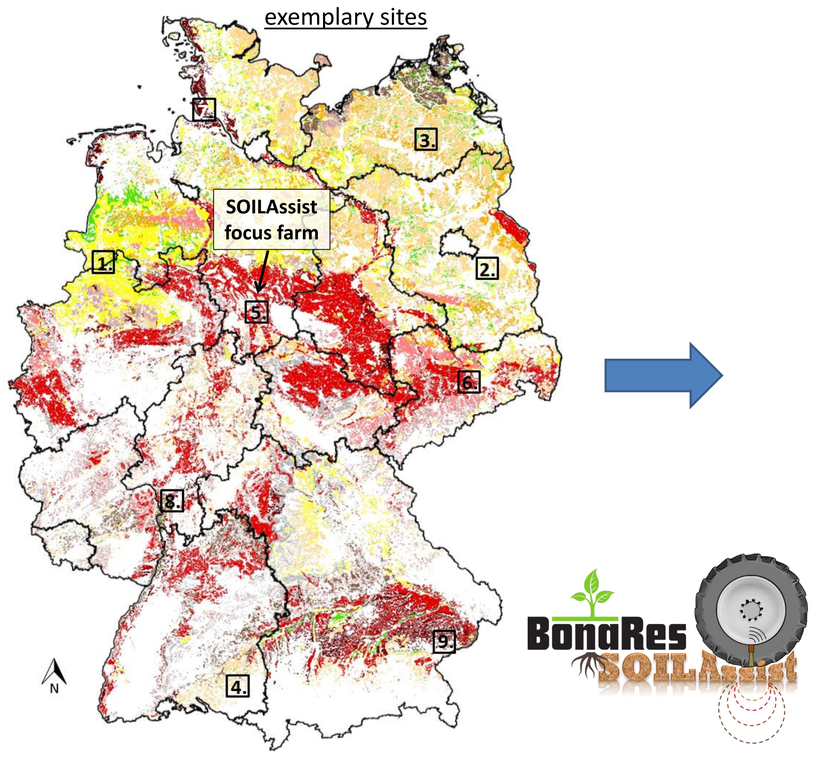
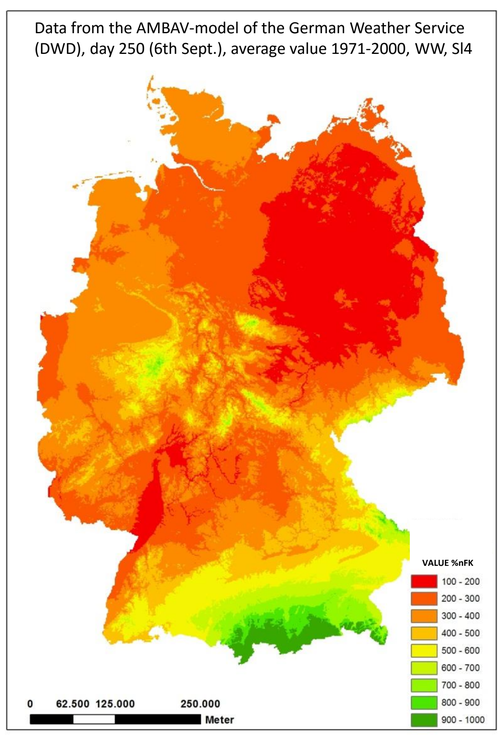
SOILAssist: Concept of a planning system - foresighted planning of soil conserving measures and processing chains

