Soil Mapping for Sustainable Land Use Planning
3rd Joint Workshop of the IUSS Working Groups on Digital Soil Mapping & GlobalSoilMap
January 21-24, 2025, ICAR-National Bureau of Soil Survey and Land Use Planning, Bengaluru, Karnataka,

Seedling: A User-Friendly, Scalable, and Collaborative Digital Soil Mapping Workflow

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ISRIC – World Soil Information

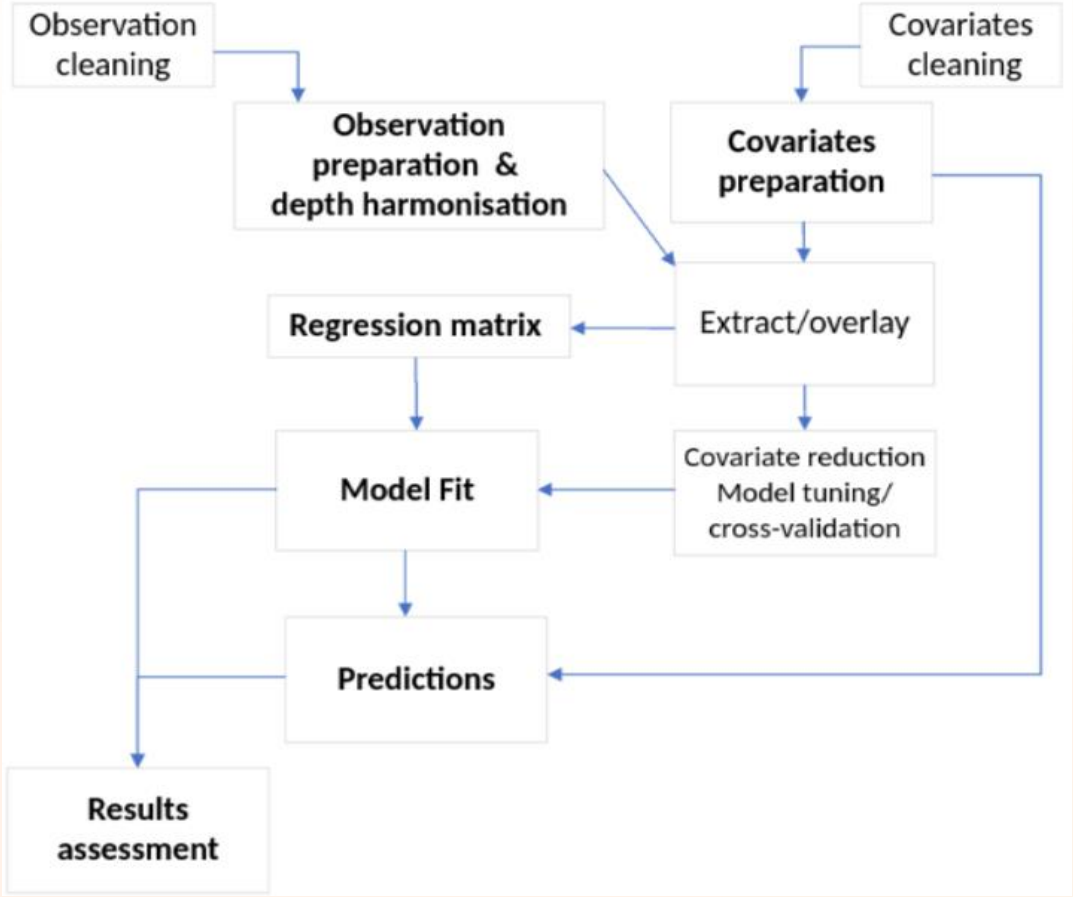
DSM workflow - Motivation

- Digital Soil Mapping (DSM) workflows have common features
- Modular structure to ease maintenance (functions and code library)
- Need-based tools and methods

