**Does backcasting lead to SItS:**
*the case of meat alternatives & NPFs*

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## 1. Backcasting: *introduction*

**Backcasting**: Create a desirable *sustainable future* **first** before *looking back* from that *future* how it could have been achieved and planning initial steps how to move towards that future.
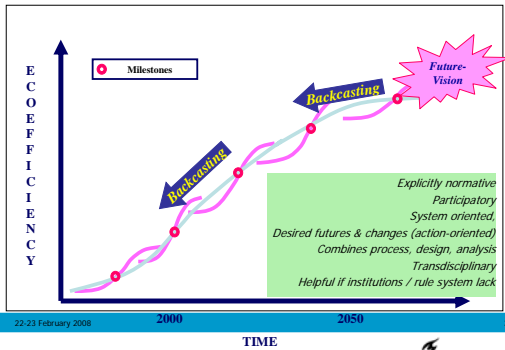
**Backcasting**: Particularly useful in case of complex 'wicked' problems that include dominant trends; when market-based solutions are insufficient; a need for a major change; long time horizons allow strong alternatives (Dreborg '96)

**Backcasting**: Intervention approach related to Constructive TA, aiming at anticipation, reflexivity and learning (Schot 2001), but also criticised for lacking these.

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## Backcasting: *from vision to action*



- E C O E F F I C I E N C Y
- Milestones
- Future-Vision
- Backcasting
- Backcasting
- Backcasting

Explicitly normative
Participatory
System oriented,
Desired futures & changes (action-oriented)
Combines process, design, analysis
Transdisciplinary
Helpful if institutions / rule system lack

2000          2050
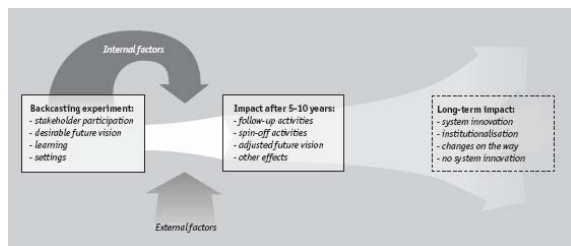
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## Research problem

- Different varieties in backcasting: Energy, Natural Step, STD, SusHouse, COOL, Canada, Sweden

- Participatory backcasting experiments have been completed in NL: vision, analysis, (action) agenda

- Sometimes considerable follow-up, not always: WHY?

- How does follow-up relate to system innovation theory?
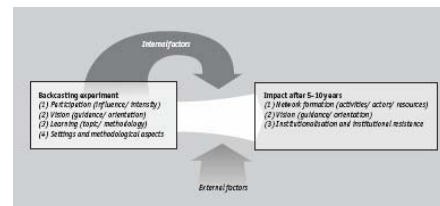
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## Backcasting and impact



Internal factors

**Backcasting experiment:**
- stakeholder participation
- desirable future vision
- learning
- settings

**Impact after 5-10 years:**
- follow-up activities
- spin-off activities
- adjusted future vision
- other effects

**Long-term impact:**
- system innovation
- institutionalisation
- changes on the way
- no system innovation

External factors

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## Backcasting: conceptual framework



Internal factors

**Backcasting experiment:**
(1) Participation (influence/ intensity)
(2) Vision (guidance/ orientation)
(3) Learning (topic/ methodology)
(4) Settings and methodological aspects

**Impact after 5-10 years**
(1) Network formation (activities/ actors/ resources)
(2) Vision (guidance/ orientation)
(3) Institutionalisation and institutional resistance

External factors

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## Framework: networks

| E1 Networks | |
|---|---|
| E1.1 Activities | Presence of activities constituted by networks |
| E1.2 Actors | Presence of actors carrying out the activities in the network |
| E1.3 Resources | Presence of mobilised resources that enable the activities |

- Based on industrial network perspective (Hakansson)
- No focal company, but focal activity
- Covering four domains: government, business, research, public
- Relationships among actors take different forms

