



BONARES
Centre for Soil Research

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Federal Ministry
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BonaRes Data management virtual workshop

13th December 2022

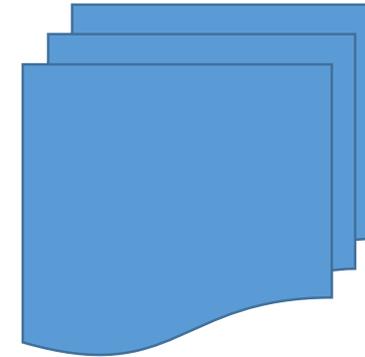
Let's Be FAIR with DATA: Researchers, Data Stewards, Re-users.

Maureen Fonji Atemkeng, Nikolai Svoboda, Carsten Hoffmann, Xenia Specka & Abraham tula



Outline

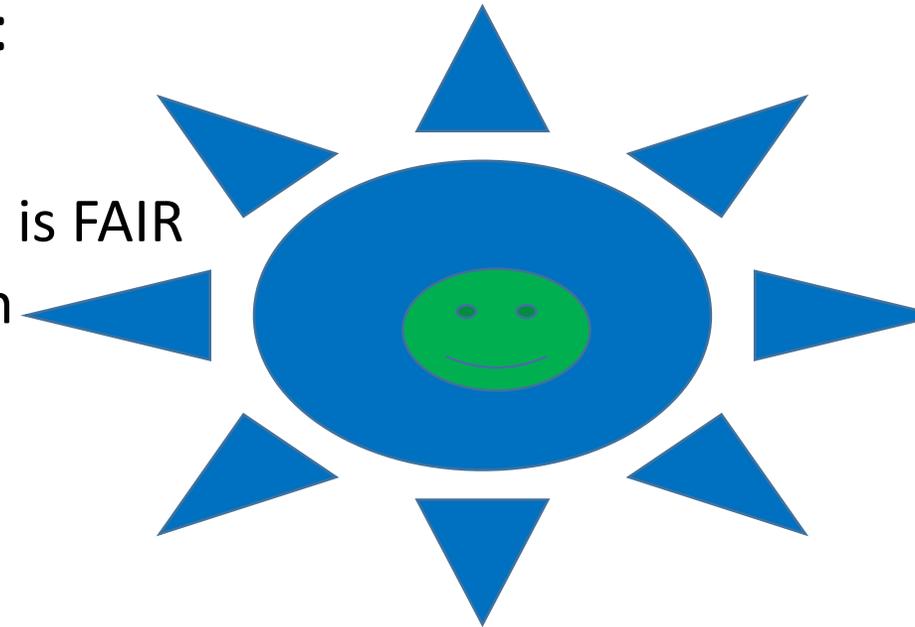
1. Introduction and warm up
2. Concepts of FAIR, Open Data and Research Data Management:
3. How to make data FAIR?
4. Publishing Data in the BonaRes repository
4. A walk through the BonaRes Repository
5. Evaluating the reusability of data sets in the BonaRes Repo (group work)
6. Feedback for improvement and open Discussions



Workshop outcomes:

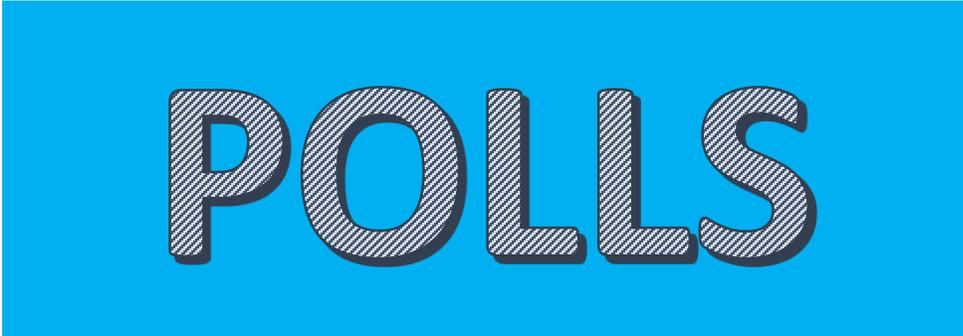
At the end of the workshop you should/may able to:

- determining whether your own or someone else's data is FAIR
- Incorporate the FAIR Principle into your future research
- Navigate through the BonaRes Repository with ease



ZOOM Polls- Mentimeter

- To get to know the composition of participants.
- To get some background and feedback information
- For interactive participation.

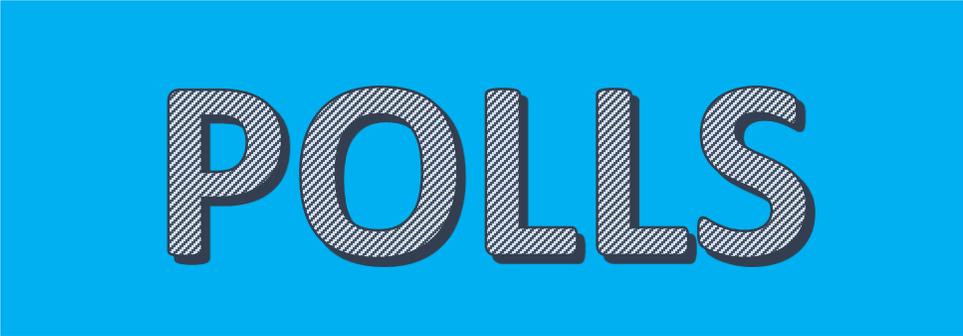


POLLS

POLL 1

- which project are you working on?

<https://www.menti.com/alepcnyded5w>

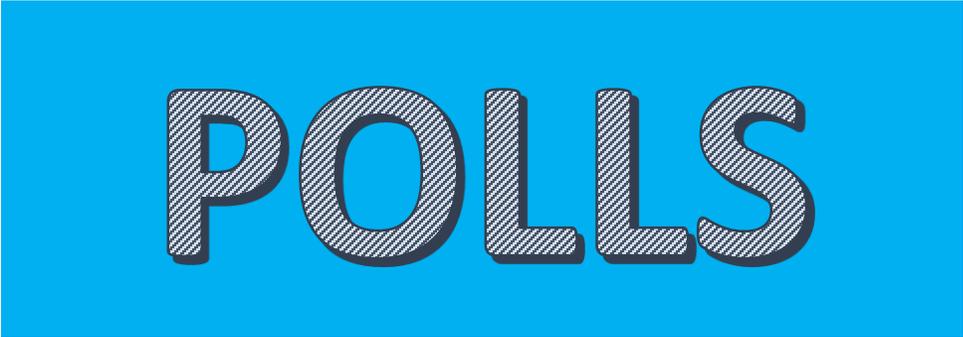


POLLS

POLL 2

- Have you published a dataset before?

<https://www.menti.com/al71hugm7zff>

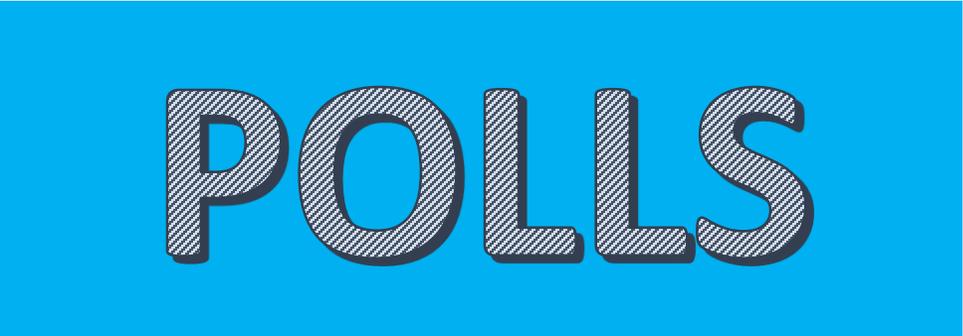


POLLS

POLL 3

- Have you viewed the video Demo in the Invitation?

<https://www.menti.com/al1mdsgcoc5>



POLL

Adapted from “A data management scene by Karen Hanson, Alisa Surkis and Karen Yacobucci.”

- We can avoid this by publishing our data!
- Take note :
 - Storage
 - Data Description
 - File format

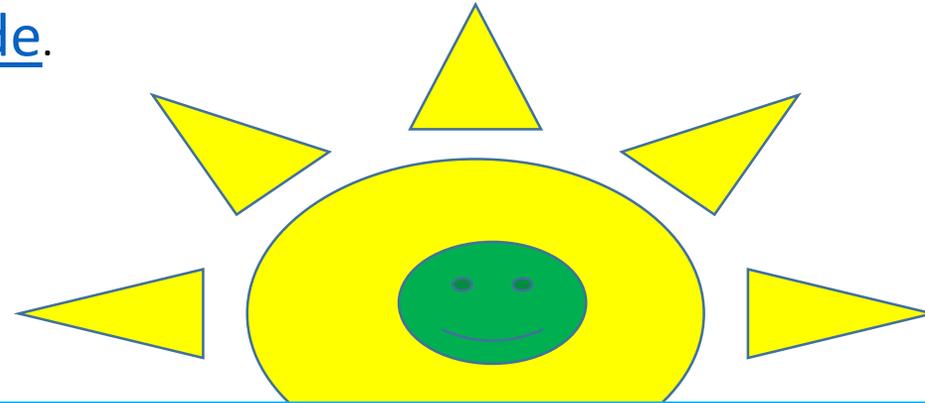


https://www.youtube.com/watch?v=66oNv_DJuPc

NYU Health Sciences Library

Your Permission to take screenshots

Photos may be published in reports or on BonaRes website
www.bonares.de.



Smile Please

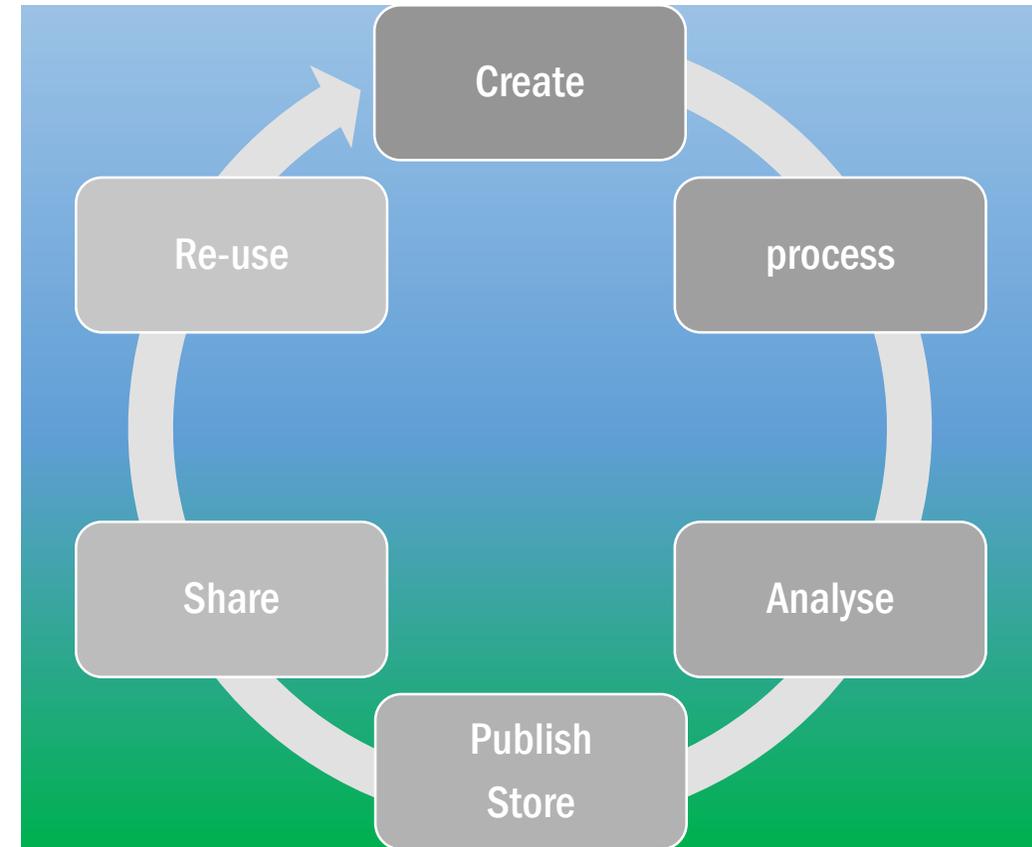
Concepts of FAIR, Open Data and Research Data Management

FAIR Data vs. Open Data

- Both emphasis on data sharing, making data accessible (Higman et al. 2019).
- Open focuses on sharing research outputs
- FAIR focuses on sharing **reusable** data.
- FAIR benefits data closed due to copyright, cultural conventions, commercial licensing, or ethical issues.

What is Research Data Management?

- ❑ RDM -procedures that make data easier to access, interpret, and use during a project or years later.
- ❑ Involves - Planning, documenting, organizing, storing, disseminating, and preserving data.
- ❑ Good data management may ensure FAIR and Open Data.



The data lifecycle

Higman et al. 2019

Data management: why?

- Research funders, organizations, reviewers, and individual researchers have different data management demands.
- Researchers move, interact with other researchers, or collaborate with researchers from various organizations. organizational requirements may be confusing.
- Globally consistent data management norms and practices enhance the research process.

