Backcasting for sustainable futures and system innovations

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Outline & focus

- Introduction: future studies and sustainability
- Backcasting
- Example I: STD programme, Novel Protein Foods
- Light version in education: guiding questions
- Conclusions & wider applicability

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1. Introduction

- SD has a strong ***future orientation***
- Future studies therefore relevant for SD
- ***New approaches are necessary***
  - Involvement of a ***broad range of stakeholders***: from different groups and throughout the process
  - Incorporating ***environmental***, ***social*** and *economic* component of sustainability
  - Taking into account both ***demand side*** and ***suply chain***: related production and consumption systems
  - CST: ***Culture***, ***Structure*** & ***Technology***
  - In sum: participatory integrated strategic LT approaches
- ***BACKCASTING***

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Future Studies:
three types of futures (relevant for SD)

- ***Likely*** futures
  - Trend extrapolation, weather forecast, market forecast, sometimes Delphi studies, short-term, well-defined systems

- ***Possible*** futures
  - Context scenarios (Shell, IPCC, Meadows et al)
  - Also: design scenarios, socio-technical scenarios

- ***Desirable/normative*** futures
  - Future visions, normative scenarios, policy scenarios
  - No blueprint thinking, but deliberation and participation of stakeholders

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Desirable futures & SD: *Relevance*

- Making ***normative*** aspects and ***preferences*** explicit
- Helpful if appropriate ***institutions*** / ***rule systems*** are lacking (like in case of SD)
- Future visions as ***niche*** for experimenting, (higher order) learning and stakeholder interactions
- Future visions can become ***multi-actor*** constructions
- When it concerns ***highly complex*** problems
- If there is a ***need*** for ***a major change***
- In case of ***dominant*** & ***persistent*** problems
- If time horizon is ***long*** and allows radical ***alternatives***

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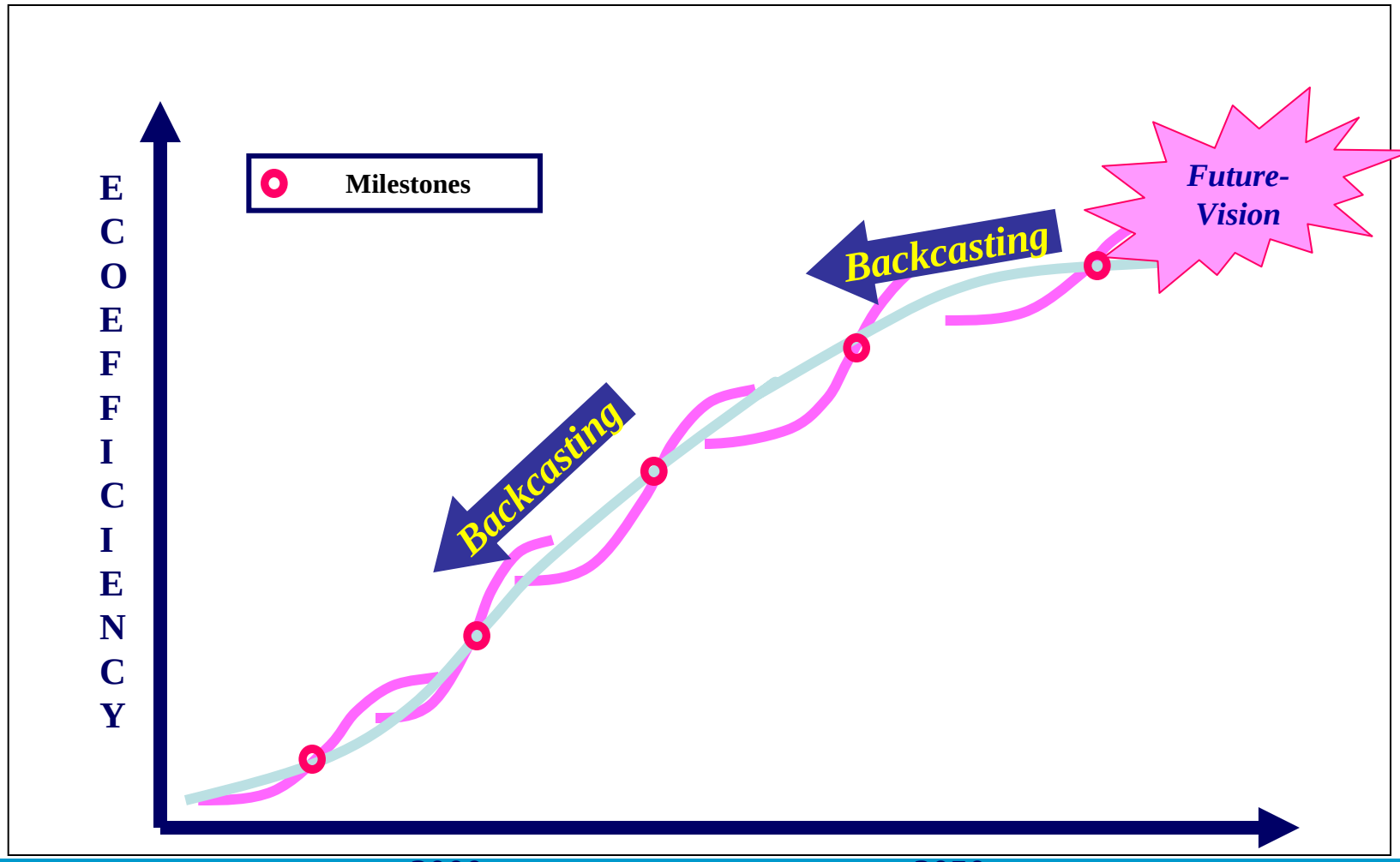
2. Backcasting: *looking back from the future*



