An Evaluation of Tea Farms in Southern India with the Sustainability Assessment Tool RISE

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Abstract

Based on the assessment tool **RISE** (Response-Inducing Sustainability Evaluation) a case study sample of 13 tea growing farms with 3 to 63 hectares in the district of Nilgiris, Tamil Nadu, India was assessed to highlight potentials, critical deficiencies and possible risks of the current production. The RISE analysis depicts its results on twelve indicators that are calculated from more than sixty parameters, covering ecological, economic and social aspects of sustainability.
The study was conducted upon the request of a tea processor with its green tea processing factory in this district. Some 500 tea growers are producing high quality tea leaves non-exclusively for this factory, which is exporting the processed green tea mainly to Japan. The tea processor has a particular interest to know whether higher quantities of tea can be produced without compromising ecological and social performance.

The empirical results can be summarized as follows:

- ***Ecological Indicators:***
  Generally good performance in indicators *Energy*, *Water*, *Soil* and *Waste*. Deficiencies were found in *Biodiversity* (only in 3 of 13 farms analysed the result for this indicator is considered sustainable; smaller farms show higher values in biodiversity), *N&P Emission Potential* (9 of 13 farms sustainable), and *Plant Protection* (6 of 13 farms sustainable). The latter two differ much within the sample due to individual farmers' practices and do not correlate with the size of the farms.
- ***Economic Indicators:***
  The *Economic Stability* is considered sustainable in 7 of the 13 farms analysed, the *Economic Efficiency* in 2 of 13. There is a tendency that large farms (> 10 ha) achieve a better economic efficiency and stability than small farms (≤ 10 ha). A good performance on the indicator *Local Economy* is observed in all farms analysed.
- ***Social Indicators:***
  The *Working Conditions* are considered sustainable in 9 of 13 farms. Lack of overtime compensation and unpaid holidays are the main issues that should be improved. The *Social Security* is considered unsustainable for all farms analysed. This is due to low salaries and the absence of any kind of insurance for the employees, as well as a substantial difference in the income of the farm managers and the employees.

The ecological situation does not appear dramatic but intervention points for improvement like the basic education of farmers in IPM, nutrient management (in conjunction with organic fertilizers), and the establishment of zones of ecological compensation were identified. The offer of work in tea plantations is important for the local population but salaries of employees, especially those of the tea plucking women are unsatisfactory and should be increased to a minimum existence income and working conditions of the employees improved.
Based on a balanced production throughout the year and subject to some restrictions, yield increases appear possible without negative effects on ecological aspects. Increasing productivity could lead to a win-win situation for processors, farmers and employees if the more regular and higher income can be used in a way to improve the situation for all stakeholders.
Overall, the project underlined the practical flexibility of RISE as a holistic, comprehensive and global tool, by generating valuable managerial information relevant to Indian tea producers and processors.

Background

Liberalisation and globalisation of markets exert the greatest pressure upon economic aspects of agricultural production by causing generally decreasing and highly volatile commodity prices, which render many farms and even entire sectors unprofitable (Worldwatch Institute 2003). The socio-economic consequences of this development are reflected in the distribution of most work in agricultural production upon a declining workforce, and in inadequately reimbursed labour (World Bank 2003). The financial pressure on salaries and expected returns on investment can lead to social and ecological dumping. This may result in discrimination, child labour and failure to provide necessities like potable water, hygiene or protection from hazardous substances, and may trigger loss of biodiversity, soil degradation, or contamination of soil, water and air (WWF 2002, Baratta 2004).

In this context it is important that the sustainability of agricultural production can be assessed and monitored in all three dimensions (ecologically, economically, and socially). A simple and inexpensive but still holistic management tool that allows pinpointing potential measures to improve the situation and to initiate a response against potential risks and bottlenecks in agricultural systems is therefore of great value for farm managers and other relevant entities. Although numerous methods to evaluate the degree of sustainability on a global, national, and local level (e.g. UNO 2001, OECD 1997, 1999) and various environmental licensing and labelling options (ISO 14040, EurepGAP, Organic, etc.) are available, a holistic management tool for the farm level appears to be missing. None of these methods visualize potentials and strengths to communicate achievements in the same way as failure. Doing so could raise the consumers' and farmers' awareness about achievements as well as problems that agricultural production faces with regard to sustainability.

To bridge this gap the Response-Inducing Sustainability Evaluation (RISE) has been developed at the Swiss College of Agriculture (Häni et al. 2002, 2003a, and 2003b, Studer et al. 2005) in cooperation between public and private entities. RISE is a computer-based tool that allows assessing the sustainability[1] of agricultural production and trends hereof at farm level (early warning system). The holistic sustainability assessment follows a systems approach and covers ecological, economic and social dimensions. The tool identifies strengths (potentials) and weaknesses with regard to sustainability, hereby providing the farmer with a testimonial on one side and the identification of intervention points for improvement on the other. RISE thus not only aims at diagnosis, but rather at the initiation of measures to improve sustainability of agricultural production. As a monitoring tool RISE can visualize trends and developments over time on individual farms as well as within sectors or catchment areas. The RISE sustainability evaluation is based on data collection at farm level using a comprehensive questionnaire. After computer-aided calculation of the indicators, a feedback discussion of the results with the farmer takes place, yielding ideas for potential measures to improve the current situation. Besides identifying specific measures at farm level to improve the situation, the analysis of larger samples can assist relevant institutions in identifying ways to adapt framework conditions (the

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[1]**Sustainable development** *allows a life in dignity for the present without compromising a life in dignity for future generations or to threaten the natural environment and endangering the global ecosystem* (Häni et al. 2002). This definition is based on the Brundtland Report (WCED 1987), but has been augmented by two more dimensions: “human dignity” and “environment” (Stückelberger 1999, modified).