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## Framework: Vision / Leitbild

- *Leitbild concept*: Dierkes et al ('92 & '96)
  - (i) Vision is *shared* and helps unite people and actors from different scientific disciplines
  - (ii) Vision guides behaviour and actions of these actors
  - (iii) **Guidance** (where to go) & **Orientation/ Image** (what to do)
  - (iv) Focus on emerging radical innovations/ new technologies

- *Adjustments/ assumptions*
  - (i) SI to sustainabilty; (ii) synchronisation across societal domains; (iii) Competing visions (2 types)

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## Framework: Vision / Leitbild

| F1 Vision: guidance | |
|---|---|
| F1.1 Collective projection | Presence of a collectively shared normative projection |
| F1.2 Synchronisation | Presence of synchronisation between disciplines and among stakeholders from various domains towards the vision |
| F1.3 Alternative rules | Presence of alternative (system of) rules and institutions |
| **F2 Vision: orientation** | |
| F2.1 Cognitive activation | Presence of cognitive activation of scientific disciplines and stakeholders from various domains towards the vision |
| F2.2 Mobilisation | Mobilisation of actors and resources in line with the vision |
| F2.3 Daily coordination | Presence of decentralised daily coordination |
| **F3 Competing visions** | |
| F3.1 Alternative visions | Presence of emergent alternative visions |
| F3.2 Dominant vision | Presence of influence by the existing dominant vision |

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## Framework: *institutional change*

| G1 Institutionalisation and institutional resistance | |
|---|---|
| G1.1 Institutionalisation | Instances of changes in existing rules and institutions |
| G2.2 Institutional resistance | Instances of resistance to change by existing institutions and the actors backing them |

- Institutions as rules (cognitive, regulatory, normative, Scott 2001)

- Institutionalisation: *...the process by which activities & practices become accepted...* (N.B. de-institutionalisation)

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## 3. NPF backcasting experiment

- **Future vision 2040**: 40% of the meat will be replaced by Novel Protein Foods that reduce environmental impact with factor 20

- 30 researchers and 9 institutes involved

- STD program: financed by government and firms

- Outcome: NPF analysis, scenario analysis, action agenda, trajectory, stakeholder support

- Substantial spin-off: new NPF-type products, like Valess; research; growing market & new products; limited product development

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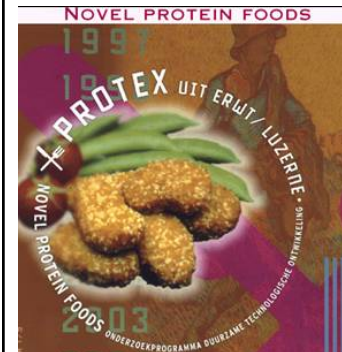


### 7 examples

- *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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## NPF backcasting experiment

- Stakeholder involvement from all four domains including capacity, funding & knowledge
- Instances of higher order learning
- Vision gradually shaped: provided guidance & orientation
- Participation, analysis, design: vision & action agenda
- Two vision champions, institutional protection

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## NPF: *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 Case: *spin-off & follow-up clusters*

| Cluster of activities | Number of actors | Amount of resources | Domain |
|---|---|---|---|
| Profetas programme | 20 - 50 * | € 1.5 Million * | Research domain |
| NPF Business R&D and supply chain development | 10 - 20 | € 5 - 10 Million | Business domain |
| SME cluster | 10 - 20 | Regular investments | |
| Ministry of Environment, targeting food actors & public interest groups | 10 - 20 * | < € 500,000 * | Government domain |
| Public interest groups | 10 - 20 * | < € 500,000 * | Public domain |

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## NPF case: *some analysis*

- **New networks:** Profetas, bus-R&D, SME, VROM, NGOs)
- 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
- **Future vision:** guidance, orientation, stability, flexibility
- **Regime change**: not (yet), more on level of niches but with growth potential

