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Life Cycle Strategies

SALCA SOIL QUALITY

1st Soil quality indicators in Life Cycle Assessment Workshop
30th August, Bordeaux, France

Hansrudolf Oberholzer, Thomas Nemecek and Andreas Roesch/ Agroscope ISS, Zurich

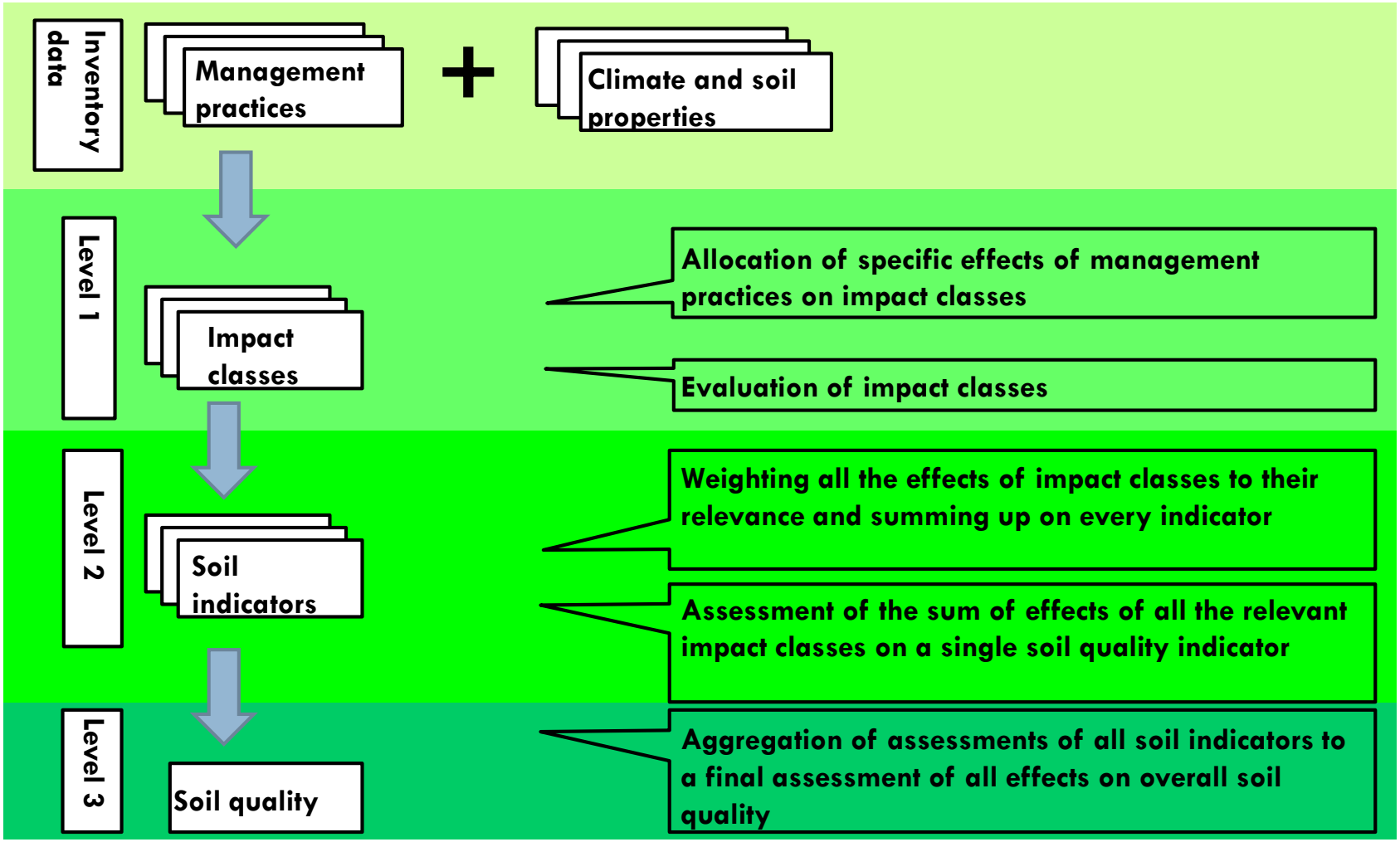
Characteristics of SALCA-SQ

- SALCA-SQ is a multi-indicator LCA method with 9 SQ indicators, calculated by an excel tool
- Estimation of effects based on management practices
- Principally based on Swiss conditions, but modular design and therefore adaptable to other regions
- Focused on arable land use, grassland use in test phase
- Designed for use in LCA and for advisory purpose
- Part of SALCA methodology

