SoilCare

SOILCARE FOR PROFITABLE AND SUSTAINABLE CROP PRODUCTION IN EUROPE

MONITORING PLAN FOR SOIL-IMPROVING CROPPING SYSTEMS

THE PROBLEM

During the SoilCare project, a comprehensive methodology was developed for assessing the benefits, drawbacks, profitability, soil quality, and sustainability of the SICS as compared to the control field.

No existing assessment framework was suitable for SoilCare since the term 'soil-improving cropping systems' is relatively new and as such its scientific underpinning is still lacking. Therefore, the SoilCare assessment methodology was based on useful and applicable elements identified from existing frameworks.

DEVELOPING AN ASSESSMENT TOOL

To set up a tool for the assessment of the overall sustainability, a decision tree was used based on weights (%) because it allowed simple aggregation to assess the three dimensions of sustainability (economic, social and environmental), and provided flexibility. Such flexibility was needed as the data for the 3 dimensions included various kinds of quantitative and qualitative data, obtained in various ways, including monitoring and questionnaire

Two versions of the assessment tool were developed: (i) a simple one consisting of checking whether the difference between SICS and control reflects a positive impact, negative impact, or no (or zero) impact; and (ii) a more complex one based on threshold values.

SIMPLE ASSESSMENT TOOL COMPARING SICS AND CONTROL

For the evaluation of overall sustainability, the project aimed to check whether the SICS is a success for farmers and societies based on the evaluation of the variables listed in Table 1.

Variables	Assessment based on the comparison between SICS and control
Benefits	Are input indicators showing positive impacts of the SICS in the three dimensions?
Drawbacks	Are input indicators showing negative impacts of the SICS in the three dimensions?
Profitability	Based on cost & financial benefits evaluation
Soil quality	Characterised by biological, chemical and physical properties of soil
Sustainability	Overall sustainability in the three dimensions

Table 1: Variables considered for assessment of SICS.

The change in the properties of the three dimensions resulting from the implementation of the SICS is evaluated via a statistical comparison of the properties with the corresponding value of the control. The input processing of data into the assessment tool consists of transforming the quantitative value of each variable into a qualitative score. This score is obtained by checking whether the difference between SICS and control reflects a positive impact, negative impact, or no (or zero) impact resulting from a statistical analysis.

The aggregation of the criteria was weighted according to utility functions defined in the decision rules. These weighting factor values were established from expert knowledge based on the literature review.

The SoilCare project is funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 677407.

ASSESSMENT TOOL BASED ON THRESHOLDS

The more complex assessment tool used in SoilCare was based on threshold values and provided more specific information on the effectiveness of SICS.

ENVIRONMENTAL DIMENSION

The threshold values used for the environmental dimension are presented in Table 2 (below).

Variables	Threshold values
Infiltration (poor)	< Ksat (measured)
Aggregate Stability Index (poor)	< 50% for grassland, < 30% for forest, < 25% for cropped system
Bulk Density (poor conditions)	>1.3g/cm3 for sandy soil; >1.1 g/cm3 for fine silts and clays; > 9,5 g/cm3 for soil with rich SOM (peaty soils)
Penetration Resistance	> 2 MPa (poor)
Mineral Nitrogen (poor)	< 8 mg NO3-N kg-1
SOC/clay	≤ 1/10
pH (poor conditions)	<4.5 or >8
Crop Yield	/
Yield Quality	GI < 30%
Crop Cover Characteristics	/
Pests	>35%
Root diseases	
Weed Diseases	% of weed infestation <50%

A rating evaluation classification was devised which accounts for the fact that the initial value of a given property of the control can be good or bad when compared to its threshold value. Eight cases that characterize these variations were identified as presented in Figure 1.

RECase	RatingControl	RatingSICS	SignifChange	RatingEvaluation	Descriptions
1	-1	1	1	4	From bad to good
2	1	1	1	3	From good to better
3	-1	-1	1	2	From bad to less bad
4	1	1	0	1	No change and good
5	-1	-1	0	-1	No change and bad
6	1	1	-1	-2	From good to less good
7	-1	-1	-1	-3	From bad to worse
8	1	-1	-1	-4	From good to bad

Figure 1 Rating evaluation considering 8 cases

SOCIO-CULTURAL DIMENSION

Data for the assessment of the socio-cultural dimension were collected through farmer interviews focused on 3 topics; effects of SICS on workload (increase/decrease), perceived risks (health, economic, crop failure, conflicts, other risks and the farmer's reputation (positive/negative.