<https://insights.uksg.org/articles/10.1629/uksg.468/>

Misconceptions about what FAIR and open mean

- a) **Does FAIR Data has to be always open? NO** . Certain types of data may benefit greatly from restricted access, which is made possible by the FAIR principles.
- Some FAIR Data (Confidential data) may not be open for the following reasons:
 - trade or cultural secrets; Human participants (in videos); endangered species; contractual agreements etc..
- b) **Does FAIR and OPEN DATA mean good quality data? NO**. A poor quality or fabricated data set could be both FAIR and Open.

At BonaRes Repository, Data quality (Plausibility test) is checked prior to publication, though we can not guarantee.

(semi-) automatic checks (in progress)

- Data gaps
- Plausibility checks
- Formal checks
- ...

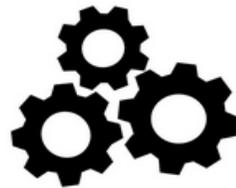
Integration in the → **Data Workflow**

Concepts of FAIR, Open Data and Research Data Management

Q & A

How to make data FAIR?

F indable A ccessible I nteroperable R eusable



By SangyaPundir - Own work, CC BY-SA 4.0

What is FAIR Principles?

i. Findable (F)

- F1. (Meta)data persistent identifier e.g. DOIs, ORCID, ISBNs
- F2. rich metadata
- F3. Metadata identifier for linked data
- F4. (Meta)data registered in a searchable resource

ii. Accessible (A)

- A1. (Meta)data are retrievable via identifier
- A2. Metadata are accessible, even when the data are no longer available.

iii. Interoperable (I)

- I1. (Meta) data use a formal and broadly applicable language.
- I2. (Meta)data use known vocabularies
- I3. (Meta)data references to other (meta)data

iv. Reusable (R)

- R1. (Meta)relevant attributes richly described
 - R1.1. (Meta)data usage license accessible
 - R1.2. (Meta)data provenance included
 - R1.3. (Meta)data meet domain-relevant community standards

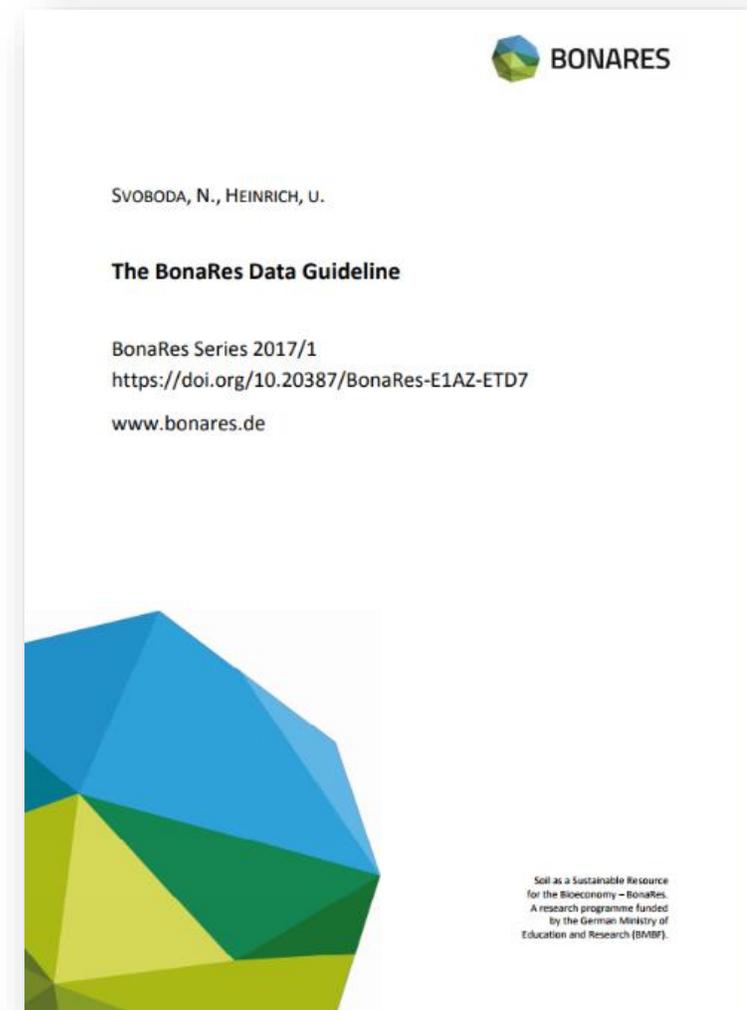
Higman et al. 2019



To make data Findable F1. (Meta)data persistent identifier e.g. DOIs, ORCID, ISBNs

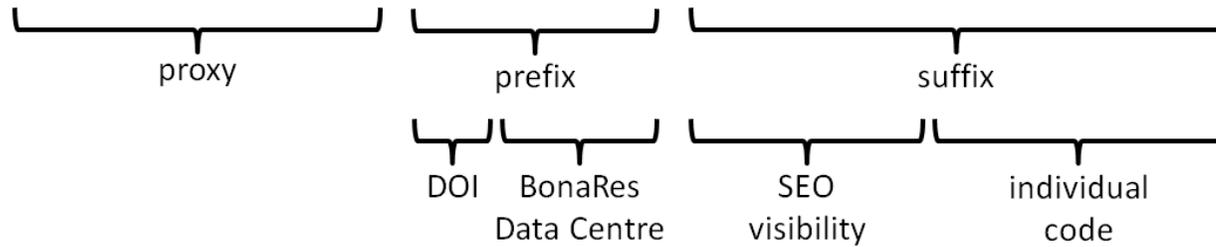


<https://doi.bonares.de>



• BonaRes Repository issuing DOI

<https://doi.org/10.20387/BonaRes-E1AZ-ETD7>



<https://doi.org/10.20387/BonaRes-BSVY-R418>



Long-term field experiment V140 Muencheberg from 1963 to 2009 - Plots

Author: Dietmar Barkusky
Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Research (ZALF))
Catalog: BonaRes Repository
Type: Dataset
Abstract: This data/file has been withdrawn by the author and is no longer available for free reuse. Author's statement: The published LTE-data was withdrawn and replaced by an updated Version. The usability of the tables is enhanced and the experiment can be analyzed in the new Version as a single factorial experiment. The tables FAKTOR_1_STUFE and FAKTOR_2_STUFE were not longer necessary. This data collection consists of 30 individual tables which are related to each other. General description of the Long-term Field Experiment "V140": The long-term field experiment "V140" was established in 1963 at the experimental site of the present Leibniz Centre for Agricultural Landscape Research

XML PDF

No related items available.

Description	Categories	Access	Distribution	Quality	Metadata	Data Model
Title		English German				
		Long-term field experiment V140 Muencheberg from 1963 to 2009 - Plots				

<https://doi.org/10.20387/BonaRes-BSVY-R418>

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XML PDF

No related items available.

Description	Categories	Access	Distribution	Quality	Metadata	Data Model
Title		En	Ge			
Long-term field exper			it V140 M		uencheberg fr	1963 to 2009 -

Provide enough information (metadata) to enable users understand your data



SOIL, 4, 23-35, 2018
https://doi.org/10.5194/soil-4-23-2018
© Author(s) 2018. This work is distributed under the Creative Commons Attribution 3.0 License.

Volume 4, issue 1



- Article
- Assets**
- Peer review
- Metrics
- Related articles

Original research article

12 Jan 2018

Bone char effects on soil: sequential fractionations and XANES spectroscopy

Mohsen Morshedizad et al.

Data sets

Raw_XANES_Data_vervollständigt (Rohdaten XANES Messungen), BonaRes Data Centre
M. Morshedizad and P. Leinweber
<https://doi.org/10.20387/BonaRes-PDY6-HHGS>

doi.org/10.20387/BonaRes-PDY6-HHGS

doi.org/10.5194/soil-4-23-2018



BonaRes Data Portal What do you want to do? ▾ 📍 xanes

Raw_XANES_Data_vervollständigt

Publisher: University of Rostock, University of Rostock, Leibniz Centre for Agricultural Landscape Research (ZALF)
 Catalog: not available
 Type: Nongeographic dataset
 Abstract: Acceptability of novel bone char fertilizers depends on their P release but reactions at bone char surfaces and impacts to soil P speciation are insufficiently known. By sequential fractionation and synchrotron-based X-ray absorption near edge structure (XANES) spectroscopy we investigated whether and how the chemical composition of bone char particles has been altered in soil and, consequently, has affected the P speciation of amended soils. Therefore, two different kinds of bone char particles (BC, produced by pyrolysis of degreased animal bone chips at 800 °C and BCplus, a BC enriched with reduced sulfur compounds) were manually separated from the soil at the end of two different experiments: "incubation-leaching" and "ryegrass cultivation". Sequential P-fractionation of amended soils showed P-enrichment

Add service
Download
 XML PDF

No related items available.



Identifiers and linked data

Identifiers are used for identifying datasets, for searching and retrieval, and for linking or connecting data

Example of Related identifier

- Digital Object Identifier (DOI)
- Uniform resource name (URN)
- International standard book number (ISBN)
- International standard serial number (ISSN)
- Uniform Resource Locator (URL)

Types of related identifiers

Two objects or resources. What you want to publish (A) and the related source (B)

Possible relation types

IsCitedBy (indicates that B includes A in a citation)

Cites (indicates that A includes B in a citation)

IsSupplementTo (indicates that A is a supplement to B)

IsSupplementedBy (indicates that B is a supplement to A)

IsMetadataFor (indicates additional metadata A for a resource B)

IsVersionOf (indicates A is a version of B)

IsNewVersionOf (indicates A is a new edition of B, where the new edition has been modified or updated)

https://openaire-guidelines-for-literature-repository-managers.readthedocs.io/en/latest/field_relatedidentifier.html

Two objects or resources. What you want to publish (A) and the related source (B)

Possible relation types

IsPreviousVersionOf (indicates A is a previous edition of B)

IsPartOf (indicates A is a portion of B; may be used for elements of a series)

IsReferencedBy (indicates A is used as a source of information by B)

IsVariantFormOf (indicates A is a variant or different form of B, e.g. calculated or calibrated form or different packaging)

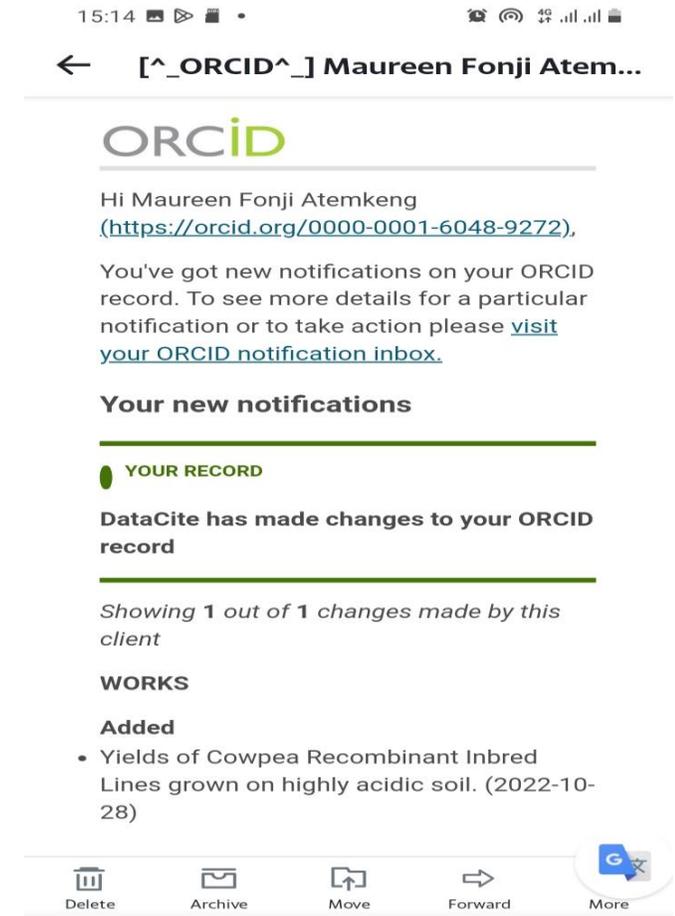
IsSourceOf (indicates A is a source upon which B is based)

IsPublishedIn (indicates that A is published in B)

https://openaire-guidelines-for-literature-repository-managers.readthedocs.io/en/latest/field_relatedidentifier.html

Common Author's identifies

Identifier	ArXiv Author ID	Scopus Author ID	Researcher ID	ORCID ID	PubMed Author ID
Properties	Part of eprint archive (ArXiv)	Integrates with bibliographic database (Scopus)	Integrates with bibliographic database (Web of sciences)	Integrates with bibliographic databases (Crossref) and other author identifier systems	Part of several biomedical databases for publications and datasets (NCBI)
Discipline	Physics, Mathematics, computer sciences and related disciplines	All	All	All	Life Sciences
Link	www.arxiv.org	www.scopus.com	www.researchid.com	www.orcid.org	www.pubmed.gov



ORCID ID and Datacite DOI are connected.



Significance of identifiers for Authors

- a) Disseminate research.
- b) compile outputs.
- c) find collaborators.
- d) ensure network presence.
- e) retrieve other's output in a given discipline.

Significance of identifiers for Institutions

- a) Collate intellectual output of their researchers to fulfill funder or national mandates.
- b) Verify a researcher/work .
- c) aid in institutes ranking programs.
- d) internal reporting and appraisals.

Significance of identifiers for Publishers

- a) collate intellectual output of the researcher.
- b) disambiguate names.
- c) link researcher's multiple identifiers.
- d) track history of research's affiliations.
- e) Track and communicate updates.