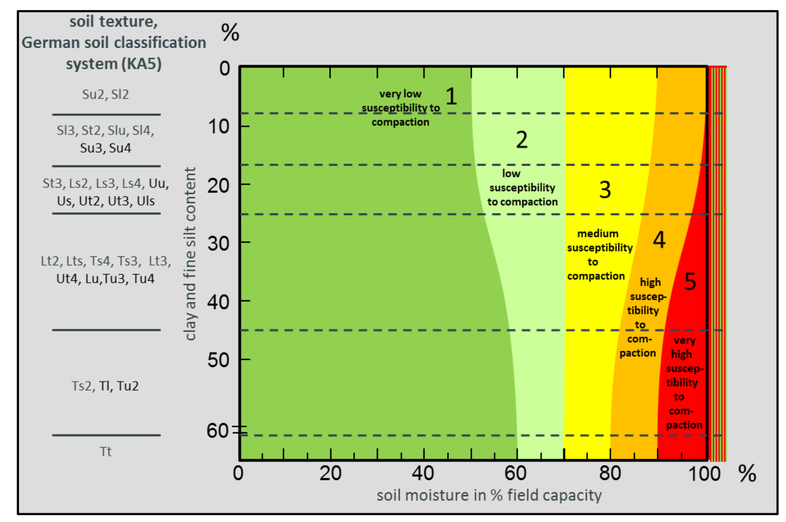
M. Lorenz, J. Brunotte

The SOILAssist planning system

The concept to ‘adapt machinery specifications to the susceptibility of soil to compaction’ combines basic soil data of soil texture and results of the soil water model AMBAV of soil moisture, with expert knowledge, and derives the susceptibility of soil to compaction and the long term trafficability of typical sites in Germany for main time spans of field work. Therefore the susceptibility of soil to compaction was compared with the soil load of the agricultural machinery. From this data, average days of trafficability of agricultural soil were derived depending on machinery and agricultural technique. The information on days of trafficability for main time spans of field work within a year will be helpful for the farmer to plan new investments and operating levels of machinery, and to adapt machinery specifications to the prevailing soil conditions to carry out soil-conserving traffic on arable land.







SOILAssist planning system:

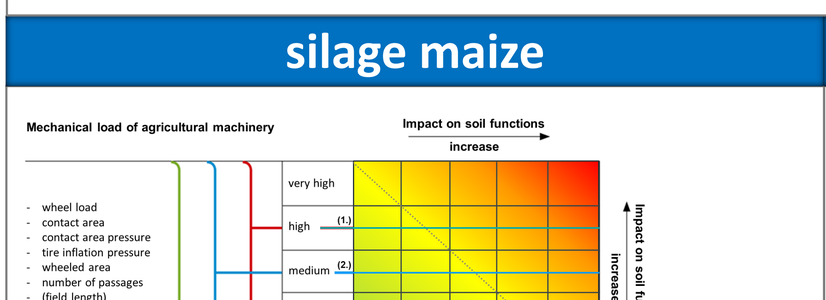
- to support decision making of farmers
- for a foresighted planning
- of investments, operating levels of machinery and
- of soil conserving measures

→

- average days of trafficability of agricultural soil
- comparing different processing chains and machines
- comparing different fields and farms

→ Internet application for farmers

silage maize



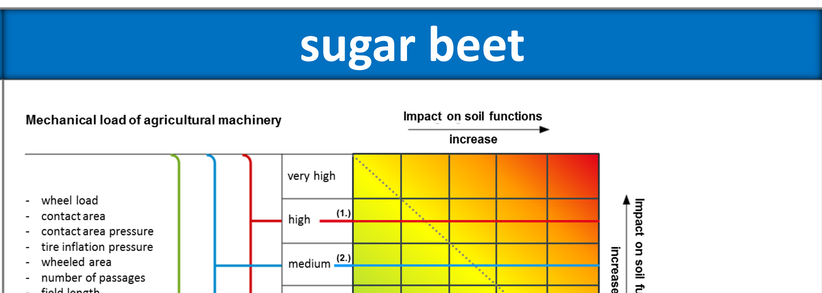
topsoil

61 days exemplary sites	Days of trafficability for different mechanical soil load (01.09. - 31.10) (1.) maize harvester + silage trailer, direct transport to silo	(2.) maize harvester + silage trailer, transfer onto a truck at the field edge and transport to silo	(3.) maize harvester with own bunker direct transfer onto a truck at the field edge and transport to silo
Sl2 1.	39 (±2)	61	61
Sl2 2.	61	61	61
Sl4 3.	60 (±1)	61	61
Sl4 4.	30 (±2)	41 (±2)	59 (±2)
Ut3 5.	61	61	61
Ut3 6.	61	61	61
Lu 7.	38 (±2)	48 (±3)	57 (±3)
Lu 8.	52 (±2)	61	61
Lu 9.	39 (±2)	49 (±3)	58 (±3)