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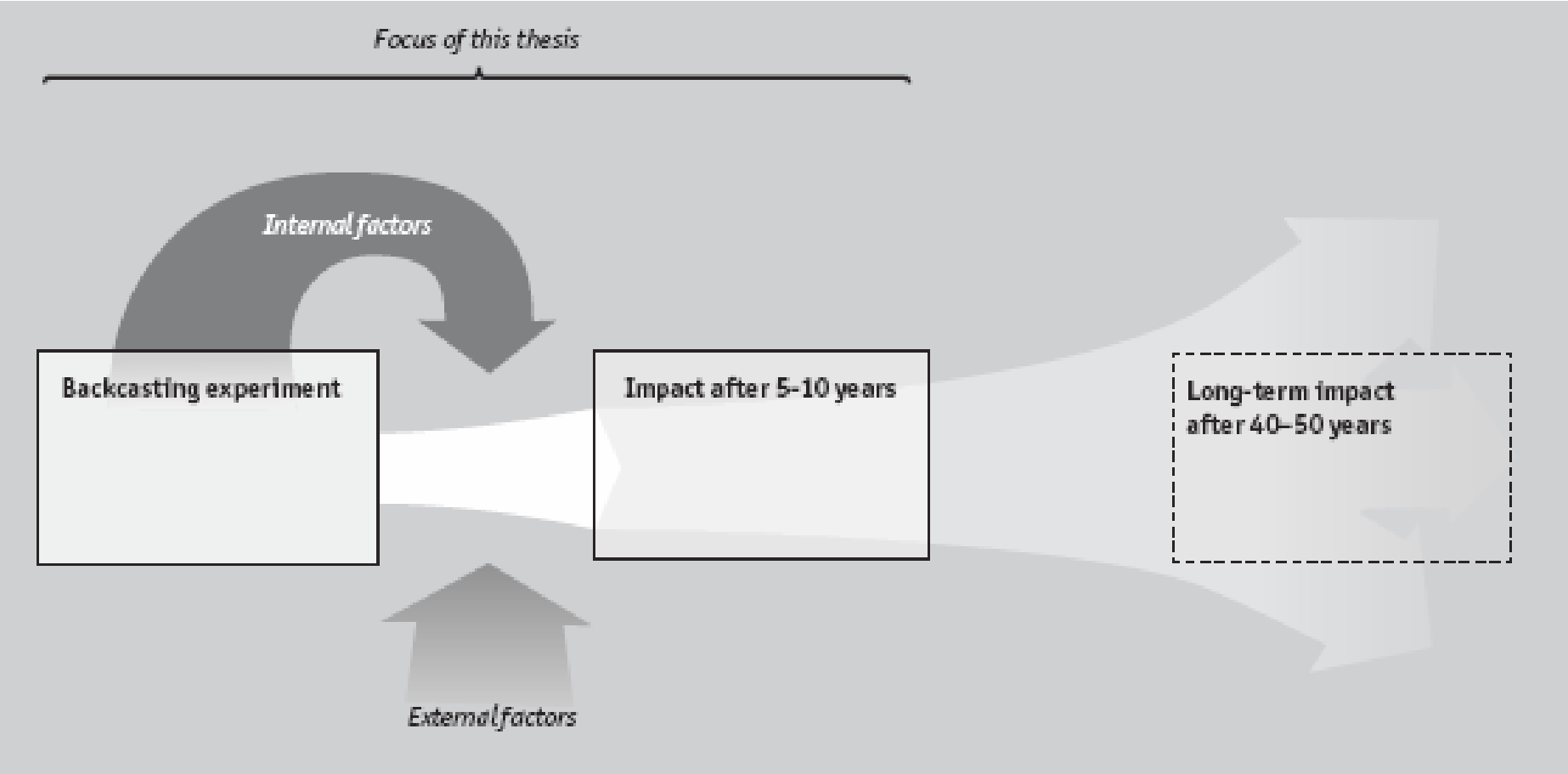
Backcasting for a sustainable future



