soil entry receives 5 points in this category.

Debater – 5 points can be awarded in this **category of development** at the end of the discussion by decision of the moderator. They should go to the person who has made a particularly important contribution to the discussion of a particular soil entry.

RANKS

Every **user** who **collects points** in certain categories climbs the “development ladder” and thus reaches higher and higher **ranks**:

Pre-Novice 0 – 9 points

Novice 10 – 29 points

Trainee 30 – 49 points

Adept 50 – 99 points

Specialist 100 – 199 points

Master \geq 200 points.

BADGES

Badges are awarded for achieving different ranks in different **categories of development**. They graphically show the **user's** overall level of progress in classifying groups of soils of different types.

In total there are 12 different badges to earn, divided into 3 levels:

- 4 green badges - for "new" soil scientists and to encourage somewhat more advanced;
- 7 orange badges - for really advanced classification skills - for thematically specialised classifiers;
- 1 yellow badge - for real experts!



NEWBORN SOIL TAXONOMIST

Novice ranks in any three categories of developments (3 x 10 points).

It does not matter in which 3 specialties you earn points in at the beginning - you need a shovel and a bucket to dig soil. Like in a sandbox 😊



VERSATILE LEARNER

Novice ranks in any six categories of developments (6 x 10 points).

Maybe for beginners - but comprehensively develop their interest in soils!



PROGRESSING SOIL TAXONOMIST

Trainee ranks in any three categories of development (3 x 30 points).

At least in three different thematic categories - you start to feel more confident 😊



EXPERIENCED SOIL TAXONOMIST

Adept ranks in any three categories of developments (3 x 50 points).

It seems that there are soils (or some of the characteristics you chose) that you can already rank very well at classifying 😊



ORGANIC CARBON EXPERT

Specialist ranks in Organic materials and Humus (100 + 100 points).

This is something for those who like soils rich in organic carbon - in various forms. From organic soils to diagnostic humus horizons. Their hands are often full of "dirt"!



PEDOGEOLOGIST

Specialist ranks in Geomorphology & Young soils and Texture & Stoniness (100 + 100 points).

For someone who also likes geology and geomorphology!



SOIL EXTREMIST

Specialist ranks in Limitations and Chemistry/mineralogy (100 + 100 points).

Someone who likes to work with soil in harsh environmental conditions gets this badge 😊



AQUARTIFICIALIST

Specialist ranks in Anthropos and Water & Redox (100 + 100 points).

He is no stranger to too much water in the soil and/or artefacts - you can tell he/she probably likes them.



TRANSITIONIST

Specialist ranks in Iron and Clay illuviation (100 + 100 points).

Podzolization and lessivage are just some of the advanced processes that are no problem for this specialist when classifying soils!



ELOQUENT PUBLICIZER

Specialist ranks in Soil paparazzo and Debate (100 + 100 points).

A true photographer and at the same time someone who knows how to justify his classification decisions - in soil debates.



PEATBULL

Specialist ranks in Organic materials and Water & Redox (100 + 100 points).

Should you be afraid of him? Not necessarily, he/she's probably sitting somewhere in the swamp 😊



MASTER OF SOIL MASTERS

Master ranks in any five categories of developments (5 x 200 points).

A badge for someone who knows soil classification so well that he/she could judge soils with his eyes closed...

The badges are visible in the user's profile (**Fig. 3 - c**) - they are also displayed in the soil discussion next to the user's avatar - so you can immediately see what experience the commentator has.

<p>The upper part of organic material is hemic - maybe You can make some more details in qualifier list describing this feature - that form 0 to 40 it is hemic and from 40 to more than 100 it is fibric?</p>	
<p>What about this Hemic? Epihemic, Katofibric?</p> <p>My qualification: RSG: -, Qualifiers: Hemic</p>	
<p>Yes, You are right. We could specify the depths of different organic material occurrence. So the full name of this soil would be like this: Eutric Rheic Drainic Epihemic Katofibric Histosol (Hyperorganic)</p>	

Figure 12. Badges visible in soil discussions

12. Soil profiles database – Soil digger

After the **soil discussion** is completed and the final soil name is approved, the entire **soil entry** is transferred to the **soil database**. To view this database, click on the **Soil digger - database** button on the dashboard (**Fig. 2**).