subsoil

61 days exemplary sites	Days of trafficability for different mechanical soil load (01.09. - 31.10) (1.) maize harvester + silage trailer, direct transport to silo	(2.) maize harvester + silage trailer, transfer onto a truck at the field edge and transport to silo	(3.) maize harvester with own bunker direct transfer onto a truck at the field edge and transport to silo
fS 1.	56 (±2)	61	61
mS 2.	61	61	61
Ls3 3.	61	61	61
Lt2 4.	35 (±2)	46 (±3)	57 (±3)
Ut4 5.	61	61	61
Ut4 6.	61	61	61
Su3 7.	60 (±1)	61	61
Sl2 8.	61	61	61
Tu3 9.	38 (±2)	57 (±3)	61

sugar beet



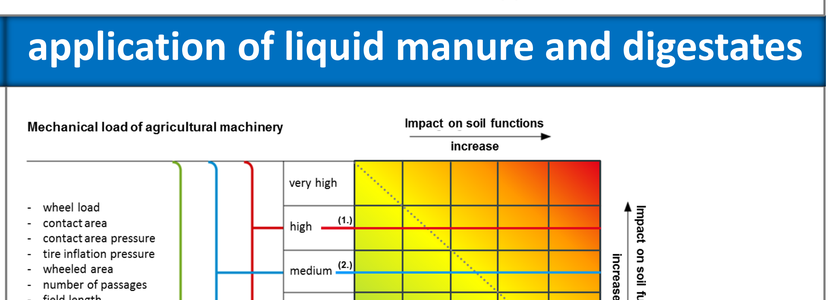
topsoil

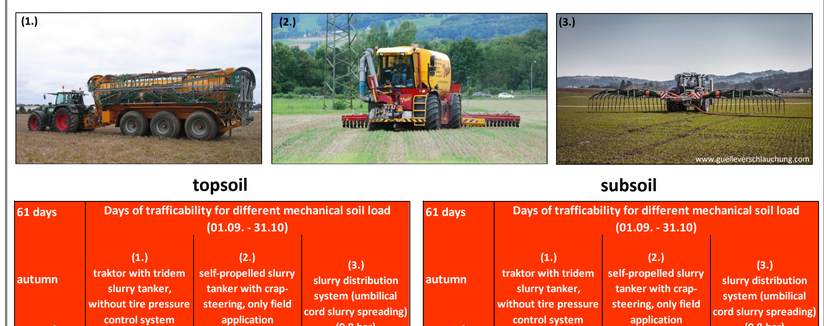
91 days exemplary sites	Days of trafficability for different mechanical soil load (01.09. - 30.11) (1.) sugar beet harvester (SP, 2-axles) + transport trailer	(2.) sugar beet harvester (field length = bunker capacity)	(3.) sugar beet harvester (field length = 1/2 bunker capacity)
Sl2 1.	58 (±2)	81 (±2)	91
Sl2 2.	91	91	91
Sl4 3.	79 (±2)	91	91
Sl4 4.	28 (±2)	49 (±2)	73 (±2)
Ut3 5.	79 (±2)	91	91
Ut3 6.	91	91	91
Lu 7.	52 (±2)	74 (±3)	77 (±3)
Lu 8.	65 (±2)	77 (±3)	83 (±3)
Lu 9.	47 (±2)	59 (±3)	73 (±3)

subsoil

91 days exemplary sites	Days of trafficability for different mechanical soil load (01.09. - 30.11) (1.) sugar beet harvester (SP, 2-axles) + transport trailer	(2.) sugar beet harvester (field length = bunker capacity)	(3.) sugar beet harvester (field length = 1/2 bunker capacity)
fS 1.	74 (±2)	91	91
mS 2.	91	91	91
Ls3 3.	91	91	91
Lt2 4.	32 (±2)	49 (±3)	72 (±3)
Ut4 5.	91	91	91
Ut4 6.	91	91	91
Su3 7.	83 (±2)	91	91
Sl2 8.	91	91	91
Tu3 9.	44 (±2)	71 (±4)	78 (±3)