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## NPF case: *Conclusions*

- STD brought right people together, backcasting was successful, broad participation,
- There is considerable **spin-off & follow-up** and it is growing
- 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; instances of **institutional** changes
- Companies are **interested**, but still little in development
- Internationally, a lot of dynamics (Nestle, US soy & health)
- **Context developments** advantageous, possibly important
- Next to opportunities, there are **threats** (supermarket war, dislike of industrial foods by consumers): **external** factors too!
- Considerable government funding

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## Finally: *System innovation & governance*

- **Long-term process**: no system innovation (yet) after 10 years
- niche development (or related niches): possible **stepping stone**
- Both drivers (context factors) and threats (government)
- **Framework** (vision, networks, institutions) relevant for transition monitoring

**Implications for governance:**
- Participatory backcasting facilitates higher order **learning** and has relevance for transition management
- **Experimentation in niches** with visions and new rules useful/helpful (learning)
- Stakeholder need to see **opportunities** in vision and capable of mobilising resources
- Not only stimulating R&D domain, but also other domains
- Visions provide **decentralised** guidance & orientation and allow **adjustment** by new stakeholders & networks in new domain: this suggests that strong hierarchical coordination by government might **not** be needed

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## Backcasting cases: *3x nutrition*

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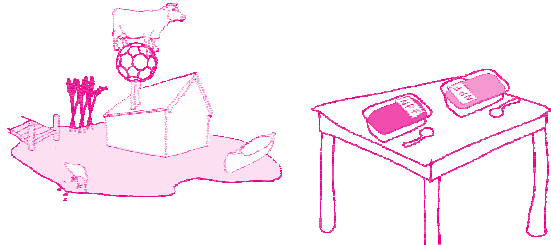
## Backcasting cases: *3x nutrition & food*

| Case and origin | When | Type of system |
|---|---|---|
| 1. Novel Protein Foods (NPF) case (STD programme) | 1993 - 1996 | Production and consumption system involving companies and consumers |
| 2. Household nutrition (SHN) case (SusHouse project) | 1998 - 2000 | Household consumption system |
| 3. Multiple Sustainable Land-use (MSL) case (STD programme) | 1994 - 1997 | Spatial rural system involving agriculture and other functions like water, nature, leisure |

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## Empirical conclusions I

- Al three backcasting experiments *successful* in broad participation, visions, higher order learning and follow-up agendas.
- This does *not* guarantee *follow-up* and *spin-off*; the extent of follow-up and spin-off depends on various internal and external factors.
- Follow-up and spin-off materializes in *networks* consisting of *activities*, *actors*, and *resources*; it involves old and new actors.
- Future visions are important in follow-up and spin-off; they provide *guidance* (where to go) and *orientation* (what to do)
- Future visions show both *stability* and *flexibility*, which relates to entries, clusters, domains.
- Follow-up and spin-off is at a niche level: *seeds for change.*
- Some *institutionalization*, but also institutional resistance

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## Empirical conclusions II

| Enabling internal factors | Constraining internal factors |
|---|---|
| High degree of stakeholder involvement & **small groups much influence** | - |
| Diversity in types of stakeholder involvement | - |
| Single vision backcasting experiment | Multiple visions backcasting experiment |
| High degrees of guidance and orientation of the future vision | - |
| Institutional protection | - |
| Presence of vision champions | - |
| Strong focus on follow-up and implementation | Strong focus on academic achievements |
| Joint and congruent learning | - |

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## Theoretical conclusions /reflections

- Conceptual framework supportive including adjustments.
- *Industrial network* theory applicable for analyzing follow-up and spin-off of backcasting experiments.
- *Leitbild* concept applicable for normative visions in addition to emerging technical innovations.
- Further conceptualization of *stability* versus *flexibility*, as well as nested character / gradual elaboration.
- Conceptualization of *linking pin* process between backcasting experiment and follow-up / spin-off: combining learning & organizational behavior

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## Closing remark

- Repository.tudelft.nl
- www.eburon.nl
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