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Backcasting and Sustainability

Backcasting: Create a desirable *sustainable future* **first** before *looking back* from that *future* how it could have been achieved and planning first steps how to move towards that future. ***It is***:

- Explicitly normative
- Participatory (but not always)
- System oriented
- Desired futures & changes
- Combines process, design, analysis
- Helpful if institutions / rule system lack

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Stakeholders

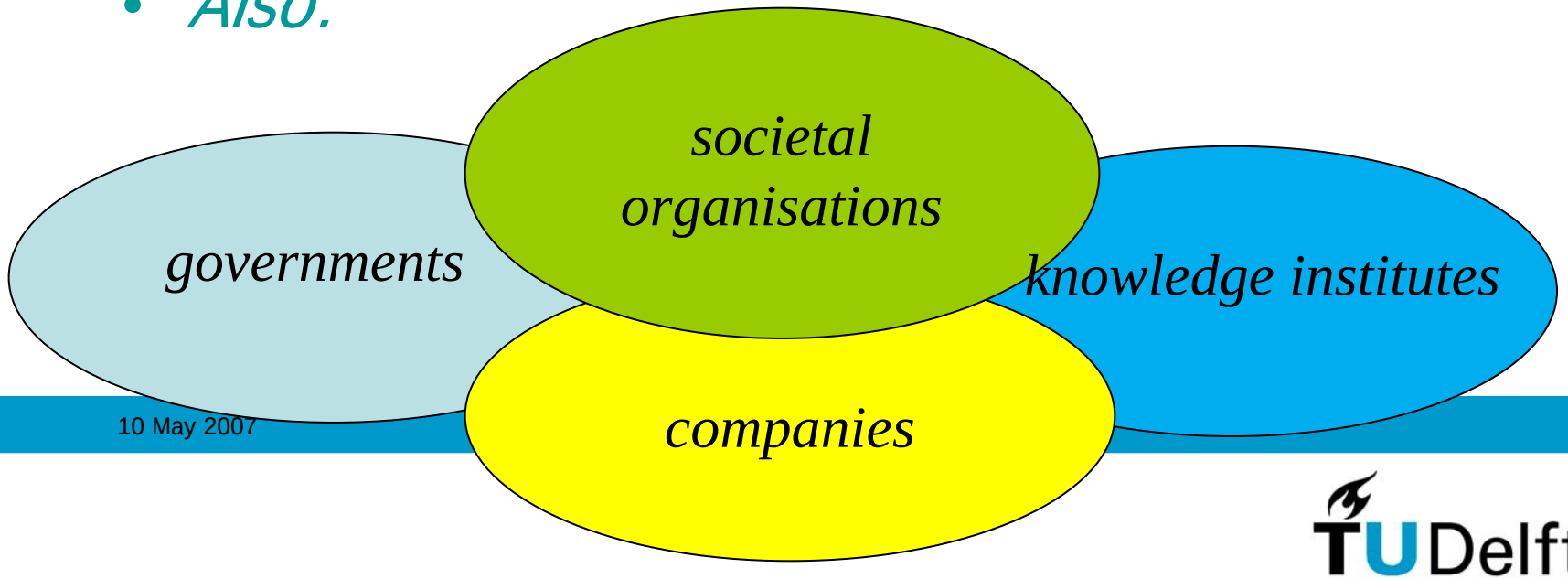
Individuals and organisations,

that can influence developments

of that can be influenced by developments

- Not only:

- *Also:*



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Example: Novel Protein Foods Project

- Future vision for the year 2040:

  40% of the meat will be replaced by Novel Protein Foods

- What are necessary changes (C, S, T), who are necessary and what should be done?

- 30 researchers and 9 institutes involved

- Financed by Dutch government and companies

- Some spin-off: NPF products, like Valess; new knowledge; acceptance is starting very very slowly

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Necessary changes

Voorbeeld Novel Protein Foods *(NPF)*	
Cultuur	Consumer & societal acceptance different position of meat, consumer benefits
Structure	Smaller livestock and meat sector (related policies), new NPF sector
Technology	New knowledge and technology for foods, production systems and chains

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Backcasting: *methodological framework*

Step 1 Strategic Problem orientation *Analysis*

Step 2 Normative future image *Vision*

Step 3 Backcasting *Wat is necessary?*

Step 4 Elaboration, analysis *Action agenda*

Step 5 Embedding, 'implementation' *Follow-up*

Methods: *I Analysis, II Design, III Interaction, IV Management*

Demands: *i Normative, ii Process, iii Knowledge*

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Backcasting: *toolkit*

- ***Participatory*** tools and methods
  - workshops, creativity tools, visioning tools,
- ***Design*** tools and methods
