D1.1

FoodMetres

Conceptual Framework and Innovation Targets

Main Authors: Dirk Wascher, Jeroen Kruit, Stefano Corsi, Jim Groot, Paul Bartels, Esther van Asselt, Annette Priorr, Ingo Zasada, Alexandra Dörneberg, Moya Kneafsey, Laura Venn and Marina Pintar.

Due date of deliverable: 30 March 2013

Actual submission date: 10 June 2013

Keywords Planning, concept, integration, innovation, sustainability

Contents

1. Introduction

As made explicit in its title, the project 'Food Planning and Innovation for Sustainable Metropolitan Regions' (FOODMETRES) aims to assess both the environmental and the socio-economic impacts of food chains with regard to the spatial, logistical and resource dimension of growing food as well as to the questions of food safety and quality as key assets for food planning and governance. The main focus is on the identification concepts as well as practical examples for *food chain innovation* across different scales and forms of agriculture and food production with special emphasis on system innovation such as eco-industrial regimes (*e.g. Metropolitan Food Clusters*) as well as social-networking concepts (*e.g. Bauerngarten*) geared towards feeding urban populations as well as on the role of regional actors taking an active role in propelling and applying innovation for the purpose of making urban food supply chains more sustainable.

Box 1

Food planning
"At the beginning of the new millennium the food system was famously described as 'a stranger to the planning field' (Pothukuchi and Kaufman 2000) on account of the fact that planners had addressed all the basic essentials of human life with the conspicuous exception of food. The fact that such a charge could not be levelled today is indicative of the progress that has been achieved in the past 12 years, a period when the planning community — academics and professionals alike — has sought to make amends for failing to address the food system. In actual fact, the planning community is now beginning to play an important role in trying to fashion a new and more sustainable food system, one that is better aligned with societal goals of public health, ecological integrity and social justice. " (Morgan, 2013)

Metropolitan Food Clusters
Metropolitan Food Clusters can be seen as a system innovation in present agricultural practice from sector oriented agriculture and food production located separately, towards vertical and horizontal integration of a number of value chains, spatially clustered or semi clustered. The clusters are linked with sourcing areas that provide commodities according to high standards of sustainable development in agriculture and precision farming. The so-called agropark is an example for a spatial cluster of several value chains in an industrial set up, situated in the close vicinity of the metropolis. The clusters contain a variety of different agro-production, -processing, agro-logistic and agro and food linked services and functions .Within the cluster the principles of industrial ecology are being applied and located in the large scale central processing unit. The spatial cluster thus combines units that represent the different parts of the value chain from primary production to ready to eat food product, with added compartments of essential agro business services like R&D, education and training facilities, trade and logistics facilities, park management services. Clustering with non-agro-industries like energy production and waste management can further decrease economic costs and environmental emissions.

It should be noted that the project objectives, especially the orientation towards the concepts of *food planning and Metropolitan Food Clusters* constitute innovative approaches in their own right (see Box 1). This is because both concepts have emerged only recently, are not broadly recognized – let alone fully understood – across Europe and still fall short of full

circle operationalization and good practice examples. The fact that the innovative dimension of these two examples might not be immediately obvious for everyone – a probably characteristic aspect of innovation that aims at moving the boundaries of tradition, familiarity and good practice, if not changing the name of the game, in this case not less than the way metropolitan food consumption is organized – points at the need to substantiate its claims and to deliver evidence that the proposed innovation is capable of solving problems. Since existing food chains are highly complex structures in terms of time and space, such evidence is not easy to deliver.

However, we consider that dimension of innovations are relevant both inside and outside the project. With 'inside' we address those methodologies and research approaches which are in development and which is part of the FoodMetres implementation process. As main examples for the innovative research approaches we consider the Maptable, the Ecological Footprint assessment and Knowledge Brokerage as relevant here:

- The use of the **Maptable** technology for interactive stakeholder input. The Maptable is a digital platform that can be used horizontally and vertically. By means of a digital pen, participants are able to draw their design proposal (e.g. land use changes, localization of food-chain-components) directly into the geographic maps of metropolitan areas. Such areas can in the following be assigned with special values in terms of economy, social and economic functions. The Maptable technology allows to calculate total hectares, and the size of the ecological footprint, and to run various software applications. Results are immediately available for the participants, allowing for fact-driven decision making and discussions.
- FoodMetres will make a difference in the way the **Ecological Footprint** is being used a key reference for Impact Assessment. The Metropolitan Footprint Tool (MFT) has specifically been designed to break down the assessment into the different components of the product food chains and to differentiate between *Local Agro-Food Systems* (LAS) and *Metropolitan Agro-Food Systems* (MAS), as well as between *local* hectares and *global* hectares as key references. Global hectares should be considered as virtual, though valid indications for the total human consumption. Together with 'local' hectare figures (spatial requirements for direct urban consumption), both figures can help to guide the discussion of stakeholders when shifting between different levels of scales, e.g. from the local to the cross-boundary, European and even global dimension of the problem.
- The application of **Knowledge Brokerage** techniques has been programmed to build relationships and networks which facilitate knowledge exchange, innovation, and the stimulation of new research. In contrast to conventional science-policy interactions which are often perceived as 'one way', knowledge brokerage aims to create dialogue between the 'producers' or creators of scientific information and the users, or decision-makers. This will be of particular importance in understanding the novel and complex relations between food chain actors, recognizing that value creation within innovative food chains appears to have been created by consumer-producer partnerships.

While these research approaches have their own innovation characteristics it should be acknowledged that we expect their *simultaneous and procedural* combination to be of innovative power: making use of the digital Maptable, researchers will apply Knowledge Brokerage techniques to literary 'table' impact assessment figures deriving from the ecological footprint analysis to engage in a fact-finding debate with decision makers and stakeholders.

Despite the importance of recognizing the role of innovative research techniques, the FoodMetres' central objective is to identify those domains of innovation that are external to the methodological devices, but belong to the world of food chains. The following main innovation domains and items can be differentiated:

Product	**Process**	**Social**	**Governance**
• Goods & Services • Market Impacts • Ideas & business models	• Technology • Infrastructure • Delivery & Services	• Change of behaviour • New relationships • Cultural inclusiveness	• Taxes & Subsidies • Labels & Certificates • Food Planning

In order to further explore the meaning and purpose of innovation with regard to the project objectives, Alterra had called for an Innovation Workshop in Wageningen on 14 March 2013. The outcome of this workshop (has found its way into this deliverable and is compiled in its annexes.

The FoodMetres Conceptual Framework had been developed at three occasions: (1) during the project proposal phase, (2) the project kick-off on October 24th 2012 and during the WP-Leader Meeting on 17-18 January 2013 in Ljubljana and (3) during the Innovation Workshop on March 24th in Alterra. The second event constitutes hence the most recent phase of the conceptual evolution and has been presented in Deliverable 7.1 (Research Implementation Plan). We hence quote from this deliverable when addressing the FoodMetres conceptual framework here again.

A special task not yet addressed in this version is the functional link with the innovation targets. This is going to be addressed in Chapter 4 of this deliverable.

2. Conceptual Framework

On the event of the FoodMetres Kick-off, the following principle considerations have been agreed-upon to form the basis for developing the conceptual framework:

a. FoodMetres's core business (compared to other initiatives) is the ambition to use food-chain characteristics (e.g. performance indicators) to assess the "land footprint" of urban food consumption in terms of the socio-economic and environmental impacts.
b. The debate and assessment of footprints (carbon, land and blue water are three dimensions – we focus on land) is largely hinged upon the concept of "global hectares" as a reference base. This because it allows to demonstrate the externalities of current resource impacts in a striking way. However, the use of "global hectares" alone can be misleading, because it conceals the true impacts and true capacities (e.g. yields, management) of the land, namely the land that is at disposition in the metropolitan regions.
c. Therefore FoodMetres will use global hectares mainly for defining the problem and for setting the targets (reduction), but will methodologically focus on "actual hectares" for implementing these targets. This means that we will identify food chains for about 5 to 8 commodities per case study (some of them common – e.g. dairy products, others only regional – e.g. asparagus) and analyse their performance, making use of sustainability criteria such as energy, labour, resource efficiency, seasonality, water protection, pesticide use, etc.).