Significance of identifiers for Funders

track funded research outputs

Publish and share your data through a repository.

The screenshot shows the BonaRes Repository website. At the top, there is a navigation bar with the BonaRes logo and menu items: Newsroom, Events, Projects, Research Data, Soil Functions, and Services. On the right, there are links for Login and language selection (DE/EN). The main content area features a section titled "Upload-Tool of the BonaRes Repository" with a subtitle "A portal for soil and agricultural research data". Below this, there is a paragraph describing the repository's access to German national and international soil and agricultural research data. A grey box contains the text: "The BonaRes Repository supports the FAIR principles for research data." Below this is a section titled "How to publish a dataset in the BonaRes Repository?" which contains three numbered steps: 1. Dataset submission, 2. Edit metadata, and 3. Publication. Each step has a brief description and a "Submit new dataset" button. To the right of the main content is a sidebar with "Dataset submission" options (Upload-Tool, My submissions, Submit new dataset), "Links" (How to edit metadata, BonaRes Data Guideline, Need help?), and "BonaRes Centre" information.

metadata description

3. Describe your data as precisely as possible.

4. Utilize a permanent identifier (like a DOI)



To make data accessible A1. (Meta)data are retrievable via identifier

- Make it retrievable through identifiers e.g DOI: 10.20387/bonares-9d7x-5k08



^ □ R script to reproduce "Improved normalization of species count data in ecology by scaling with ranked subsampling (SRS): application to microbial communities".

Details

Author: Lukas Beule

Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Research (ZALF))

Add service

Catalog: BonaRes Repository

XML

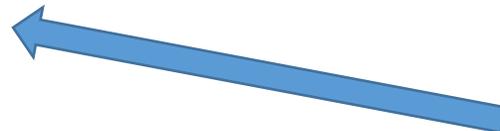
PDF

Abstract: The R script and data are available for download: https://metadata.bonares.de/smartEditor/rest/upload/ID_7050_2020_05_13_Beule_Karlovsky.zip R script and data for the reproduction of the paper entitled "Improved normalization of species count data in ecology by scaling with ranked subsampling (SRS): application to microbial communities" by Lukas Beule and Petr Karlovsky. Comparison of scaling with ranked subsampling (SRS) with rarefying for the normalization of species count data in ecology. The example provided is a library obtained from next generation sequencing of a soil bacterial community. Different alpha diversity measures, community composition, and relative abundance of taxonomic units are compared.

Type: Dataset

Related tables: NA

A2. Metadata are accessible, even when the data are no longer available.



11. (Meta) data - use formal and broadly applicable language

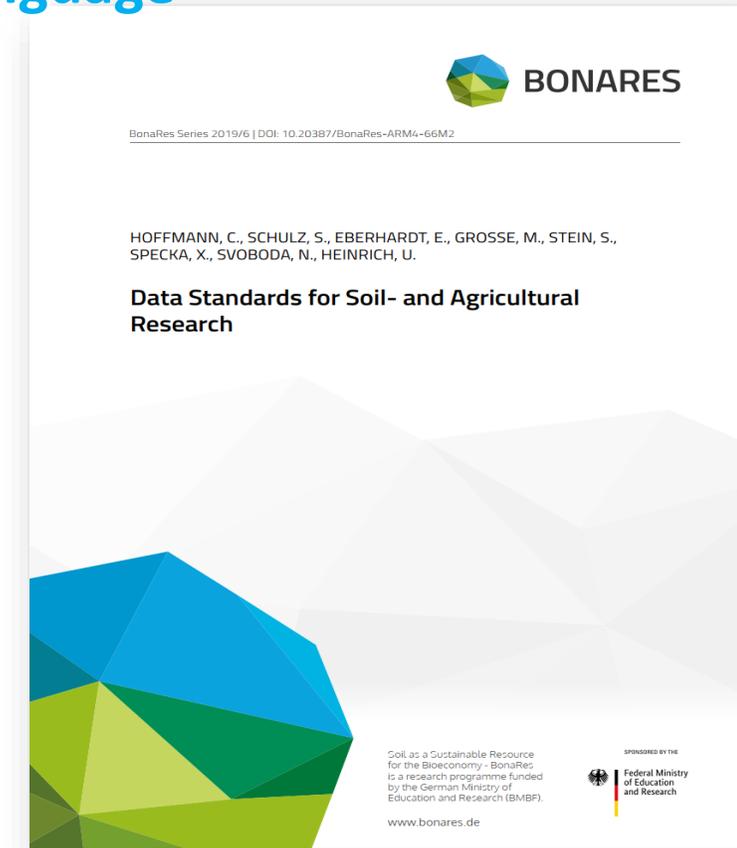
- Use common standards for metadata

12. (Meta)data use known vocabularies

- Consistent utilization of Vocabulary

-  facilitate data exchange and **reuse**
-  increase resource efficiency
-  increase cross-disciplinary communication
-  make data **interoperable** with international data infrastructures

Standards

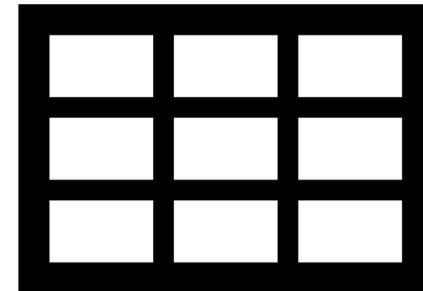


<https://doi.org/10.20387/BonaRes-ARM4-66M2>

To make data interoperable

Use data formats that are editable, standard, and widely used.

- Avoid **proprietary (e.g PDF)** and **lossy (compressed)**formats
- Use Formats that can be edited (e.g CSV)
- Untransformed data is better or describe transformation in the metadata



13. (Meta)data references to other (meta)data

- When using the data of others, include a data citation.
 - Example: Grosse, M., & Hierold, W. (**2019**). *Long-term Field Experiments in Germany* (Version 1.1, **Updated 23.1.2020**). Leibniz Centre for Agricultural Landscape Research (ZALF). <https://doi.org/10.20387/bonares-3tr6-mg8r>.

To make data Reusable

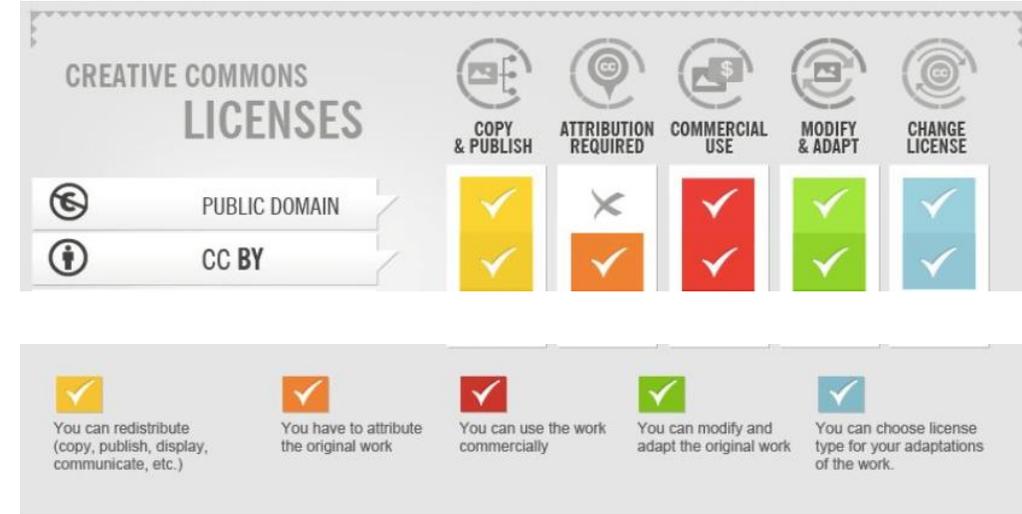
R1. (Meta)relevant attributes richly described

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
column_name	column_long_name	column_description	column_unit		column_methods													
GROHAB		Plant growth habit	-		plants were described with with a score from 0 to 3, 0 referring to ver erect and annual growth habit and 3 standing for climbing and perrenial growth habit.													
LCS/plant		Leaf colour score from chlorophyll meter	-		three leaves per genotype in a replication were sampled at 6 weeks after planting and chlorophyll content measured. The LSC was measured with a chlorophyll meter (Markwell et al., 1995).													
D 1st flw		Number of days to first flowering	days		Data was collected on number of days from sowing to when one plant in a treatment showed the first fully open flower													
D 50 flw		Number of days to 50% flowering	days		Data was collected on number of days from sowing to when 50% of the plants of same genotype in a treatment showed the first fully open flower													
NSC/plant		Nodule score per plant	-		one plant per genotype in a replication was harvested at early podding stage (5-8weeks after planting). To examine the roots, the plants were carefully removed from the pots manually. The soil wa													
NN/plant		Nodule number per plant	-		After scoring, the total number of nodules per plant was counted.													
SFW (kg)/plant		Shoot fresh weight per plant	kg/plant		At harvest, the fresh weight of the shoot was taken on the field and expressed in kg per plant.													
SDWPLANT (g)		Shoot dry weight per plant	g		At the early podding stage, after collecting data on nodulation, above ground parts were harvested and dried in the oven at 70°C for 72 h. These dried plants were weighed and value recorded in gra													
RDWPLANT(g)		Root dry weight per plant	g		At the early podding stage, after collecting data on nodulation, the roots were dried in the oven at 70°C for 72 h. These dried roots were weighed and value recorded in grams per plant													



BonaRes recommendation for data License

- 🌐 Licenses allow the reuse of research data under flexible, legally compliant conditions.
- 🌐 BonaRes research data are subject to copyright
- 🌐 Data Published under CC BY license (Credit must be given to the creator)
- 🌐 Metadata gets CC0 license (**no copyright reserved**)



<https://creativecommons.org/licenses/>

3D soil parameter space of the agricultural landscape [Germany, Version 1] (Part 1 of data collection, table SFT version1.zip)

Author: Ließ, Mareike
 Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Research (ZALF))
 Catalog: BonaRes Repository
 Type: Dataset
 Abstract: Societal demands on soil functionality in agricultural soil-landscapes are confronted with yield losses and environmental impact. Soil functional information at national scale is required to address these challenges. Following the rationale that similarity in soils is reflected by similarity in landscape characteristics, soil functional types (SFTs) were defined and projected into space by machine learning. Each SFT is described by a multivariate soil parameter distribution along its depth profile. The agglomerated simplicity of the 3D multivariate soil parameter space into a limited number of spatially allocated process units provides the basis to run agricultural process models at national scale (Germany).

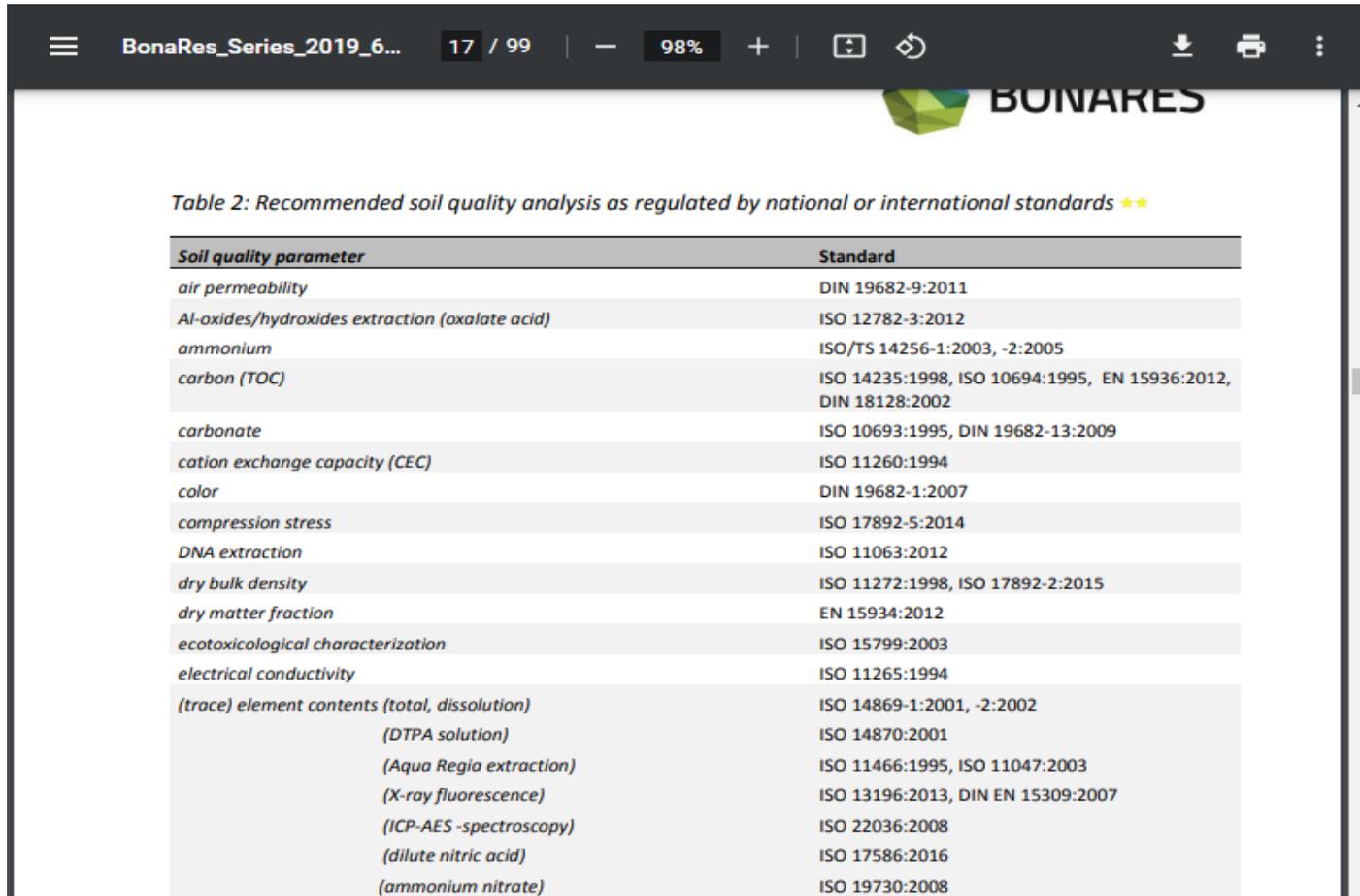
Description	Categories	Access	Distribution	Quality	Metadata	Data Model
Valid:						
Abstract	English		German			
	Societal demands on soil functionality in agricultural soil-landscapes are confronted with yield losses and environmental impact. Soil functional information at national scale is required to address these challenges. Following the rationale that similarity in soils is reflected by similarity in landscape characteristics, soil functional types (SFTs) were defined and projected into space by machine learning. Each SFT is described by a					
Resource identifier	https://doi.org/10.20387/bonares-6b4v-fx71					
Contact	1	2	3			
	Organisation name		Helmholtz Centre for Environmental Research - UFZ			
	Individual name		Ließ, Mareike			
	Phone					
	Facsimile					
	Role		author			
	City					
	Country					
	Delivery point					
	Administrative area					
Postal code						
E-Mail		mareike.liess@ufz.de				
URL		https://orcid.org/0000-0001-9325-199X				
Bounding box	1					
	Description					
	North		35.514			

Add service
 Download
 XML PDF
 No related items available.