  - scenario design, product design, system design
- ***Analytical*** tools and methods
  - modelling, env assessments, consumer acceptance economic analyses, risk, stakeholder analyses and process evaluation
- Overall process & stakeholder ***management*** tools and methods

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Backcasting: *when and where*

- When it concerns ***highly complex*** problems
- If there is a ***need*** for ***a major change***
- When it includes ***dominant*** & ***persistent*** problems
- if time horizon is ***long*** and allows strong ***alternatives***

- It has been applied:
  - For energy studies (Lovins, 1970s-1980s)
  - Sustainable companies (Natural Step, 1990s)
  - System innovations (Sweden, NL, 1990s)
  - Participatory backcasting (STD, COOL, 1990s)

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3. Backcasting: *STD programme*

- profs Leo Jansen & Philip Vergragt
- Sustainable technologies for future sustainable need fulfillment, Factor 20
- Focus on 2040 & CST
- 5 need areas: Nutrition, Mobility, Housing, Water, Chemistry
- 1993 – 2001, 5 ministries, together with stakeholders

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STD programme: *Nutrition example*

Step 1 Strategic Problem Orientation

- Major unsustainabilities: pesticides, energy, primary agriculture, greenhouse horticulture, meat

Step 2/3 Future vision and backcasting

- Sustainable Future vision 2040 for sustainable consumption and production of foods. Four directions for elaboration:
  1. *Sustainable Multiple Land-use in rural areas*
  2. *High-tech closed system horticulture*
  3. *Integral Crop/biomass conversion*
  4. *Novel Protein Foods*

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Novel Protein Foods: *future vision & backcast*

Future vision: *40% of meat consumption replaced by Novel Protein Foods (vegetable, microbial) in Netherlands and exports*

***Necessary changes (in CST-format)*:**

- C: Consumer & Social acceptance, changed role of meat, consumer benefits
- S: Decreasing meat sector, new NPF-sector
- T: new (food) technologies & knowledge, improved growing systems