In the **Soil digger - database** panel, you can search for specific Reference Soil Groups (**Fig. 13 – a**), that contain a specific qualifier (**Fig. 13 – b**) or that fulfil both criteria at the same time. You can also switch to the map view (**Fig. 13 – c**) and search it by clicking on the location markers of individual soil profiles.

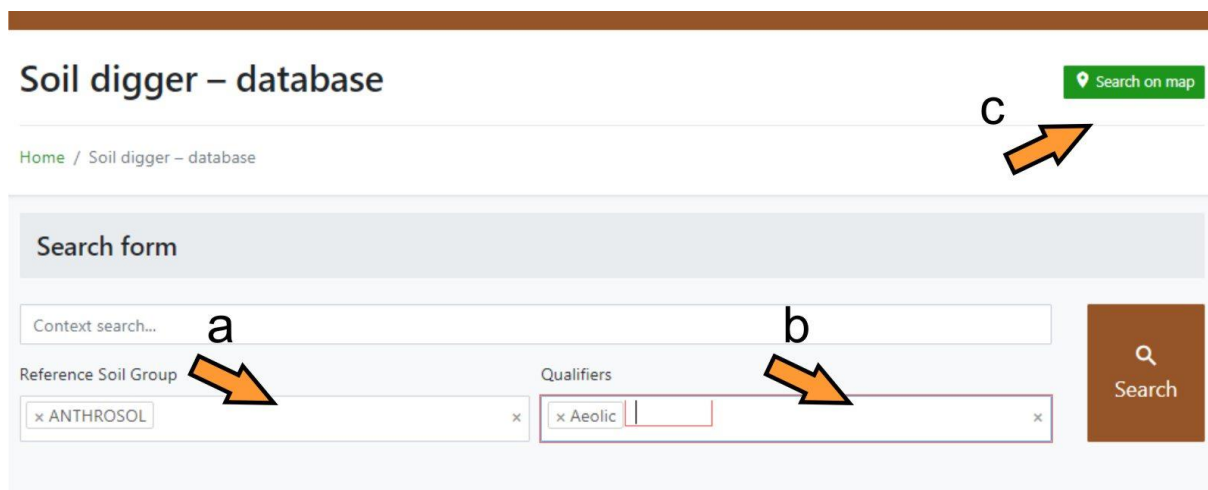


Figure 13. Soil digger - database

The portal and the Share Your Soils application hide a few other small possibilities - discovering them yourself will no longer be a problem after you have familiarised yourself with the options described above.

The presented version is a prototype and still contains many elements that need to be improved/extended.

If you have any questions, please contact:

swit@umk.pl - Marcin Świtoniak

13. Authors with affiliation

GIAN FRANCO CAPRA

DIPARTIMENTO DI ARCHITETTURA, DESIGN E URBANISTICA
UNIVERSITÀ DEGLI STUDI DI SASSARI, ITALY
PEDOLNU@UNISS.IT

PRZEMYSŁAW CHARZYŃSKI

DEPARTMENT OF SOIL SCIENCE AND LANDSCAPE
MANAGEMENT, FACULTY OF EARTH SCIENCES AND
SPATIAL MANAGEMENT, NICOLAUS COPERNICUS
UNIVERSITY TORUŃ, POLAND
PECHA@UMK.PL

MANUEL PULIDO-FERNÁNDEZ

UNIVERSITY RESEARCH INSTITUTE FOR SUSTAINABLE
TERRITORIAL DEVELOPMENT, UNIVERSIDAD DE EXTREMADURA,
SPAIN
MAPULIDOF@UNEX.ES

ANTONIO GANGA

DIPARTIMENTO DI ARCHITETTURA, DESIGN E URBANISTICA
UNIVERSITÀ DEGLI STUDI DI SASSARI, ITALY
AGANGA@UNISS.IT

BARTŁOMIEJ GLINA

DEPARTMENT OF SOIL SCIENCE AND LAND PROTECTION,
POZNAN UNIVERSITY OF LIFE SCIENCES, POZNAŃ,
POLAND
BARTLOMIEJ.GLINA@UP.POZNAN.PL