Sustainable Agriculture *adopts productive, competitive and efficient production practices, while protecting and improving the environment and the global ecosystem, as well as the socio-economic conditions of local communities* (SAI 2003, adapted), *in line with the principles related to human dignity.*

political and economic environment) in order to improve prevailing weaknesses regarding the sustainability of agricultural production.
The individual information collected at farm level is subject to strict confidentiality when stored in the database (unless there is a different contractual agreement). The database provides farmers and other interested entities a basis for comparison with other farms or farm types. This benchmarking shall motivate the farm manager to improve the sustainability of his or her production methods.
RISE can be used globally for analysis and comparison of all kinds of farms and production systems. In the development of the tool emphasis was put on simplicity and meaningful outputs. The balance between straightforwardness of the analysis and complexity of the reality as well as transparency of the results shall make the output comprehensible for a wider public. Based on the experience in practical applications in Brazil, Canada, China, India, Russia, Switzerland and Ukraine, RISE is adapted and improved on a continuous basis. The establishment of national and regional "RISE-hubs" (competence centers), which are linked in an open RISE platform, allows for adaptations to local conditions, promotion of the use and further development of the model and its database. In spring 2005 the first full version RISE_1.0 was launched for a widespread application in cooperative projects and fee for service assignments.

Objective

The application of the RISE model among a specified sample of tea growers in India was requested by a tea processor. Planning to expand its tea-manufacturing unit in the district of Nilgiris, Tamil Nadu, India, this processor was interested in evaluating a small number of its roughly 500 tea producers with RISE providing a case study rather than a representative sample. As the non-exclusively for this processor producing tea growers are a vital source of raw material for the factory, it is important to analyse the sustainability of the prevailing tea production systems as well as possible future threats for these farms. The study further aims at highlighting the potentials of tea production and to check for possibilities of supplying larger amounts of tea leaves from this area. The findings of the assessment will have to be presented to and discussed with the farmers and should encourage steps of action to improve the situation. At a later stage, the induced changes can then be monitored with the model RISE and the effectiveness of the measures taken can thereby be verified.
A RISE-specialist and a Diploma student from SCA collected the required data on 13 tea farms that had been selected by the tea processor according to different farm sizes and production methods. The gathered data have been processed and analyzed using RISE_1.0 (Studer et al. 2005).

Materials & Methods

RISE methodology

The RISE analysis depicts its results on twelve indicators, which are calculated from more than sixty parameters covering ecological, economic and social aspects of sustainability. In addition, a "Rating" (Strength-Weakness Profile) outlines further aspects, e.g. “animal welfare” or “grey energy” (not presented in this paper). Each sustainability indicator contains parameters that outline the state (S) of the system and parameters that describe a driving force (D) on or within the system, driving it in a certain development direction. This allows a combination of a systems and an analytical approach. D allows to consider the long-term tendencies and risks whereas S can serve as an analytical database for the actual situation. State parameters have a value between 0 (worst case) and 100 (best case). Driving force parameters are also computed on a scale between 0 and 100, but since they are valued as a negative pressure on the system, 0 indicates the best case and 100 the worst (biggest pressure). The Degree of Sustainability (DS) is calculated as DS = S – D. Individual indicators are considered sustainable if DS is above +10, the whole farm is considered sustainable if no indicator has a DS below –10 (Häni et al. 2003b, Studer et al. 2005). Values between –10 and +10 are here called threshold values because they represent a transition zone that borders on one side sustainable and on the other side non-sustainable values.

Area, sample and data collection

The district of Nilgiris is a hilly region and the analysed area has an elevation of 700 to 1200 meters above sea level. Tea is the main source of income and it shapes the landscape of the district. There are 15 *Ind*ustrial *Co*operative tea factories (*INDCO*s) uniting 20’300 small tea growers cultivating less than 6ha each and producing 17% of the total tea production in the district of Nilgiris. In addition to the *INDCO*s private factories like the tea processor plant collect leaves from other small farms. Big estates of sometimes more than 1'000 hectares with their own tea factories are other key players. Suppliers collect the green tea leaves from farmers and pay them the *INDCO*-price, which is calculated based on the price for black tea sold at public auctions. The tea processor does not have control over the payments to the farmers, but generally the *INDCO*-price is known among all farmers. As the tea price has been low during the last 3 years, the government of Tamil Nadu intervened in favour of the small farmers. Small tea growers that own up to 4 hectares were eligible to benefit from a Price Stabilisation Fund Scheme.