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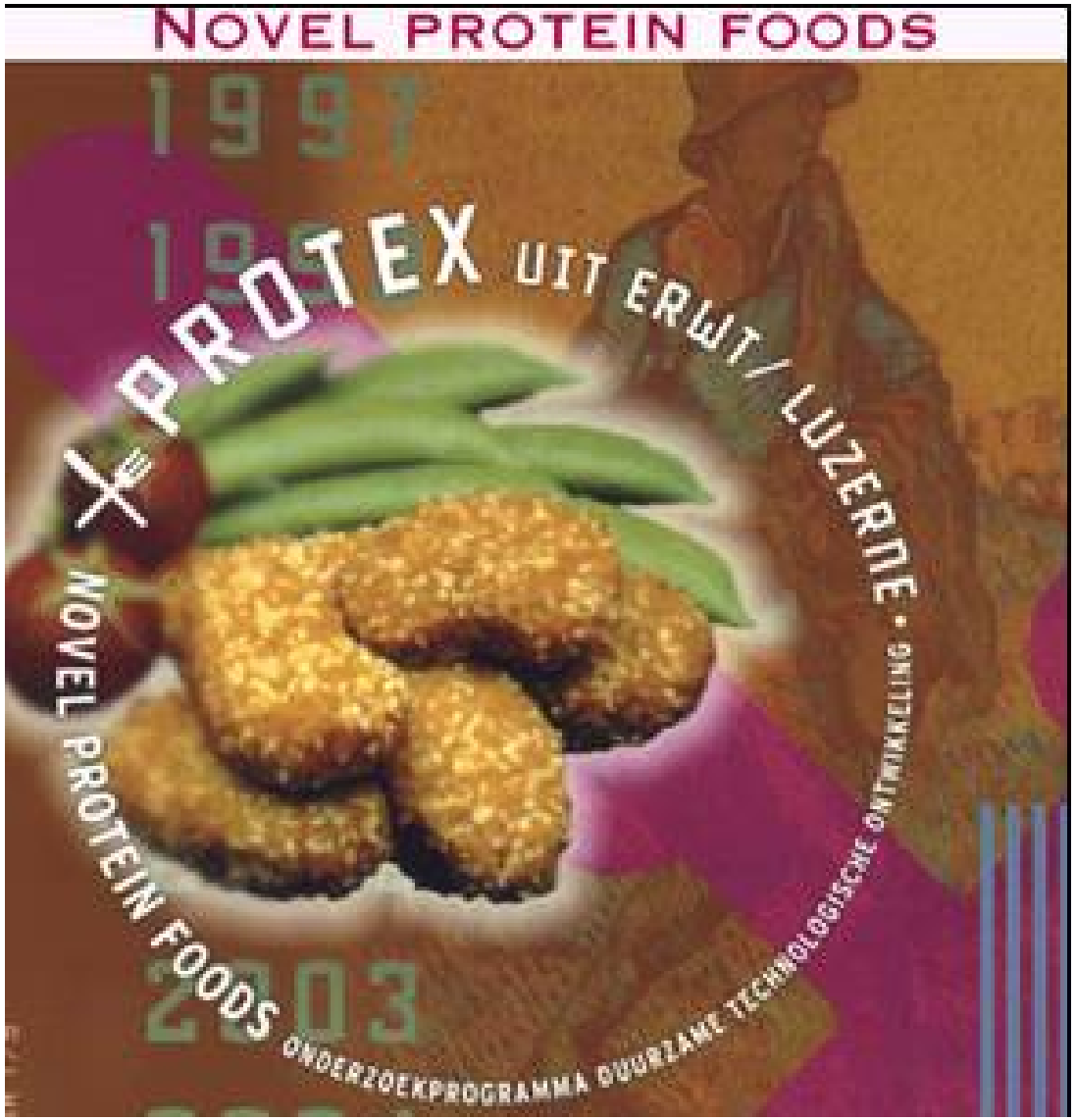

7 examples

- *Protex*
  (1) Spirulina
  (2/3) Green pea
  (4) Lucerne
- *Fibrex*
  (5) Fusarium
- *Fungopy*
  (6) Pea with mould
  (7) Lupine with mould (rhizopus)