To make data Reusable

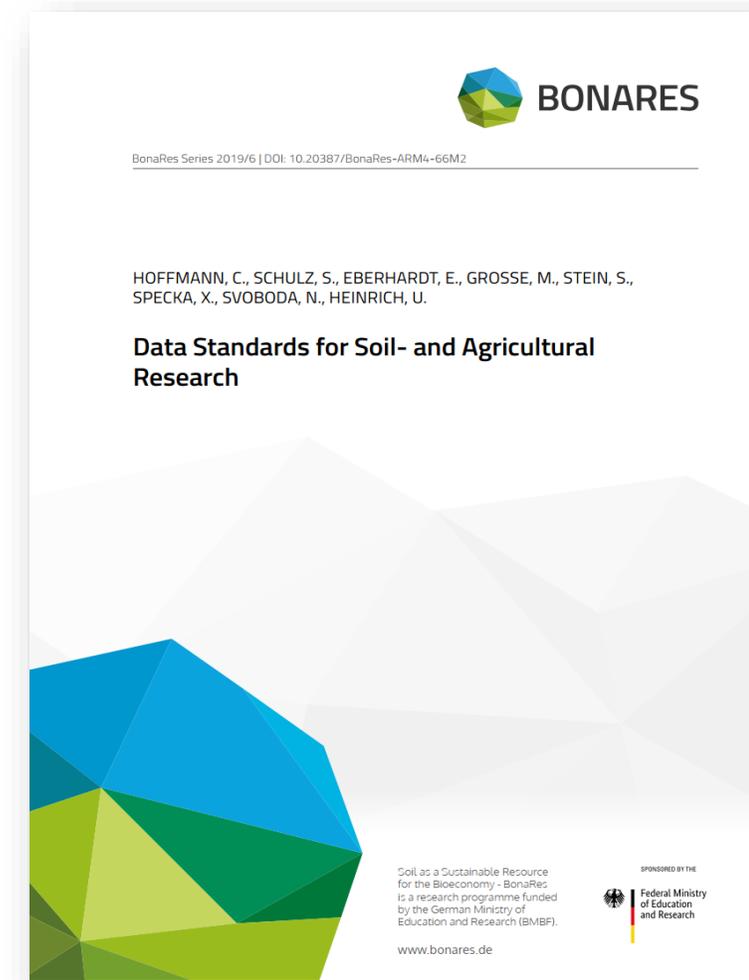
R1.3. (Meta)data meet domain-relevant community standards



The screenshot shows a PDF viewer interface with a dark header bar containing navigation icons and the text 'BonaRes_Series_2019_6...' and '17 / 99'. The main content area displays a table with two columns: 'Soil quality parameter' and 'Standard'. The table lists various soil quality parameters and their corresponding international or national standards.

Soil quality parameter	Standard
air permeability	DIN 19682-9:2011
Al-oxides/hydroxides extraction (oxalate acid)	ISO 12782-3:2012
ammonium	ISO/TS 14256-1:2003, -2:2005
carbon (TOC)	ISO 14235:1998, ISO 10694:1995, EN 15936:2012, DIN 18128:2002
carbonate	ISO 10693:1995, DIN 19682-13:2009
cation exchange capacity (CEC)	ISO 11260:1994
color	DIN 19682-1:2007
compression stress	ISO 17892-5:2014
DNA extraction	ISO 11063:2012
dry bulk density	ISO 11272:1998, ISO 17892-2:2015
dry matter fraction	EN 15934:2012
ecotoxicological characterization	ISO 15799:2003
electrical conductivity	ISO 11265:1994
(trace) element contents (total, dissolution)	ISO 14869-1:2001, -2:2002
(DTPA solution)	ISO 14870:2001
(Aqua Regia extraction)	ISO 11466:1995, ISO 11047:2003
(X-ray fluorescence)	ISO 13196:2013, DIN EN 15309:2007
(ICP-AES -spectroscopy)	ISO 22036:2008
(dilute nitric acid)	ISO 17586:2016
(ammonium nitrate)	ISO 19730:2008

<https://zalf-rdm.github.io/>



How to make data FAIR?

Q & A

15 MIN BREAK

Publishing Data in the BonaRes repository



Repositories

Why a repository?

- Data repositories can serve as backups when lost data must be retrieved.
- Data deposited in a repository is considered a separate publication.
- Data published in a repository receives a licence, metadata and the data becomes citable.
- This increases the data's findability, accessibility, and reusability.
- Publishing data increases researcher's output.



Publishing Data in the BonaRes repository

Choice of repository

- If possible, choose a suitable repository at the very start of a project
- The choice of repository should depend on the researcher's data types and the repository's support.
- Generalist and Domain Specific Repository.

Qualities of a Trustworthy repository

Principle	Guidance for repositories
Transparency	To be transparent about specific repository services and data holdings that are verifiable by publicly accessible evidence.
Responsibility	To be responsible for ensuring the authenticity and integrity of data holdings and for the reliability and persistence of its service.
User Focus	To ensure that the data management norms and expectations of target user communities are met.
Sustainability	To sustain services and preserve data holdings for the long-term.
Technology	To provide infrastructure and capabilities to support secure, persistent, and reliable services.

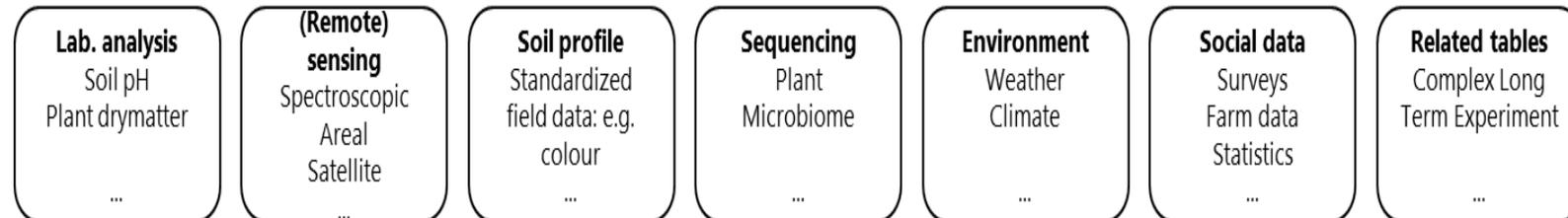
<https://doi.org/10.1038/s41597-020-0486-7>



BonaRes Repo

The scope of the BonaRes Repo

- The BonaRes Repository is domain specific
- Soil and Agricultural Research (Geo Repository)





Simplified Publication workflow data

Former Data Publication workflow

Data upload tool

1. Dataset submission <p>First you submit your dataset preferably as csv, excel or zip-file. We analyse your dataset and integrate it into our repository.</p> <p>+ Submit new dataset</p>	2. Edit metadata <p>We send you a metadata xml file that you have to upload and complete in our Metadata Editor. Then, we will review your metadata to ensure high data reusability.</p>	3. Publication <p>Your dataset will be published in the BonaRes Repository and provided with a DOI.</p>
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Recent Data Publication workflow

Data upload tool

Meta data Editor- no more

Word Template

Excel Template

Provision of metadata through a Template (New workflow)

You get a Template through e-mail

1. Collect metadata during all data life stages
→ prepare and store for submission
2. Please take your time to describe your data with detailed metadata.
→ Please fill in optional metadata elements, too!
3. Use keywords from controlled vocabularies (GEMET, AGROVOC), so metadata can be found and reused.

WORD TEMPLATE OVERVIEW

Excel TEMPLATE for attribute description



AGROVOC

GEMET
General
Multilingual
Environmental
Thesaurus

Metadata: Keywords

- **Why are keywords so important?**
 - Explore and find data!
 - Reusability of data / research
 - Interoperability between systems
 - Use of “controlled vocabularies” (ontologies, thesauri)

Note! Submission of only individual keywords would hamper data findability!

Please keep number of individual keywords to a minimum.

<https://www.eionet.europa.eu/gemet/en/themes/>

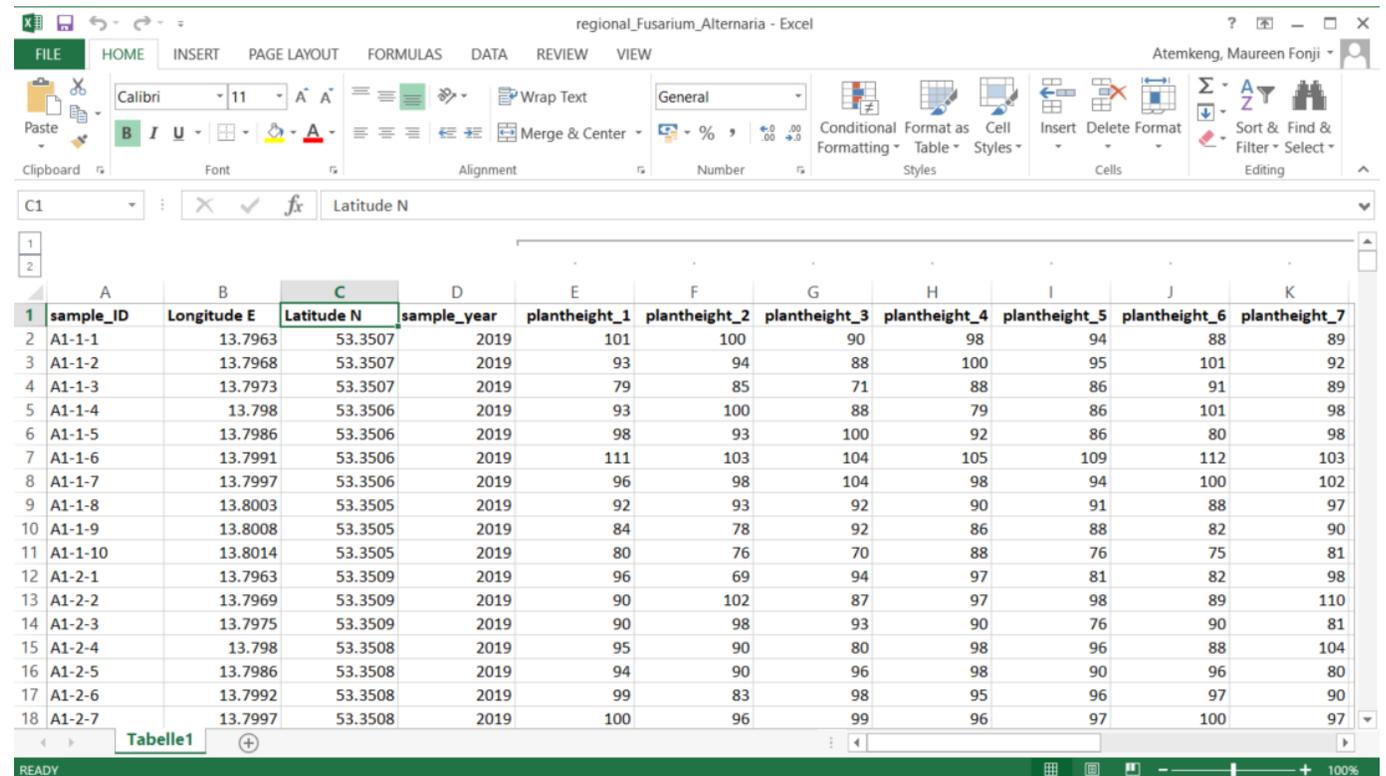
Data types published by the BonaRes Repo

❑ Non geographic datasets e.g
Laboratory experiments

Provide **coordinate data** so your data can be located on the map.