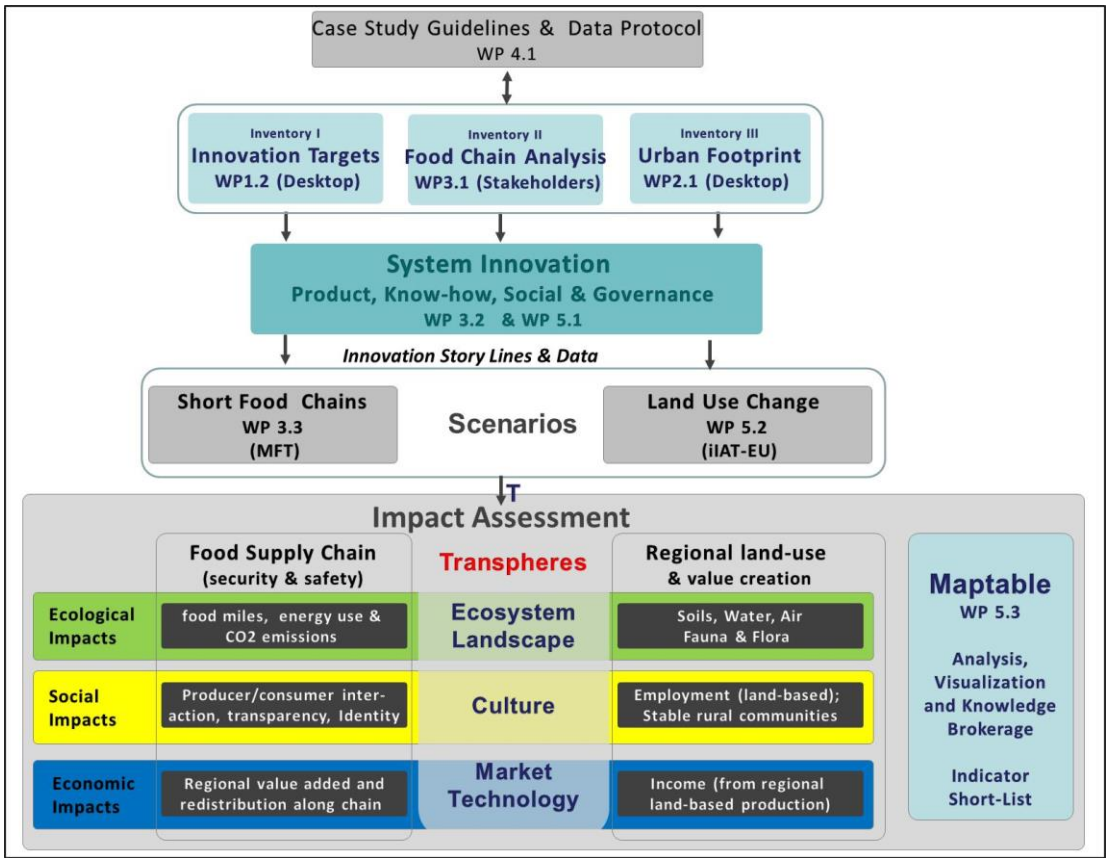


Figure 1. Conceptual Framework of the FoodMetres research approach.

d. Food chain performance indicators such as efficiency, flexibility, responsiveness and food quality put emphasis on optimizing the business performance *within* the given framework of parameters such as long transport ways. FoodMetres will establish a different set of rationales (priorities) in this respect, challenging conventional performance assessments.
e. The sustainability impact assessment of urban food consumption via supply chains will need to focus on key issues. Combining indicator frameworks of food chain performance with those of sustainability impact assessment (thus addressing environmental, social and economic issues) can potentially result in an extremely wide range of data needs and indicator assessments. FoodMetres needs to be *selective and focussed to reduce complexity*, especially with regard to (1) providing input to the Metropolitan Footprint-Tool (MFT by Alterra) and the European integrated Impact Analysis Tool (iIAT-EU by Zalf), and (2) the active involvement of stakeholders at the regional level.

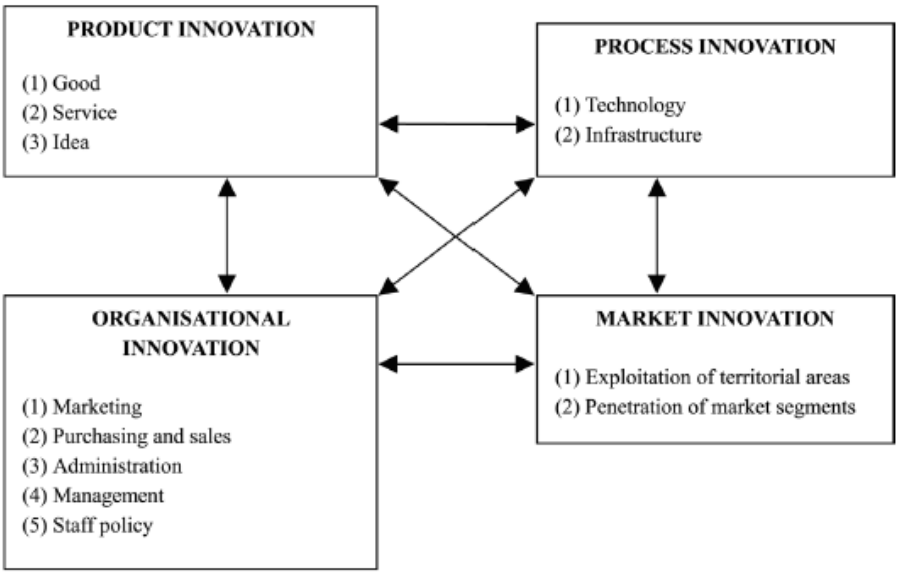
Figure 1 presents a schematic representation of the key functional and organizational concepts that tie the different work flows together. Please note that in comparison to the version in D7.1 it introduces the concept of *Transpheres* and *System Innovation.*

3. A Sustainable Approach towards Innovation

Following the FoodMetres kick-off meeting in October 2012, we considered the following four key dimensions (or *domains* as we prefer to call in this report) of innovation as identified by the European Commission:

- **Technological innovation:** techniques and artefacts embodying knowledge, as a means to exchange and expand rural knowledge, beyond simply lab-based science being transferred to users.
- **Know-how innovation:** knowledge around methods and practices in rural areas often combines new and traditional knowledge. Know-how innovation is often the result of participatory research, spanning the normal boundary between knowledge producers and users.
- **Organisational innovation:** changes in management and cooperation among stakeholders across the agri-food value chain.
- **Social innovation:** change of behaviour of groups in society, establishing new relationships, enhancing the cultural inclusiveness.

During a critical review of these domains at the event of the Alterra Innovation Workshop at Alterra (14 March 2013) we cross-compared this approach with the typology put forward by Clarysse et al. (1998), Lundvall (1922) and Avermaete (2003), presented in Figure 2.



Source: Based on Clarysse *et al.* (1998) and Lundvall (1992)

Fig. 2: Typology of innovation by Avermaete et al. (2003) based on Clarysse et al. (1998), Lundvall (1922)

Compared to the innovation domains put forward by the European Commission, the typology developed by Avermaete (2003) represents more of a business approach with regard to the various components of the agro-food industry. The domains market, organisation, products as well as process which include technology describe the company perspective at which innovation does and should take place. Such an interpretation considers innovation to come with „the introduction of a new product or a new procedure that is based on invention, research or development" (Albach 1991). Porter (1990) takes this perspective even a few steps further by considering "innovation as a new way of doing things (inventions) that is commercialized". Especially this emphasis on the commercial success demonstrates that from an economic point view innovation is per definition considered as a market-driven phenomenon which drives upon competitiveness, profit and the virtues of good entrepreneurship, hence reflecting the principles of a free market economy.

However, both the high frequency of reoccurring agro-food crisis events such as severe cases of animal diseases, the use of poisonous waste products to feed ever growing number of livestock, manipulations in the declaration of food products (recently the British horse-meat scandal, but also fraud with biological eggs in Germany) and the excessive use of pesticides in certain regions as well as the silent but long-term impacts of continuous air and water pollution (due to excess manure production and disposal) on traditionally managed landscapes including the associated recreational and ecological values demonstrate that an exclusively market-oriented food chain innovation is not likely to make the agro-food sector more sustainable. To the contrary: agricultural production is still considered to be the main driving force behind the loss of biodiversity in Europe (EEA 2010) and the contribution of urban food consumption to the ecological footprint is the highest from all sectors.

Just because the agro-food business follows the principles of other industrial sectors at the global level in terms of growth, efficiency and price politics, innovation is being considered as an almost magic formula for translating business success into sustainability and vice versus. For example, a livestock farmer who builds new, modern barns with solar energy supply to raise ten times as many cows than before can claim to contribute to sustainable development because of the reduction of energy consumption per animal and the prospect of contributing to feed the ever increasing urban population of the world. While this cannot not be disputed, we should be aware the consequent increase of food waste, soya imports, land use intensification, and transport volume is a result of purely market and technology-driven innovation.

Sustainability carries a whole range of *wicked problems* (Van Latesteijn and Rabbinge 2012):

- No definitive formulation of the problem.
- Stakeholders have different frames of reference concerning the problem.
- Constraints and resources for solution change over time.
- Impacts in space and time are unpredictable.
- Solutions are not true or false but better or worse.
- Wicked problems are never solved.

From the above it becomes clear why sustainability issues related to the agro-food sector usually defy grand-scale (one-size *does not* fit all!) or single-domain innovation efforts. The latter are prone to produce *rebound effects* which mark many of today's environmental debates in other sectors.

However, in the agro-food business, technological innovation is still considered as the main driver for creating a competitive business advantage rather than sustainable forms *of global resource efficiency*. With the latter we mean that all innovation efforts should be directed towards the social, economic and environmental dimension of sustainability – thus not only one- or two-sided. We further think that the emphasis on *global resource efficiency* holds the key to reducing the ecological footprint of urban populations and to reduce undesired rebound effects. Nevertheless, global ambitions – thus the reduction of impacts *outside* a regional agro-food system – be it a specific company, a food chain, or a metropolitan region – need to be accomplished by offering regionally sound solutions, especially with regard to local stakeholders, local ecosystem services and local land use. Thriving to achieve such a balance between the global and the local impacts will undoubtedly require rethinking the principles of ever-lasting economic growth as a driver for wealth and progress.

We hence will concentrate on exploring ways for allowing an evidence-based approach towards sustainable agro-food systems which is based on a broad notion of innovation which includes the process of learning, knowledge-sharing, governance, education, searching and exploring, resulting in sustainable products, new techniques, new form of organization and new markets (Lundvall 1995). For example, in the IN-SIGHT project**,** (see: http://www.insightproject.net/index.php?page=2) innovation has been considered as the *outcome of collaborative networks***,** challenging the classical linear view of innovation processes. In this way, innovations can be defined as the successful exploitation of creative ideas, which can be products, services, processes, markets, institutions. We hence consider the European Commission's approach to defining innovation in a more holistic fashion. At the same time we favour the emphasis on interrelations between the different domains of innovation as suggested in the approach by Avermaete et al (2003): innovation that addresses sustainable forms of resource efficiency will most likely to be confined to one or the other domain. Instead we see the added value of innovation just to include, link up with, build upon and incorporate several domains to form an *integrated innovation approach*.