Results

The results of the 13 farms analysed are displayed in Table 1 and a summarizing sustainability polygon is exhibited in Figure 1. This polygon was derived from the mean value for each indicator of the 13 farms. Some indicators show high variation, others vary only slightly from farm to farm (Figure 2).

		Ecology							Economy			Society	
Size	Farm	EN	WR	SO	BD	EP	PP	WS	ES	EE	LE	WC	SS
Small (≤ 10ha)	1	99	86	58	12	38	6	35	41	-86	50	20	-37
	2	100	89	36	11	22	6	46	-17	-97	50	9	-38
	3	95	86	33	0	88	18	46	-33	-99	50	13	-49
	4	100	89	65	6	-51	-6	46	-50	-95	50	22	-46
	5	100	86	49	10	65	22	37	-59	-95	50	10	-54
	6	86	64	43	2	52	32	46	22	-62	50	25	-48
	7	96	88	30	-9	54	12	46	50	82	46	6	-18
Small	Mean	97	84	45	5	38	13	43	-7	-65	49	15	-41
Large (>10ha)	8	52	86	45	-6	-19	6	35	62	68	50	12	-15
	9	84	86	65	3	-20	21	64	-51	-97	50	17	-54
	10	100	89	35	-28	87	2	46	18	-76	50	24	-56
	11	99	59	25	-15	-18	-3	46	86	-35	50	11	-36
	12	96	86	9	-31	59	10	46	9	-95	50	25	-33
	13	100	86	34	-12	71	84	29	11	90	48	0	-9
Large	Mean	89	82	36	-15	27	20	44	23	-24	50	15	-34
Total	Mean	93	83	41	-4	33	16	44	7	-46	50	15	-38

Sustainable value
Threshold value
Non-sustainable value

Table 1: Degree of Sustainability (DS) for the 12 RISE indicators on each of the farms assessed. Acronyms cf. Figure 1. Farms are sorted according to farm size, from 2.8 to 10ha for small and from 22.8 to 62.9ha for large farms.

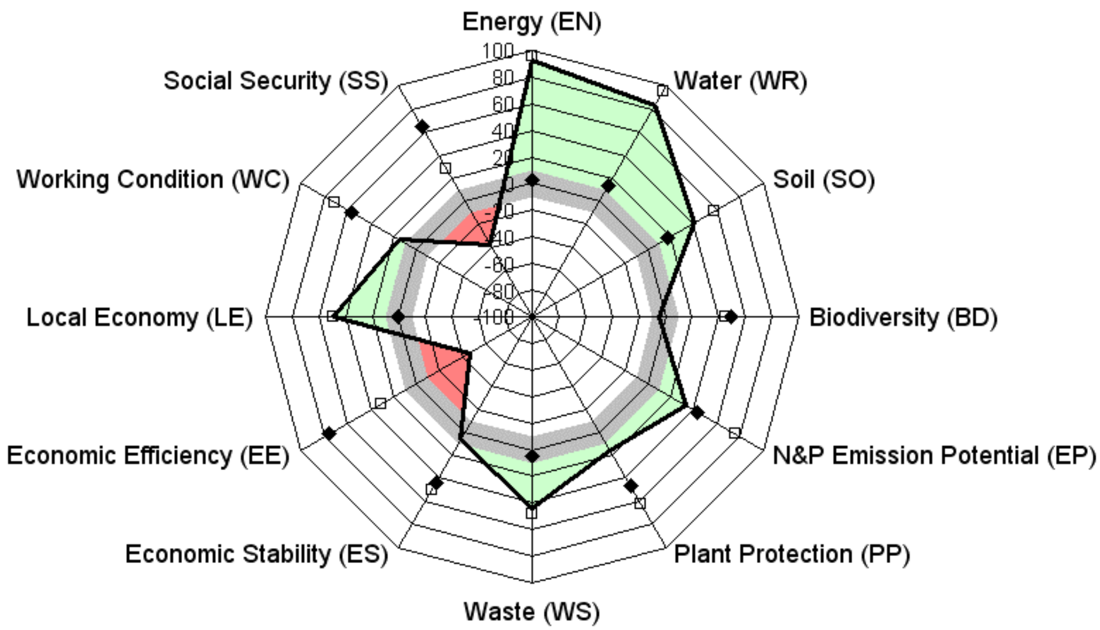

Figure 1: Synthesis on the RISE –polygon of the 13 assessed farms (means of the 12 indicators, legend cf. Table 1)

