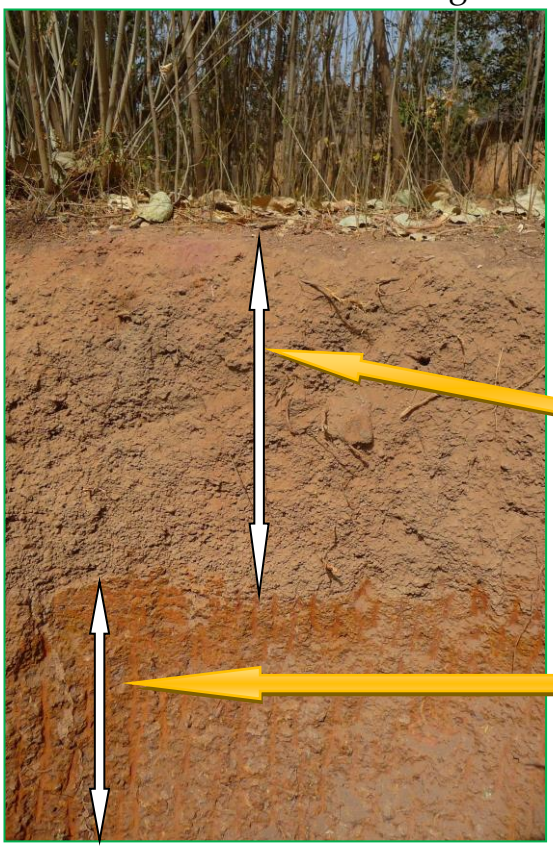
Root wells, to grow the impossible trees!

In Burkina Faso, as in most Sahelian countries, shallow soils over lateritic crust are very common. This makes it difficult for trees and shrubs to take root, as they are forced to thread their roots and rootlets through the random cracks in the laterite. This laterite forms a layer of variable thickness that blocks or hinders the path of roots toward the softer, moister layers underneath.



To facilitate the root penetration of trees and shrubs, we have developed the concept of **root wells** and their variant, **root trenches**.

Laterite is the product of intense chemical weathering of rocks under a hot, humid tropical climate. This process leads to the dissolution and leaching of soluble elements, and the concentration of iron and aluminum oxides, forming a hardened reddish rock as a crust on its surface. The lateritic layers observed today are very ancient geological formations.

Methodology:

Observing that Sahelian trees struggle to penetrate the lateritic layer to secure their water supply during the dry season, we initiated this root well technique in 1998. The idea is to dig wells through the lateritic layer, which is 1 to 4 meters thick depending on the location, in order to facilitate the infiltration of rainwater and root penetration toward deep, friable rock layers favorable to root development and to the trees' water supply during the dry season.

www.eauterreverdure.org / info@eauterreverdure.org

Step-by-step method:

Period: this work is done in the dry season, between November and early May, for reasons of workforce availability and safety, as the first soft layers can collapse.

Necessary tools: metal stakes, marking template, short-handled pickaxe and shovel, hard hats, gloves, crowbar, hammer, chisel, masonry bucket and rope for extraction. We even tried using jackhammers, but this makes the cost of the operation skyrocket.

After determining the precise planting locations (orchard, tree-lined road, forest or ornamental trees), a circle 90 centimeters in diameter is marked on the ground around each location, indicated by a stake. The 90 centimeters are a compromise between a size sufficient for root development and a descent without a ladder by the operator inside the well, thanks to footholds dug into the wall of the well.

We start digging, and if down to 80 to 100 centimeters in depth we do not encounter laterite, depending on the quality of the soil, we can decide not to make a root well, since the soil allows good development of forest roots, unless below this first layer there is a laterite that is very hard and impenetrable by roots.

If we encounter laterite before 80 centimeters in depth, we must absolutely plan to break through this lateritic layer until reaching the softer underlying layers, most often composed of sandy clays resulting from the ancient degradation of granite.

In both cases, the excavated soil must be placed all around the hole for two reasons: first for safety, so that the hole can be spotted from a distance by passersby, and second to make it easier to mix the different types of soil during the backfilling that will follow once the digging is finished.