Fig. 3: Domains of Innovation based on Avermaete (2003) and Kovacz (2012)

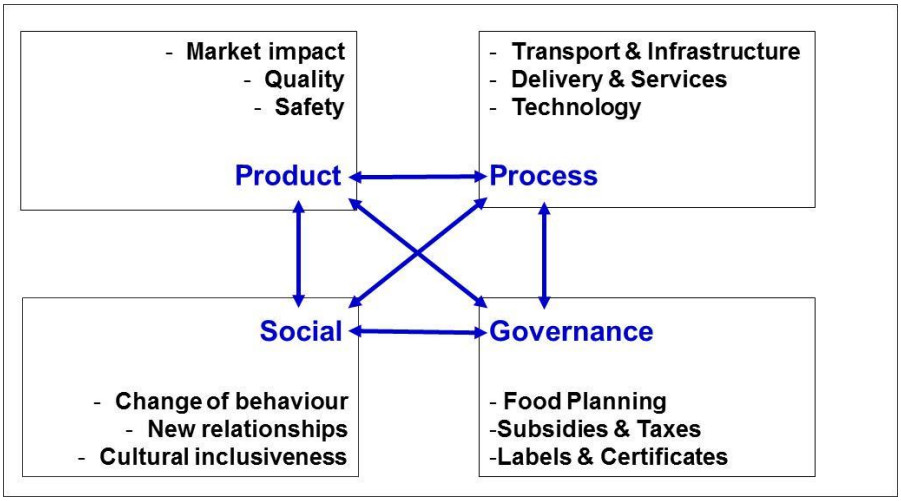


Fig. 4: Integration of Innovation Domains on Avermaete (2003) and Kovacz (2012)

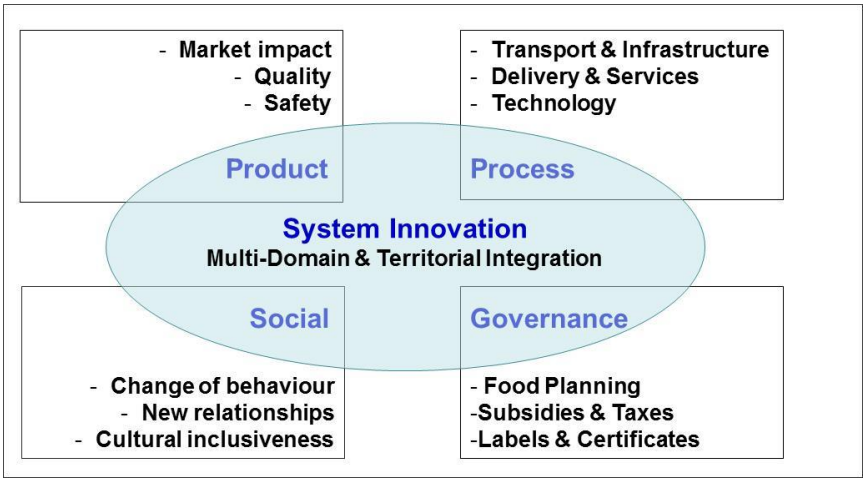


Fig. 5: Agro-food system innovation domains to address global resource efficiency

The sequence of Figures 3 to 5 illustrates, that we propose to move from incidental forms of domain innovation towards an *organized* approach of agro-food system innovation. The meaning of system innovation as an integrated approach shall be further examined in the next section.

4. The Concept of System Innovation[1]

The basic meaning of innovation is understood as something which is new or original in a way which improves upon the existing. Some definitions include:

- The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relation. The minimum requirement for an innovation is that the product, process, marketing method or organisation/method must be new (or significantly improved) to the firm. (European Commission, 2009).

- The use of a new idea, social process or institutional arrangement, material, or technology to change an activity, development, good, or service or the way goods and services are produced, distributed, or disposed of. (International Assessment of Agricultural Knowledge, Science and technology for Development, McIntyre et al., 2009, p.285)

In the late 1990s, the concept of system innovation was developed in innovation studies, which widened the perspective of innovation to encompass not just individual organizations, such as business firms, but also networks of organizations (Geels, 2004). System innovation is a non-linear learning process, that is, the process occurs in a manner which builds in feedback loops which enables constant re-evaluation and revision. This is a fundamental change from the formerly prevalent top-down model of knowledge transfer from scientific experts to practitioners.

[1] Chapter 4 is largely based on a contribution of B.J. Andersen to the draft paper by Andersen, B.J. and Wascher, D.M. (2011) " System Innovation as a Driving Force for Sustainable Dutch Metropolitan Agriculture", un-published

Pannell carried out an analysis of research about agricultural innovation adoption (1999), with a focus on farmers switching to more ecologically-oriented farming. In the analysis, four qualities were found necessary for farmers to adopt a new system: awareness of the innovation, believing that trying the innovation is feasible, judging that the innovation is worth trying, and accepting that the innovation supports the farmer's objectives. Pannell stated that, for developed countries, innovations can face obstacles of how to develop more profitable systems, proving profitability, and conquering uncertainty about the innovation. The critical challenge with successful and lasting innovation adoption seems to be convincing the farmer that the innovation has a clear advantage over the existing technology, system or approach. Farming systems are complex and it is probably necessary to consider not just individual farmers but also the range of stakeholders varying from farmers to rural communities to the global food system. Pannell's study seems quite useful for consideration of the selected food chains. Especially for the food chains directly involving farmers, but perhaps more generally for the other food chains as well, understanding the possible barriers to innovation adoption and important qualities for innovations to be successfully adopted can supply useful information and guidance for metropolitan agriculture projects.

A paper on the adoption of more sustainable practices through innovations stressed the twin nature of technical and societal changes which need to happen more or less concurrently for innovations to be adopted (Elzen and Wieczorek, 2005). Unlike incremental processes, system innovations, also known as transitions, are characterized by this dual nature of technical change coupled with society undergoing changes that allow and promote the adoption of technical changes. Understanding transitions means grasping this interrelatedness and the mutual dependencies of technological and socio-cultural changes. Then, for more sustainable transitions to be encouraged, issues such as policy formation by governments and learning processes of actors and networks need to be understood. These ideas are particularly applicable in the case of the Schieveen development plan near Rotterdam (http://www.schieveensepolder.eu/) which involves many technical practices, i.e., manure management improvement for the benefit of pasture birds or the mapping of pasture birds' nest sites, coupled with social factors, such as the inclusion of urban recreationalists, such as birdwatchers.

A study of organic farming in Quebec examined the role of innovation and found that location of farms in urban fringe areas was associated with the development of organic agriculture as an innovation (Beauchesne and Bryant, 1999). The researchers propose that urban fringe areas induced more adoption of organic practices over other rural areas through the presence of positive aspects of the urban fringe, such as market access and the availability of specialized services, through the presence of dynamic actors, and through positive local forces, such as agriculture being valued by the community. Negative aspects of agriculture at the urban fringe were also discovered, such as land speculation, incompatibility of urban and rural land uses, lack of leadership, and negative attitudes about agriculture in the community. Urban fringe areas with concentrations of organic farming were found to provide more positive than negative factors favouring this type of innovation. This study is relevant for Greenport NL (http://www.agriholland.nl/info/info_english.html) as well as for Green Care farming (http://www.youtube.com/watch?v=05DjZP7czms) of which there are 55 located around Rotterdam, 23 of which labelled as outstanding quality. For both, Greenports as well as Green Care farms the proximity to an urban centre is essential because of the involvement of urban populations for purposes of marketing (for Greenport NL) and health care centre involvement (for Green Care farms).

Pearson (2007) reviewed studies in parts of Europe, New Zealand and North America which compared the profitability of organic vs. conventional agriculture. For various crops in Western Europe, the 22% to 37% higher production costs of organic agriculture were more than offset by price premiums. To promote more regenerative agriculture, a combination of encouragement, financial incentives and legislation work together to induce farmers to change practices. Three trends of increasingly metropolitan areas favour a shift to organic agriculture: less tolerance for negative environmental impacts of agriculture, such as pesticide drift, in areas where farmland and residential areas are adjacent, more value placed by society on relationships between urbanites and farmers, such as pick-your-own operations and other opportunities for consumers to purchase food directly from farmers, and more prospects for urban agriculture as urban areas spread and conventional farming faces increasing difficulties in peri-urban areas. Pearson wrote that a blend of farmer-oriented information, public property management changes, and legislation is probably best. It's difficult to say how this study could be applied to the selected food chains since so many factors are involved.

5. The role of System Innovation in Impact Assessment[2]

DPSIR is a conceptual framework adopted by the European Environmental Agency (EEA) for representing interactions between society and the environment. DPSIR stands for driving forces, pressures, state, impacts and responses. It extends the Pressure-State-Response model developed by the Organization for Economic Co-operation and Development (OECD) (Bürgi et al., 2004; Svarstad et al., 2008) by incorporating possible causal agents, i.e., driving forces, and by also including the impacts resulting from environmental pressures, such as the use of resources and the discharge of pollutants.

Driving forces consist of the social, economic or environmental developments that put pressures on the environment. The EEA describes driving forces indicators as "the social, demographic and economic developments in societies and the corresponding changes in lifestyles, overall levels of consumption and production patterns" (EEA, 2009). The EEA further states that population growth is a primary driving force, along with individuals' needs and activities (EEA, 2009). As a result of these primary driving forces, levels of production and consumption change, and thus apply pressure to the environment.