Characteristics of SALCA-SQ

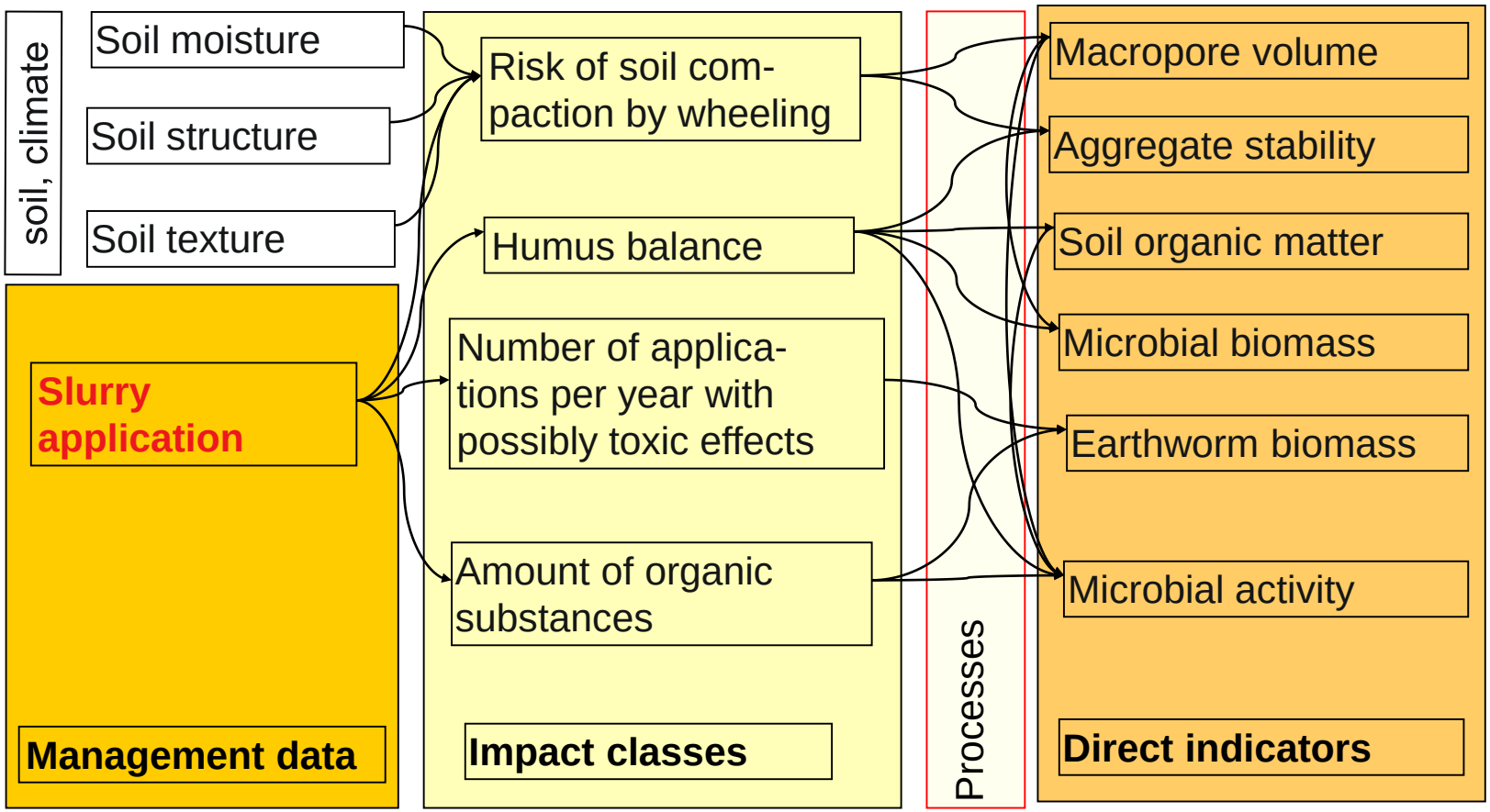
Indicators SALCA-SQ	
Physical	Rooting depth of soil
	Macropore volume
	Aggregate stability
Chemical	Soil organic matter
	Inorganic pollutants
	Organic pollutants
Biological	Earthworm biomass
	Microbial biomass
	Microbial activity

