3rd International Life Cycle Thinking Workshop :
SUSTAINABILITY ASSESSMENT AND INDICATORS IN BIOETHANOL PRODUCTION

Swiss Bioethanol supply in 2010

50% domestic production
versus 100% importation from Brazil

What are the sustainability stakes of these two scenarios for Switzerland?

UNIL | Université de Lausanne

Tourane Corbière-Nicollier
Isabelle Blanc
Suren Erkman

UNIL | Université de Lausanne

Bioethanol production in Switzerland ??

- Is production in Switzerland possible (technically) and relevant (economically)?
- Which is the most suitable production option (ligno-cellulosic, wheat…) ?
- In which socio-economic and legal framework ?
- Does domestic production contribute significantly to the Swiss energetic independency ?

UNIL | Université de Lausanne

Bioethanol importation from Brazil

- Is imported bioethanol meeting quality requirements ?
- Is Brazilian bioethanol production sustainable ?
- Which criteria to choose to define such sustainability ?
- How to define a sustainability reference ?
- Is it universal ? (common to Brazil AND Switzerland ?)

UNIL | Université de Lausanne

Two scenarios

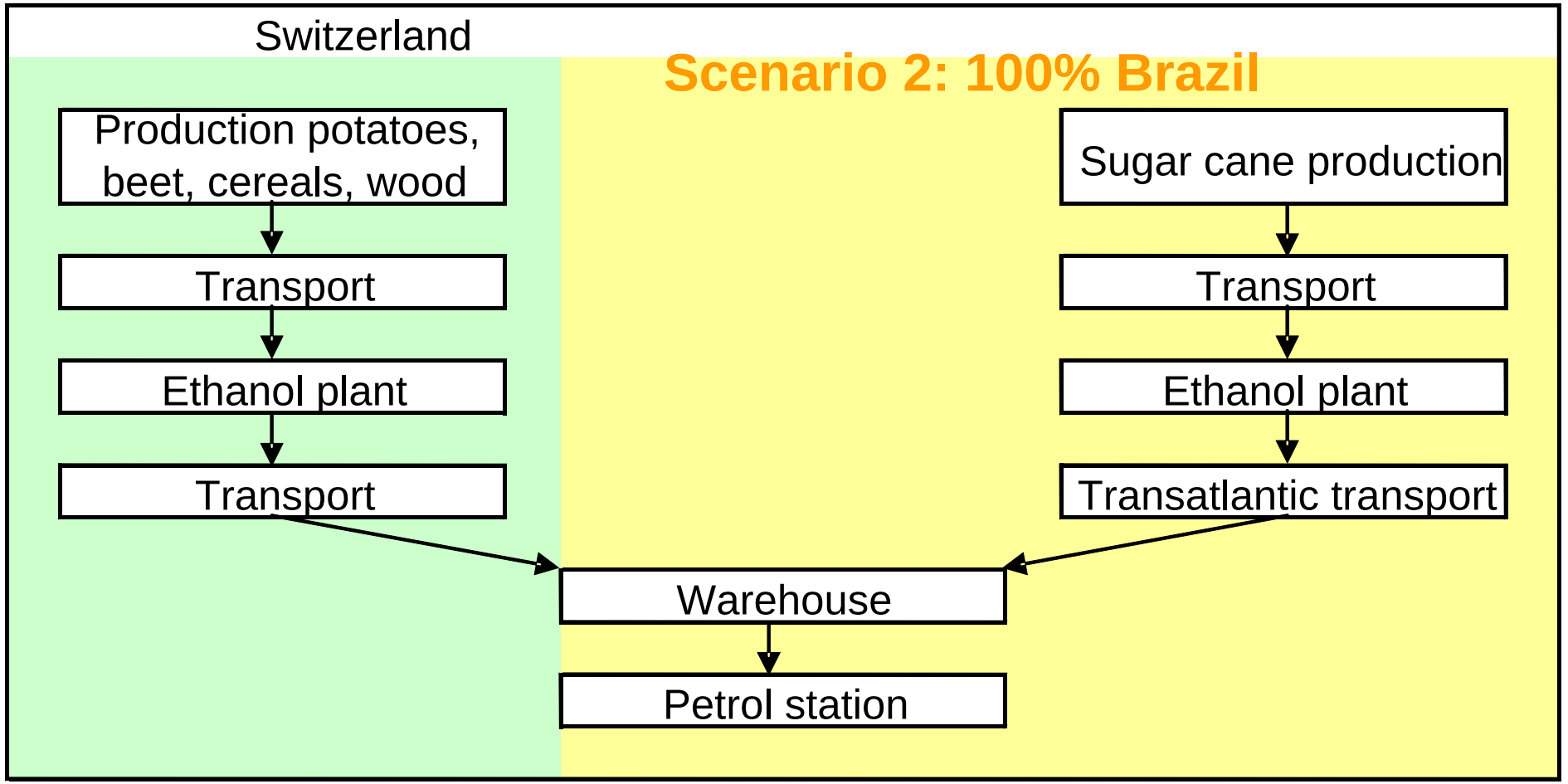
Swiss consumption: **200 billions liters/year (2010)**

Corresponds to share **5%** bioethanol in petrol 95.