Numerous studies have utilized the DPSIR framework as a way to understand how human actions and policies relate to environmental changes. For example, in a study of Kenyan reef fisheries management, the DPSIR structure was utilized with the socio-economic drivers of population, unemployment, tradition and culture, poverty and tourism (Mangi et al., 2007). The DPSIR model proved to be a useful tool for simplifying the complexities of the fisheries situation and informing policy.

Another study employed the DPSIR approach to analyse the risks of not meeting the European Water Framework Directive (WFD) for groundwater protection. Using DPSIR, the researchers identified and described driving forces of population, industry concentrations, number of ports, number of fisheries, and numbers of farms causing pressures and impacts in the Basque area of northern Spain estuarine and coastal waters (Borja et al., 2006). DPSIR

[2] Chapter 4 is largely based on a contribution of D.M. Wascher to the draft paper by Andersen, B.J. and Wascher, D.M. " System Innovation as a Driving Force for Sustainable Dutch Metropolitan Agriculture", un-published

was found useful in this case study with the caveat that sufficient data, both spatial and temporal, needs to be available. Also notable in was the researchers' description of DPSIR as a four-stage process in their study: description of the driving forces, identification of pressures, and assessment of impacts produced by the pressures and evaluation of the risks if the WFD objectives were not met.

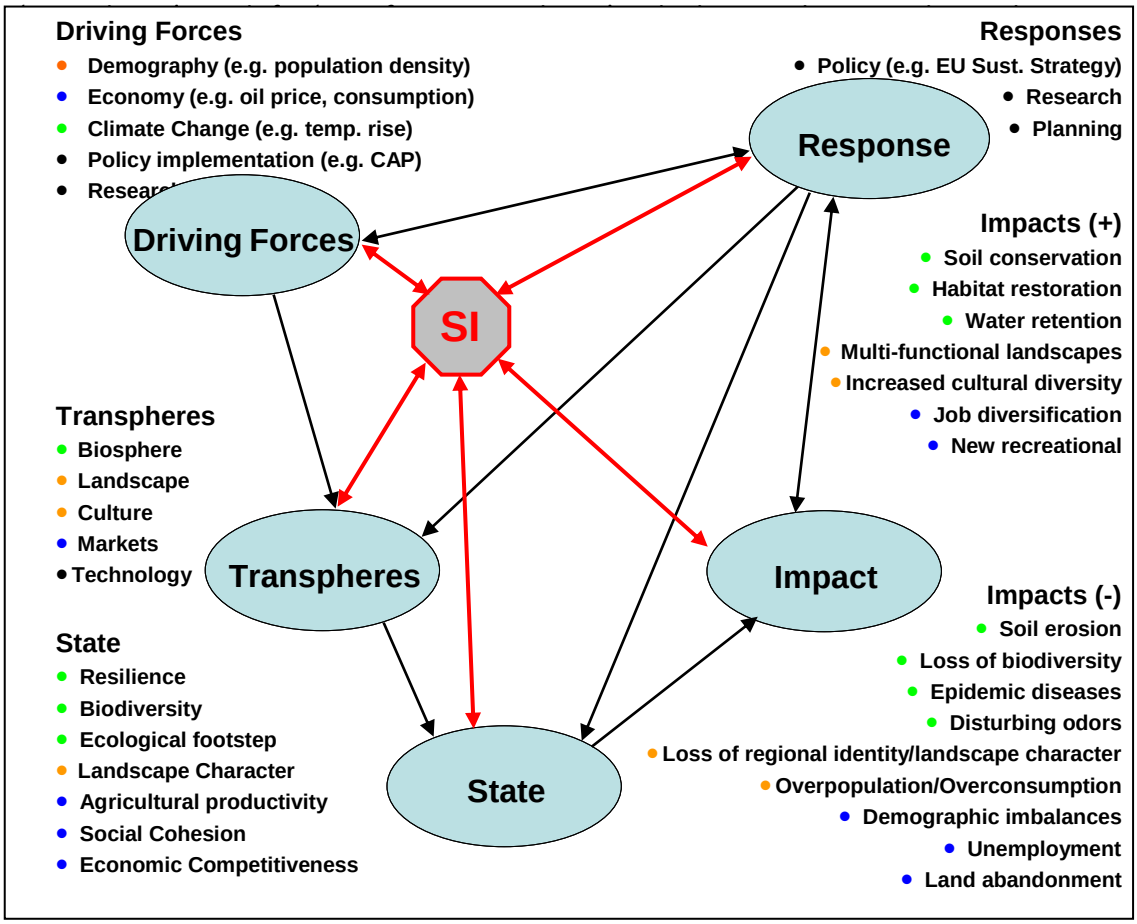


Figure 6: The role of System Innovation (SI) as part of the Driving Force – Transpheres – State – Impact – Response (DTSIR) - Concept

There has also been criticism of the DPSIR approach. Svarstad et al. (2008) stated that DPSIR is hardly a neutral framework as it is usually depicted. Based on a foundation of four types of knowledge or discourses - preservationist, win-win, traditionalist and Promethean - DPSIR explicitly favours a preservationist position. Preservationists' aim is the conservation of species, biotopes and landscapes. The win-win discourse type also seeks to conserve but involves different interest groups and tries to achieve an integrated outcome so that everyone is satisfied with the results. Traditionalist discourse supports use of resources by local actors and condemns exploitation, especially by outsiders. The Promethean perspective has been the dominant one in Western society until recently. From a Promethean point of view, human ability to manipulate nature with technology is paramount and any environmental problems can be solved through technological advances. Is this purported bias towards preservation a problem? It depends on society's goals. If preservation is agreed upon, as it seems to be in EEA documents, then this orientation seems fitting. However, as Svarstad et al. argue, when multiple stakeholders with different perspectives are involved, using the DPSIR as a discourse tool can hinder communication. A

way to meet this criticism would seem to be overt recognition of the bias and willingness to listen to other discourses. Another way proposed by Svarstad et al. (2007) is discourse analysis, carried out alongside use of the DPSIR framework.

Another criticism has been the hierarchical nature of the DPSIR framework, suggesting that a relatively small number of national governments, supranational organizations, and international organizations standing as 'drivers' at the top of this hierarchy are the actors capable of addressing the 'root causes' of the environmental problem (Carr et a., 2007). While the latter argues that the application of the DPSIR framework to sustainable development initiatives is likely to reproduce false or mis-guided power relations, we feel that sustainable issues such as those related to metropolitan agriculture require a different framework orientation since the current applications are focusing mainly on environmental issues, thus only at one of the three dimensions of sustainability. The current environmental bias of DPSIR mainly manifests itself through the position of 'Pressures' between Driving Forces as their main causes and 'State' and 'Impacts' as their main consequences.

Though such a constellation does reflect many of our contemporary environmental problems, it underestimates the role of human activities in *support* of socio-economic and environmental functions and values and it is running short in acknowledging the positive effects Driving Forces can have with regard to sustainability. Because any human interaction can have positive as well as negative effects on a given sector, landscape or living being – sometimes even simultaneously – the category comes across as biased in summarizing them all under the category 'Pressures' or in only focusing on those which are negative. We hence propose to abandon the term pressures and to introduce instead the concept of 'Transpheres'. The state of *sustainability* - thus its three dimensions of people, planet and prosperity – is what here is referred to as Transpheres. With regard to sustainability assessment, State and Impact are hence only measurements, e.g. by means of indicators, of conditions, flows and performances.

As Morgan et al. (2006) have detailed agri-food systems in much of Europe and the U.S. have split into two "worlds of food." The conventional system, the agri-industrial model, is predominately characterized by large scale production, product standardization, and large companies focusing on the production, processing and retail sale of food at national and global levels. An alternative system centres around the ecological and social aspects of agriculture and supports smaller scale producers and retailers within localized markets. These two worlds, though possessing distinctly different worldviews, no longer represent mutually exclusive sets of actors and interests and have become more intertwined recently. For example, large supermarkets in Europe and the U.S. now commonly feature some organic products and emphasize the "greenness," i.e., the environmentally beneficial practices, of certain food production companies. The system innovation of changing consumer preferences acts as a driving force helping to bring about more sustainability in metropolitan agriculture.

Innovation is fundamentally a creative endeavour. It is often risky because one needs to be willing to leave familiar ground or ways of doing something and venture into the unknown in creating a new path. In developing sustainable metropolitan agriculture, major types of innovation exist in the areas of new markets, such as direct marketing to consumers and restaurants, new agricultural products, such as pasture-raised livestock, and new agricultural techniques, for instance, producing value-added farm products. System innovation can be a driving force for sustainable metropolitan agriculture by providing new ways for agriculture providers to be economically viable, socially acceptable, and environmentally responsible.

Thus, System Innovation, as shown in the schematic (Figure 6) is the nexus, linking with Driving Forces, *Transpheres*, Impacts and State. A system innovation can be a large scale driving force, such as when the price of oil increases and contributes to the use of system innovations that rely less on oil, for example, bicycle-powered harvesting machines. System innovation can also be a response such as the EU's sustainability strategy policy.

6. Framing the Scale and Direction of Innovation Domains

At the heart of the scheme stands the development of "innovation storylines" also sometimes referred to as "innovation biographies". These storylines describe summarize the following items:

- The central innovation concept/idea
- The different dimensions e.g. technological, know-how, organisational, social..?
- The envisioned gain for sustainability of the food-chain
- The main actors and capacities that are involved
- The expected (regional) opportunities for making this concept successful
- The anticipated obstacles/risks
- The demand on governance support when implementing the innovation

These **innovation storylines** are linked to certain commodities and will be drawn up on by means of two desktop studies, namely the identifications of generic innovation targets for short food chains (WP1.2) and the analysis of the generic urban footprint (WP2.1), as well as by inquiries among stakeholders in the commodity-specific food chain analysis (WP3.1). The stakeholder analysis will draw most likely upon focus group assessment techniques in which the innovation storylines are going to be critically reviewed and if necessary adjusted.