Characteristics of SALCA-SQ



SALCA methodology
Method for soil quality – impact assessment

Example: slurry application



Conclusions of application (tests)

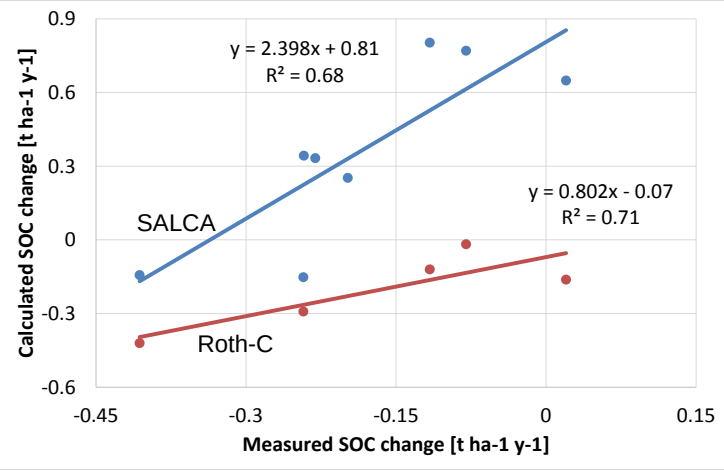
- SALCA-SQ needs a lot of data, with 9 indicators interpretation and communication of results is difficult
- Grouping of related indicators improves communication of results
- An approach for aggregation of 9 indicators results in one single result exists, based on logical decisions
- Reducing necessary data by use of default values gives correct results for LCA, but isn't appropriate for advisory use of the method
- Simple models for estimation of effects on SOC change and of soil compaction give sufficiently accurate results compared to more complex models

Validation, verification …..

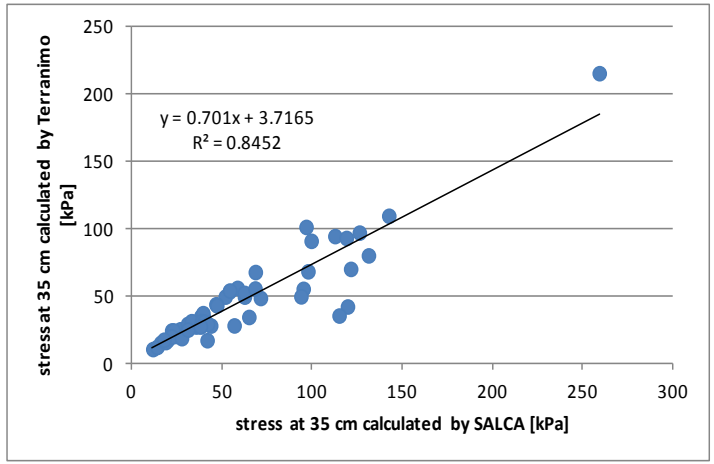
It is extremely difficult to validate a complex Soil Quality assessment method because:

- Effects occur mostly in the long term and depending on multiple factors
- → single indicators (models within the method) have to be validated (checked), e.g. carbon simulation or soil compaction model

Validation of calculated SOC change by SALCA-SQ and Roth-C



Correlation of Stress at 35 cm soil depth, calculated by SALCA-SQ and Terranimo®



Aggregation of results (of several indicators)