CEZARY KABAŁA

INSTITUTE OF SOIL SCIENCE AND ENVIRONMENTAL
PROTECTION, WROCLAW UNIVERSITY OF ENVIRONMENTAL
AND LIFE SCIENCES WROCLAW, POLAND
CEZARY.KABALA@UPWR.EDU.PL

ŁUKASZ MENDYK

DEPARTMENT OF SOIL SCIENCE AND LAND PROTECTION,
POZNAN UNIVERSITY OF LIFE SCIENCES, POZNAŃ,
POLAND
MENDYK.GEO@GMAIL.COM

TIBOR JÓZSEF NOVÁK

UNIVERSITY OF DEBRECEN, DEPARTMENT OF LANDSCAPE
PROTECTION AND ENVIRONMENTAL GEOGRAPHY,
DEBRECEN, HUNGARY
NOVAK.TIBOR@SCIENCE.UNIDEB.HU

VÍT PENÍŽEK

DEPARTMENT OF SOIL SCIENCE AND SOIL PROTECTION,
CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE, CZECHIA
PENIZEK@AF.CZU.CZ

ENDLA REINTAM

INSTITUTE OF AGRICULTURAL AND ENVIRONMENTAL
SCIENCES, ESTONIAN UNIVERSITY OF LIFE SCIENCES,
TARTU, ESTONIA
ENDLA.REINTAM@EMU.EE

BLAŽ REPE

GEOGRAPHY DEPARTMENT, FACULTY OF ARTS, UNIVERSITY
OF LJUBLJANA, SLOVENIA
BLAZ.REPE@FF.UNI-LJ.SI

MARCIN SYKUŁA

DEPARTMENT OF SOIL SCIENCE AND LANDSCAPE
MANAGEMENT, FACULTY OF EARTH SCIENCES AND
SPATIAL MANAGEMENT, NICOLAUS COPERNICUS
UNIVERSITY TORUŃ, POLAND
SYKULA@UMK.PL

SZABOLCS CZIGÁNY

DEPARTMENT OF PHYSICAL AND ENVIRONMENTAL
GEOGRAPHY, UNIVERSITY OF PÉCS, HUNGARY
SCZIGANY@GAMMA.TTK.PTE.HU

MARCIN ŚWITONIAK

DEPARTMENT OF SOIL SCIENCE AND LANDSCAPE
MANAGEMENT, FACULTY OF EARTH SCIENCES AND
SPATIAL MANAGEMENT, NICOLAUS COPERNICUS
UNIVERSITY TORUŃ, POLAND
SWIT@UMK.PL

ILZE VIRCAVA

INSTITUTE OF SOIL AND PLANT SCIENCES, LATVIA
UNIVERSITY OF LIFE SCIENCES AND TECHNOLOGIES,
JELGAVA, LATVIA
ILZE.VIRCAVA@LLU.LV

Project: SHARE YOUR SOILS

ERASMUS+ Programme STRATEGIC PARTNERSHIPS
2019-1-PL01-KA203-065101

Co-funded by



The views expressed in this work are those of the contributors and do not necessarily reflect those of the European Commission.

This work is licensed under Creative Commons Attribution 4.0 International (CC BY 4.0)



APPENDIX 1

Table 1. Allocation of RSGs and qualifiers to the categories of development

*10, 2 - points Part of soil name	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOGY
RSG:										
HISTOSOLS	10*									
ANTHROSOLS		10								
TECHNOSOLS		10								
CRYOSOLS			10							
LEPTOSOLS			10							
SOLONETZ			10							
VERTISOLS				10						
SOLOCHACKS			10							
GLEYSOLS					10					
ANDOSOLS							10			
PODZOLS						10				
PLINTHOSOLS						10				
PLANOSOLS				10						
STAGNOSOLS					10					
NITISOLS						10				
FERRALSOLS						10				
CHERNOZEMS								10		
KASTANOZEMS								10		
PHAEZEMS								10		
UMBRISOLS								10		
DURISOLS										10
GYPSISOLS										10
CALCISOLS										10
RETISOLS									10	
ACRISOLS									10	
LIXISOLS									10	
ALISOLS									10	
LUVISOLS									10	
CAMBISOLS							10			
FLUVISOLS							10			
ARENOSOLS				10						
REGOSOLS							10			