The whole process is going to be guided and coordinated by WP4 which develops the data protocols and case study guidelines to ensure consistency and efficiency. The resulting innovation storylines will become multi-facetted policy-like inputs which represent different entrepreneurial and societal choices to be made. Just for illustrative purposes, the following innovation storylines can be imagined:

- *The product innovation storyline*: the production of regional cheese is a matter of the past. All milk is transported to a large national company which makes and markets various dairy products. Some farmers form a cooperative to produce their own regional cheese and market it on the farm.
- *The process innovation storyline*: the production of tomatoes is handicapped by regional climate, transport problems and expensive land prices. The establishment of glasshouse structures and re-organizing the transport network allows to substantially changing the regional tomato market.
- *The social innovation storyline*: people like to receive their self-ordered, home-delivered selection of organic food in a carton-box. Marketing regional food in this way (the box guarantees to only contain regional products) means a very short food chain (direct delivery) and high social value.
- *The governance innovation storyline*: a regional authority might provide tax incentives for companies that put forward innovative food chains with a regional orientation.
- *The system innovation storyline:* farmers, local authorities and knowledge institutes team up to explore opportunities for bio-based economy which provides them with a market advantage. E.g. they recycle biomass coming from

agricultural waste such as manure or excess fibre materials for energy, fertilizers or other products (the term system innovation is here identical with 'integrated innovation')

These types of innovation storylines become objects of scenario developments at two levels: by developing the Metropolitan Footprint Tool (MFT) which has both a spatial (land use change) and functional, food chain oriented dimension. The main media which for applying the MFT is the Maptable allowing stakeholder participation and knowledge brokerage by means of serious gaming. However, the Maptable requires simplification, aggregation and operationalization of the research results. This means only a limited list of indicators can be applied.

In parallel, the European integrated Impact Analysis Tool (iIAT-EU) allows to run more complex and comprehensive sustainability impact assessments at all three levels, the environmental, the social and the economic dimension. Here, more indicators are going to be produced and will provide input to the IA Reports which are going to be produced for each storyline.

6.1 Product Innovation

Product innovation for serving the city is related to quality, safety, nutritional values of food products and additional impact of the production and processing of those food products.

Upcoming trends may influence food quality and safety. A holistic approach can be used to identify factors that in the near future may cause emerging safety risks. This implies that emergence of a risk can be the result of factors inside the production chain (endogenous) or outside the chain (exogenous). In addition, emergence of hazards related to risks is usually a result of a particular change inside or outside the production chain. Endogenous factors (associated with changes within the production chain) may be related to technological innovations, for example nanotechnology (Marvin et al., 2009; van Asselt et al., 2010). An example of an exogenous factor is climate change, which may influence fungal growth and subsequent mycotoxin formation (Paterson and Lima 2010; Van der Fels-Klerx et al., 2012; Marvin et al., in press). Public concern is another exogenous factor that affects food safety. As consumers are more and more interested in the origin of the products they buy, this has resulted in an upcoming market for local productions and shorter food chains. Novel production systems and/or products related to this trend are indicated in the sections below.

Innovating in the market impact of products

A new group of food products are the "experience" products, grown by a consumer themselves or in such a way they are interacting with the growth of the products in their direct neighbourhood. The interaction with the informal food market, education and the social and green ecological environment is found in many cities and form an important part of this multifunctional product. Being responsible for the growth of ornamental and food plants on common grounds or gardens, but also in buildings using for instance LED light, will be of growing important for consumers. The distance between production location and the consumer needs to be at walking or biking distance, being a part of the city-feeling. This combination of impacts for the importance of food products forms an innovation.

Examples:

- Innovation in urban farming by means of LED lights en hydro growing in empty office and factory spaces, still experimental

http://www.vmt.nl/nieuws/vmt-nieuws/2012/telen-onder-led-licht-wordt-gangbare-manier-van.166679.lynkx
http://www.degroentenuitamsterdam.nl/
http://www.plantlab.nl/4.0/index.php/revolution-in-growing/?lang=nl

- But also on straw balls:
  http://www.earth-matters.nl/7/7291/duurzaam-20/meteen-en-overal-tuinieren-beplanten-met-strobalen.html

Products quality, safety and nutritional innovation

Aspects that influence food safety of innovations in peri-urban agriculture are connected to the small scale of production as well as the location. Due to the small scale, producers are often not using HACCP-based systems and are not always aware of possible food safety risks involved. Furthermore, depending on the location of peri-urban agriculture, concentrations of heavy metals, PAHs and pathogens may differ. These aspects should be taken into account when new initiatives are introduced.

One of the upcoming trends is the production of novel proteins as a replacement for meat. World population is growing and welfare standards are increasing, which causes an increased demand for meat consumption. Between 1950 and 2000 the global human population doubled from 2.7 to 6 billion people. Meat production, however, increased with a factor of five from 45 to 233 billion kilo per year. As a result of the high meat demands, shortages are foreseen in the near future. Novel protein sources that have comparable nutritional composition are currently under investigation. Examples are the use of insects, algae production and application of beet loaf. Apart from protein production, algae may also be used to produce ß-carotene (a source of vitamin A), which is another innovative application of algal production. Furthermore, insects may also be used for their fat composition and chitin (Belluco et al., 2013; Devlin and Fleming, 2013; Palmer, 2013; Van der Spiegel et al, submitted).
Plant proteins are also used as replacement of animal proteins. For example, lupine is currently applied in the production of 'vegetarian meat'. Furthermore, it is used in bread production as a quality improver and to replace wheat in order to meet increased market demands for gluten-free products. These applications have caused a recent increase in lupine cultivation in Europe. Other plant materials that are used as replacement for wheat are sorghum, millet and oats and cultivation of these crops is also increasing (Taylor et al., 2006).
Another topic of concern is the reducing bee numbers within Europe. Over the past 10 to 15 years, beekeepers have been reporting unusual weakening of bee numbers and colony losses, particularly in Western European countries. In North America, colony losses observed since 2005 have left the region with fewer kept bees than at any time in the past 50 years. Bees are critically important in the environment, sustaining biodiversity by providing essential pollination for a wide range of crops and wild plants. They contribute to human wealth and wellbeing directly through the production of honey and other food and feed supplies such as: pollen, wax for food processing, propolis in food technology, and royal jelly as a dietary supplement and ingredient in food. Several contributing factors have been suggested as a cause for the reducing bee populations, acting in combination or separately. These include the effects of intensive agriculture and pesticide use, starvation and poor bee nutrition, viruses, attacks by pathogens and invasive species, genetically modified plants, and environmental changes (e.g. habitat fragmentation and loss) (EFSA, 2013). This has

resulted in an upcoming trend in urban bee keeping resulting in the production of urban honey.

Examples:

- City bees: http://www.ilovebeeing.nl/urban-beekeeping/video-blog/
- Union of insect breeders: http://www.venik.nl
- Microalgae production: http://www.wageningenur.nl/en/Expertise-Services/Facilities/AlgaePARC.htm
- Vegetarian meat from lupine: http://www.devegetarischeslager.nl/over-ons/lupine

6.2 Process Innovation

Here we especially consider new – often technological – food chain aspects such as logistics, infrastructure, delivery services and the like.

Transport duration and order system is leading for the growing cities
Important is the maximum delivery duration because of the quality of the product wanted and the order or service system for the food. Most of the staple food and other basic ingredients will be transported from other areas by boat, train and/or truck. The products can have a global, regional or sub-urban source with different transport, storage and ordering systems. The type of infrastructure depends strongly on how perishable the products are and the way to handle the products as single units or in bulk. Bringing large quantities of perishable food products into the centre of the city will be challenging more and more, while the cities are extending fast. The packaging of these commodities, storage in the city and transport are related with a logistical infrastructure around the city with production, processing and trade locations, hubs and selling points, making shifts between transport modalities possible. There is a relation to be quantified between distance, quality experience of perishable food products and type of transport.

Examples:

- using new transport other than trucks from the producer/retailer
  http://www.informatie.binnenvaart.nl/vervoer/intermodaalvervoer.html
  The innovation is the sharing of distribution system using also shared transport for distribution inside the city (sustainable: electricity is favourable)
- By ship (Amsterdam/Utrecht canals), Parijs
  http://www.overmeer.com/PrimoSite/show.do?ctx=382584,424246,602217 , pdf stedelijke distributie in Amsterdam
- By tram/train (Den Haag and Amsterdam)
  http://www.logistiek.nl/Distributie/transport-management/2007/12/Nuon-stapt-in-stadsdistributie-per-tram-LOGNWS105877W/
- By car (From Cargohopper, general electric car to ToekToek in Amsterdam)
  http://www.evo.nl/site/peeters-vervoercentrale-transport
  http://www.logistiek.nl/Distributie/duurzaam-transport/2012/6/Internationale-waardering-voor-Cargohopper--1032381W/?dossier=20047&widgetid=0
  http://www.020stadsdistributie.nl/
- By bike (old-fashioned bakkerfiets or bakfiets)
  http://www.essers.com/nl/transport/stadsdistributie/

New ordering and delivering networks

Products like herbs or red fruit are special quality demanding products asked for by consumers on a short term notice or with very perishable characteristics. Production locations have to be found in the neighbourhood of the consumers. Also a consumer likes to understand more and more the source of the product and to see or 'connect' with the growth and production as a part of their quality experience.
New order and delivery systems form a part of the product innovation. The use of internet and organizing the producers and suppliers in self learning and fast responding value networks form a solution. The nearest producers in the city will deliver the food in such a network. An example of such systems can be worked out.