application of liquid manure and digestates





topsoil

61 days exemplary sites	Days of trafficability for different mechanical soil load (01.09. - 31.10) (1.) traktor with tridem slurry tanker, without tire pressure control system (pi: 3,0 bar)	(2.) self-propelled slurry tanker with crap-steering, only field application (pi: 2,0 bar)	(3.) slurry distribution system (umbilical cord slurry spreading) (0,8 bar)
Sl2 1.	8 (± 2)	36 (± 2)	61
Sl2 2.	57 (± 2)	61 (± 2)	61
Sl4 3.	35 (± 2)	60 (± 1)	61
Sl4 4.	0 (+2)	0 (+2)	34 (± 2)
Ut3 5.	36 (± 2)	61	61
Ut3 6.	56 (± 2)	61	61
Lu 7.	9 (± 2)	25 (± 2)	36 (± 2)
Lu 8.	35 (± 2)	49 (± 3)	61
Lu 9.	0 (+2)	2 (± 1)	26 (± 4)

89 days spring exemplary sites	Days of trafficability for different mechanical soil load (01.02. - 30.04) (1.) traktor with tridem slurry tanker, without tyre pressure control system (pi: 3,0 bar)	(2.) self-propelled slurry tanker with crap-steering, only field application (pi: 2,0 bar)	(3.) slurry distribution system (umbilical cord slurry spreading) (pi: 0,8 bar)
Sl2 1.	0 (+2)	17 (±2)	73 (±2)
Sl2 2.	0 (+2)	34 (±2)	89 (±2)
Sl4 3.	0 (+2)	14 (±2)	33 (±2)
Sl4 4.	0 (+2)	0 (+2)	10 (±2)
Ut3 5.	0 (+2)	10 (±2)	29 (±4)
Ut3 6.	0 (+2)	13 (±2)	45 (±5)
Lu 7.	0 (+2)	0 (+2)	14 (±3)
Lu 8.	0 (+2)	3 (±3)	22 (±4)
Lu 9.	0 (+2)	0 (+2)	10 (±2)

subsoil

61 days exemplary sites	Days of trafficability for different mechanical soil load (01.09. - 31.10) (1.) traktor with tridem slurry tanker, without tire pressure control system (pi: 3,0 bar)	(2.) self-propelled slurry tanker with crap-steering, only field application (pi: 2,0 bar)	(3.) slurry distribution system (umbilical cord slurry spreading) (0,8 bar)
fS 1.	11 (± 2)	48 (± 2)	61
mS 2.	61	61	61
Ls3 3.	51 (± 2)	61	61
Lt2 4.	0 (+2)	0 (+2)	9 (± 3)
Ut4 5.	37 (± 2)	61	61
Ut4 6.	50 (± 2)	61	61
Su3 7.	14 (± 2)	61	61
Sl2 8.	31 (± 2)	61	61
Tu3 9.	0 (+2)	0 (+2)	18 (± 5)

89 days spring exemplary sites	Days of trafficability for different mechanical soil load (01.02. - 30.04) (1.) traktor with tridem slurry tanker, without tyre pressure control system (pi: 3,0 bar)	(2.) self-propelled slurry tanker with crap-steering, only field application (pi: 2,0 bar)	(3.) slurry distribution system (umbilical cord slurry spreading) (pi: 0,8 bar)
fS 1.	0 (+2)	0 (+2)	20 (±2)
mS 2.	0 (+2)	0 (+2)	46 (±2)
Ls3 3.	0 (+2)	0 (+2)	6 (±3)
Lt2 4.	0 (+2)	0 (+2)	0 (+2)
Ut4 5.	0 (+2)	0 (+2)	0 (+2)
Ut4 6.	0 (+2)	0 (+2)	0 (+2)
Su3 7.	0 (+2)	0 (+2)	89
Sl2 8.	0 (+2)	0 (+2)	89
Tu3 9.	0 (+2)	0 (+2)	0 (+2)

SOILAssist is a part of the German research program ‚BonaRes - Soils as Sustainable Resource for the Bioeconomy‘ (05/2015 – 07/2018)

This project is supported by BMBF BonaRes (grant no. 031A563A)

Partners:

THÜNEN

Christian-Albrechts-Universität zu Kiel
Mathematisch-Naturwissenschaftliche Fakultät

German Research Center for Artificial Intelligence

Supported by:

BONARES Zentrum für Bodenforschung

ptj Projektträger Jülich Forschungszentrum Jülich

SPONSORED BY THE
Federal Ministry of Education and Research

Contact:
Marco.Lorenz@thuenen.de
Thünen Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries