



**Formation IAR-ACV**  
**Mercredi 19 Janvier — Université de Technologie de Compiègne**  
**« Les impacts socio-économiques du développement des bioproduits et bioraffineries ! »**

**Eco-Efficiency methodology - SEEBALANCE® as a tool developed by BASF that encompasses the environmental, economic and social impacts of products and processes**

**Dr. Peter Saling,**  
**Head of Sustainability Evaluation**  
**BASF SE**

**BASF**  
 The Chemical Company



**BASF 2015**

**BASF**  
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**Ensure Sustainable Development**

**Help our customers to be more successful**

**The Chemical Company**

**Form the best team in industry**

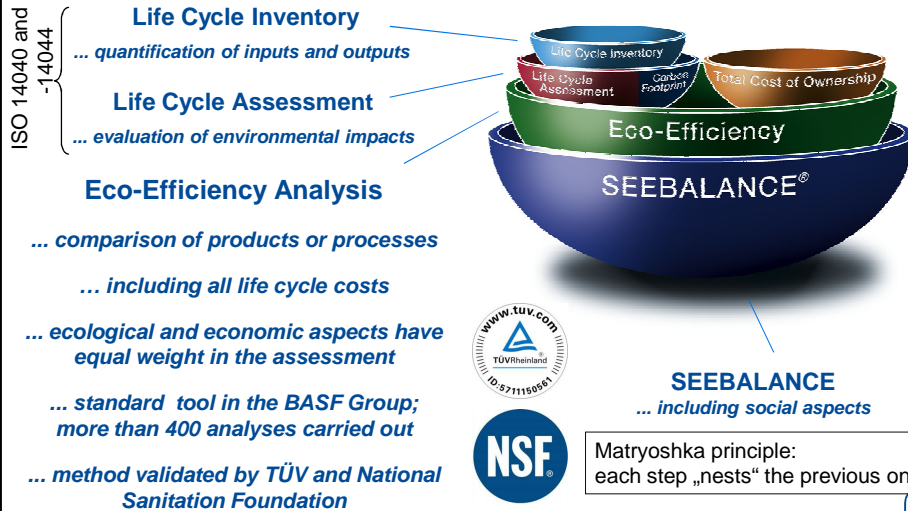
**Earn a premium on our cost of capital**

Peter Saling, Sustainability Evaluation BASF

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# Sustainability Assessment Methods and Eco-Efficiency Analysis



# Environmental Assessment

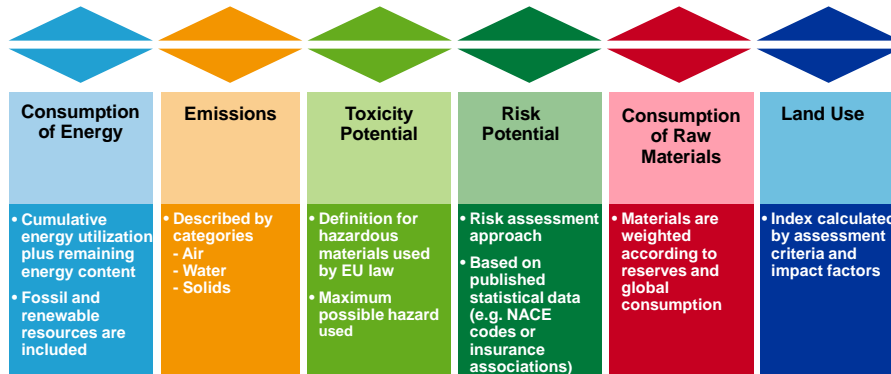


- Eco-profile or Life Cycle Inventory
- Life Cycle Assessment
- Carbon Footprint



# Environmental Categories

Environmental impact over the entire life cycle\*



\*Data acquisition and calculation is done according to ISO 14040 and 14044 (ecological part)

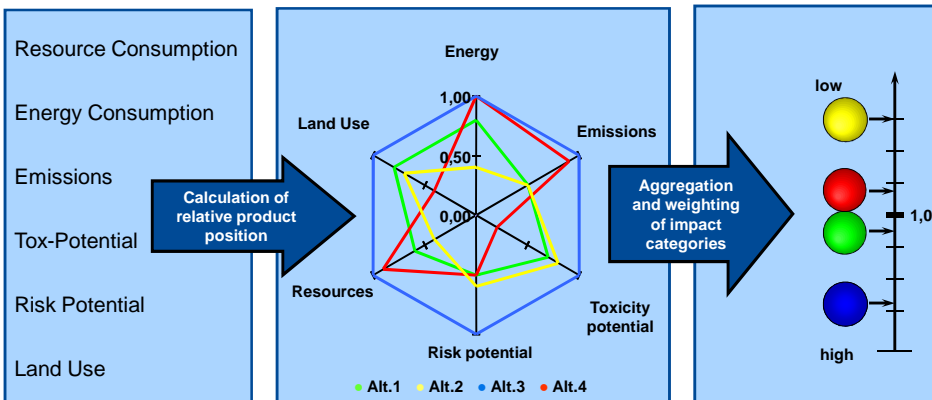


# Environmental Assessment

## Effect Category

## Ecological Fingerprint

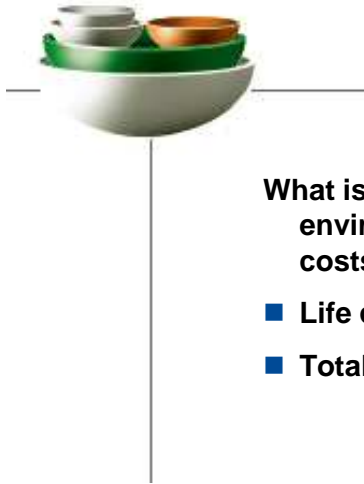
## Environmental Burden



Calculation → Normalization → Weighting → Aggregation



## Integration of cost assessment

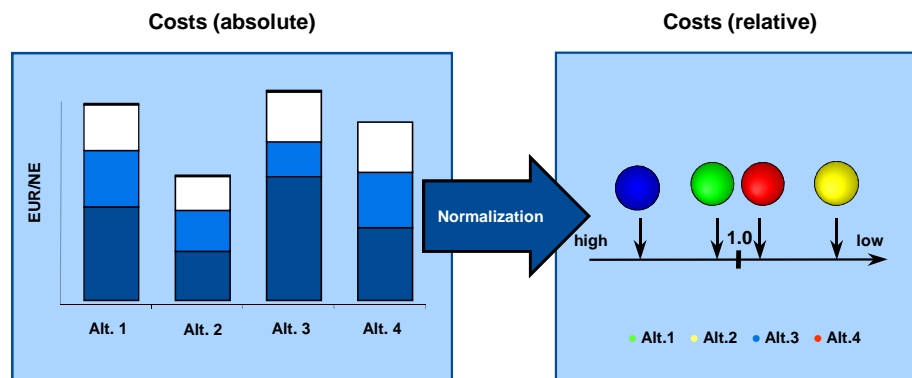


What is the effect of the improved environmental performance in the costs of the product?

- Life cycle costs (LCC)
- Total cost of ownership (TCO)

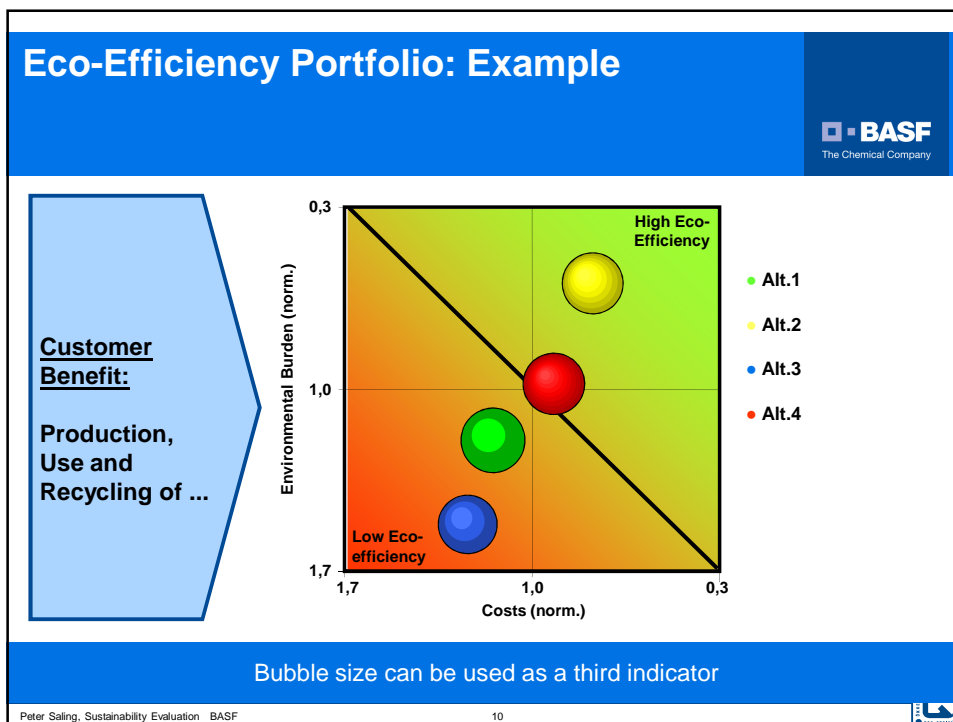
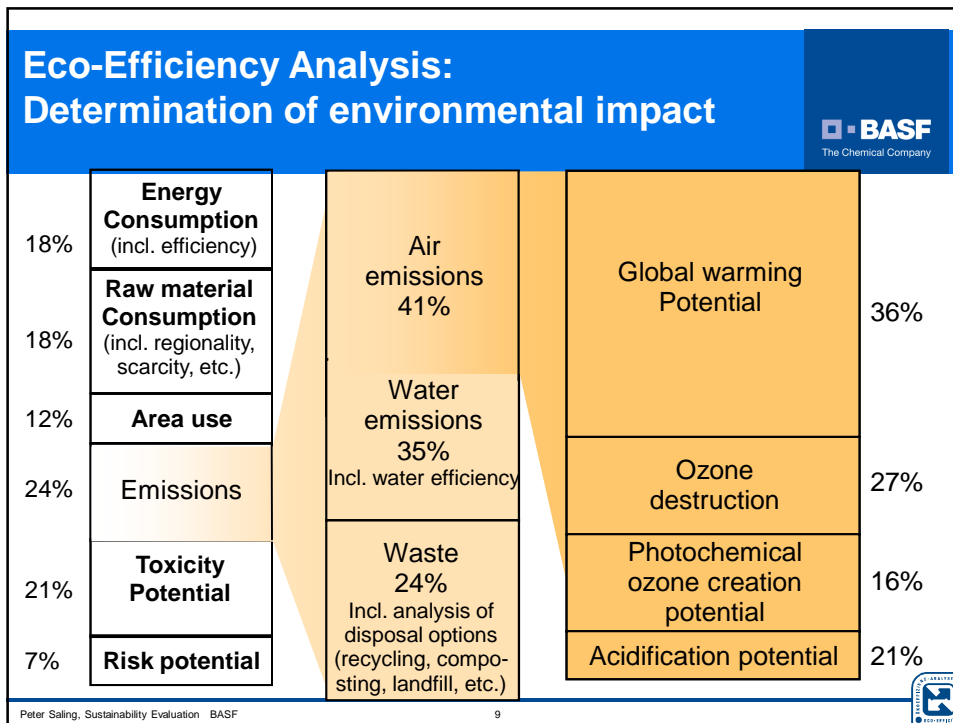


## Cost Analysis Life Cycle Costing (LCC) Total Cost of Ownership (TCO)

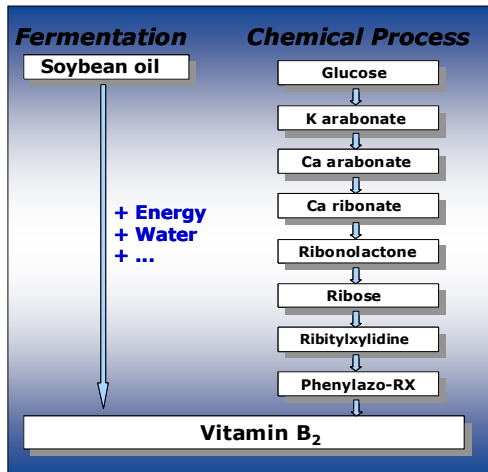


Addition of all real costs along the life-cycle!

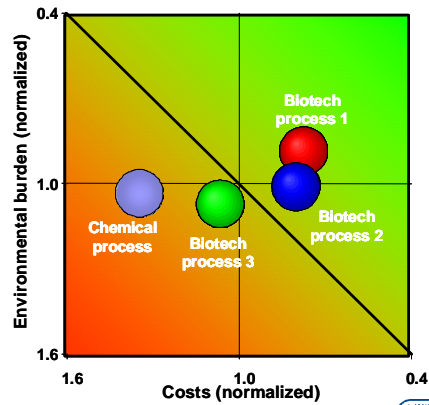




## The Three Pillars of Sustainable Development is the Basis of the SEEBALANCE



Vitamin B<sub>2</sub> for production of feed premixes

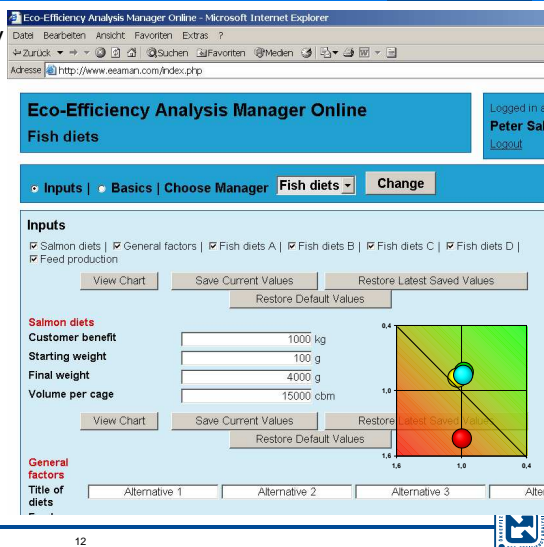


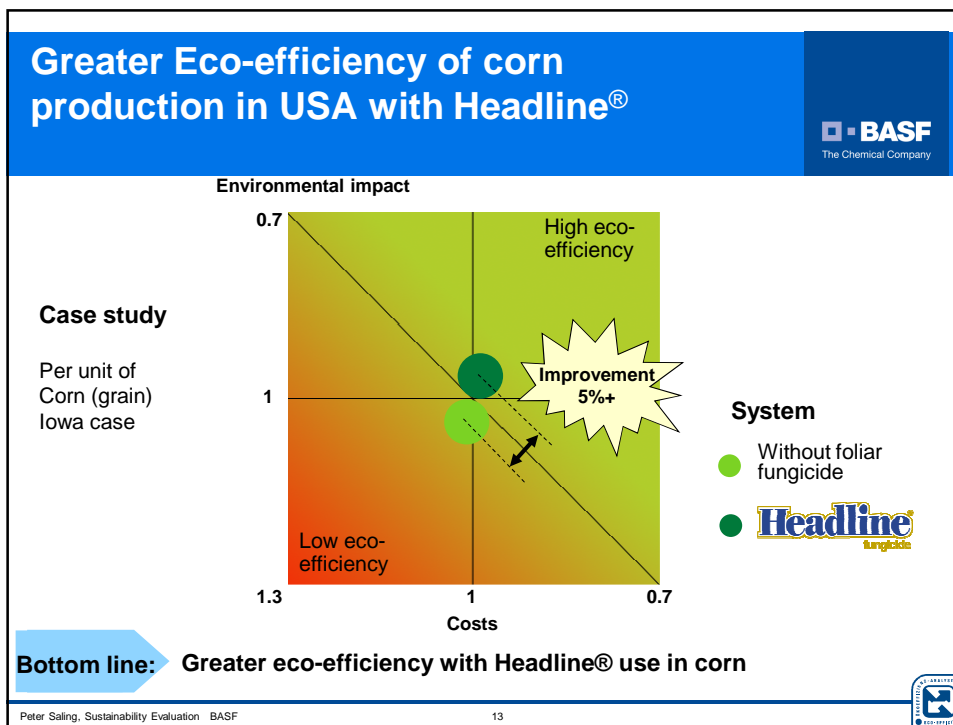
## Example: Fish farming

Eco-efficiency analysis by our customers


- Partners: Fish farming industry and scientific institutes in Scandinavia
  - Internet portal for performance of independent eco-efficiency analyses
  - Feed composition can be selected from 30 ingredients for various fish species
- The eco-efficiency manager allows customers to optimize their formulas independently

[www.eeaman.com](http://www.eeaman.com)





## Integration of the Social Dimension into the Eco-Efficiency Analysis




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### From the Eco-Efficiency Analysis to the SEEBALANCE®

- ➔ Integrated assessment of economic, ecological and social aspects of products and processes
- ➔ Cooperation with the University of Karlsruhe, the University of Jena and the Öko-Institut: part of the BMBF project „Sustainable Chemistry of Aromatics“


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**Öko-Institut e.V.**  
Institut für angewandte Ökologie  
Institute for Applied Ecology




Universität Karlsruhe (TH)  
Institut für Geographie  
und Geoökologie



Federal Ministry  
of Education  
and Research




Friedrich-Schiller-Universität Jena  
Chemisch-Geowissenschaftliche Fakultät  
Institut für Technische Chemie und Umweltchemie

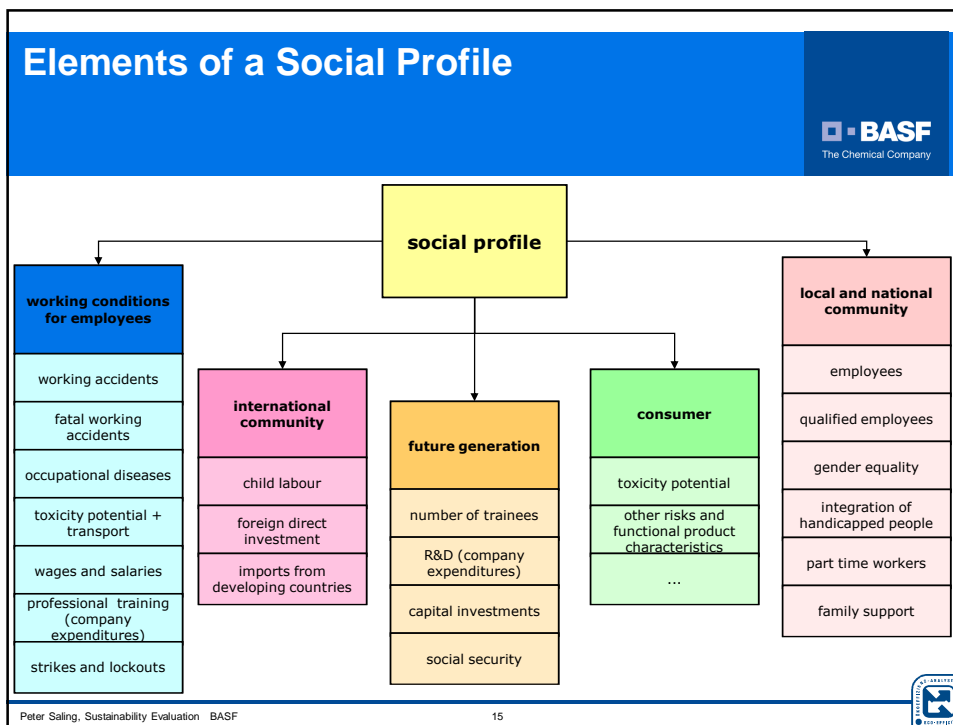


**Pto**  
Projekträger des BMBF, BMWA und BMU  
Forschungszentrum Jülich GmbH


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## SEEBalance® Social categories of SEEBALANCE



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**The social impact of the use of a substance and of its alternatives on the employees is assessed by considering e.g.:**

**employees**

working accidents

fatal working accidents

occupational diseases

toxicity potential + transport

wages and salaries

professional training (company expenditures)

strikes and lockouts

***Number of working accidents*** shows how the production process of substance contributes to the wellbeing of employees.

***Professional training*** shows the level of education that leads to products.

***Toxicity potential*** reflects human health effects on employees.

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## SEEbalance® Social categories of SEEBALANCE



The social impact of the use of a substance and of its alternatives on the future generations, as a basic principle of sustainability, is assessed by considering e.g.:

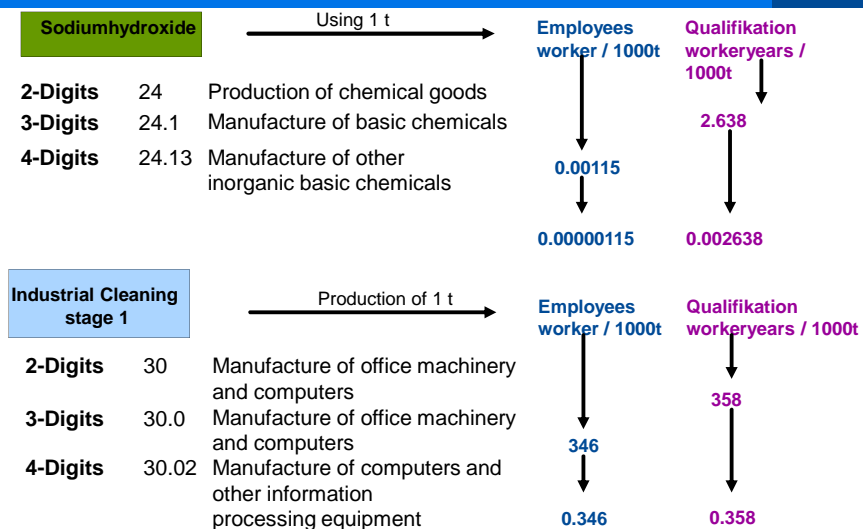
future generation
number of trainees
R&D (company expenditures)
capital investments
social security

**Number of trainees** shows how the next generations are involved in the industrial processes and which substance will be able to support their education more effectively.

**Social Security** shows the level of living conditions and of services that will be provided by the substance for people in a community.

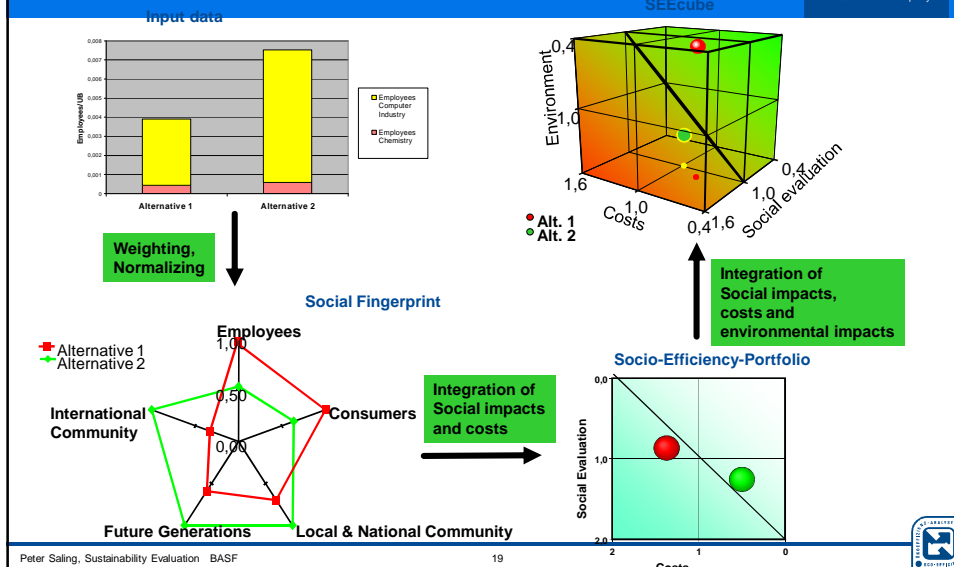


## Example: Cleaning processes



## Summarizing all three dimensions of sustainability in one Graph: SEEcube®

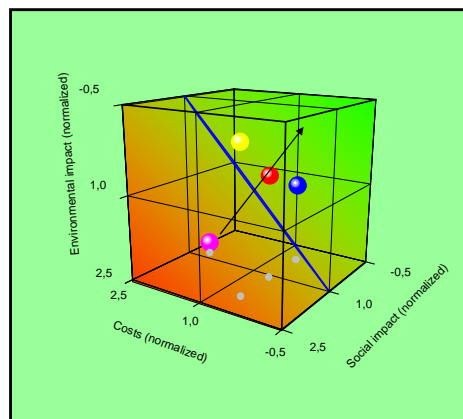
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## SEEBALANCE® Results of 4-Methoxy-acetophenon together with Prof. Leitner, RWTH Aachen

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User benefit:  
Production of  
1kg of  
4-methoxy-  
acetophenon



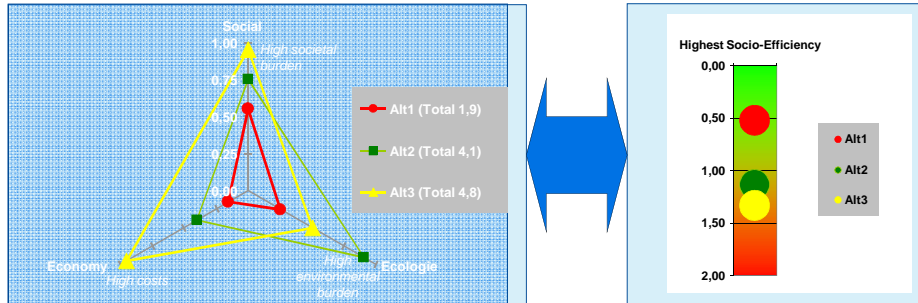
- AlCl<sub>3</sub> process
- zeolite process
- Fe(HSO<sub>4</sub>)<sub>3</sub> process
- Indiumtriflat process

The Fe(HSO<sub>4</sub>)<sub>3</sub> process is the most sustainable alternative

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## Alternative Illustration of SEEBALANCE results in a single score manner



- Fingerprint for a more detailed explanation of the results in all three categories
- Ranking in a single score evaluation to show the clear result of the study



## Crop Life International: Additional Sustainability Aspects of Agriculture



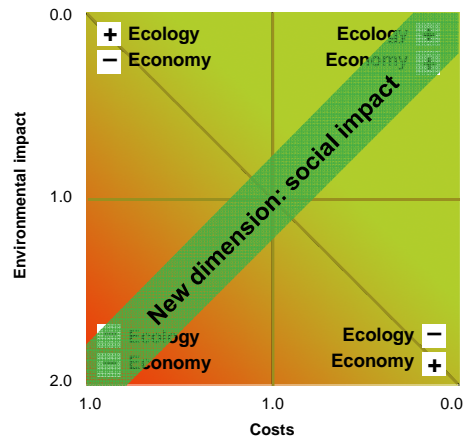
- Agriculture is beautiful green fields
- Agriculture is bountiful vegetables
- Agriculture is ripe fruit – and agriculture is much more.
- Improved varieties and crop protection products
- Growing more on less land, preserving bio-diversity and wildlife habitats
- More productivity with less labour
- More choice for education
- Agricultural innovation inspires young farmers to adapt to changing farming conditions and markets
- Higher yields provide higher incomes
- Opportunities for schooling and health care
- Knowledge of integrated pest management can improve crop quality and marketability



## From Eco-Efficiency Analysis to AgBalance

### New areas:

Biodiversity  
Soil  
Water use  
Land use



## Environmental Impact

### Biodiversity:

- Agri environmental schemes
- Protected area
- Ecotox potential
- Farming intensity
- Fertilizer intensity
- Crop rotation



- Growing more on less land, preserving biodiversity and wildlife habitats



## Environmental Impact



### Soil:

- Organic Matter
- Nutrients
- Compaction
- Erosion



No till



- Knowledge of integrated pest management can improve crop quality and marketability



## Social Impacts; Examples



- |                              |                        |
|------------------------------|------------------------|
| ■ Working accidents/diseases | ■ Food supply security |
| ■ Educational skills         | ■ Access to land       |
| ■ Average salaries           | ■ Social security      |



## How does BASF use the Sustainability Evaluation tools?



### Strategic Decisions

- Investment decisions
- Technology decisions
- Site decisions
- Evaluate product portfolio

### Marketing, Customers

- Demonstration of product advantages
- Improved customer relations
- Product Differentiation
- Better understand competitive advantages

### Research and development

- Quantification of the most important factors
- Drive sustainable products and processes
- Drive production/process improvements

### Stakeholder and Government Dialogue

- Communication with authorities
- Demonstration of Sustainability
- Government "approvals"



## The competence center of product safety within BASF- your partner in questions of:



- **Eco-Efficiency Analysis, LCA**
- **Sustainability, SEEBALANCE**
- **Eco-Efficiency Internet managing tools**
- **Eco-Efficiency Label**
- **Business Development**
- **REACH**
- **Carbon Footprints**



Our Homepage: (<http://www.oekoeffizienzanalyse.de/>)

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Espaco Eco foundation and BASF S.A., Sao Bernardo, SP, Brazil