Operational tool that facilitates the process

DSM workflow - Motivation

- DSM workflow Common features



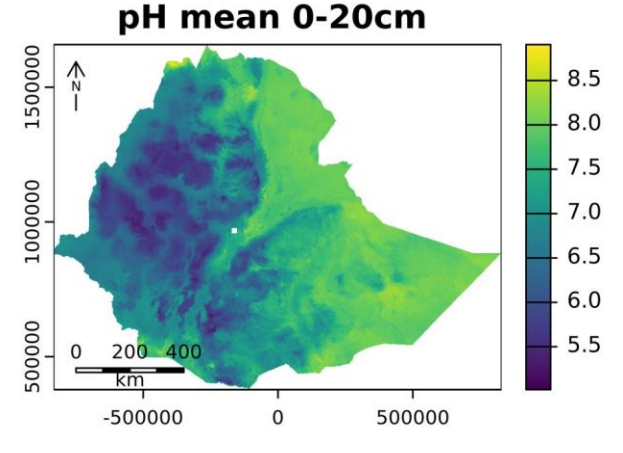
DSM workflow - Seedling

Main characteristics

- Completely R based
- Easy to Use for people with limited DSM expertise
- Multiplatform (Windows, Linux, Mac)
- Running on single laptop/workstation (and on HPC, cloud-computing, etc.)

Seedling - What is it

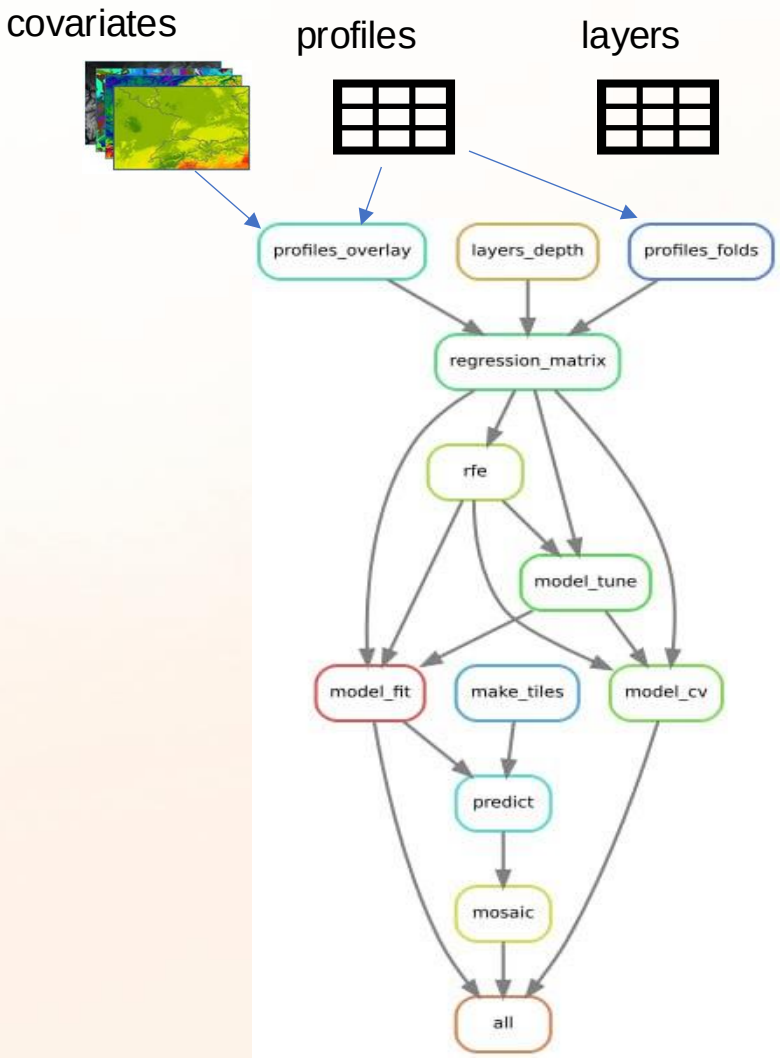
- What is it
  - A modular software stack to perform DSM. R package and configuration files
  - An operational tool
  - Based on SoilGrids workflow (but not limited to)
  - Starts with **standardised inputs**
  - Produces: Maps, Accuracy stats, Plots, and more
- What is it **not**
  - A data preparation tool
  - A training tool