❑ Geographic datasets with xy
coordinates

❑ Geographic datasets with
shape files etc..



The screenshot shows an Excel spreadsheet titled 'regional_Fusarium_Alternaria - Excel'. The spreadsheet contains a table with the following columns: sample_ID, Longitude E, Latitude N, sample_year, planheight_1, planheight_2, planheight_3, planheight_4, planheight_5, planheight_6, and planheight_7. The data rows are numbered 1 to 18. The 'Latitude N' column is highlighted in green.

	A	B	C	D	E	F	G	H	I	J	K
1	sample_ID	Longitude E	Latitude N	sample_year	planheight_1	planheight_2	planheight_3	planheight_4	planheight_5	planheight_6	planheight_7
2	A1-1-1	13.7963	53.3507	2019	101	100	90	98	94	88	89
3	A1-1-2	13.7968	53.3507	2019	93	94	88	100	95	101	92
4	A1-1-3	13.7973	53.3507	2019	79	85	71	88	86	91	89
5	A1-1-4	13.798	53.3506	2019	93	100	88	79	86	101	98
6	A1-1-5	13.7986	53.3506	2019	98	93	100	92	86	80	98
7	A1-1-6	13.7991	53.3506	2019	111	103	104	105	109	112	103
8	A1-1-7	13.7997	53.3506	2019	96	98	104	98	94	100	102
9	A1-1-8	13.8003	53.3505	2019	92	93	92	90	91	88	97
10	A1-1-9	13.8008	53.3505	2019	84	78	92	86	88	82	90
11	A1-1-10	13.8014	53.3505	2019	80	76	70	88	76	75	81
12	A1-2-1	13.7963	53.3509	2019	96	69	94	97	81	82	98
13	A1-2-2	13.7969	53.3509	2019	90	102	87	97	98	89	110
14	A1-2-3	13.7975	53.3509	2019	90	98	93	90	76	90	81
15	A1-2-4	13.798	53.3508	2019	95	90	80	98	96	88	104
16	A1-2-5	13.7986	53.3508	2019	94	90	96	98	90	96	80
17	A1-2-6	13.7992	53.3508	2019	99	83	98	95	96	97	90
18	A1-2-7	13.7997	53.3508	2019	100	96	99	96	97	100	97

Example of dataset with xy coordinate

Publishing Data in the BonaRes repository

Q & A

Reusing data from the BonaRes Repository



BonaRes Repository home page

The screenshot displays the BonaRes Repository home page. At the top left is the BonaRes logo and the text "BONARES Repository". To the right is a search bar with the placeholder "Enter search term...". Further right are icons for settings, search, and a checkbox labeled "Use current map extent". On the far right are buttons for "Explore", "Tools", "Basemap", "Login", and "Sign Up".

A large map of Europe is the central feature, showing countries like Germany, Poland, Czechia, Slovakia, Austria, Hungary, and Belarus. Major cities such as Berlin, Warsaw, Prague, and Vienna are labeled. A scale bar at the bottom of the map indicates 200km. The map's coordinates are -412,112; 7,314,864, and the projection is WGS 84 / Pseudo-Mercator with a scale of 1:7,699,376.

Overlaid on the map is a "Welcome to the BonaRes Repository" dialog box. It contains the following text:

- "The BonaRes Repository is a quality-assured research data infrastructure open to the scientific community."
- Logos for BonaRes and ZALF (Leibniz Centre for Agricultural Landscape Research).
- "The repository is part of the BonaRes funding initiative and operated by ZALF e.V."
- "Discover soil- and agricultural data or submit your data [here!](#)"
- "For any questions concerning research data management please contact: [dataservice\[at\]zalf.de](mailto:dataservice[at]zalf.de)"

At the bottom of the dialog box, it says "Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Th...".

<https://maps.bonares.de/mapapps/resources/apps/bonares/>



The types of data available in the BonaRes Repository

Data Diversity

Soil profile

Standardized
field data: e.g. colour

...

Sequencing

Plant
Microbiome

...

(Remote) sensing

Spectroscopic
Areal / Satellite

...

Environment

Weather
Climate

...

Socio-economic data

Surveys
Farm data
Statistics

...

Long-term experiments

Complex related data
tables

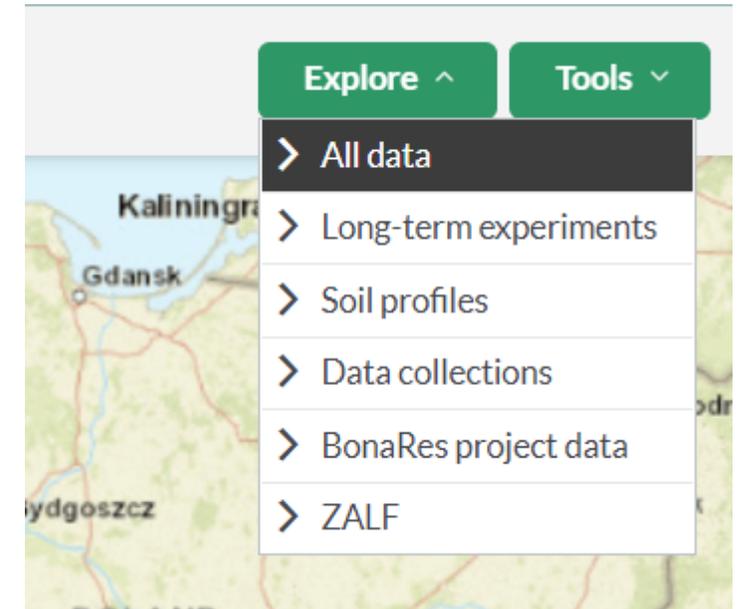
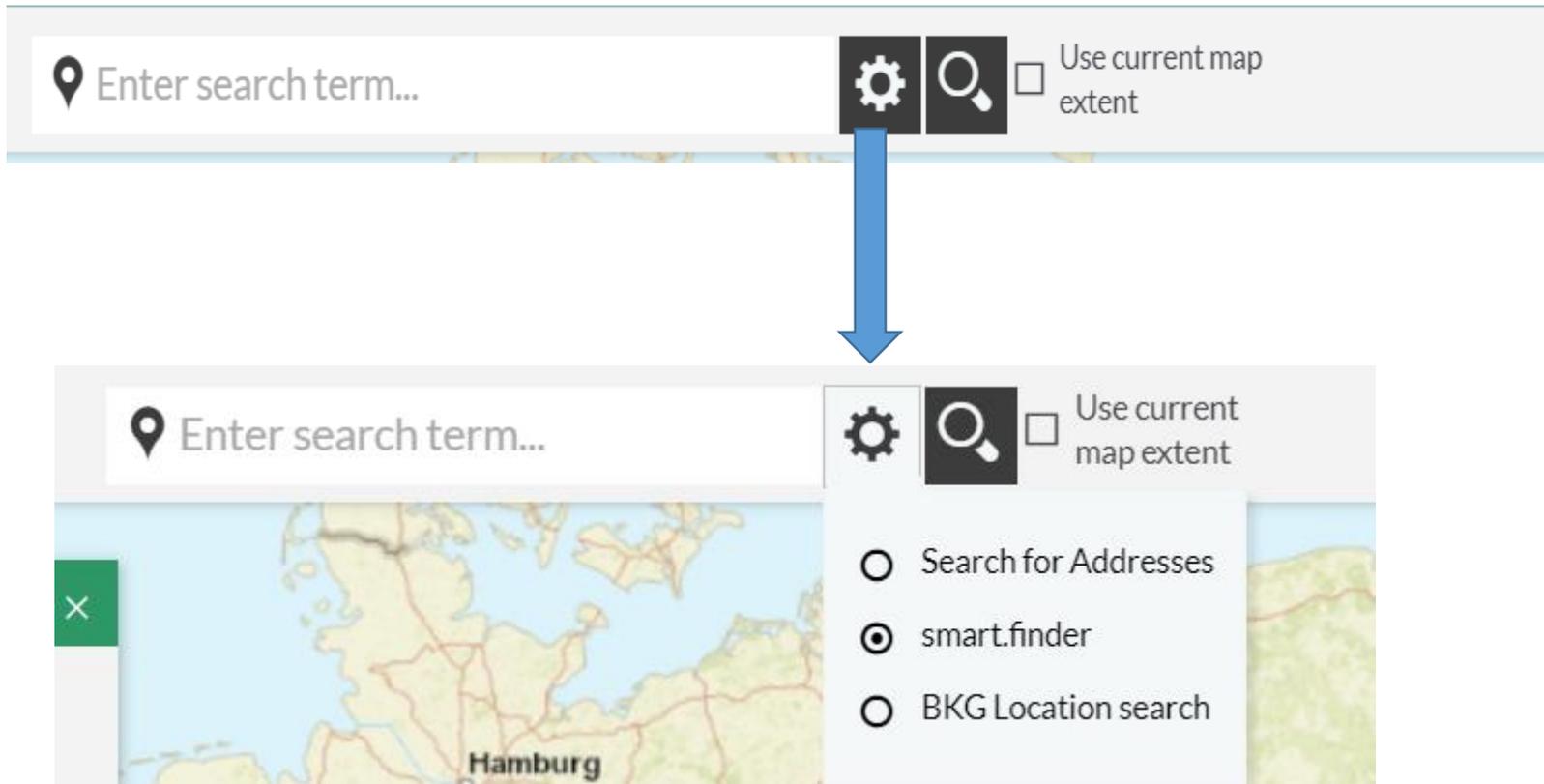
...

Lab. analysis

Soil pH
Plant dry matter

...

The different search options



Viewing the hits – List view

Result Center Items 1-6 of 6

Refine your search

- ▶ Resource type
- ▶ Category
- ▶ Other constraints
- ▶ Funder name
- ▶ Contact Name
- ▶ Organisation
- ▶ City
- ▶ Administrative area

▼ **3D soil parameter space of the agricultural landscape [Germany, Version 2]**

Author: Ließ, Mareike
Publisher: undefined (Leibniz Centre for Agricultural Landscape Research (ZALF))
Catalog: BonaRes Repository

Abstract: The national-scale evaluation and modelling of the impact of agricultural management and climate change on soils, crop growth, and the environment require soil information at a spatial resolution addressing individual agricultural fields. The agglomeration of the soil parameter space into a limited number of functional soil process units (SPUs) allows for reducing the required resources to run agricultural process models without having to cut back on the spatial resolution. To serve these needs, this data product was developed with a data science approach. The agricultural soil-landscape of Germany is represented by 20 SPUs. Each SPU is described by a multivariate parameter distribution along its depth profile. The data product refers to the parameter space until a depth of 1 m. It has a 100 m raster resolution in the 2D mapping space, and its resolution along the depth profile is 1 cm. It includes the soil properties: particle size distribution (sand, silt, and clay content), stone content, bulk density, occurrence of stagnic and gleyic properties, total organic carbon content, and pH value. The data product consists of two files: A nationwide raster (SPU.tif) indicating the spatial allocation of the SPUs in terms of an identifier variable, and one related table (MPD.csv) including the information of the multivariate parameter distributions of the SPUs. The table is linked to the raster by the identifier. Research domain: Soil Sciences Research question: None

Type: Dataset

▼ **Web Map Service of the dataset '3D soil parameter space of the agricultural landscape [Germany, Version 2]'**

Author: Ließ, Mareike
Publisher: undefined (Leibniz Centre for Agricultural Landscape Research (ZALF))
Catalog: BonaRes Repository

Abstract: This Web Map Service includes spatial information used by datasets 'AGIS Map Service of the dataset '3D soil parameter space of the agricultural landscape [Germany, Version 2]'

Type: Service

Viewing the hits – Facet view

Result Center

Items 1-6 of 6 All ▾

Refine your search

- ▶ Resource
- ▶ Category
- ▶ Other constraints
- ▶ Funder name
- ▶ Contact Name
- ▶ Organisation
- ▶ City
- ▶ Administrative area

Result 1:

Title: 3D soil parameter space of the agricultural landscape [Germany, Version 2]

Type: dataset

Identifier: <https://doi.org/10.20387/bonares-13qm-mw25>

Result 2:

Title: Web Map Service of the dataset '3D soil parameter space of the agricultural landscape [Germany, Version 2]'

Type: service

Identifier: af49ba66-b6cb-497b-b65e-a4e983999725

Result 3:

Title: 3D soil parameter space of the agricultural landscape [Germany, Version 1] (Part 3 of data collection, table MSPD_part2)

Type: dataset

Identifier: Child table of dataset <https://doi.org/10.20387/bonares-6b4v-674>

Result 4:

Title: 3D soil parameter space of the agricultural landscape [Germany, Version 1] (Part 2 of data collection, table MSPD_part1)

Type: dataset

Identifier: Child table of dataset <https://doi.org/10.20387/bonares-6b4v-674>

Map Content | **Result Center** | Layer manager | Legend

200km | 1,104,424 : 7,108,208 | WGS 84 / Pseudo-Mercator | Scale: 1:8,666,118 | SRS: **WGS 84 / Pseudo-Mercator (...)** | Scale: 1: 12,724,107



How to filter the hits



Result Center



Refine your search

▼ Resource type

dataset (4)

service (0)

▼ Category

BonaResCentre (4)

▼ Other constraints

CC BY (4)

▼ Funder name

Federal Ministry of Education and Res...