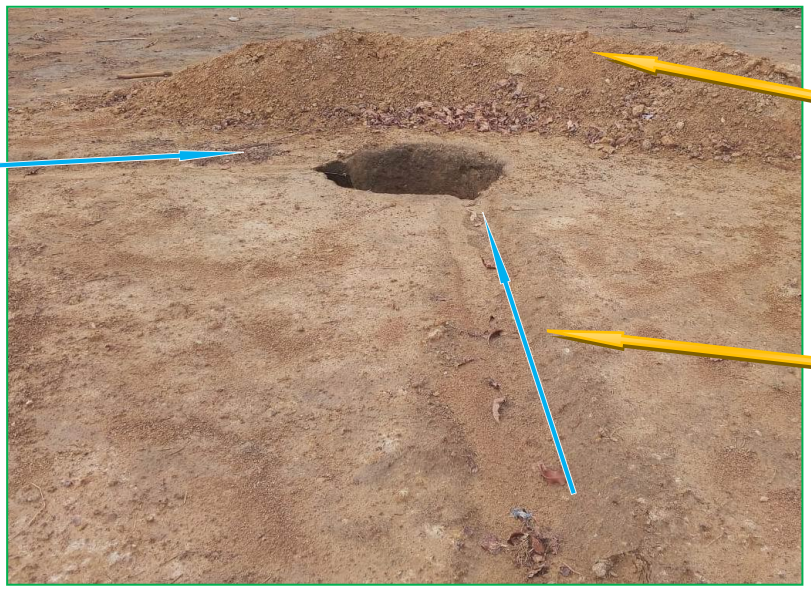
Root wells in the Sahel

Laterite shows great variability in hardness, ranging from hard to very hard forms, making digging difficult and slow, sometimes significantly increasing the cost of building the root wells.

When the lower level of the lateritic layer is reached, digging continues one more meter deep into the friable rock so that the roots can penetrate it more easily.

Generally, a well is dug by two people working in shifts, one in the hole digging and the other at the surface hauling up the spoil and arranging it in a circle around the hole. Depending on the diligence of the operators, the hardness of the laterite encountered, and the depth to be reached, digging a root well can take anywhere from one day to a week of work.

At the surface, we therefore find laterite and sandy clay arranged in layers. They will be mixed together and put back into the well during backfilling.



Due to root proliferation, not all the excavated rocks can be put back into the hole during backfilling.

Once the well is backfilled, two deflectors will channel rainwater into the well.

Rainwater causes the backfilled soil to compact and settle by 50 to 80 centimeters within the well. We then fill in with the rest of the root proliferation material, mixed with compost to reform a living soil.

The last remains of the root proliferation material will be used to build a half-moon berm so that a maximum amount of rainwater enters the root well toward the deeper layers, thus facilitating the descent of the roots.

Variant, the root trench:

In the establishment of mixed hedges for the outer boundary of bocage enclosures, the layout sometimes passes through highly lateritic areas. We then apply the root well principle in a linear fashion: the root trench, which creates loose soil at depth for the development of the hedge shrubs' roots. At this level, the width of the root trench must reach one meter to facilitate the work.

The metal stakes of the mixed hedge are lengthened by welding so they can anchor into the holes dug afterward at the bottom of the root trench, since they would not hold in the loose soil of the backfilling.

Results obtained:

This makes it possible:

- To avoid, or even completely eliminate, watering during the dry season. An early planting (end of June – beginning of July) allows the roots to follow the water that has infiltrated deep down throughout the rainy season.
- To achieve a plant survival rate close to 100%.
- To create orchards on lateritic terraces,
- To plant trees along roads that often pass through lateritic areas because they are drier,
- To maintain the planned layout of mixed bocage hedgerows, by crossing lateritic zones without having to go around them.
- To reforest forest areas or cultivated zones where trees have disappeared due to insufficient soil depth; we call these the "trees of the impossible"!

Conclusion :

Root wells add to the techniques of the Sahelian bocage that help overcome the frustration caused by the loss of rainwater during torrential rains. The technique is relatively costly, but it is fully in line with sustainability: root wells produce trees that are productive over the long term, and their holes remain usable for future generations!

A video allows you to visualize the steps of the process, as a complement to this technical sheet: **https://youtu.be/3rD0MuWmFoo**

For further information:

eau.terre.verdure@gmail.com ; info@eauterreverdure.org ;
Website: www.eauterreverdure.org