Seedling - Main features

- What does it do
  - 2D and 3D modelling
  - Depth standardisation: weighted average of layers (for 2D)
  - Recursive feature elimination
  - Hyperparameter tuning
  - Accuracy (Cross validation) – Uncertainty maps
  - Parallel predictions with tiles

- Licence: GPL v3



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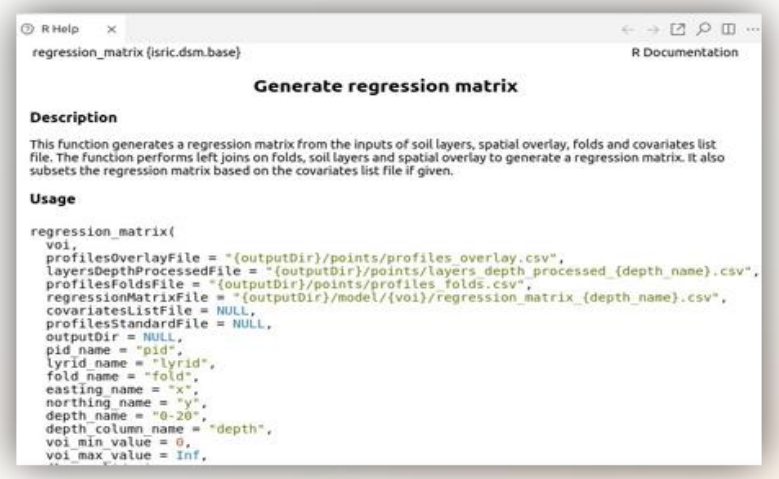
Seedling - Documentation

- R package documentation {isric.dsm.base}
- The online documentation contains:
  - How to install the workflow and its dependencies
  - How to setup and run the workflow
  - Additional information on modelling and design choices
  - The Licence



Seedling - Usage

To use the workflow, you will need two files

- Configuration file: where all the options are defined
- Workflow script: runs the steps of the workflow

```yaml
# Input/Output files definition
outputDir: "./output/"
profilesStandardFile: "./input_example/points/geul_profiles_4326.csv"
layersStandardFile: "./input_example/points/geul_layers.csv"
covarsDir: "./input_example/covariates"
maskFile: "./input_example/other/geul_mask.tif"

# The variable of interest
voi: "pb"

voi_parameters:
  voi_min_value: 0
  voi_max_value: Inf
  transformation:  "notransform"

# Dataset variables
pid_name: "pid"
lyrid_name: "lyrid"
easting_name: "x"
northing_name: "y"
top_layer_name: "top"
bottom_layer_name: "bottom"
depth_column_name: "depth"
fold_name: "fold"
stratum_name: "stratum"

# Model parameters
depth_name: "0-20"
depths_3D:
  - "0,5,15,30,60,100,200"
use_rfe: "dorfe"
do_tune: "notune" # "tune"
```

```r
library(isric.dsm.base)
library(argparser)

config_location <- "config.yaml"

p <- arg_parser("Run the entire workflow")
p <- add_argument(
     parser = p, arg = "--config_file",
     help = "configuration file location", default = config_location
)
config <- yaml::read_yaml(parse_args(p)$config_file, eval.expr = TRUE)

# ## Prepare

profiles_overlay(
     profilesStandardFile = config$profilesStandardFile,
     covarsDir = config$covarsDir,
     profilesOverlayFile = config$profilesOverlayFile,
     covariatesListFile = config$covariatesListFile,
     outputDir = config$outputDir,
     easting_name = config$easting_name,
     northing_name = config$northing_name,
     crs_profiles = config$crs_profiles,
     pid_name = config$pid_name,
     covariate_pattern = config$covariate_pattern,overwrite = config$overwrite
)

layers_depth(
     layersStandardFile = config$layersStandardFile,
     layersDepthProcessedFile = config$layersDepthProcessedFile,
     outputDir = config$outputDir,
     pid_name = config$pid_name,
     lyrid_name = config$lyrid_name,
```