Examples:

- using hubs in the city or suburb, see also in New York or Vermont
- Food Centre Amsterdam: Distribution hub, education, leisure (restaurants using spoiled food), markets, http://www.herstructureringfoodcenter.amsterdam.nl/main.php?asset_action=download&action=asset&obj_id=943350546; In such a centre also the recycling with transport has been taken care for
- using deliverable systems (the last mile)
  - AH and Bol.com but also Kiala: The ordered system will be delivered in a shop: easy pick up
  - Regio Hengelo introduces pick-up locations for food.
  - Siemens introduces the refrigerator which can be filled from the outside (to be placed next to the front door)
  - ambient lunches to be delivered via the post box or to be picked up at gas stations
  - transporting food per public transport (e.g. transport trailers behind busses such as in Brandenburg)
  - Experiment by Albert Hein to offer food via drive-in sales points
  - Combination of pick-up and delivery services such as by Dutch Westland hothouse farmers : value networks http://www.coena.com/
- Using the network of vending machines in Slovenia:
  - for milk: http://www.mleko-mat.si/mlekomat/for meet: http://terra-gourmet.com/en-US/default
- Delivery of ecological produced vegetable to a home in Slovenia: http://www.zeleni-zabojcek.si/
- Online marketplace in Slovenia: http://www.zelenjava-pikapolonica.si/spletna-trznica.html
- Online store for vegetable and fruits. Mark label: GoGeaGo: http://www.geaprodukt.si

6.3 Social Innovation

Kirwan et al (2013) provide a useful review of the concept of 'social innovation' in their research on food localization. A key point, drawn from Howard and Schwartz (2010) is that social innovation is concerned with change in social practice. This is often expressed in new forms of collaborative action and the impacts may well be immaterial or intangible, at least in the short term. So for example, as noted by Neumeier (2012), social innovation can be expressed in terms of changes in behaviour, perception or attitude. Kirwan et al (2013) also

observe that social innovation is concerned with social inclusion, democratization and civic involvement, which are all key issues in current critical food research and local food movements. The general trend is for social innovation to be conceived of as a 'bottom up', place-based process, which may be stimulated by externally originated processes and initiatives (such as governance innovation, for example), but which is nevertheless attuned to existing local circumstances, needs and assets.

Whilst social innovation is often conceptualized as localized practice, it is clear that social innovation will occur in relationship with product, process and governance innovation, and it is important to consider the ways in which these different innovation domains intersect in particular places. For example, do social innovations drive governance innovations as policy makers and institutions play 'catch-up' with localized citizen-driven innovations (or 'grassroots' innovations, as described by Seyfang and Smith 2007)? Do technological innovations such as new social media drive social innovations by enabling new forms of communication and knowledge exchange? In each case study in FoodMetres, the constellation of actors and drivers of innovation will have some unique characteristics as well as more generalizable features. The existence of successful new food chain formations in particular localities can act as stimulant to diffusing the innovative practices to other locations and social groups. Within this context, a key research challenge lies in developing appropriate methods to evidence and communicate social innovations which may be largely intangible and outside normal conventions of what is considered 'successful'. Two particularly important aspects of social innovation are the development of new business models, and behaviour change amongst consumers.

New Business Models

The development of new business models is an innovation which will be crucial to the emergence of sustainable urban food chains. New business models often require new forms of exchange and new modes of entrepreneurial behaviour based on values which challenge 'conventional' business behaviour. Social enterprises, for example, are committed to investing profits back into communities, rather than generating shareholder profits. Local exchange trading schemes (LETS) are based on exchanges of skills, knowledge and time, rather than money. There are also examples of local currency schemes (such as the Brixton Pound, in London) which seek to challenge the traditional power relations which are embedded into national and international trading and banking systems. Many of these initiatives are led by community based organisations and are designed to support local economic development and resilience. In the food sector, new business models include initiatives to restructure the relationships between producers, consumers and food, through either 'shortening' or 'localising' food chains (e.g. Farmers' Markets, CSAs, urban growing initiatives). Whilst it is clear that these restructuring efforts require product and process innovation, notably in terms of logistics, they obviously need to operate in relationship with social innovation in the form of changes in attitude and expectations on the part of the various actors involved. For example, it is already known that many small scale producers involved in local food systems are not profit 'maximizers', but rather are profit 'sufficers'. They seek to sustain particular lifestyles and farming practices rather than engage in a continued race for ever increasing profits and so their success will not be defined in purely economic terms. Moreover, research has also shown that 'trust' is a key feature of the relationships which underpin these new business models and indeed, distinguish them from relationships of 'distrust' which characterize many conventional business and civic relationships (for example, distrust of supermarkets, banks, politicians).

Behaviour Change - Consumers

For new business models to flourish, behaviour change from consumers is often needed, and this too can be thought of as a form of social innovation. For example, Farmers Markets are often irregular and located in town centres, and so a special trip is needed on the part of consumers (unlike supermarket shopping which can be fitted in on the way home from work, or done online, for instance). The decision to start participating in a CSA may also require people to re-schedule their time: typically, a voluntary contribution to the work of growing and harvesting the food is needed in order to sustain the CSA. For some people, this re-scheduling will be relatively easy and straightforward. For others, it will reflect efforts to (re)prioritize aspects of their daily and weekly routines. The food received from a CSA may also require behaviour change, which might seem small on first glance but can have a considerable impact on peoples' use of time. Making a transition from pre-prepared convenience food, to cooking from scratch depends in behaviour change, for example. The vegetables acquired need washing, scrubbing or peeling and this often requires a re-thinking of routines. Also, the work is more likely to fall upon women than men. Despite increases in the numbers of women working outside the home, in most countries it is still the case that women (especially mothers) are the main party responsible for food shopping and cooking and so the decision to acquire and prepare food differently inevitably impacts upon their domestic workload. Indeed, it may well be speculated that for local food chains to become truly sustainable and embedded into daily practice, a social innovation in the gender division of labour around food may well be required. Whilst an exploration of this is beyond the scope of FoodMetres, the point is that the barriers and opportunities for behaviour change from the consumers' point of view, are often negotiated at the household scale, and are strongly bound up with the practicalities, logistics and pressures of daily urban lifestyles.

Examples:

- Innovation in food-experience: a combination of social contact – learning – fun – growing – dining – recreation. They are selling a product image.
  The old-fashioned school-garden is an example for product and learning experience which still works: http://www.rotterdam.nl/educatieve_tuinen_prins_alexander ; http://terra-gourmet.com/en-US/default
- Making farming practices accessible and supporting animal welfare: the example of the 'Roundel housing system' in the Netherlands: http://www.rondeel.org/
- Landscape management, school education and multi-functional agriculture in sheep farming near Rotterdam: http://maoosthoek.nl/
- Regional development plan for Schieveen near Rotterdam to combine grassland bird protection with regional food production: http://www.schieveensepolder.eu/
- Initiative for the live network of European public gardens in various European countries with different climatic: http://www.srce-me-povezuje.si/drustvo-mule/
- The net of schools eco-gardens. Education of children in schools about ecological vegetable and herbs production: http://www.solskiekovrt.si/
- Local currency systems designed to support local businesses and encourage local trade and production, such as the Brixton Pound in London: http://brixtonpound.org/what/
- Reconnecting producers and consumers through new forms of 'localised' food chains, see the Local to Ludlow Campaign which holds Farmers Markets, encourages traders to source locally and runs education programmes for consumers and community groups: http://www.localtoludlow.org.uk/
- Capital Growth, an urban growing initiative in London offering advice, support and practical help to people and communities who want to grow food for themselves in newly created growing spaces: http://www.capitalgrowth.org/big_idea/

- Lambeth Poly - polytunnel growing in the middle of public housing land, engaging residents in the cropping of salad leaves for restaurants persuing the local food USP in gentrifying Brixton.
- Garden Organic Master Gardeners - developing the skills of expert amateur growers to not only educate, encourage and inform beginner fruit and veg growers, but also to develop their portfolio of horticultural/community engagement skills. http://mastergardeners.org.uk/

6.4 Governance Innovation

Governance innovation for feeding the city is aimed to coordinate logistics, quality, and safety, nutritional values of food products and additional impact of the production and processing of those food products. Moreover governance innovation has to include the contribution of all the actors in the territory (local administrators, producers, processors, brokers, consumers, communities, associations, NGOs, etc.).

Governance innovation is mainly based on the structuring of partnerships that are of vital importance because governance has not been a static principle but a subtly changing concept as differing actors are given room at the table and the attitudes of those there change (Jones O., Little J., 2000).
In addition, the concept of governance has shifted from public sector/business partnerships to more comprehensive forms of partnership which include all stakeholders, included the community, voluntary groups and non-government organizations(Jones O., Little J., 2000).

In particular in the Metropolitan Agrifood System (MAS) and in the Local Agrifood System (LAS) governance doesn't correspond to a specific government body. The model of partnership involves different actors in the urban and rural areas in order to organize supply and demand, manage the flows (agricultural products, food, waste, etc.), secure funding and deliver services.

In order to analyse the concept of governance it is important to focus on the whole partnership concept, enlarging issues of the formation, membership, power relations between partners, etc., to include the social, political, cultural and economic contexts in which partnerships are being formed at the local level (Jones O., Little J., 2000).

Governance innovation can be considered a social innovation, defined as "new ideas that work to meet pressing unmet needs and improve people's lives" (Mulgan et al., 2007: 7), or as "changes in [human] structure and organization" (Simms, 2006).