▼ Contact Name

Ließ, Mareike (4)

BonaRes Data Centre (3)

I (3)

▼ Organisation

▼ 3D soil parameter space of the agricultural l

Author: Ließ, Mareike

Publisher: undefined (Leibniz Centre for Agricultural Landsc

Catalog: BonaRes Repository

Abstract: The national-scale evaluation and modelling of the spatial resolution addressing individual agricultural fields. Th required resources to run agricultural process models witho approach. The agricultural soil-landscape of Germany is repr refers to the parameter space until a depth of 1 m. It has a 10 particle size distribution (sand, silt, and clay content), stone c consists of two files: A nationwide raster (SPU.tif) indicating t the multivariate parameter distributions of the SPUs. The tal
Type: Dataset

▼ 3D soil parameter space of the agricultural l

Author: Ließ, Mareike

Publisher: BonaRes Data Centre (Leibniz Centre for Agricult

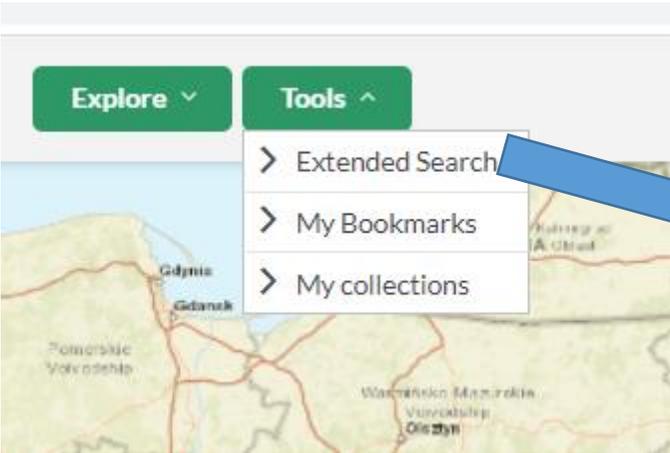
Catalog: BonaRes Repository

Abstract: Societal demands on soil functionality in agricultur required to address these challenges. Following the rationale projected into space by machine learning. Each SFT is descri parameter space into a limited number of spatially allocated

SPONSORED BY THE



Use the tools for extended search



Extended Search

Description	Categorisation	Access	Spatial extent	Contact	Metadata	Data model
Title (EN) <input type="text"/>			Description (EN) <input type="text"/>		Abstract Type (EN) -- <input type="button" value="v"/>	
Title (DE) <input type="text"/>			Description (DE) <input type="text"/>		Abstract Type (DE) <input type="button" value="v"/>	
Alternate title <input type="text"/>			Organisation name <input type="text"/>			
Language -- <input type="button" value="v"/>			Lineage statement <input type="text"/>		Geographic identifier <input type="text"/>	
Described interval From <input type="text"/>			To <input type="text"/>			
Resource -- Choose date -- <input type="button" value="v"/>			-- Choose operator -- <input type="button" value="v"/>		<input type="text"/>	<input type="button" value="v"/>
Identifier (DOI) <input type="text"/>			Spatial representation type <input type="button" value="v"/>		Funder name <input type="text"/>	

A walk through the Bonares Repository

BONARES Repository Mareike

Welcome to the BonaRes Repository

The BonaRes Repository is a quality-assured research data infrastructure open to the scientific community.

The repository is part of the [BonaRes](#) funding initiative and operated by [ZALF e.V.](#)

Discover soil- and agricultural data or submit your data [here!](#)

For any questions concerning research data management please contact: [dataservice\[at\]zalf.de](mailto:dataservice[at]zalf.de)

Result Center

Refine your search

- Resource type
- Category
- Other constraints
- Funder name
- Contact Name
- Organisation
- City
- Administrative area

3D soil parameter space of the agricultural landscape [Germany, Version 1] (Part 1 of data collection, table SFT version1.zip)

Author: Ließ, Mareike
 Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Research (ZALF))
 Catalog: BonaRes Repository
 Type: Dataset

Abstract: Societal demands on soil functionality in agricultural soil-landscapes are confronted with yield losses and environmental impact. Soil functional information at national scale is required to address these challenges. Following the rationale that similarity in soils is reflected by similarity in landscape characteristics, soil functional types (SFTs) were defined and projected into space by machine learning. Each SFT is described by a multivariate soil parameter distribution along its depth profile. The agglomerated simplicity of the 3D multivariate soil parameter space into a limited number of spatially allocated process units provides the basis to run agricultural process models at national scale (Germany).

Description Categories Access Distribution Quality Metadata Data Model

Title

English German
 3D soil parameter space of the agricultural landscape [Germany, Version 1] (Part 1 of data collection, table SFT version1.zip)

Alternate title

Date stamp

Accepted: 2022-08-09
 Available: 2022-08-09
 Collected:
 Copyrighted:
 Created: 2022-07-18
 Issued: 2022-07-18
 Submitted:
 Updated: 2022-07-18
 Valid:

Abstract

English German
 Societal demands on soil functionality in agricultural soil-landscapes are confronted with yield losses and environmental impact. Soil functional information at national scale is required to address these challenges. Following the rationale that similarity in soils is reflected by similarity in landscape characteristics, soil functional types (SFTs) were defined and projected into space by machine learning. Each SFT is described by a

Resource identifier

<https://doi.org/10.20387/bonares-6b4v-fx71>

Contact

1	2	3
Organisation name	Helmholtz Centre for Environmental Research - UFZ	
Individual name	Ließ, Mareike	
Phone		
Facsimile		
Role	author	

Map Content Result Center Layer manager Legend

Windows taskbar: Type here to search, 11:46, 29/11/2022



Details - Access - License

https/resources/apps/bonares/index.html?lang=en&mid=175f7d25-ca2e-4166-b569-03789a3658c6

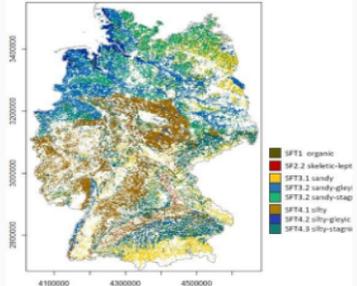
Mareike

3D soil parameter space of the agricultural landscape [Germany, Version 1] (Part 1 of data collection, table SFT version1.zip)

Author: Ließ, Mareike
Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Research (ZALF))
Catalog: BonaRes Repository
Type: Dataset

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Description	Categories	Access	Distribution	Quality	Metadata	Data Model
Use limitation						
Access constraints						
Use constraints		license				
Other constraints		CC BY				
Geodata link						



Add service
Download
XML PDF

No related items available.

BONARES

to address these
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ing with GA optimizer
959.
re listed in the metadata

84 / Pseudo-Mercator (...)

11:51
29/11/2022
DEU



Add service - Mapview

Load Services

Deselect all Toggle layer order

Choose the available resources

- Web Map Service (WMS): WMS
 - Layers
 - DE_admin_wgs84

Add to map



Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape)
Catalog: BonaRes Repository
Abstract: Societal demands on soil functionality in agricultural soil-landscape challenges. Following the rationale that similarity in soils is reflected by similar patterns described by a multivariate soil parameter distribution along its depth profile the basis to run agricultural process models at national scale (Germany). The along the depth profile is 1 cm. It includes the soil properties: horizon occurrence (symbol_C), the depth limitation by bedrock (symbol_mC) as well as files: A nationwide raster (SFT.tif) indicating the spatial allocation of the SFTs distributions of the SFTs. The tables are linked to the raster by the identifier. to model the agricultural soil-landscape of Germany: An approach involving: <https://www.frontiersin.org/articles/10.3389/fenvs.2021.692959> This file contains element 'Related Identifier'. Dataset version 1.0
Type: Dataset
Related tables: [Datamodel](#) [zentrum.ID 221 MSPD PART1](#) [zentrum.ID 222 MSPD PART2](#)
Linked objects: [URL](#) [URL](#) [URL](#) [URL](#) [URL](#)

BONARES Repository Mareike

Result Center

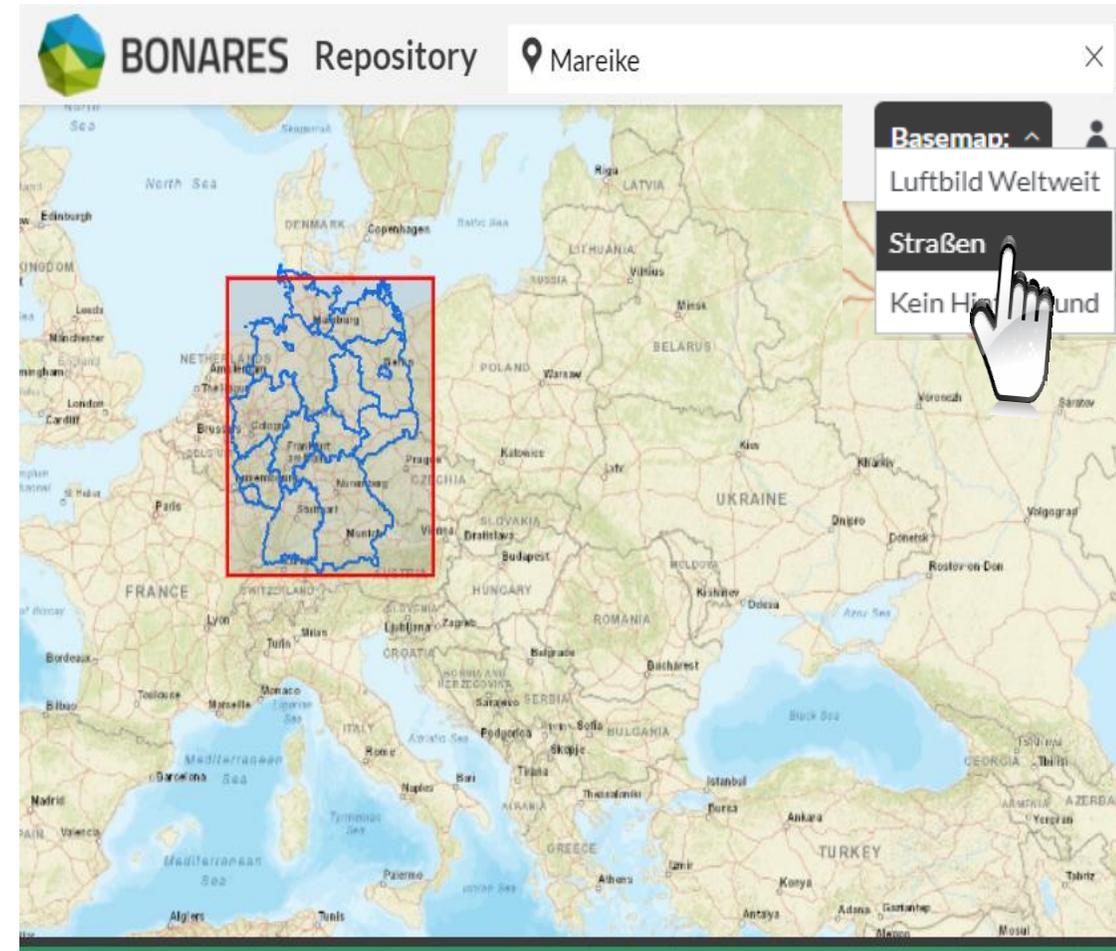
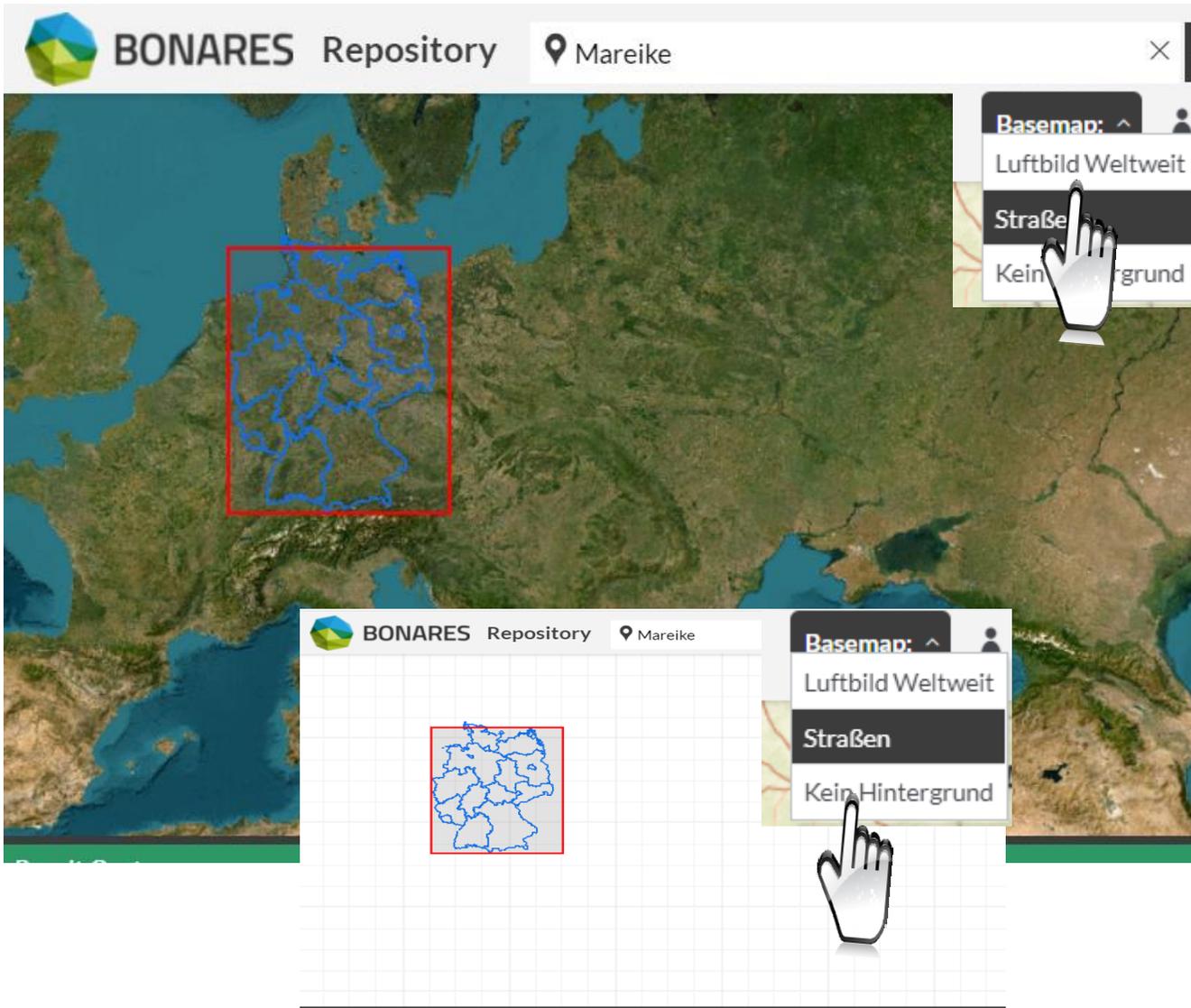
Refine your search