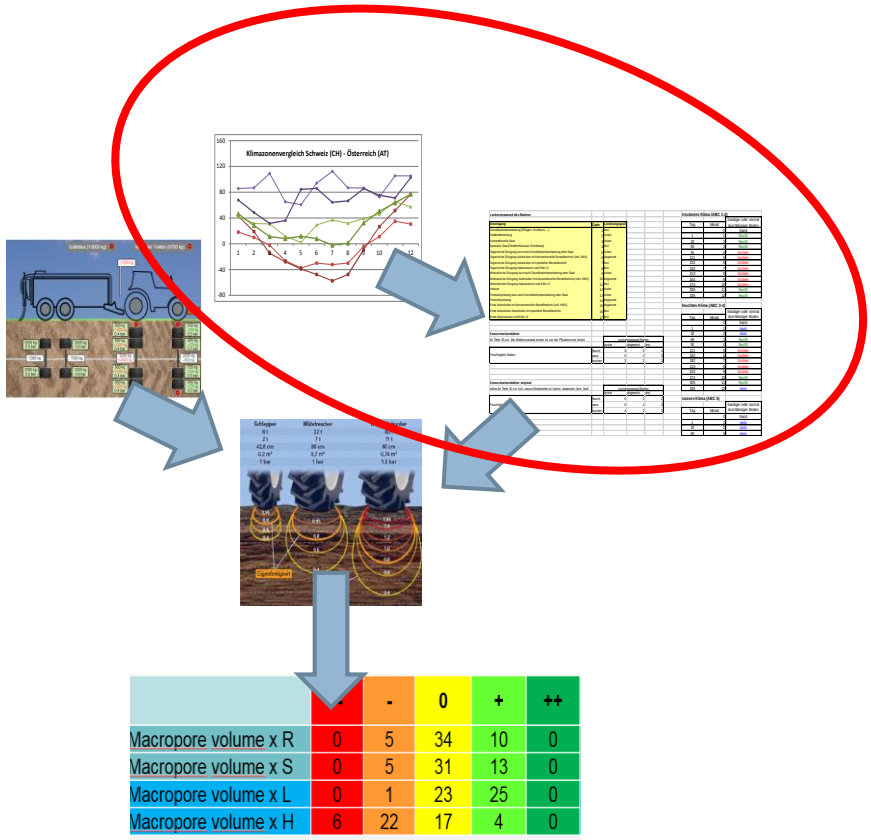
- Aggregation is made stepwise:
  - first the 3 indicators of each discipline soil physics, chemistry and biology are aggregated,
  - Then the results of the 3 disciplines are aggregated to one indicator of overall soil quality.
- Keeping in mind principles of precautionary soil conservation: the negative assessment of an indicator cannot be compensated by the positive result of another indicator
- This leads to a stronger discrimination and a higher proportion of negative assessments (risk for soil quality by current management).

Effects of management on Swiss farms on soil quality assessed by SALCA-SQ

Effect	Macropore volume	Aggregate stability	Soil organic carbon	Earthworm biomass	Microbial biomass	Microbial activity	Overall soil quality
highly unfavourable	0	1	5	0	1	1	11
unfavourable	5	8	4	14	10	10	8
none	34	8	11	17	38	23	1
favourable	10	28	29	16	0	15	29
highly favourable	0	4	0	2	0	0	0

Adaptation of the SALCA-SQ method to another region

- Selection of relevant indicators, necessary impact classes and consequently management practices
- Adaptation of background tables for the estimation of effects: consideration of specific climatic and site situations, soil and crop properties



	-	0	+	++
Macropore volume x R	0	5	34	10	0
Macropore volume x S	0	5	31	13	0
Macropore volume x L	0	1	23	25	0
Macropore volume x H	6	22	17	4	0

Outlook

- SALCA-SQ will stay a module within SALCA and an advisory tool
- Therefore we will keep it in the form of an excel tool
- SALCA-SQ should be easier adaptable to other regions
- We work on this by adapting it to Austrian conditions and therefore objectifying single steps of the method