The basic step for governance innovation, that can be included among the social innovations, is the identification of:
1) "What it is" definition (e.g. something new, such as a law, an organization, a social network, a profession or training for it, a value, a norm and a code of conduct, a role, a pattern of behaviour, an intelligence system, patterns of incentives, types of entrepreneurships and a combination thereof).
2) "Who can make it" definition (e.g. law makers, administrators, policy makers, entrepreneurs, managers, planners, educators, engineers, leaders of associations, scientists).
3) "How to make it" definition (e.g. imported vs. created, trial and error vs. systematic search) (Dedijer, 1984).

To describing appropriately the governance innovation in the LAS and MAS, it is crucial to define at what level of the supply chain the governance innovation is located, which impact may cause on food chain structure, who is involved and what is its role, what political and financial instruments must be enabled.

In the LAS and MAS the different approaches to the governance innovation can compete at the same time to the activation of new sustainable food chains that may benefit from new organizations and relationships (e.g. joint purchasing groups), new services offered (e.g. vending machines distributors of raw milk or snacks of fresh fruit), new technologies (e.g. online sales), the inclusion of the people involved with the innovation process (e.g. community supported agriculture), changing patterns of goods and services structure in an economy (e.g. supply contracts between public catering and local farmers), new lifestyles expressing one's values and status aspirations, observable through changes in one's spending of resources (e.g. increased spending on local or organic food) (Zapf, 1987, 1991).

Finally the effects of governance innovation in MAS and LAS can be summarized as follows:
"…to do something good in/for society" (Phills et al., 2008).
"…to contribute to urban (and rural) and community development" (Moulaert, 2010: 10).
"…to reorganize (work) processes" (Pot and Vaas, 2008: 468).
"…to imbue technological innovations with cultural meaning and relevance" (Cova and Svanfeldt, 1993)

Examples:

- Legislative DecreeMay 18th 2001, n. 228 "Orientamento e modernizzazione del settore agricolo, a norma dell'articolo 7 della legge 5 marzo 2001, n. 57" (Orientation and modernization of agriculture): promotion, definition and structuring of rural districts (http://www.camera.it/parlam/leggi/deleghe/01228dl.htm)
- Lombardy regional law 1/2007 "Strumenti di competitività per le imprese e per il territorio della Lombardia"(Tools of competitiveness for firms and for the territory of Lombardy). Art. 4: "Districts are business combinations in accordance with bonds of affinity that may have thematic-sectoral, territorial or joint, or other specific binding of correlation. Industrial, craft, cooperative, distribution, services, construction, tourism, agriculture and agri-food enterprises can freely join districts." (http://suap.comune.merate.lc.it/sites/default/files/lr_lombardia_1_07.pdf)
- Lombardy regional law Dgr 10085/2009: "Districts chain = production systems with a high degree of specialization, strong integration of the segments of the supply chain, significant representation at regional or sector level"
- Ministerial Decree November 20th 2007: "Markets reserved to the exercise of direct sales by farmers" (http://gazzette.comune.jesi.an.it/2007/301/4.htm)
- "Feeding Milan. A design for territorial ecology project" (http://www.nutriremilano.it/index.php?option=com_content&view=article&id=190)
- "Sustainable food chains and local communities") (http://www.forumct.it/it/progetti/filiere-agroalimentari-sostenibili-e-comunita-locali/)
- "Progetto BIOREGIONE": Study of the demand / supply of food at regional level, with a focus on institutional catering, short chains, organic food and support to public decision-makers
- "Dentro il capitale delle relazioni" CORES Research group on Consumption, Networks and Practices of Sustainable Economies (http://www.unibg.it/struttura/struttura.asp?id_notizia=58628&cerca=cores)

- Regulation on governing garden sites in the City of Ljubljana. Describes the conditions under which an individual can hire garden plots in the garden plot area in the Municipality of Ljubljana: http://www.uradni-list.si/1/content?id=94266

6.5 System Innovation

Rather than compiling a random selection of various food chain innovation opportunities, FoodMetres is designed to identify opportunities for integrated innovative solutions – so-called system innovation - for provisioning urban areas with high quality food in an environmentally sustainable way. Crucial for such an integrated approach is a thorough rethinking and redesign of the agricultural value chain, both vertically (from primary production to processing to logistics and retail) and horizontally (integrating animal and plant production chains and their waste management, in which waste streams from one element of the agricultural production system function as resources for other elements as much as possible). Central to this redesign is resource use efficiency to maximize the productivity of the energy, water, nutrients and space used, while at the same time offering opportunities for social interaction and inclusion. FoodMetres considers various forms of system innovation – from strongly industrial-ecology approaches towards traditional knowledge-based solutions. Inherent to all of them is the multi-level and territorial integration as the underlying concept.

In order to demonstrate the principle of the two entirely different approaches towards system innovation we would like to point at (a) the example of Metropolitan Food Clusters and (b) at the example of close rural-urban food chains as established in the Bauerngarten approach.

Metropolitan Food Clusters
(http://www.wageningenur.nl/en/Expertise-Services/Research-Institutes/alterra/Projects/Metropolitan-Food-Clusters-en-Agroparks.htm)
The concept of Metropolitan Food Clusters (MFCs) provides this food system innovation in an integrated and operational manner. In addition to food, the “F” of these clusters can also entail value strategies for the production, processing and logistics of Fodder, Fuel, and Fibre from biomass (crops and waste), Fashion products such as Flowers and Fragrances and Pharmaceuticals of biological origin. MFCs are integrated agro-production constellations consisting of three key elements; see the example of the Nieuw Prinsenland in the Netherlands (Fig. 7):

- Agroparks (AP) - spatial clusters of high-productivity plant and animal production and processing units in an industrial set up. The integration of production and processing (e.g. slaughtering of animals) and the application of industrial ecology principles, combining high levels of both knowledge and technology, aims to increase productivity and at the same time reduce costs, transport, veterinary risks and environmental emissions.
- Rural Transformation Centres (RTC) - satellites in rural areas where the inputs from land dependent production for the whole network are collected. They are also the centres for training and education of high productivity land dependent farmers.
- Distribution and Consolidation Centres (DCC) - centres where raw and processed products, coming from either the rural environment or from specialized APs, are

combined with import flows, processed further if necessary, and then recombined and distributed to the metropolises. DCCs directly serve metropolitan and export markets.

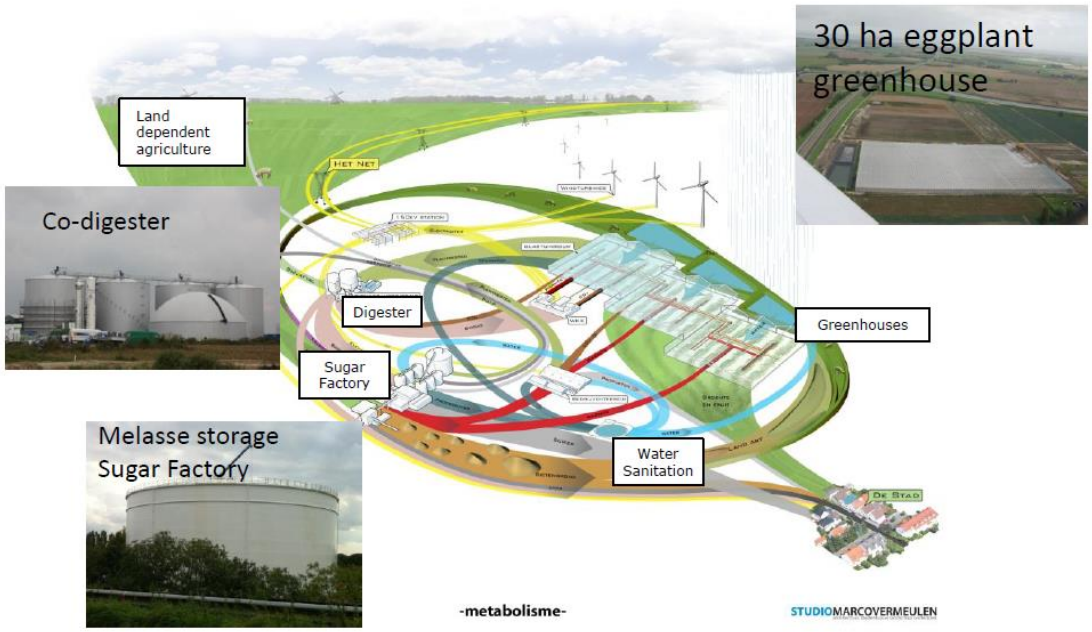


Figure 7: Nieuw Prinsenland, example of a real life MFC combining various forms of agro production and linking their waste-streams to optimize resource use efficiency.

MFCs are an innovation of the agro production system that aims to increase productivity in a sustainable manner by a) improving resource use efficiency, b) integration of food production chains, c) closing cycles in water, minerals, energy and carbon, and d) transformation of rural landscapes into climate robust food production areas through optimization of agro-logistics to link food production areas to internal and external markets. This low carbon, highly efficient approach of high quality food production will provide answers to the threats stated above and the desire to boost sustainable development in urban areas. MFCs have a high potential for creating new ventures and jobs.
So much for the theory, real-life MFCs hardly ever contain all components presented in the conceptual model; in most cases they develop out of existing situations and show a slowly developing horizontal and vertical integration. An example of such a developing MFC is Nieuw Prinsenland in the Netherlands (see Fig. 7). In this Agropark organic waste from the sugar factory is combined with manure of surrounding pig farms to produce biogas in a co-digestor, which is burned in a power generator. The heat and CO2-wasteflows from the generator and sugar factory are fed to the greenhouses for heating and enhancing productivity. Accomplishing this required a collaboration of provincial and municipal authorities, water boards, industries, farmers and knowledge institutes.

