RISE:
Response-Inducing Sustainability Evaluation at the farm level

Fritz Häni, Andreas Stämpfli, Thomas Keller and Harald Menzi
Swiss College of Agriculture (SCA), CH-3052 Zollikofen
Contacts: fritz.haeni@shl.bfh.ch

Background and aims

Whereas the liberalisation of the world markets today seems to exert the greatest pressure on development, sustainable production is the most important leading principle. According to the Brundtland Commission (UNCED 1987), "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The three key factors of sustainable development are environmental protection, economic efficiency and solidarity in society.

Numerous studies have been conducted to evaluate the degree of sustainability on a national and local level and broadly accepted indicators have also been recommended. However, only little information for the precise assessment of a single farm is available. To fill this gap and to provide a simple and robust tool for the assessment of the sustainability of farms and the sustainable development and optimisation of farms, we developed RISE, a model for the Response-Inducing Sustainability Evaluation at the farm level.

The goals set for the new model were:

- An easy instrument for the assessment of the sustainability of farms and a tool for the comparative evaluation and planning of farms or farming sectors.
- A holistic approach, working with a "whole system approach" and using relevant and measurable indicators in agreement with ISO-14040 norms for life cycle assessment.
- An instrument applicable for different farm types and conditions and in different countries.
- Indicators, data procurement and interpretation of the results must be verifiable and understandable for farmers and a wider public.
- The effect of individual measures on the whole system must be easy to visualise.
- The farmer should be able to see both the strengths and the weaknesses of his farm to be able to optimise the farm accordingly (response-inducing approach).

Principles of the approach

RISE is based on twelve indicators for the economic, ecological and social situation: Energy consumption, water consumption, situation of the soil, biodiversity, emission potential, plant protection, wastes and residues, cash flow, farm income, investments, local economy, social situation of farmer family and employees. For each indicator the “Driving force” (D) and the “State” (S) are assessed (figure 1). The "driving force" quantifies the "pressure" on the ecological, economic or social situation (e.g. nutrient input, amount of pesticides used) on a scale of 0 to 100. The "state" quantifies the present situation of the different indicators on a scale of 0 (worst case) to 100 (ideal situation). The degree of sustainability (DS) is calculated as S-D. Single indicators are considered sustainable if DS is above +10, the whole system of farm is considered sustainable if no indicator has a DS below –10. D, S and DS of every indicator are shown in the form of a sustainability polygon (figures 2 and 3) to visualize the results and to allow for an easy interpretation. To visualise the results and allow an easy interpretation, D, S, and DS of all the indicators are shown in the

form of a sustainability polygon (figure 2, 3). In an ideal situation the polygon does not show maximum values for individual indicators but rather a regular band of positive values for DS. The interpretation of the results will identify weak aspects (D and S) of the farm and will thus induce steps to improve the situation.

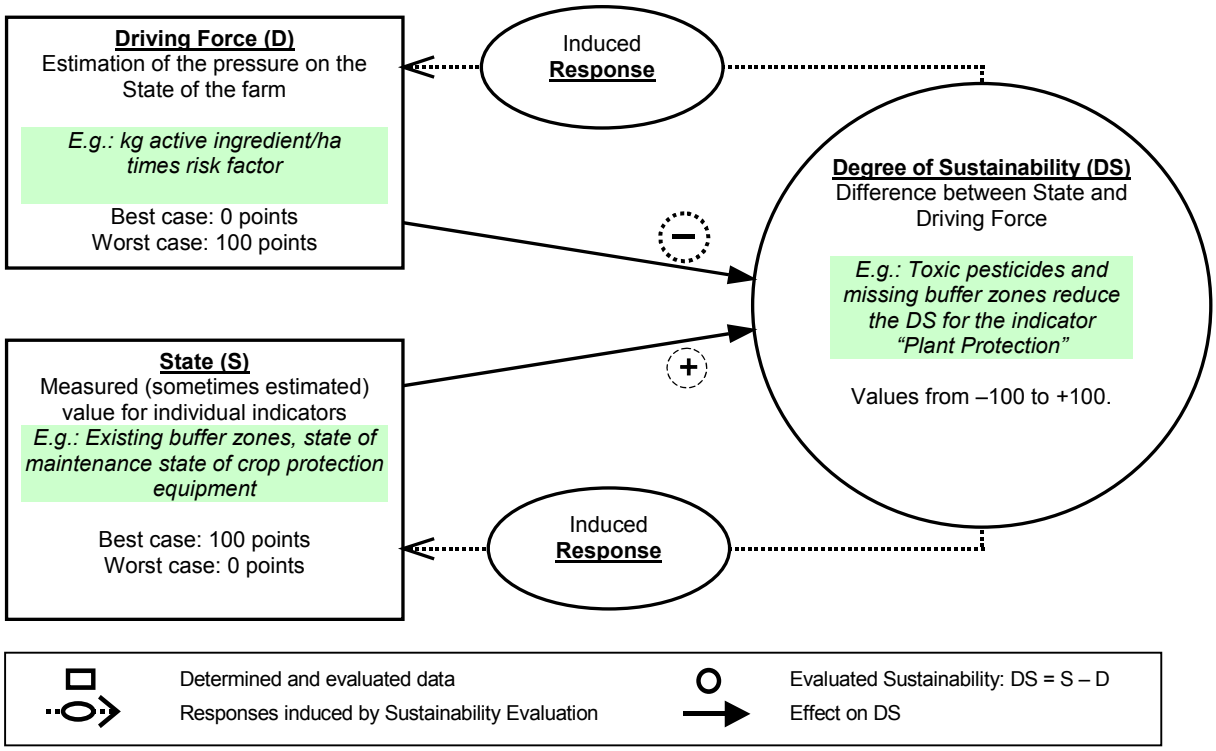

Figure 1: Schematic approach of the response-inducing sustainability evaluation (RISE). The degree of sustainability (DS) is calculated as "state (S)" – "driving force (D)". For single indicators values above +10 are considered sustainable; the whole system is sustainable if no values of DS are below –10.

Examples

Figure 2 shows the example of the sustainability assessment for a typical mixed Swiss livestock and crop production farm of 19 ha with a livestock density of 1.5 LU/ha and a milk production of 5070 kg/ha. The result can be considered as rather typical for many farms working along the lines of the Swiss agricultural policy with direct payments for ecologically beneficial farming systems. The most serious handicap is the farm income, energy consumption and wastes are other weak aspects. The farm could clearly improve its situation by optimising the cattle housing system and investing into renewable energy systems (biogas, canola oil driven tractor).

Figure 3 shows the example of a dairy cattle farm of 1.4 ha and a livestock density of 25 LU/ha and a milk production of 82'850 kg/ha in Northern China (South of Harbin in Heilongjiang province). The farm is economically sound but has a very high emission potential. By recycling the manure as fertiliser, the situation can be improved considerably. This means investments into the storage, transport and spreading of the manure as well as the export of 85% of the manure to crop farms.

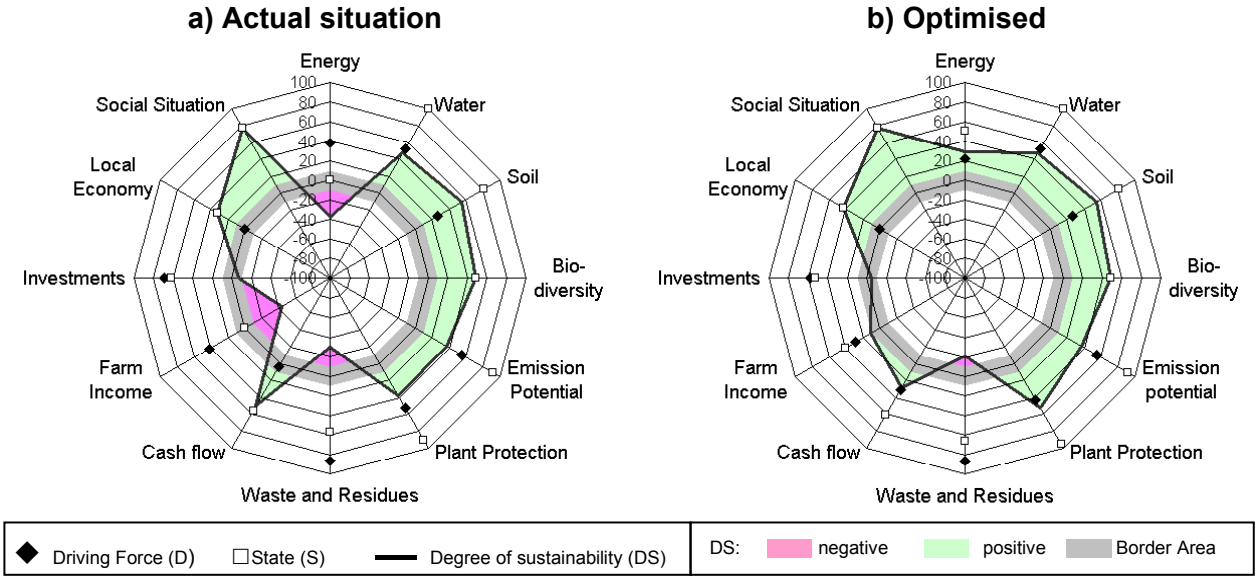

Figure 2: Sustainability polygon of a typical Swiss mixed livestock and crop farm of 19 ha with a livestock density of 1.5 LU/ha and a milk production of 5070 kg/ha.

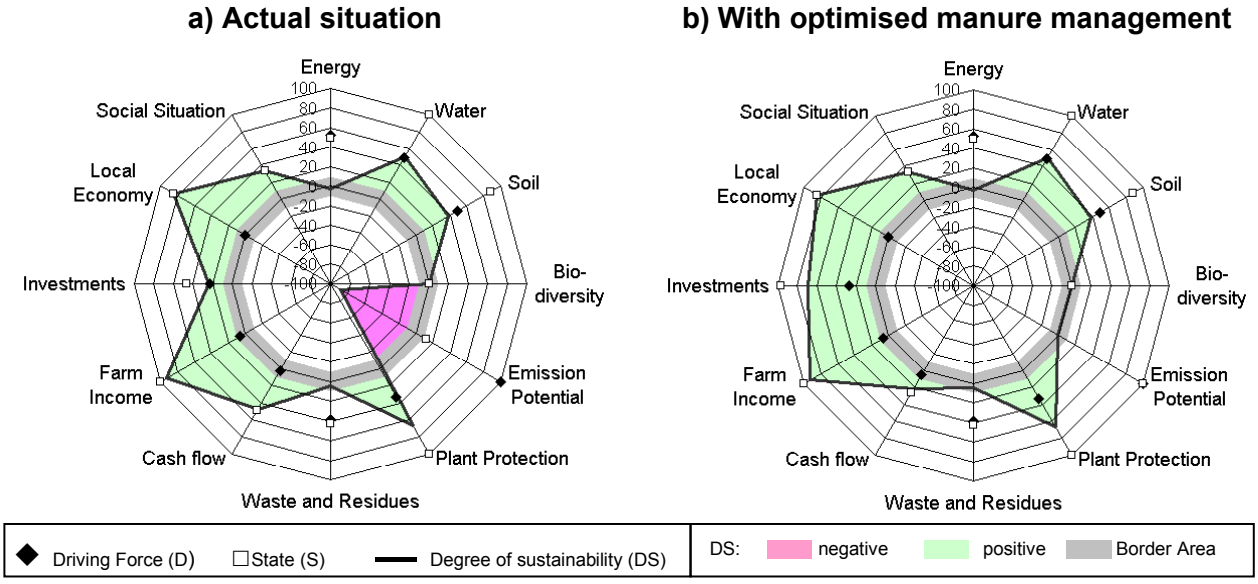

Figure 3: Sustainability polygon of a dairy cattle farm of 1.4 ha and a livestock density of 25 LU/ha and a milk production of 82'850 kg/ha in Northern China.

Outlook

RISE has been successfully tested on farms with very variable conditions in Switzerland, China (in collaboration with Nestlé) and Brazil. It is now validated further and brought into a PC-based version.