

organic agricultural sciences **U N I K A S S E L**

Organic Plant Production and Agroecosystems
Research in the Tropics and Subtropics

A Step-by-Step Guide to Preparing a Portable Soil Profile (PSP) Using the Lacquer Peel Method



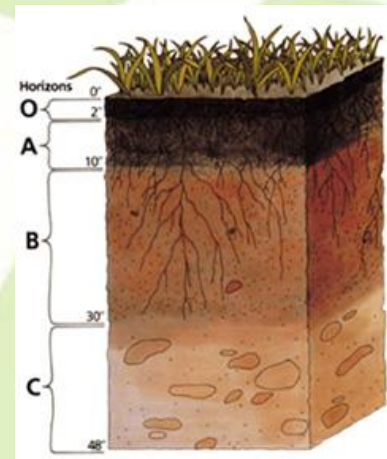
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Introduction

The use of soil profiles is of great benefit when learning and teaching about soils. Typically, photos of soil profiles are used to demonstrate soil physical characteristics, such as horization, color and structure. To get a more hands-on experience of soil profiles, digging soil pits in the field is best. However, this is not easy to do for non-local profiles. The preparation of portable soil profile columns (e.g. by the "Soil Monolith" method) is complicated and time consuming. The resulting columns are also fragile and heavy, therefore difficult to transport.

However, with the "Lacquer Peel Method", soil profiles for presentation are easy to produce, to handle and to transport. These soil profiles can be transported in a suitcase, mounted on wooden boards later and hung on a wall for display.

The method was created in the early 20th century, and has been successfully applied in the Department of Organic Plant Production and Agroecosystems Research in the Tropics and Subtropics of the Faculty of Organic Agricultural Sciences, University of Kassel, Germany. The "Step-by-Step Guide to Preparing a Portable Soil Profile (PSP) Using the Lacquer Peel Method" was prepared to give the reader an overview of the method, a detailed and visual description of each step of the preparation process and practical tips and tricks to overcome common difficulties.



A soil profile with the typical horizons: O (Organic), A, B & C

Brief description of the method

First, locate a soil that is characteristic of the area or contains certain features of interest to you. Expose the profile by digging a pit or locating an overhang. Prepare a smooth vertical surface.

Then apply a mix of thinner and lacquer (4:1) with a spray bottle until the surface is soaked with the mixture. To accelerate the drying process, carefully set the soaked profile surface on fire, until the thinner is almost burned away and only a layer of lacquer is left.



People applying gauze bandages to a soil profile in a pit.

Hang two layers of gauze bandage loosely over the surface and with a brush apply multiple layers of a more concentrated thinner and lacquer mix (2:1 or 1:1).

After 1 hour of drying, the gauze with its adherent soil layer is carefully removed from the pit by cutting the soil 5-10 cm behind the gauze layer with a spade. Excess soil (i.e. soil not glued to the gauze with lacquer) is removed by carefully shaking the soil profile. To fill-in areas where soil did not adhere to the gauze, soil samples are taken from the corresponding horizon of the profile, packed

in plastic bags and labeled. Gaps on the gauze are filled with this soil after minimum one day of drying.

Checklist of items needed to prepare and transport a PSP

At the sampling site:

- Digging tools (shovel, spade, brick trowel, etc.) → for digging a soil pit;
- Thinner/solvent (acetone, if not available, use benzene or petroleum ether);
- Lacquer (we use *Renia*, an all-purpose cement shoe repair glue for leather);
- Tins/jars/glasses → for mixing lacquer & thinner;
- Hand-Pump-Spray bottle (such as the ones used for pesticide application)
 - should be available at construction centers, hardware or do-it-yourself stores.
- Matches/lighter (for burning off thinner);
- Gauze/cotton tissue (medical supply, for one profile ca. 1m is needed);
- Brush (4-10 cm broad);
- Permanent marker, plastic bags, paper, scissors, knife;
- Stable board → to transport the fragile profile from sampling site to lab for further preparation.



Mixing acetone and lacquer in a tin ... remember to use appropriate ratio.



Pouring mixture into spray bottle.

In the lab:

- Thinner and lacquer (to touch-up gaps in profile by replacing soil, stones and roots collected at sampling site);
- Tins/jars/glasses;
- Paint brushes;
- Scissors, knife;
 - open windows or use exhaust duct in closed rooms.

For transport:

- Foam packing material → to wrap profile;
- Wide plastic sheet, plastic bags;
- String, tape;
- Thin plywood, 4 mm (same size as the profile)
- Thicker and more robust board (core board, 1 cm thick)



Dabbing lacquer into cavities in the soil profile with a brush.