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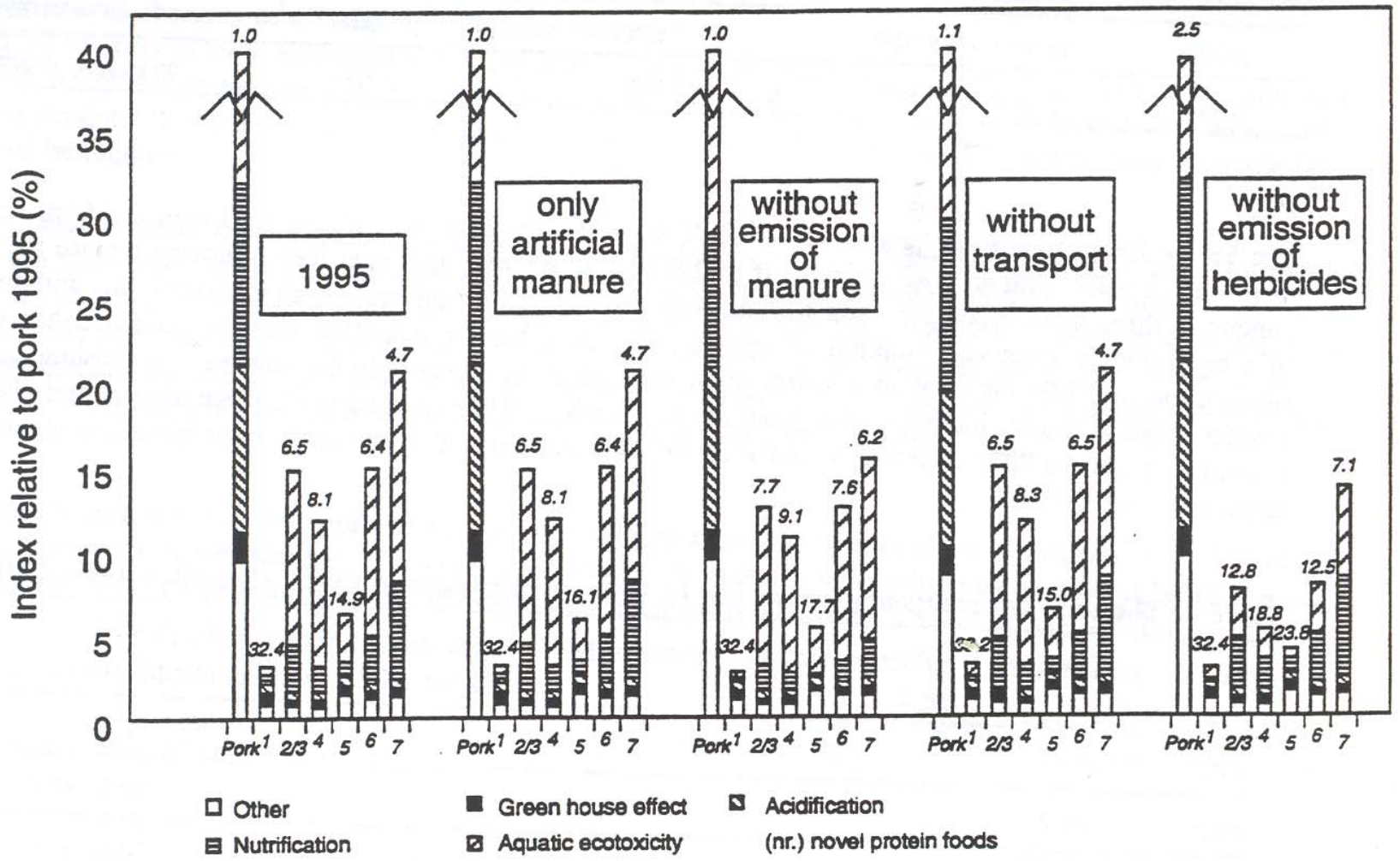
Index relative to pork 1995 (%)
0
5
10
15
20
25
30
35
40
1995
only artificial manure
without emission of manure
without transport
without emission of herbicides
1.0
1.0
1.0
1.1
2.5
32.4
6.5
8.1
14.9
6.4
4.7
32.4
6.5
8.1
16.1
6.4
4.7
32.4
7.7
9.1
17.7
7.6
6.2
32.4
6.5
8.3
15.0
6.5
4.7
32.4
12.8
18.8
23.6
12.5
7.1
Pork 1 2/3 4 5 6 7
Other
Nutrification
Green house effect
Aquatic ecotoxicity
Acidification
(nr.) novel protein foods