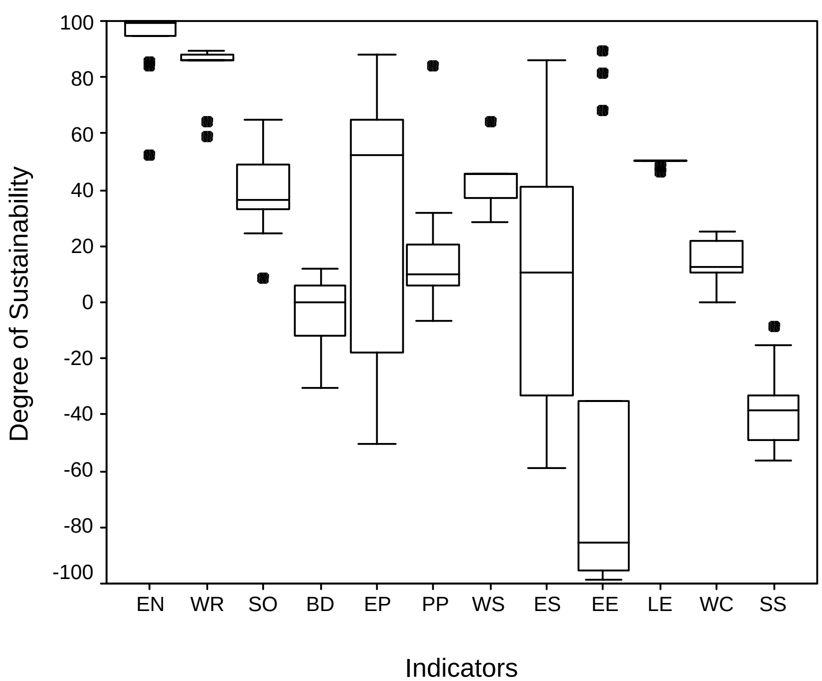

Figure 2: Box-Plots of the 12 indicators for the 13 farms; acronyms cf. Figure 1

Highest variations were recorded on the indicators “Economic Efficiency” (EE),“Economic Stability” (ES) and ”N&P Emission Potential” (EP) (Figure 2). The outlier on the indicator “Energy” (EN) represents a farm that uses two vehicles for the farming operation and Diesel for the irrigation. The outliers in the indicator “Water” (WR) stand for two farms with irrigation from sources that are unstable.

Ecological Indicators

- *Energy EN, Water WR, Waste WS and Soil SO:* A generally good performance was observed for these indicators. The positive result for the indicator *Waste WS* originates from the small amount of waste produced at farm level. It consists of fertilizer bags and containers for pesticides. The disposal of litter on farm is problematic: In most cases farmers dig a hole to discard the waste or simply throw it in an unused well; water used for cleaning spraying implements is discarded on bare soil. Though the amount of produced waste is low, a risk of ground water contamination exists.
  Plots with an inclination of more than 30% were recorded regularly. Perennial crop coverage, anti-erosion measures like drenches and ditches, and contour cropping to avoid run-off are generally practiced.
- *Biodiversity BD* showed accentuated deficiencies, particularly with regard to the wild flora; only 3 of 13 farms are considered sustainable. This is mainly due to an overall high intensity of production that includes fertilisation of *all* plots, regular pesticide applications and lacking of ecologically valuable field margins. Intercropping is a general practice. All farms produce pepper, a majority also betel nut (areca nut) and some coconut palm. Coffee used to be grown commonly, but some have completely removed it due to the low price during the last decade. Some farmers grow different spice crops, especially cardamom. They further grow fruit trees like bananas, mango, papaya, jackfruit etc. mainly for own consumption. As vanilla achieved very high market prices during the last year a few farmers made significant investments to grow and irrigate this crop, but the price has again decreased sharply.
- *“N&P Emission Potential EP* (9 of 13 farms sustainable) and *Plant Protection PP* (6 of 13 farms sustainable) vary considerably among the farms due to different practices. Deficiencies are due to high quantities of fertilizers (mainly organic manure) on some farms that do not match with the crop requirements. For all farms an appropriate education for plant protection and especially integrated pest management (Boller et al. 2004; Häni F., Boller E., Keller S., 1998) is lacking, application units (sprayers, nozzles, etc.) are not inspected on a regular basis, and buffer zones along waterways and sources are missing.

Economic indicators

- *“Economic Stability” ES*: In general, larger farms achieved a better performance regarding this indicator than small farms (≤10ha); 5 of the 6 large farms, but only 3 of the 7 small farms are considered sustainable with regard to ES. The debt burden is generally low due to restricted access to credit. Only on five farms substantial expansion investments were undertaken over the last five years, but the state of the tea plantations is usually good. Some coffee fields, however, were in mediocre condition because they were neglected due to low commodity prices. The farmers generally work with very few assets and buildings for their production.
- *“Economic Efficiency” EE*: The economic efficiency of most farms evaluated is poor (only 4 of 13 are sustainable). Some farmers may have exaggerated their costs of production (COP) and understated tea yields assuming a better basis for future price

negotiations with the suppliers of the tea processor. Nevertheless, the high values of tea plantations in contrast to the low income result in a low return on investment (ROI).

- *"Local Economy" LE:* Since the well maintained tea plantations are able to produce up to 25'000 kg of green leaves per year and hectare (equivalent to 5'500 kg of processed tea) and this provides on average more than two regional employees with a regular though low income, nevertheless common for the region - Indian GNI in 2003 was only US $ 540 per capita and year (World Bank, 2005) - the *LE* indicator is considered sustainable for all evaluated tea farms.