Things to consider before starting

- Soil profile has to be dry, not wet, not frozen!
- Try to avoid big roots or stones in your profile: they tend to fall off. If they are present, collect them for later replacement onto the final, prepared profile.

How to prepare a PSP on site

1. Choose a site with soil that is representative of the area or that contains characteristics of interest to you. Dig a soil pit to expose the soil profile. The hole should be large enough:
 - a. to allow you to work on the whole depth of the column;
 - b. for air to circulate and dry the profile; and
 - c. to safely burn off thinner.
2. Make sure that the surface of the profile is vertical, flat and even.
The more cavities you have on the surface, the less soil adheres to the gauze later and the more you have to work in the lab to fill empty spaces with soil.
3. Mix the thinner and the lacquer at a 3 to 4:1 ratio.
4. The mixed liquid should be thin enough to be sprayed onto and soak the entire surface of the soil column.
5. Fill the mix in a spray bottle and carefully spray the surface of the profile from top to the bottom at a width of about 40 cm.
Make sure the whole profile surface is sprayed with the liquid until the soil is saturated and no more mix is soaked up.
6. The thinner should be allowed to evaporate from the profile surface. To accelerate the process and to remove additional thinner, set the profile surface on fire.
The profile can burn for minutes.
After this step, a thin peel of dried lacquer should appear on the profile face.



A vertically dug profile



Spray until soil is saturated, then light with care.



CAUTION!

The thinner-lacquer mix is **highly flammable** and may burn very fast and strong. Be extremely careful.

Use a burning roll of paper to set the saturated profile on fire by throwing the paper at the profile from a distance.

To avoid flames spreading, make sure to remove all chemicals from the site before starting the fire. Have a bucket of water or soil handy to stifle flames if they start to spread.

7. Hang two layers of gauze, 30-40 cm wide on the profile.

It is important to apply the cloth a bit loosely, to allow it to later fill cavities.

You can attach it at the top with nails.



Gauze draped loosely over profile, attached to top with nails.

8. Mix the thinner and the lacquer at a ratio of 2:1. Fill it in tins wide enough to dip your brush into. Apply the mixture abundantly to the gauze, letting it soak the cloth.

Avoid cavities or letting air bubbles develop (mind the work later in the lab).

The gauze should stick to the soil as much as possible.



9. Let the lacquer dry for 30-60 minutes, it should be as dry as possible before further steps are undertaken.

10. When the lacquer is dry, cut the soil profile from the pit wall at a distance of 5-10 cm from profile surface. It is useful to have two people to undertake this step: one person cuts the profile from the pit wall while the other supports the profile and gently removes it from the wall as it gets loose.

Use a spade, taking care not to cut the gauze with the blade. After you have loosened the profile, shake it carefully to get rid of excess soil that has not adhered to the gauze.



11. Place the profile, gauze-side down, on a board for transport to the lab.

12. For further preparation in the lab, take soil samples from every horizon uncovered, ensuring that you have at least 200-400 g of each. Bag and label soil samples for easy identification later.



Cutting profile from pit wall with spade ...

... sometimes the amount of empty spaces on the gauze depends as much on the soil in the profile as on the care you took making the PSP.

Preparation for transport to the lab

In general, soil profiles are very fragile, so the preparation has to be done carefully in order to prevent the PSP from damage during transport.

13. Take the profile and wrap it in layers of foam. Fix the wrapped PSP on a board. It is also possible to fold the wrapped PSP for transport. To do so, place a board onto the gauze side of the PSP and fold the PSP around to board, then wrap in foam.



Carefully packed PSP

14. Use tape or string to fix foam to PSP and secure the bundle.

Final preparation

If necessary, the PSP is carefully unfolded in the lab. For more stability we recommend gluing the PSP onto a thin plywood sheet (4 mm). Apply a lot of glue to the wood and lay the PSP on it.

To ensure the PSP adheres to the wood, place a thick layer of foam material (>6 cm) on top of the PSP and put some heavy objects (bricks, stones, etc.) on top of the foam to ensure equal pressure. Once the glue has dried and the PSP is fixed onto the plywood sheet, you can glue particles like stones, roots or soil on the surface where gauze is visible (i.e. where a cavity was present and the lacquer did not reach soil). Use pure flexible glue, like the leather glue, put it on the empty spots and stick stones or dust on it. The surface should look like dry soil and not saturated with glue. After one day of drying, the PSP is ready to be fixed on a thicker board for more stability.



Foam material folded and marked



Heavy stones placed on foam to press the PSP on to the sheet of plywood.



PSP unpacked after shipping, packed in foamed material. Loose soil is removed by brush, air or slow careful overturning.

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Ideas to improve this guide are welcome.

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A finished, well-prepared PSP.