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Novel Protein Foods (II): Analysis

Results of NPF analysis for 40% replacement in 2040:

- 7 options based on different resources/technologies
- 10-30x lower environmental impact than pork meat '95
- Production costs lower than of meat
- Consumer potential
- New technological knowledge and R&D-programmes necessary for meeting consumer demands
- Moderate negative impact on employment meat sector
- Action agenda: communication, consumer research, R&D, product development, Necessary related *legislature* & *social measures*

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Novel Protein Foods (III): Action agenda

- ***Communication*** with public & society
- (Professional) Education & knowledge transfer
- Consumer research & marketing instruments
- ***Fundamental R&D + chain organisation***
- NPF product development
- Further environmental improvement (also LCA)
- Necessary related ***legislature & social measures***

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NPF (IV): *follow-up after 10 years*

- Multidisciplinary research programme ***Profetas***
- ***Food Companies*** developing new protein foods, sometimes in alliance with research institutes
- Follow-up by ministry of the Environment, addressing ngo's, present producers of veggie foods, retailers
- Initiatives for ***V-day*** and ***product office***
- Positive attention from ***NGOs*** (vegetarians union NVB, environmental movement) and ***Supermarket AH***
- ***Media*** attention & usage by ***educational bodies***
- Recently: ***Campina*** has launched ***Valess***

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NPF (VI): *some analysis*

- ***New networks*** (Profetas, company-RO, SME-ngo)
- Adjustment ***innovation system***: NPF knowledge base, product office + broader impact
- ***Future vision:*** redefinition to a global problem and reframing in line with actor ***expectations*** / missions
- ***Regime change***: not (yet), more on level of niches but with growth potential
- Considerable ***learning***

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NPF (VII): *context 2000-2005*

- Little in academia abroad
- Developments Dutch market (novel products, new producers, market growth), SME has hard times
- Food multinationals starting / enhancing activities veggie products:
  - Nestle / Tivall, Heinz / Linda McCartney
  - Soy MNCs: Cargill / ADM / Sole-Dupont
- Growth global meat consumption (China, South-America)
- Ministries leave it to the market (at present)
- Public Interest Organisations are ‘followers’, plea for organic meat
- Food Innovation System: specialisation, focus on risks, fast returns and controversies.

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Conclusions for NPF case

- STD brought right people together, backcasting was successful, there is considerable impact
- The future vision was adjusted, but includes its original core
- There is an emerging NPF knowledge base and network in NL, but still as a niche
- It concerns radical new products and innovations (not me-too)
- Companies are interested, but still little in development
- Internationally, a lot of dynamics (Nestle, Heinz, US soy & health)
- Context developments advantageous, possibly important
- Next to opportunities, there are threats (supermarket war, dislike of industrial foods by consumers)

Backcasting in education:
adjustments for a light version

- Simulation by student groups vs real stakeholders:
  - No real-life interests, mental frameworks, values
  - Future vision by student groups
  - Stakeholder involvement through interviews
- Limited time (4 ects) vs considerable time
- Duration of a few weeks vs 0,5-2 years
- Students learning approach vs professional facilitators
- Learning (applying) more important than outcomes
- Guiding questions, limited additional methods / tools
- Leaving out Stage 5 (achieving follow-up)

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TiSD advanced course: *compact city*

- ***Future vision***: compact city surrounded by strong nature:
  - underground transport to/from city
  - limited use of nature (resources, tourism)
  - independent in terms of energy, water, (partly) food
- ***Backcasting***:
  - New transportation technology
  - Decentralised small-scale energy technologies
  - Water recycle and sanitation technologies
  - City farming, harvesting from forest

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Programme today

13.00 Presentation backcasting
14.00 Step 1: Strategic problem orientation
15.00 Break
15.15 Step 2: Making future vision
16.30 Step 3: Backcasting analysis
17.30 Final discussion

QUESTIONS?

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