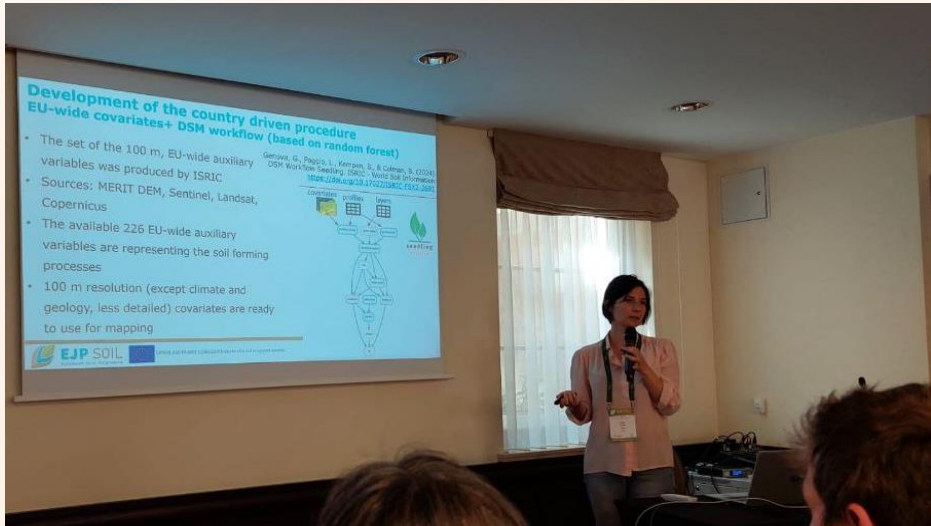
Users and impact

Several users in different countries

- ISRIC's (internal projects/ production pipelines)
- DSM trainings. Rwanda, Kenya, Ethiopia, Nepal
- EJP soil. All national partners (Europe)
- PhD projects
- Other research groups non necessarily involved in projects
- Growing community?

Land Soil Crop Hubs

Rwanda – map comparison exercise



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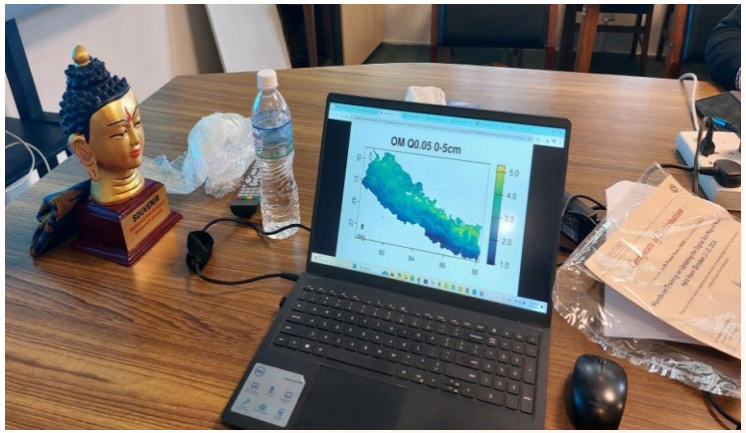

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Conclusions

- Easy to use and scalable tool to lower the bar to enter DSM
- Evolving and improving
- Open source, community involvement?
- Reach out if you want to know more and get involved

https://git.wur.nl/isric/dsm-general/dsm.workflows/seedling

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Thank You

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Event Digital Partner