- Resource type
- Category
- Other constraints
- Funder name
- Contact Name
- Organisation
- City

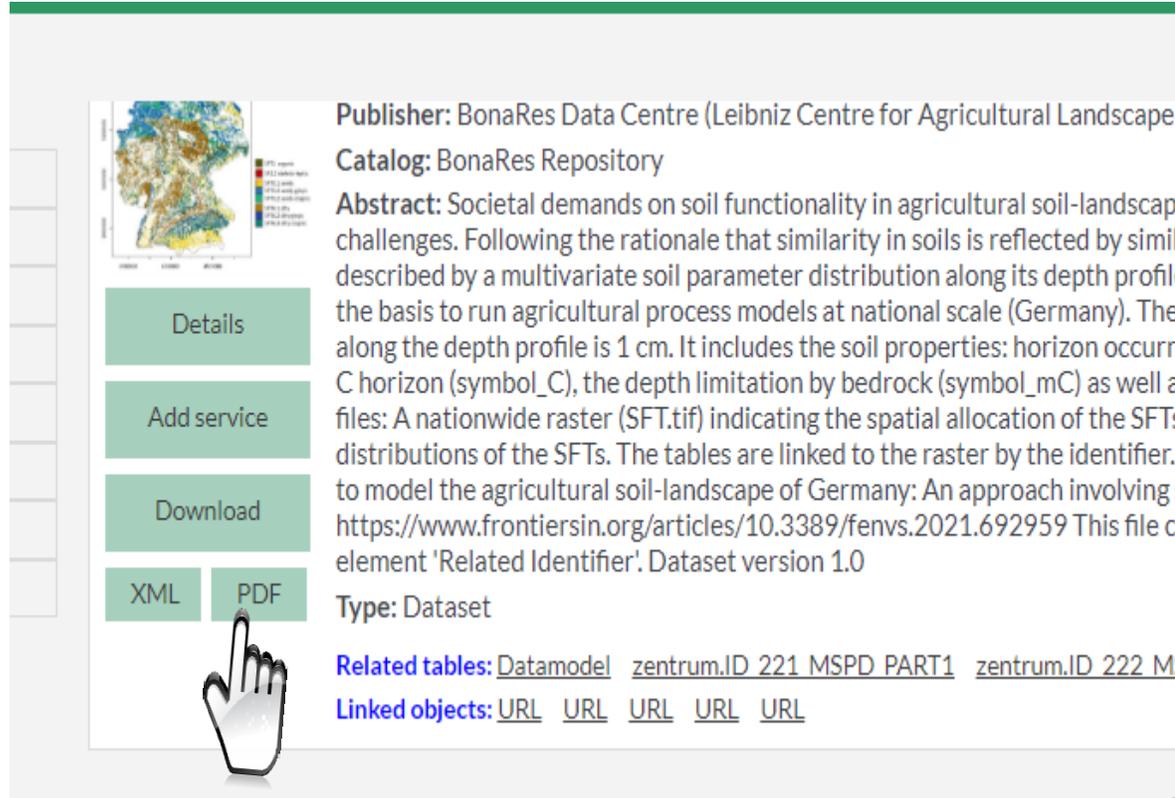
Catalog: BonaRes Repository
Abstract: Societal demands on soil functionality in agricultural soil-landscape challenges. Following the rationale that similarity in soils is reflected by similar patterns described by a multivariate soil parameter distribution along its depth profile the basis to run agricultural process models at national scale (Germany). The along the depth profile is 1 cm. It includes the soil properties: horizon occurrence (symbol_C), the depth limitation by bedrock (symbol_mC) as well as files: A nationwide raster (SFT.tif) indicating the spatial allocation of the SFTs distributions of the SFTs. The tables are linked to the raster by the identifier. to model the agricultural soil-landscape of Germany: An approach involving: <https://www.frontiersin.org/articles/10.3389/fenvs.2021.692959> This file contains element 'Related Identifier'. Dataset version 1.0

A walk through the Bonares Repository

Basemap options



A walk through the Bonares Repository



Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Catalog: BonaRes Repository)

Abstract: Societal demands on soil functionality in agricultural soil-landscape challenges. Following the rationale that similarity in soils is reflected by similar soil properties, soil functional types (SFTs) were defined and projected into space by machine learning. Each SFT is described by a multivariate soil parameter distribution along its depth profile. The agglomerated simplicity of the 3D multivariate soil parameter space into a limited number of spatially allocated process units provides the basis to run agricultural process models at national scale (Germany). The data product refers to the parameter space until a depth of 1 m. It has a 100 m raster resolution in the 2D mapping space, and its resolution along the depth profile is 1 cm. It includes the soil properties: horizon occurrence probability of the organic horizon (symbol_H), the horizon with stagnic properties (symbol_S), groundwater influence (symbol_G), and the C horizon (symbol_C), the depth limitation by bedrock (symbol_mC) as well as the soil properties texture (sand_content, silt_content, clay_content), stone content, and bulk density. The data product consists of three files: A nationwide raster (SFT.tif) indicating the spatial allocation of the SFTs in terms of an identifier variable, and two related tables (MSPD1.csv and MSPD2.csv) including the information of the multivariate parameter distributions of the SFTs. The tables are linked to the raster by the identifier.

Type: Dataset

Related tables: [Datamodel](#) [zentrum.ID 221 MSPD PART1](#) [zentrum.ID 222 MSPD PART2](#)

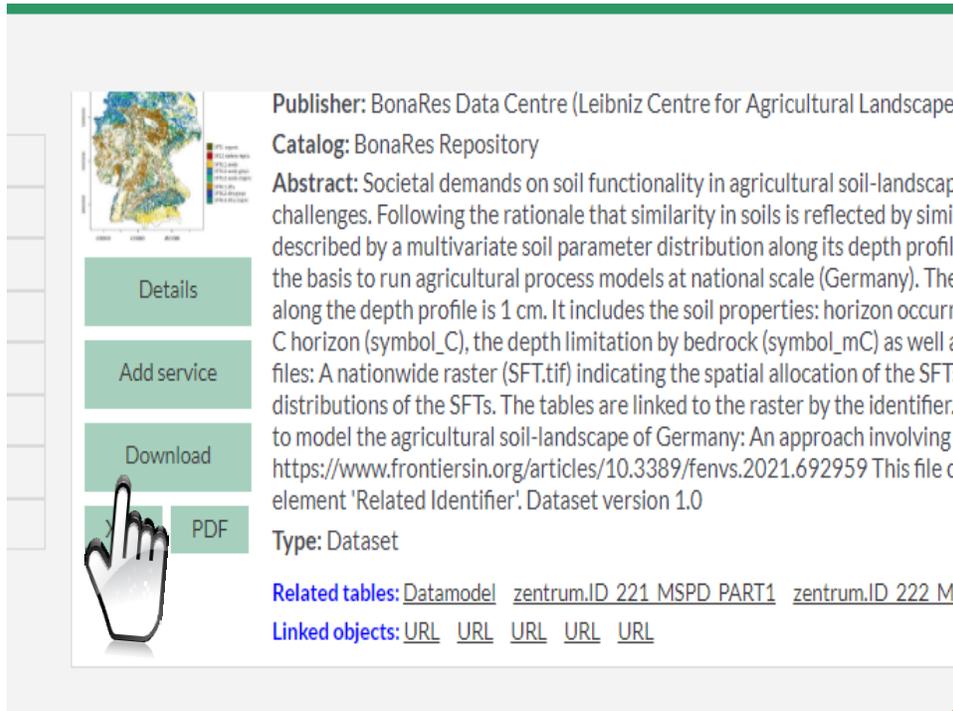
Linked objects: [URL](#) [URL](#) [URL](#) [URL](#) [URL](#)



Bonares Repository
PDF Details View


Description	
Title:	3D soil parameter space of the agricultural landscape [Germany, Version 1] (Part 1 of data collection, table SFT version1.zip)
Title (German):	3D Bodenparameterraum der landwirtschaftlich genutzten Böden [Deutschland, Version 1] (Teil 1 der Datensammlung, Tabelle SFT version1.zip)
Abstract:	<p>Societal demands on soil functionality in agricultural soil-landscapes are confronted with yield losses and environmental impact. Soil functional information at national scale is required to address these challenges. Following the rationale that similarity in soils is reflected by similarity in landscape characteristics, soil functional types (SFTs) were defined and projected into space by machine learning. Each SFT is described by a multivariate soil parameter distribution along its depth profile. The agglomerated simplicity of the 3D multivariate soil parameter space into a limited number of spatially allocated process units provides the basis to run agricultural process models at national scale (Germany).</p> <p>The data product refers to the parameter space until a depth of 1 m. It has a 100 m raster resolution in the 2D mapping space, and its resolution along the depth profile is 1 cm. It includes the soil properties: horizon occurrence probability of the organic horizon (symbol_H), the horizon with stagnic properties (symbol_S), groundwater influence (symbol_G), and the C horizon (symbol_C), the depth limitation by bedrock (symbol_mC) as well as the soil properties texture (sand_content, silt_content, clay_content), stone content, and bulk density.</p> <p>The data product consists of three files: A nationwide raster (SFT.tif) indicating the spatial allocation of the SFTs in terms of an identifier variable, and two related tables (MSPD1.csv and MSPD2.csv) including the information of the multivariate parameter distributions of the SFTs. The tables are linked to the raster by the identifier.</p> <p>Please cite this data product by its DOI and the following reference: Ließ M, Gebauer A, Don A (2021). Machine learning with GA optimization to model the agricultural soil-landscape of Germany: An approach involving soil functional types with their multivariate parameter distributions along the depth profile. <i>Front. Environ. Sci.</i> 9:692959. https://www.frontiersin.org/articles/10.3389/fenvs.2021.692959 This file contains the multivariate parameter distributions of the Soil functional types (SFTs) and the graphic.</p> <p>Related datasets are listed in the metadata element 'Related Identifier'. Dataset version 1.0</p>
Abstract Type:	Abstract
Abstract (German):	<p>Gesellschaftliche Ansprüche an die Bodenfunktionalität in landwirtschaftlich genutzten Bodenlandschaften stehen Ertragseinbußen und Umweltbelastungen gegenüber. Zur Bewältigung dieser Herausforderung ist funktionale Bodeninformation auf nationaler Ebene erforderlich. Der Überlegung folgend, dass sich ähnliche Böden in ähnlichen Landschaftspositionen finden, wurden funktionale Agrarbodentypen (SFTs) definiert und durch maschinelles Lernen in die Fläche projiziert. Jeder SFT wird durch eine multivariate Bodenparameterverteilung entlang seines Tiefenprofils beschrieben. Diese Agglomeration des multivariaten 3D-Bodenparameterraums zu einer begrenzten Anzahl von räumlich verorteten Prozesseinheiten bildet die Grundlage, um landwirtschaftliche Prozessmodelle auf nationaler Ebene (Deutschland) zu betreiben.</p> <p>Das Datenprodukt bezieht sich auf den Bodenparameterraum bis zu einer Bodentiefe von 1 m. Es hat eine Rasterauflösung von 100 m, seine Auflösung entlang des Tiefenprofils beträgt 1 cm. Es umfasst folgende</p>

A walk through the Bonares Repository



Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Research)
Catalog: BonaRes Repository

Abstract: Societal demands on soil functionality in agricultural soil-landscape challenges. Following the rationale that similarity in soils is reflected by similar soil properties, a multivariate soil parameter distribution along its depth profile is used as the basis to run agricultural process models at national scale (Germany). The dataset includes the soil properties: horizon occurrence (symbol_C), the depth limitation by bedrock (symbol_mC) as well as a nationwide raster (SFT.tif) indicating the spatial allocation of the SFTs. The tables are linked to the raster by the identifier. This file is used to model the agricultural soil-landscape of Germany: An approach involving soil-landscape elements 'Related Identifier'. Dataset version 1.0

Type: Dataset

Related tables: [Datamodel](#) [zentrum.ID 221 MSPD PART1](#) [zentrum.ID 222 MSPD PART2](#)

Linked objects: [URL](#) [URL](#) [URL](#) [URL](#) [URL](#)

Download E-mail required



BonaRes Repository <support-data@bonares.de>

Download of dataset(s)

o Atemkeng, Maureen Fonji

Thank you for downloading a dataset in the BonaRes Repository. Your requested download is now available under the following link:

<https://maps.bonares.de/mapapps/proxy?>

https://fme.bonares.de/fmedatadownload/results/FME_656D6600_1668433699713_10724.zip

Please note that the link is only valid for 24 hours. After this time period you have to again download the dataset in the BonaRes Repository.