ECONOMIC DIMENSION

The economic dimension was assessed via a cost and benefit evaluation using a questionnaire. Three types of costs were assessed; investment, maintenance and production costs. The benefits were considered at the farm level and consequently were defined as "on-site benefits" and included, for example, products harvested, recreation/tourism, subsidies (e.g. for agri-environmental measures), protection against natural hazards.

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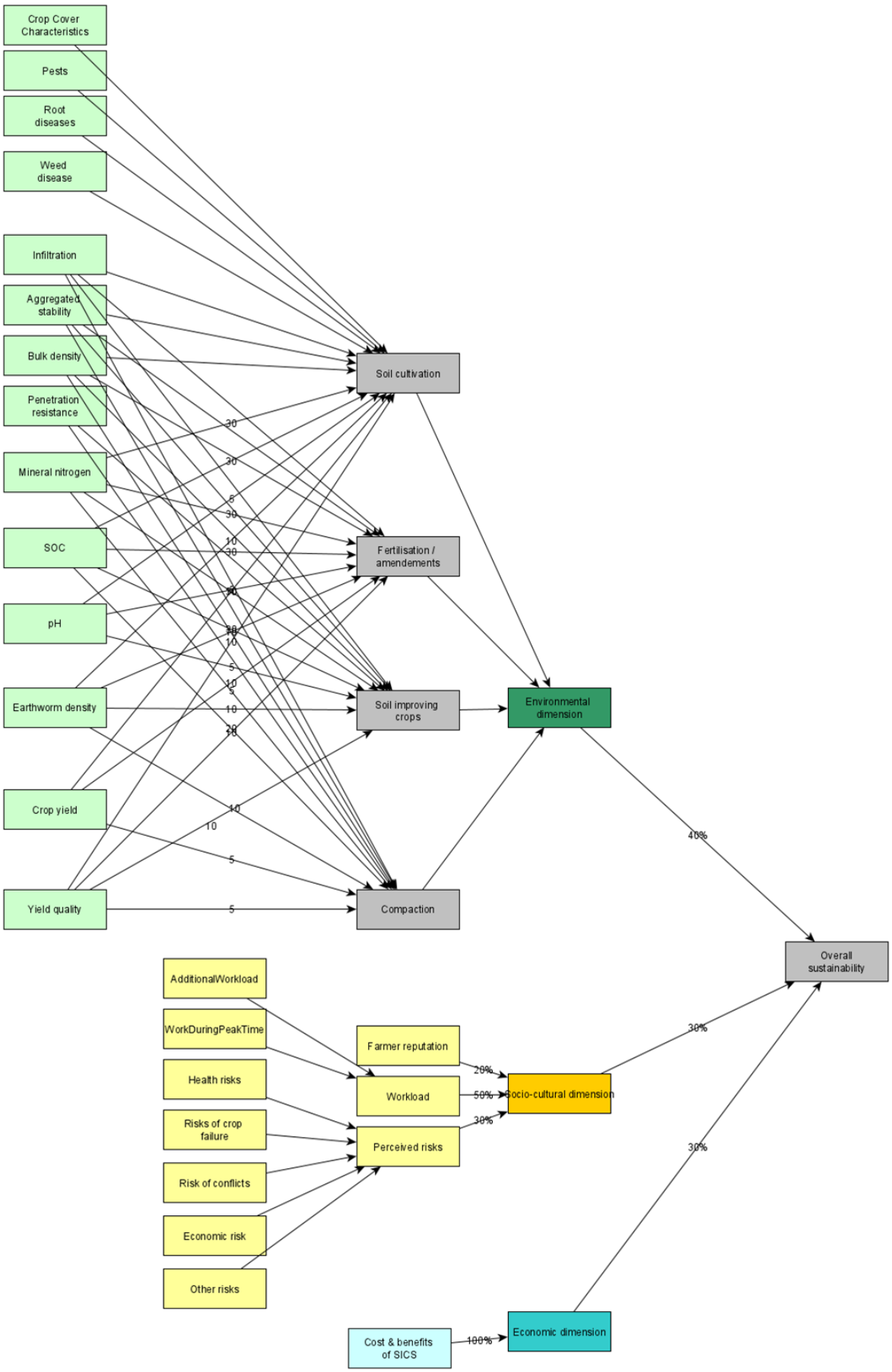
ASSESSMENT VARIABLES WITH WEIGHTING FACTORS



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