Social indicators

- *"Working Condition" WC*: Although 9 of 13 farms present overall a sustainable WC indicator, it has to be stressed that the farmers don't have written contracts with their employees, and the big gap between potentially payable salaries and effectively paid salaries does not support a sustainable development. Even more so since a lack of overtime compensation, unpaid holidays, the heavy labour requested, no emergency plans in case of an accident or any advanced training further strain the situation. Forced and child labour was not found on any farm.
- *"Social Security" SS* highlights a common sustainability issue on all evaluated tea farms. Old-age pension schemes, unemployment-, health-, accident- and disability insurance, protection against loss of earnings and against dismissal do not exist. Some employees may profit from private solutions, since farm owners generally bear the expenses in the case of an accident; failure to do so may have a negative effect on reputation. Whereas in the case of illness employees are not protected at all. In contrast, farm managers/owners have a high living standard and in general a family network replacing an old-age pension scheme as well as health and accident insurances. The salaries paid by all farmers are below the minimum existence income. Salaries for the tea pickers are in particular low. Large farms >10ha further sidestep for them legally fixed minimum salaries (being below the existence minimum income) in that they split the property into several legal entities <10ha.

Discussion

Value of assets and return on investment

Figures 3 and 4 display the situation as analysed on farm No. 11, once with an imputed ROI of 4.6% (Figure 3) based on the average government bond yield of the evaluation year (Reserve Bank of India 2005) and once without subtracting the imputed return on assets from net profit/loss. The comparison of the two figures highlights the impact of the return on owner's equity on the net profit/loss and, therefore, on the different indicators. Based on the interviews a market value of roughly 400'000 INR (US $8'800) per acre (0.405ha) of tea was assumed for the Nilgiris district. The World Bank reported an inflation rate of 5.4% for 2004 and for the same year the average government bonds yielded 4.6%. It can be assumed that the land under tea cultivation is inflation neutral or even gains in value over the long-term. Interestingly enough, after setting the ROI rate to zero only four farms still accounted for a critical economic loss.

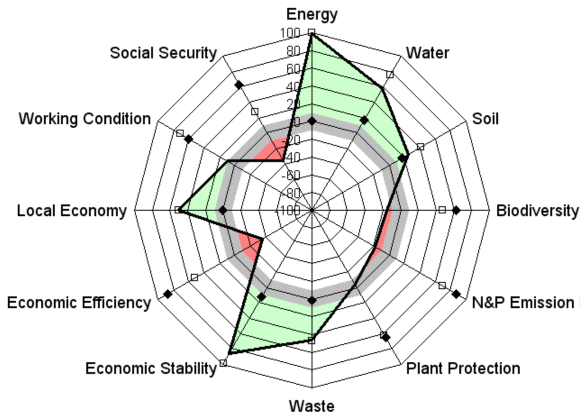

Figure 3: Standard calculation for farm No.11 with an interest on the owners' equity of 4.6%

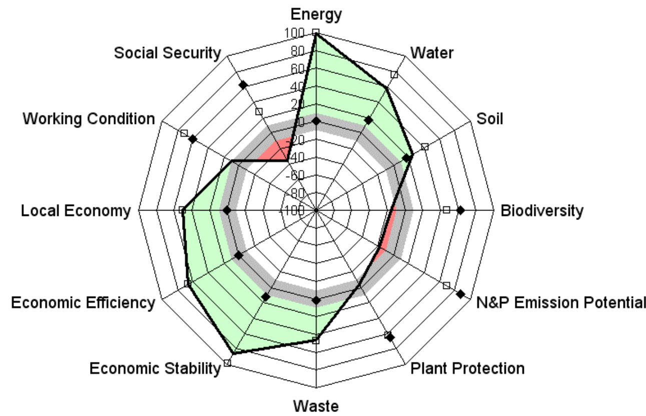

Figure 4: Indicators calculated for farm No.11 without an interest on the owners' equity

Farmers often ignore ROI and sometimes do so for good reasons. More important to them is to get a decent remuneration from the tea production. The demand for land, which leads to high prices per ha, indicates that there must be several advantages to invest in land. One reason may be that a tea plantation generates a regular income and in the long run will allow a reasonable standard of living. For tea farmers the prestige may also play an important role. To get a better status in society, one needs to increase the size of his farm.

Definition of the minimum salary and its consequences

A factor that needs to be defined for the calculation of the social indicators is the minimum salary per year and household (family with two children) that corresponds to the minimum living standard in the area the evaluation takes place (minimum existence income). Based on preparatory interviews with different tea stakeholders and independent local representatives US $800 per year was used. The amount was said to be enough to sustain a family with modest demands (food, clothes, housing, hygiene, basic education and basic precaution measures). Furthermore, we concluded that a minimum salary of less than US $266 per year would not even be sufficient to buy enough food, or in other words would lead to starvation. The interviews also showed that a farm owner expects a minimum salary of US $2400 per year generated for himself by the farm operation; this corresponds to a salary of US $1600 per year for the employees according to RISE standards.

Figures 5, 6, and 7 display the calculations of a single farm polygon based on these different minimum salaries. It is obvious that the farm appears not sustainable with regard to social aspects if the expected minimum salary were to be based on the farm manager's income. The sustainability polygon becomes more balanced when using the somewhat realistic minimum living standard defined during the preparatory interviews (minimum existing income). Nevertheless, not a single farm of the evaluated sample could come up with a sustainable indicator for *Social Security SS* under these assumptions. Assuming a minimum salary that only allows for bare survival of the employees only improves the picture marginally. One reason why the value of the *Economic Efficiency EE* indicator can be improved by lowering the minimum salary is that "total work output" is put in relation to this number; it is one out of 3 parameters that change based on the value given to the minimum salary.

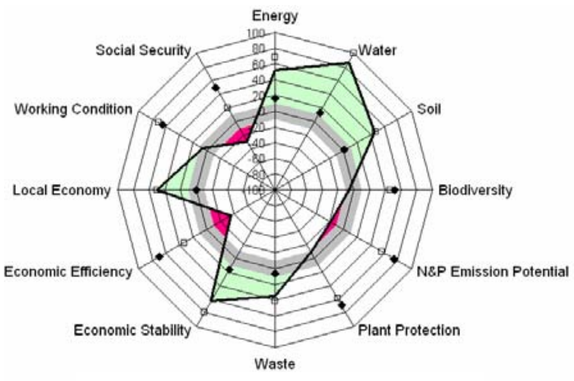

Figure 5: RISE -polygon of farm No. 8 assuming a minimum salary of US $1600/year

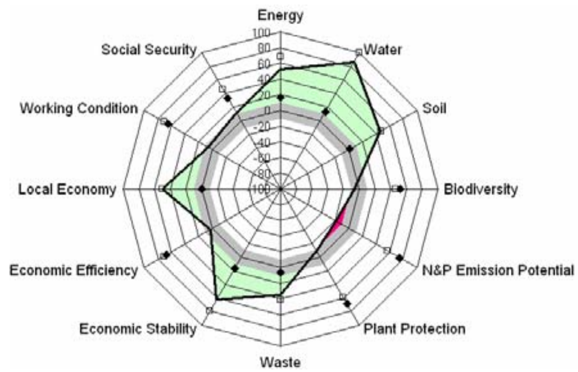

Figure 6: RISE -polygon of farm No. 8 assuming a minimum salary of US $266/year

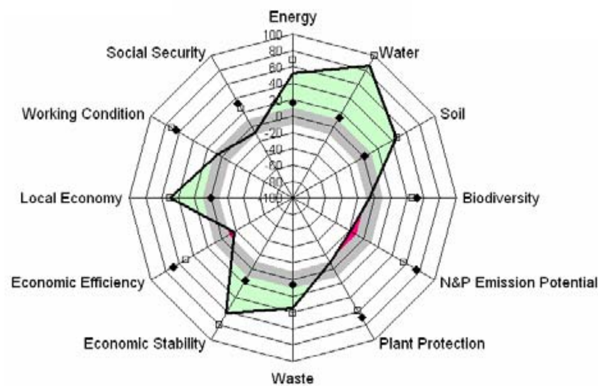

Figure 7: RISE -polygon of farm No.8 assuming a minimum salary of US $800/year, i.e. the minimum salary that was used for the entire study

Comparison of large and small farms

To allow for a comparison of small farms with farms larger than 10ha two summarizing polygons using the average indicator values for the two farm types were calculated from the evaluated sample (Figure 8), and box-plots presented by farm size (Figure 9). Substantial differences regarding average values between small and large farms appear in *Economic Efficiency (EE), Economic Security (ES)* and *Biodiversity (BD)*. The *EE* indicator shows a tendency that large farms achieve a better efficiency. However, the massive variance indicates that good management of the farm and strict finances are required to achieve a profitable farm operation, particularly on large farms. Also with regard to *Economic Security (ES)* the large farms seem to outperform small ones. The indicator *Biodiversity BD* yields significantly better results on small than large farms. In general, the smaller a farm is, the smaller and therefore more diverse are the plots (Boller, Häni and Poehling 2004). In addition, the bigger farms grow fewer shade trees than the small ones. Since this is not an economic necessity, the situation on large farms could be improved through appropriate awareness building and support in practical application.

The ecological indicators Soil (SO) and Emission Potential (EP) yield tendentiously slightly inferior results for large than for small farms; this indicates that on bigger farms the situation regarding environmental issues has to be observed more cautiously.
In the domains of *Energy, Water, Waste, Plant Protection* and *Local Economy* there appear to be no differences between the smaller and the bigger farms. Also with regard to *Working Conditions* and *Social Security* no substantial differences are perceptible.

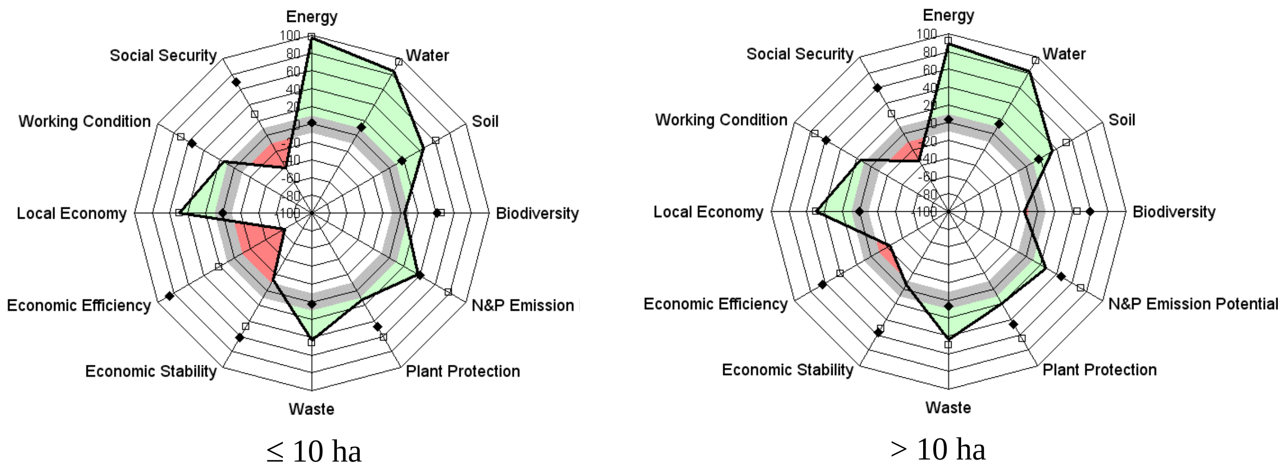

Figure 8: Comparison of the mean indicators for farms bigger than 10 hectares and those smaller.

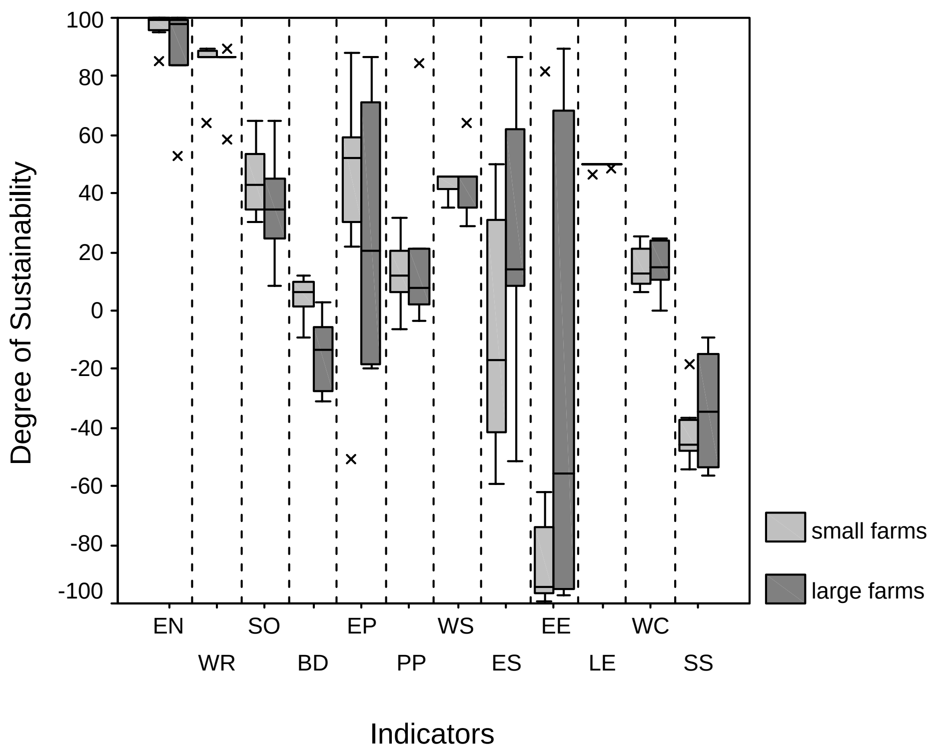

Figure 9: Box-plots of the 12 indicators split according to farm size (left <10ha "small" vs. right >10 ha "large" farms). Statistically significant differences only on Biodiversity based on a Mann-Whitney U Test.

Potential to increase tea production

Increases of tea yield appear possible without much negative effect with regard to ecological aspects provided that the level of education and awareness is improved. This can be concluded by comparing the sustainability polygons of two farms, one producing twice the yield/ha than the other (Figure 10).

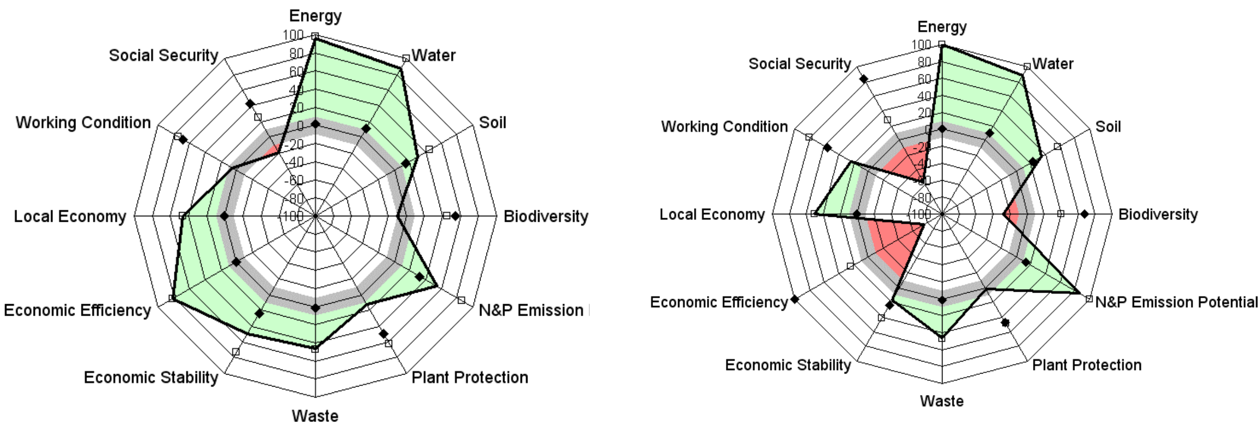

Figure 10: Two sustainability polygons of farms No. 7 and No. 10. Farm No. 7 (left) achieves double the tea yield per acre than No. 10 (right).

Higher yields may be achieved by increased use of fertilizers and pesticides. Inappropriate applications of these fertilizers may pose a high risk for N pollution of the water resources. An increased fertilisation will further demand higher pesticide applications because of higher disease pressure. Therefore good farm management practices, awareness of the IPM principles, and education of people that are involved in pesticide application are prerequisites to avoid possible problems in the domain of ecology and health.
Tea yield might also be increased and kept at a more constant level through irrigation. However, irrigation during the dry season might require major investments into irrigation equipment. Increased irrigation of the tea crop might become a competition for drinking water in the dry season, and water scarcity may result as a problem in the future.

Some of the other issues that have arisen from the RISE evaluation are discussed in short:

- Child labour is not present in the tea plantations at all. But since salaries are very low and there is a lot of work for women available (plucking is a job exclusively done by women) children must help out with the workload in most households, which is difficult to assess and evaluate.
- To get closer to an environmentally sound production several actions can be suggested:
  - Fungicides containing copper should be replaced, e.g. by the available substitute Contaf (5% EC of Hexaconazole), which is assumed to be more environmentally friendly.
  - For the application of pesticides an appropriate education or training should be mandatory. The education will reduce mistakes and undesirable side effects while

increase the effectiveness of pesticide applications. Additionally, the risks of building up resistances can be diminished with a correct application.

- Some farmers already have an idea about Integrated Pest Management (IPM). This potential needs to be further supported and the knowledge about IPM practices has to be dispersed among other farmers.
- Ecologically valuable field margins are rare. Farmers should not only know that such border strips may provide habitats for pests. Rather, they should become aware about their potential as habitats for natural predators and, as a consequence, their importance as resources of natural regulation and buffer zones. If such zones were established, a more balanced and stable agro-ecological system could be installed, which in the long run may decrease the number of intervention measures required (Boller, Häni and Poehling 2004).
- The red spider mite *Tetranychus cinnabarinus* is a problem on big estates in the Nilgiris district, although tea is only a secondary host for this pest (CABI 2002). In this study no farm with problems regarding this pest was assessed. Possible reasons for the difference between the farms evaluated and the big estates (several hundred ha) are:
  - On big estates the tea fields are much larger and the biodiversity at farm level is reduced as compared to smaller farms with an agro-forestry system.
  - More intensive use of pesticides and fertilizer on big estates.

If farmers have to reduce the production costs because of low tea prices they may decrease inputs. A drastic price decrease over a long period would result in decreased fertiliser applications so that soil mining and slow soil degradation is most likely to take place.

Conclusion

Tea is a favorable crop to grow in the region of the Nilgiris, Tamil Nadu, India, but in particular small farmers are under great economic pressure. The ecological situation is not dramatic, but certain measures could be easily implemented to improve it. The social situation of farm labor is clearly insufficient due to lacking insurance and low salaries of employees, especially of tea pickers, resulting in a potential for social conflicts. Efforts to improve the situation have to be undertaken. An increased and balanced tea yield per farm seems possible without causing negative effects regarding sustainability. This could be obtained by optimising fertilization and plant protection. Irrigation might be an interesting option, but would need thorough previous research of influences on water stability and other possible negative side effects. Any measures have to be cautiously implemented and need agronomic advice and supervision.

The application of RISE_1.0 on 13 tea farms in India has confirmed that even by analysing a very small sample of farms in a short time, important issues of relevance to the sustainability of agricultural production can be highlighted. RISE allows identifying strengths as well as weaknesses with regard to sustainability, whereby the situation on different farm types can be differentiated. By pinpointing specific weak spots, the tool facilitates the implementation of measures that can improve the situation with regard to ecological, economic and social aspects. Recommendations for improvements may target specific farming practices as well as the improvement of framework conditions in a way to achieve an environment more favourable for sustainable production. It is therefore important that the RISE sustainability assessment does not stop with the data analysis, but is followed by feedback discussions with the farmers as well as other important stakeholders. It has to be noted, however, that to get a representative picture of the prevailing situation, well-defined larger samples of farms would have to be analysed.

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