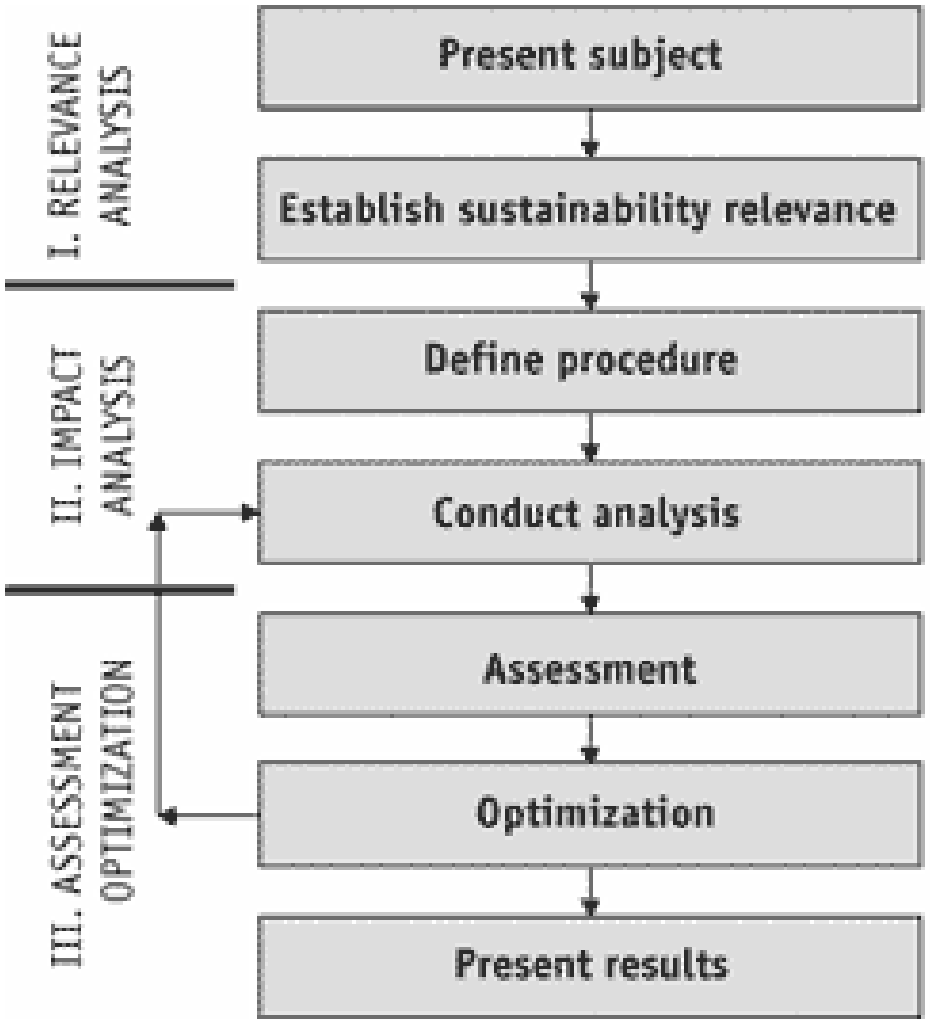
- ***Scenario 1***: Switzerland produces 100 billions liters and imports 100 billions liters from Brazil.
- ***Scenario 2***: Switzerland imports 200 billions liters from Brazil.

UNIL | Université de Lausanne

Scenario 1: 50% Switzerland, 50% Brazil



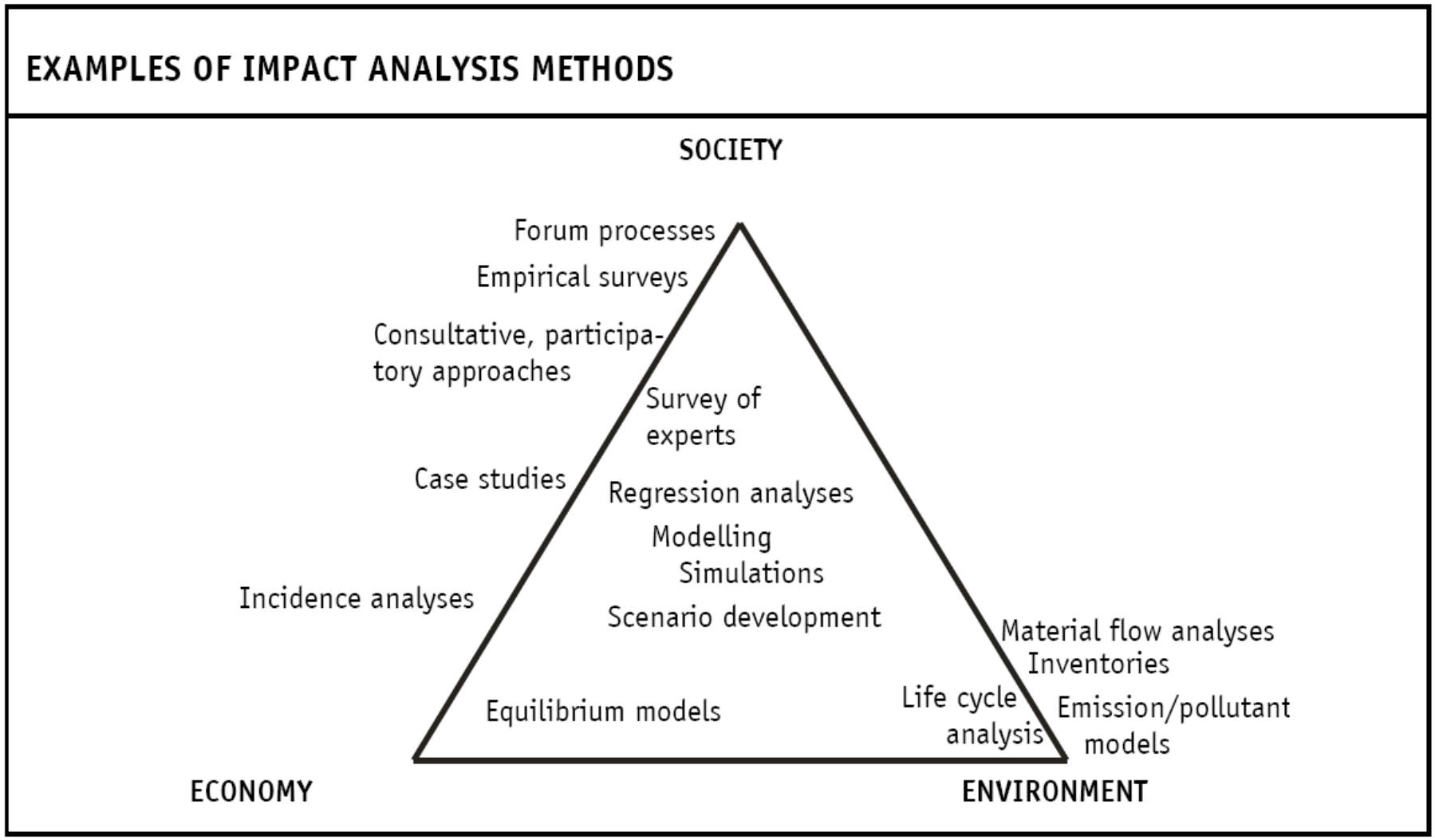
Federal Office for Spatial Development (ODT/ARE) approach



http://www.are.admin.ch/are/fr/nachhaltig/beurteilen/index.html

UNIL | Université de Lausanne

Impact analysis



UNIL | Université de Lausanne

ODT/ARE approach
Criteria

Social Criteria	Economical Criteria	Environmental Criteria
Food security	Stability and increase of production assets	Natural spaces Biodiversity
Equity, income distribution	Competitivity & innovation capacity	Renewable Ressources
Health, security	Income & employment	Non renewable Ressources
Education, Individual identity	Costs, External Costs	Emissions, pollutants (water, soil, air, climate)
Culture, social values		Ecological risks Industrial risks
Rights equity		
Poverty		
Intergeneration Solidarity Global solidarity		

UNIL | Université de Lausanne

Life-cycle based sustainability indicators

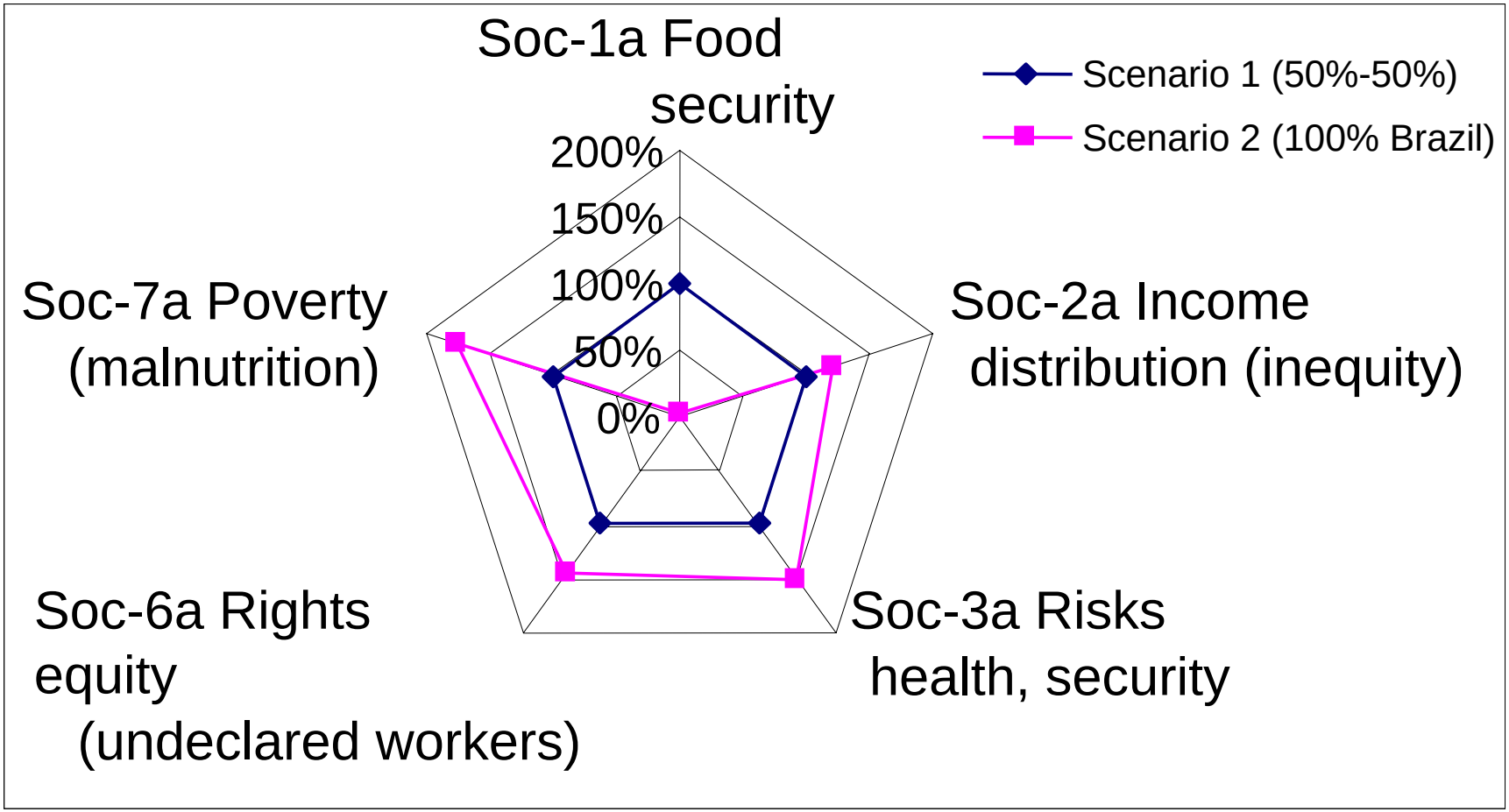
Illustration: environmental criteria:

- Natural spaces, indicators : ($ha_{bioethanol}/ha_{total\_agriculture}$)

Stake:

Does the ethanol promotion induce a change in the agricultural systems?

Social synthesis



5 out 8 criteria assessed

Social synthesis

Reliability: 9/10

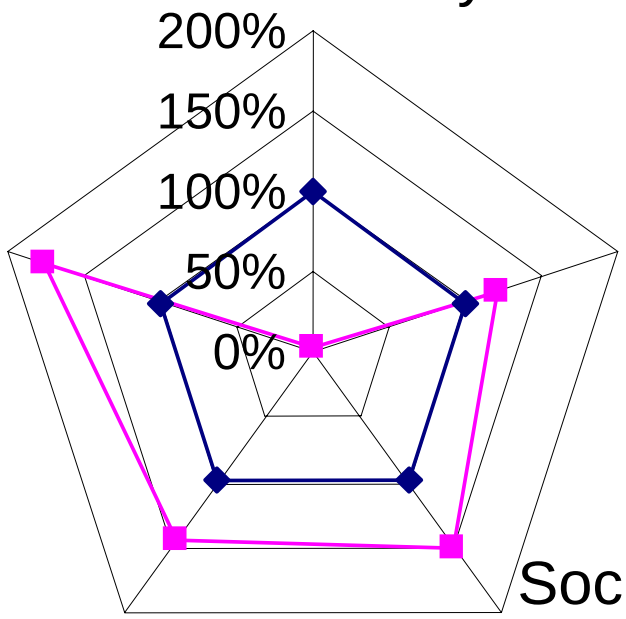
Relevance: 8/10

Soc-1a Food security

Reliability: 8/10

Relevance: 6/10

Soc-7a Poverty (malnutrition)



Soc-2a Income distribution (inequity)

Reliability: 5/10

Relevance: 9/10

Soc-6a Rights (undeclared workers)

Reliability: 5/10

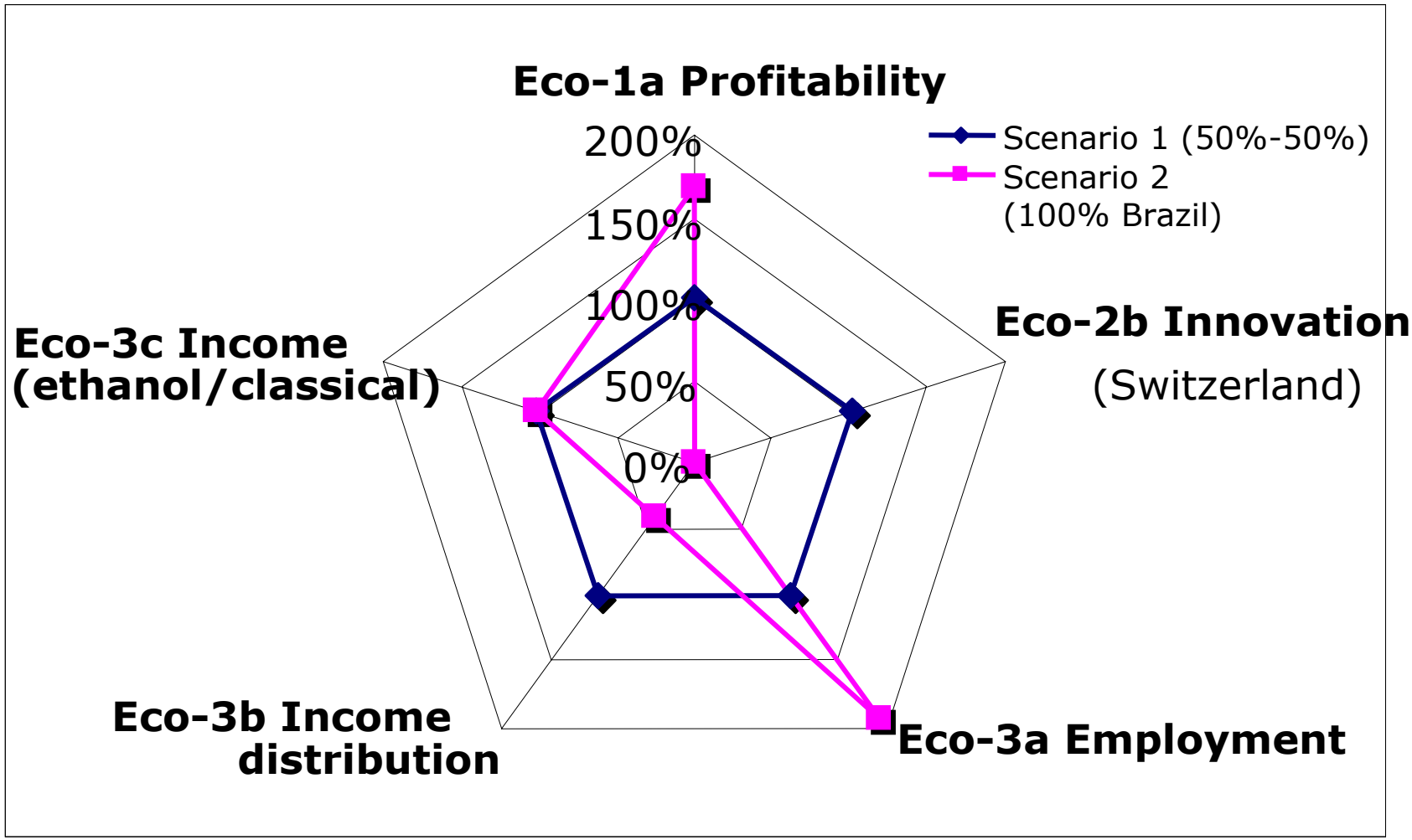
Relevance: 5/10

Soc-3a Risks health, security

Reliability: 5/10

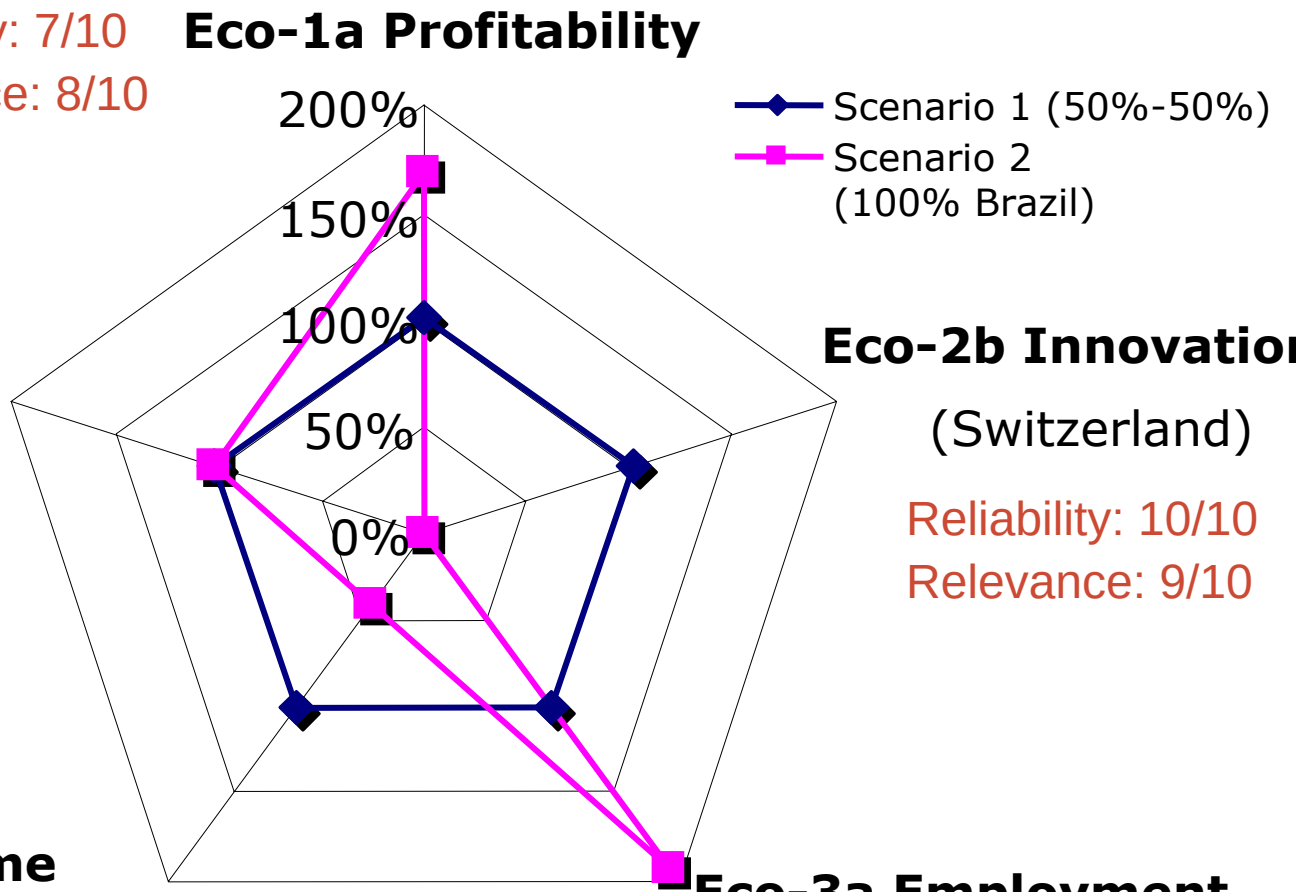
Relevance: 9/10

Economic synthesis



Economic synthesis

Reliability: 7/10
Relevance: 8/10



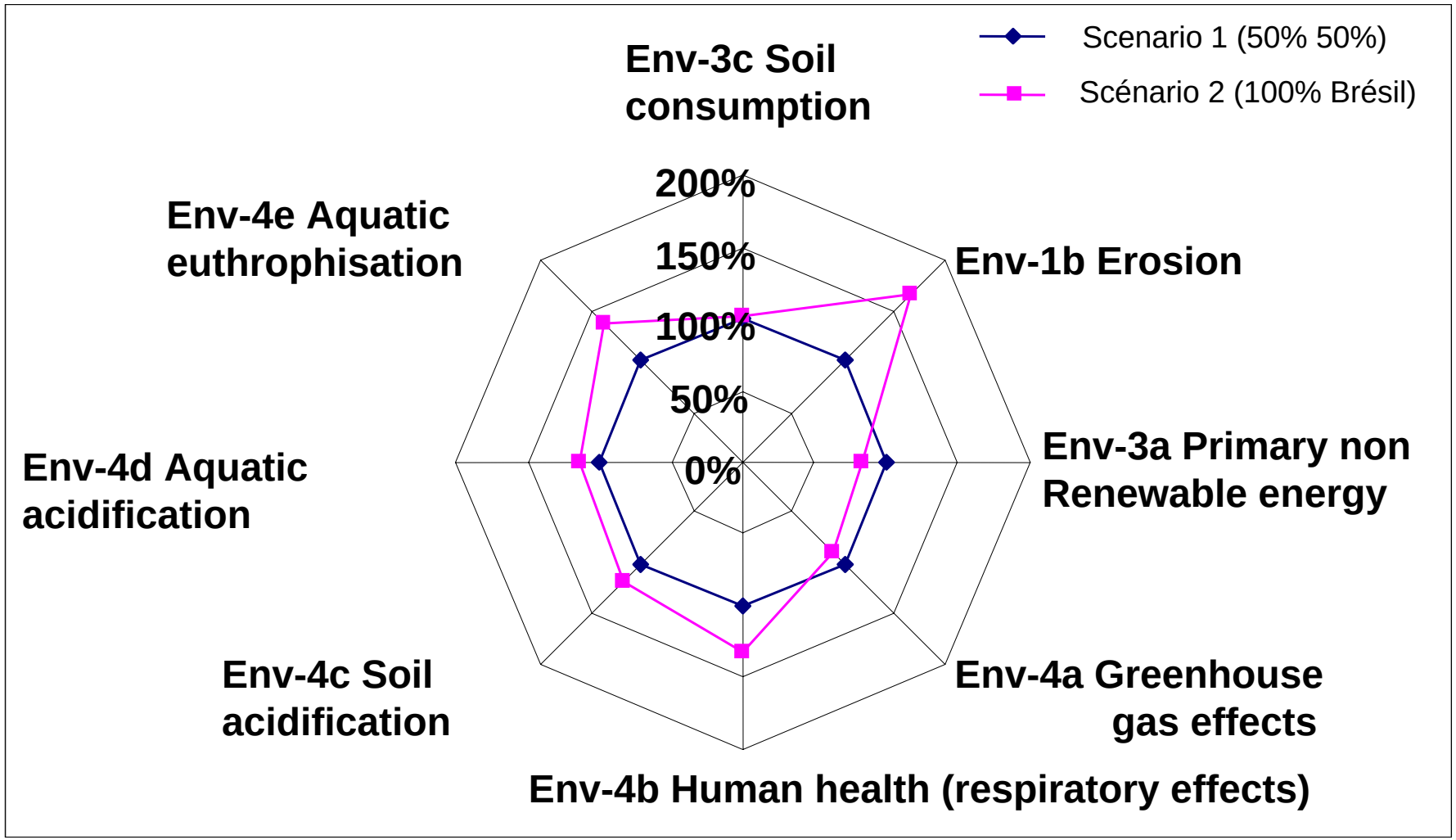
Reliability: 10/10
Relevance: 9/10

Reliability: 6/10
Relevance: 9/10

Reliability: 4/10
Relevance: 9/10

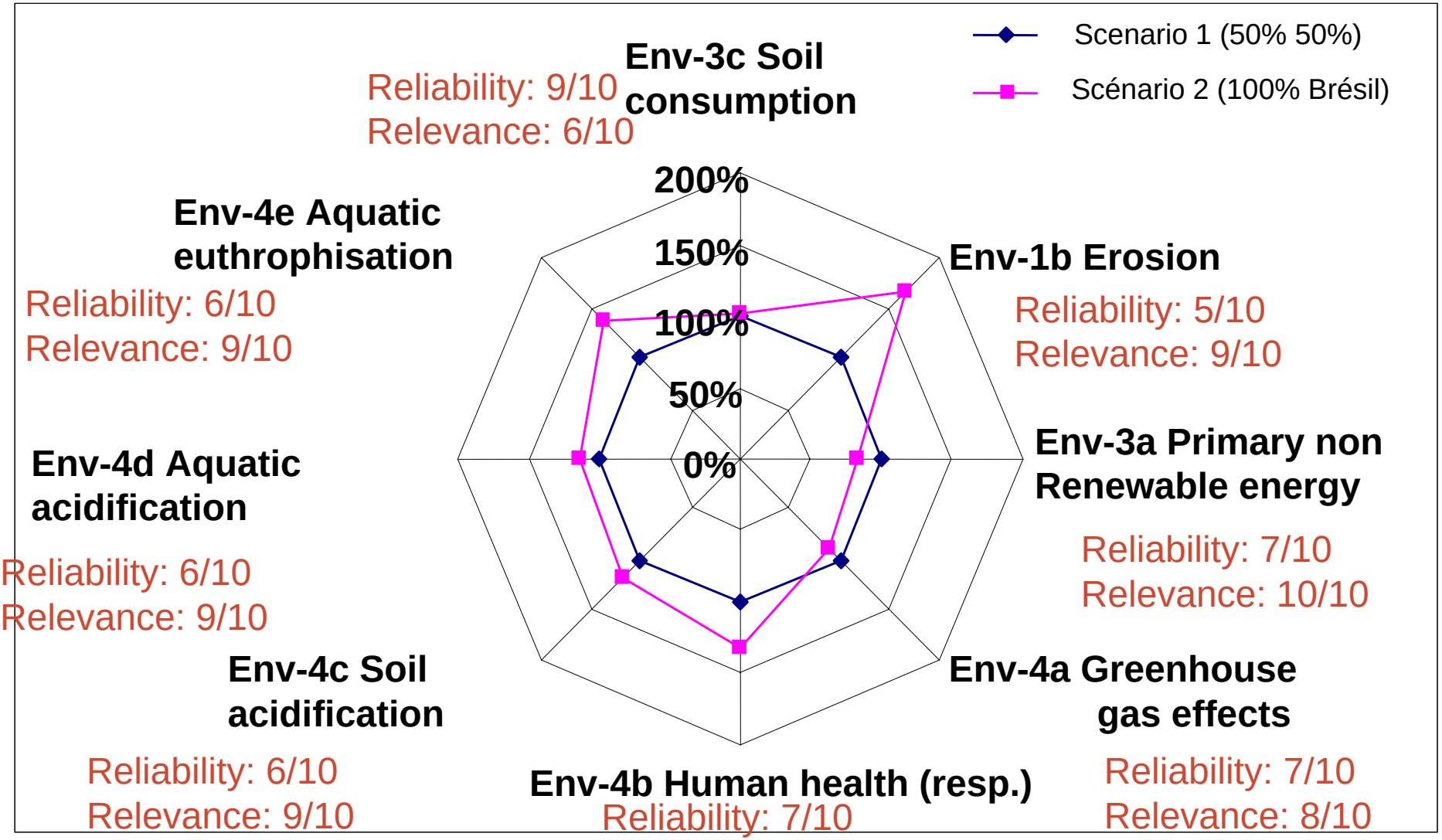
Reliability: 6/10
Relevance: 9/10

Environmental synthesis
LCA results(*) + Erosion



(*) ENERS data

Environmental synthesis (LCA results)



UNIL | Université de Lausanne

Mixed results ….!

- **Social aspects** clearly worse for scenario 2 (100% importation):

  Income distribution inequity, worker's health, worker's conditions. No potential negative impact on food production.

- **Economical aspects** better for the Brazilian production pathway:

  sugar cane productivity, process efficiency. But what about INNOVATION ?

- **Environmental aspects**:

  positive for energy and greenhouse gases indicators, unfavorable for soil and water pollution.

Critical vision ….

Some critical key points :

- The strategic engagement of Switzerland in this new agro-industrial die (cf, Europe with Sweden or France).
- The quality of the Brazilian ethanol.
- Feed-grains import will be necessary.
- Will the farmer subsidies be identical (food/energy?)
- Development of a sustainability reference framework unavoidable (cf WWF).

Conclusion

- This approach brings interesting perspectives and points out project weaknesses (eg brazilian farmer situation),
- Its flexibility enables transfer to other countries/studies,
- Further developments needed to quantify social impacts.