*10, 2 - points Part of soil name	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOLOGY
Qualifiers:										
Abruptic				2						
Aceric										2
Acric								2		
Acroxic										2
Activic								2		
Aeolic							2			
Akrofluvic							2			
Akromineralic							2			
Akroskeletal				2						
Albic						2				
Alcalic										2
Alic								2		
Aluandic										2
Andic										2
Anthraquic		2								
Anthric		2								
Anthromollic		2								
Anthroumbic		2								
Archaic		2								
Arenic				2						
Arenicolic	2									
Areninovic				2						
Argisodic								2		
Aric		2								
Arzic					2					
Biocrustic	2									
Brunic							2			
Calcaric										2
Calcic										2
CalcifRACTic										2
Cambic							2			
Capillaric					2					
Carbic								2		
Carbonatic										2
Carbonic		2								
Chernic								2		

*10, 2 - points Part of soil name	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOLOGY
Chloridic										2
Chromic						2				
Claric						2				
Clayic				2						
Clayinovic				2						
Coarsic				2						
Cohesic			2							
Columnic										2
Cordic						2				
Cryic			2							
Cutanic								2		
Densic			2							
Differentic								2		
Dolomitic										2
Dorsic			2							
Drainic		2								
Duric			2							
Dystric										2
Ejectiskeletic				2						
Ekranic		2								
Endic			2							
Entic						2				
Epic			2							
Escalic		2								
Eutric										2
Eutrosilic										2
Evapocrustic			2							
Ferralic						2				
Ferric						2				
Ferritic						2				
Fibric	2									
Floatic	2									
Fluvic							2			
Folic	2									
Fractic			2							
Fragic			2							
Garbic	2									

*10, 2 - points	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOLOGY
Part of soil name										
Gelic			2							
Gelistagnic					2					
Geoa abruptic				2						
Geric										2
Gibbsic										2
Gilgaic							2			
Glacic			2							
Gleyic					2					
Glossic									2	
Greyzemcic								2		
Grumic								2		
Gypsic										2
GypsifRACTic										2
Gypsic										2
Haplic							2			
Hemic	2									
Histic	2									
Hortic		2								
Humic								2		
Hydragric		2								
Hydric					2					
Hydrophobic					2					
Hyperalic									2	
HyperartefACTic		2								
Hypercalcic										2
Hyperduric			2							
Hyperdystric										2
Hypereutric										2
Hyperferritic						2				
Hypergarbic		2								
Huypergeric										2
Hypergyptic										2
Hyperhumic								2		
Hyperhydragric		2								
Hypermagnesian										2
Hypernatric			2							
Hyperorganic	2									

*10, 2 - points Part of soil name	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOLOGY
Hypersalic			2							
Hypersideralic						2				
Hyperspodic						2				
Hyperspolic		2								
Hypersulfidic			2							
Hypertechnic		2								
Hyperthionic			2							
Hyperurbic		2								
Hyposulfidic										2
Hypothionic										2
Immissic		2								
Inclinic					2					
Inclinigleyic					2					
Inclinistagnic					2					
Infraandic										2
Infraspodic						2				
Irragric		2								
Isolatic		2								
Isoptric	2									
Kalaic		2								
Lamellic									2	
Lapiadic				2						
Laxic							2			
Leptic			2							
Lignic	2									
Limnic							2			
Limonie						2				
Linic		2								
Lithic			2							
Litholinic				2						
Lixic									2	
Loamic				2						
Loaminovic				2						
Luvic									2	
Magnesian										2
Manganiferic						2				
Mahic		2								