Best regards,
Your BonaRes Repository team

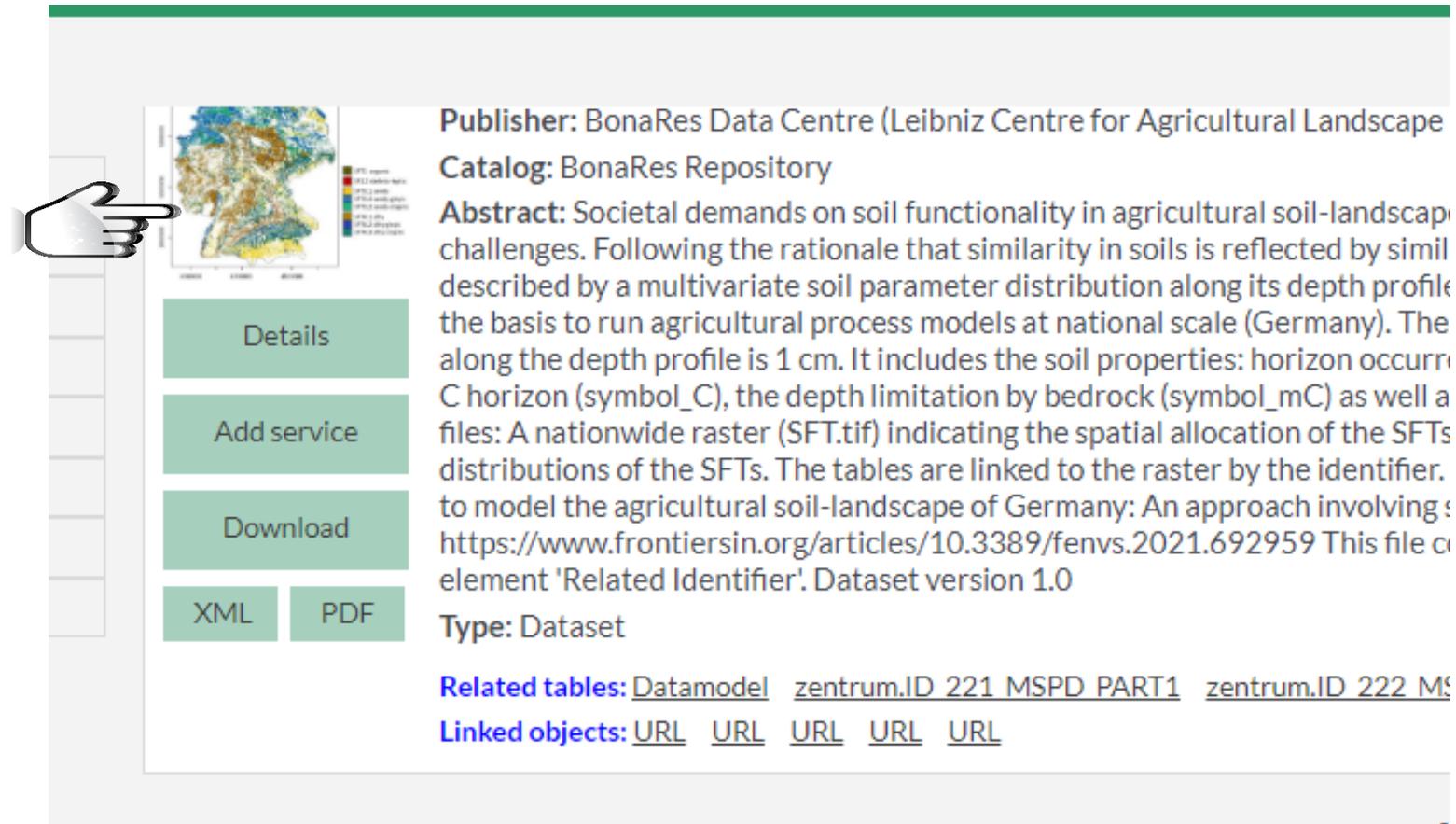
--
BonaRes Repository
BonaRes Centre for Soil Research www.bonares.de
Email: support-data@bonares.de

Download link received through E-mail



A walk through the Bonares Repository

Graphics as first impression of data content



Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape Research)

Catalog: BonaRes Repository

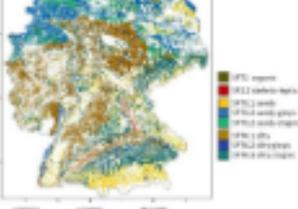
Abstract: Societal demands on soil functionality in agricultural soil-landscape challenges. Following the rationale that similarity in soils is reflected by similar soil properties along its depth profile, the basis to run agricultural process models at national scale (Germany). The data along the depth profile is 1 cm. It includes the soil properties: horizon occurrence (symbol_C), the depth limitation by bedrock (symbol_mC) as well as files: A nationwide raster (SFT.tif) indicating the spatial allocation of the SFTs distributions of the SFTs. The tables are linked to the raster by the identifier. to model the agricultural soil-landscape of Germany: An approach involving: <https://www.frontiersin.org/articles/10.3389/fenvs.2021.692959> This file contains the element 'Related Identifier'. Dataset version 1.0

Type: Dataset

Related tables: [Datamodel](#) [zentrum.ID 221 MSPD PART1](#) [zentrum.ID 222 MSPD PART2](#)

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A walk through the Bonares Repository



Details

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Publisher: BonaRes Data Centre (Leibniz Centre for Agricultural Landscape

Catalog: BonaRes Repository

Abstract: Societal demands on soil functionality in agricultural soil-landscape challenges. Following the rationale that similarity in soils is reflected by similar described by a multivariate soil parameter distribution along its depth profile the basis to run agricultural process models at national scale (Germany). The along the depth profile is 1 cm. It includes the soil properties: horizon occurrence C horizon (symbol_C), the depth limitation by bedrock (symbol_mC) as well as files: A nationwide raster (SFT.tif) indicating the spatial allocation of the SFTs distributions of the SFTs. The tables are linked to the raster by the identifier. to model the agricultural soil-landscape of Germany: An approach involving: <https://www.frontiersin.org/articles/10.3389/fenvs.2021.692959> This file contains element 'Related Identifier'. Dataset version 1.0

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Linked objects: [URL](#) [URL](#) [URL](#) [URL](#) [URL](#)

View dataset Related identifiers

A walk through the Bonares Repository

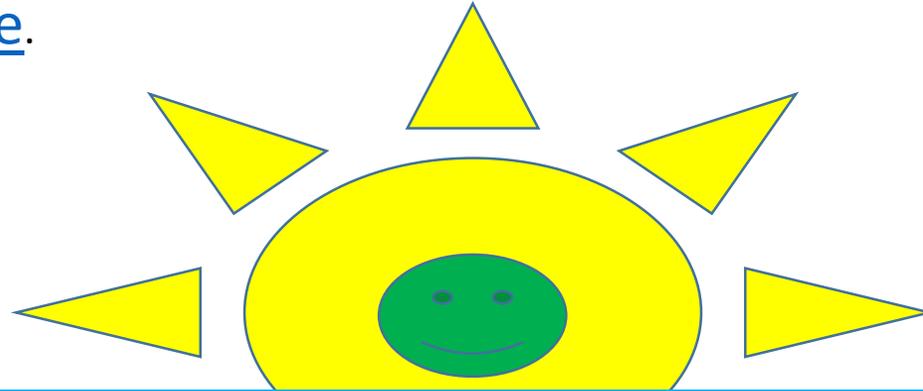
Q & A

Discovering the BonaRes Repository



Your Permission to take screenshots

Photos may be published in reports or on BonaRes website
www.bonares.de.



Smile Please

Discovering the BonaRes Repository

Let's discover the repository ourselves and rate a dataset.

How FAIR is the data?

Excellent	☆☆☆☆☆
Very Good	☆☆☆☆☆
Good	☆☆☆☆☆
Fair	☆☆☆☆☆
Poor	☆☆☆☆☆



Discovering the BonaRes Repository

Search for a dataset of your choice

- It can be your data set or that of an Author you know.
- View its location on the map,
- note the authors name or title
- note the related identifiers,
- note the access rights

Discovering the BonaRes Repository

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- dataset or data collection(Just part of it to save time)

Discovering the BonaRes Repository

Share Summary with all participants

Excellent	
Very Good	
Good	
Fair	
Poor	

- Prepare a short summary to share with others.
- Let us know how FAIR the data is.
 - 1 =not FAIR, poor;
 - 5 = very FAIR, Excellent.
- Justify your rating.
- One person per group gives feedback on their experience with the Repo.

Discovering the BonaRes Repository

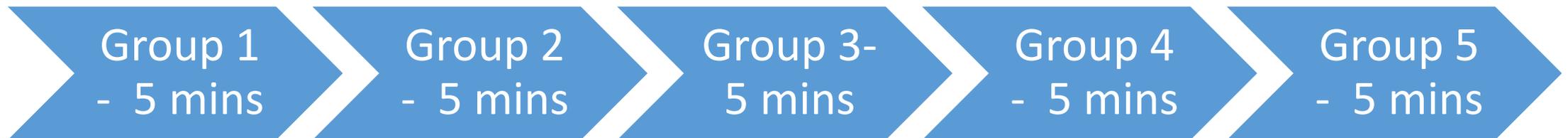
Breakout in to small groups

- Breakout into 5 groups
- Group work - 20 mins



Discovering the BonaRes Repository

Group presentation

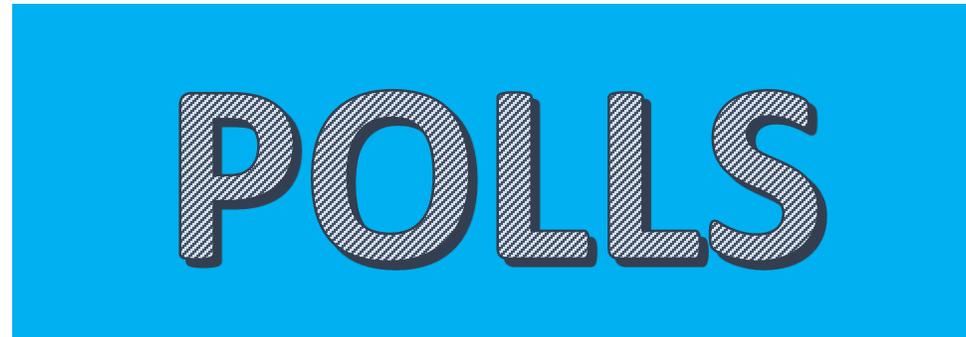


Let's improve the repository and next workshop

Workshop evaluation

- Were your workshop expectations met?

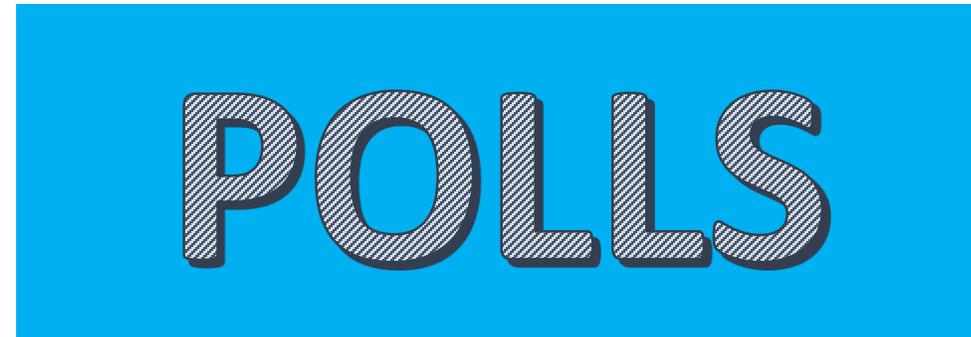
<https://www.menti.com/alinfj2q2ztr>



Repository Evaluation

- what should be improved in the Bonares repository?

<https://www.menti.com/al2qjm8fdo8p>



Documents for further reading

- › FAQs: https://www.zalf.de/de/forschung_lehre/dataservice/Seiten/FAQ.aspx
- › Documents
 - › Citing Soil & Agricultural Research (<https://doi.org/10.20387/bonares-fm2j-c233>)
 - › BonaRes Metadataschema (<https://doi.org/10.20387/BonaRes-5PGG-8YRP>)
 - › BonaRes Dataguideline (<https://doi.org/10.20387/BonaRes-E1AZ-ETD7>)
 - › The BonaRes Data Policy (<https://doi.org/10.20387/BonaRes-RYCV-30RK>)
 - › BonaRes Tips & Tricks (<https://doi.org/10.20387/bonares-mvkn-a4mb>)
- › Tools
 - › Upload Tool (<https://upload.bonares.de/>)
 - › BonaRes Repository (<https://maps.bonares.de/mapapps/resources/apps/bonares/index.html?lang=en>)



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