*10, 2 - points	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOGY
Part of soil name										
Mawic	2									
Mazic			2							
Mineralic	2									
Minerolimnic							2			
Mochipic					2					
Mollic								2		
Mulmic								2		
Murshic	2									
Muusic			2							
Naramic										2
Natric			2							
Nechic								2		
Neobrunic							2			
Neocambic							2			
Nitic				2						
Novic							2			
Nudiargic									2	
Nudilithic			2							
Nudinatric			2							
Nudipetric			2							
Nudiyermic							2			
Ochric								2		
Oligoeutric										2
Ombric					2					
Organolimnic	2									
Organotransportic		2								
Ornithic										2
Orthodystric										2
Orthoeutric										2
Orthofluvic							2			
Orthomineralic	2									
Orthoskeletal				2						
Ortsteinic			2							
Oxyaquic					2					
Oxygleyic					2					
Pachic								2		
Panpaic							2			

*10, 2 - points Part of soil name	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOLOGY
Paviyermic							2			
Pellic								2		
Pelocrustic			2							
Petric			2							
Petrocalcic			2							
Petroduric			2							
Petrogypsic			2							
Petroplinthic			2							
Petrosalic			2							
Pisoplinthic						2				
Placic						2				
Plaggic		2								
Plinthic						2				
Posic										2
Pretic		2								
Profondic									2	
Profundihumic								2		
Protic							2			
Protoandic										2
Protoargic									2	
Protocalcic										2
Protogleyic					2					
Protogypsic										2
Protokalaic		2								
Protosalic										2
Protosodic										2
Protospodic						2				
Protostagnic					2					
Prototechnic		2								
Prototephric							2			
Protovertic				2						
Puffic										2
Pyric		2								
Radiotoxic			2							
Raptic				2						
Reductaquic					2					
Reductic					2					

*10, 2 - points	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOGY
Part of soil name										
Reductigleyic					2					
Relictigleyic					2					
Relictistagnic					2					
Relictiturbic			2							
Relocatic		2								
Rendzic								2		
Retic									2	
Rheic					2					
Rhodic						2				
Rockic			2							
Rubic						2				
Rustic						2				
Salic										2
Sapric	2									
Saprolithic			2							
Sideralic						2				
Silandic										2
Siltic				2						
Siltinovic				2						
Skeletalic				2						
Skeletofolic	2									
Skeletohistic	2									
Skeletotransportic		2								
Sodic										2
Solimovic							2			
Sombric								2		
Someric								2		
Somerimollic								2		
Somerirendzic								2		
Someriumbric								2		
Spodic						2				
Spolic		2								
Stagnic					2					
Subaquatic					2					
Sulfatic										2
Sulfidic										2
Takyric							2			

*10, 2 - points	Category of development									
	ORGANIC MATERIALS	ANTHROPOS	LIMITATIONS	TEXTURE & STONINESS	WATER & REDOX	IRON	GEOMORPHO & YOUNG	HUMUS	CLAY ILLUV	CHEMISTRY/MINERALOGY
Part of soil name										
Technic		2								
Technotephric		2								
Tephric										2
Terric		2								
Thionic			2							
Thixotropic										2
Thyric		2								
Tidalic					2					
Tonguic								2		
Tonguichernic								2		
Tonguimollic								2		
Tongiumbric								2		
Totilamellic				2						
Toxic			2							
Transportic		2								
Tsitelic						2				
Turbic							2			
Umbric								2		
Urbic		2								
Uterquic					2					
Vermic								2		
Vertic				2						
Vitric										2
Wapnic	2									
Xanthic						2				
Yermic							2			

APPENDIX 2 – glossary

Author - the user who created and uploaded the soil entry.

Categories of development - categories in which points are awarded, defined by the main soil characteristics considered in their classification.

Collect points – receiving points for correct suggestions of soil name elements, distinctive participation in the discussion, adding an entry with a photo of the soil profile.

Dashboard – main control panel of each user.

Moderator – teacher who approves soil entries before they are “published”, leads soil discussions and approves final soil names.

Soil discussions – debates on the systematic position of soil (there is a separate discussion for each soil entry), where users propose changes to soil names, select qualifiers and reference groups, and support these decisions with reasoned comments. At the end of the discussion, points are awarded for correctly selected soil name elements.

Soil entry – all elements related to the description of a soil e.g., soil profile photo, environment photo, WRB name, location, soil horizon data.

User – a person registered with Share Your Soils - author of soil entries, debater as well as a person who only searches the soil database.



User manual