The integration processes which are characteristic for MFC development can be seen as a “wicked problem”, which requires new forms of design and development, and therefore new applications of knowledge, management and business creation. New services to support MFC development are also needed. One way to induce effective solutions for the “wicked problems” of sustainable climate proof agriculture and food production is via the so called KENGi approach, a 'creative research by design’ process (co-design), in which Knowledge Institutes, Entrepreneurs, Non-governmental and Governmental Organisations co-operate closely together to enable systems-innovations. Wageningen University has

applied the KENGi approach in a Community of Practice (CoP) as a management concept to strengthen imagination, engagement and alignment in order to design and realise MFC initiatives. The aim is to create an international network, acting as a focused think-tank and incubator-innovator in the EU arena, with centres of excellence in agriculture and food, as well as links to SME partners and large value-chain parties. The CoP will work in a trans-disciplinary manner based on the exchange of scientific concepts and tacit knowledge of the various participants.

Self-harvesting concept Bauerngarten (www.bauerngarten.net)

As stated above, system innovation addresses the combination of new and traditional knowledge around methods and practices and often is the result of participatory research, spanning the normal boundary between knowledge producers and users. Beyond methods and practices we also consider technological and infrastructure innovation. The novel self-harvesting concept Bauerngarten in Berlin offers various innovation storylines transforming traditional knowledge into new methods and practices.

The central idea is a self-harvesting concept optimized for demand-supply conditions in metropolitan regions, that can be regarded as an alone standing concept within the range between Community Supported Agriculture on the side and urban gardening on the other. Its particularity and novelty lies in the fact that it is tailored towards urban lifestyles. Bauerngarten offers contracts for the care and self-harvesting of already partially seeded plots, providing a substantial share of the consumption with vegetables for individuals and groups (families) over the growing season. Elements of community gardening and common learning are combined with service offers from small scale agricultural entrepreneurs located within cities or at the easily accessible urban fringe.

The concept covers several innovation dimensions: the technological dimension (e.g. through plot formats optimized for sectorial irrigation, leading to reduced water consumption), the process dimension through contracting machinery work or knowledge intensive practices (e.g. tillage and certain seedings as well as the possibility of short term outsourcing of any management practice from the contractor/ gardener to the entrepreneur),and finally the social dimension by being organised as a community garden with mutual support and exchange possibilities (exchange of know-how, seedlings, harvested produce) as well as by offering common learning in thematic courses (e.g. about plant diseases, composting etc.).

The anticipated obstacles/risks are the niche character due to a limited market, and the risk to be a trend phenomenon only.

Figure 8: Bauerngarten schematic map and example in Havelmathen, Brandenburg
Advantages with regard to sustainability of the food chain distinguish the Bauerngarten concept from other forms of urban gardening or peri-urban agriculture. In economic terms viability for consumers arises from the compensation of costs for organic food by own labour input, and by consumption of non-marketable qualities. This is connected with the social component of accessibility to healthy food independent from income level. More important are even social learning, awareness building, personal skill development, community experience and health aspects (green gym). Environmental advantages lie in controlled organic farming, food safety aspects due to professional management, and resource efficiency. Food miles are low.

When implementing the innovation governance support plays a significant role for the success and economic viability. Examples from Berlin and other towns point to planning support rather than to CAP and market instruments.

7. Conclusions

Innovation characteristics are often regarded, and guarded, as competitive assets within industrial sectors to be deployed as a means of achieving competitive advantage. We consider that with the appropriate use of knowledge brokerage tools and techniques and given the collaborative nature often inherent in many innovative shortened food chains, knowledge in relation to system innovation be effectively identified and shared via the various work packages.

However, knowledge brokerage does not happen of its own accord. It needs to be systematic and routinized in order for ideas, and understanding to be effectively shared. There are many ways in which this can be achieved, dependent on stakeholder relationships, cultural context and geographical scale. A suite of tools ranging from traditional workshop formats to online, interactive technologies will be adapted to the needs of the stakeholders in the different case study areas. FOODMETRES will therefore deliver a range of innovative solutions, among which system innovation, to the challenge of achieving evidence-based decision making in the complex realm of urban-peri-urban agriculture.

References

Albach, H. (1991) *Innovation, A Cross-Cultural Perspective*, Academy of Science and Technology in Berlin, Berlin: draft-report, mimeographed.

Andersen, B.J. and Wascher, D.M. (2011) System Innovation as a Driving Force for Sustainable Dutch Metropolitan Agriculture, Paper developed as part of the SUSMETRO project implementation, Alterra, Wageningen, un-published

Avermaete, T., Viaene,J., Morgan, E.J., Crawford, N. (2003) Determinants of innovation in small food firms, European Journal of Innovation Management, Vol. 6 Iss: 1, pp.8 – 17

Beauchesne, Audric and Bryant, Christopher. 1999. Agriculture and innovation in the urban fringe: The case of organic farming in Quebec, Canada. *Tijdschrift voor Economische en Social Geografie* 90(3):320-328.

Belluco, S., Losaso, C., Maggiolwetti, M., Alonzi, C.C., Paoletti, M.G. and Ricci, A. (2013). Edible insects in a food safety and nutritional perspective: a critical review.

Borja, Á., Galparsoro, I., Solaun, O., Muxika, I., Tello, E.M., Uriarte, A. and Valencia, V. (2006) The European Water Framework Directive and the DPSIR, a methodological approach to access the risk of failing to achieve good ecological status. Estuarine Coastal and Shelf Science 66:84-96.0

Bürgi, M., Hersperger, A. M. and Schneeberger, N.(2004 Driving forces of landscape change – current and new directions. Landscape Ecology 19:857-868.

Carr, E. R., Wingard, P. M., Yorty, S. C., Thompson, M. C., Jensen, N. K. and Roberson, J. (2007.) Applying DPSIR to sustainable development', International Journal of Sustainable Development & World Ecology,14:6,1

Cova B. and Svanfeldt C. (1993) Societal innovations and the postmodern aestheticization of everyday life. In *International Journal of Research in Marketing* 10 (3), pp. 297–310.

Clarysse, B., Van Dierdonck, R., Gabriels, W. and Uytterhaegen, M. (1998). Strategische verschillen tussen innovative KMOs: een kijkje in de zwarte doos. Publication N. 5, IWT, Brussels.

Dedijer S. (1984) Science- and Technology-related Social innovations in UNCSTD National Papers. In Carl-Göran Hedén, Alexander King (Eds.): Social innovations for development. Oxford ;, New York [etc.]: Pergamon Press, pp. 57–92. Jones O., Little J. (2000) Rural Challenge(s): partnership and new rural governance, Journal of Rural Studies 16 171-183

Devlin, H. and Fleming, N. (2013). The future of food. Focus, June, 52-57

EFSA (2013). Bee health. Available at: http://www.efsa.europa.eu/en/topics/topic/beehealth.htm

Elzen, B. and Wieczorek, A. (2005) Transitions towards sustainability through system innovation. Technological Forecasting and Social Change 72:651-661.

European Commission (2009) Glossary: Innovation. Available at http://ec.europa.eu/enterprise/policies/innovation/glossary/index_en.htm, accessed May 30, 2009.

European Environmental Agency (2009) Glossary: driving force. Available at http://glossary.eea.europa.eu/terminology/concept_html?term=driving%20force, accessed May 15, 2009.

Geels, F. W. (2004) From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. Research Policy 33:897-920.

Jones O., Little J. (2000) Rural Challenge(s): partnership and new rural governance, Journal of Rural Studies 16 171-183

Kovacz, B. (2012) Oral contribution to the FoodMetres Kick-off meeting in Rotterdam on October 29th, 2013

Lundvall, B.A. (1992). National systems of innovation: towards a theory of innovation and interactive learning, Frances Printer, London.

Mangi, Stephan C., Roberts, Callum M. and Rodwell, L. D. (2007) Reef fisheries management in Kenya: Preliminary approach using the driver–pressure–state–impacts–response (DPSIR) scheme of indicators. Ocean and Coastal Management 50(5-6):463-480.

Marvin, H. J. P., Kleter, G. A., Frewer, L. J., Cope, S., Wentholt, M. T. A., & Rowe, G. (2009) A working procedure for identifying emerging food safety issues at an early stage: Implications for European and international risk management practices. Food Control, 20, 345–356.

Marvin H.J.P., Kleter, G.A., Van der Fels-Klerx, H.J., Noordam, M.Y., Franz, E., Willems, D.J.M., and Boxall A. (2013) Proactive systems for early warning of potential impacts of natural disasters on food safety: Climate-change-induced extreme events as case in point. Food Control (in press).

McIntyre, B.D., Herren, H.R., Wakhungu, J. and Watson, R. T. (2009) North America and Europe Report. Agriculture at a Crossroads. International Assessment of Agricultural Knowledge, Science and Technology for Development. Washington: Island Press.

Morgan, K., Marsden, T. and Murdoch, J. (2006). Worlds of Food: Place, Power and Provenance in the Food Chain. Oxford: Oxford University Press.

Morgan, K. (2013) The Rise of Urban Food Planning, International Planning Studies, 18:1, 1-4

Moulaert F. (2010) Social innovation and community development. Concepts, theories and challenges. In Frank Moulaert, Flavia Martinelli, Erik Swyngedouw, Sara González (Eds.): Can neighbourhoods save the city? Community development and social innovation. London ;, New York: Routledge, pp. 4–16.

Mulgan G., Tucker S., Ali R., Sanders B. (2007) Social Innovation. What it is, why it matters and how it can be accelerated. Oxford Said Business School - Skoll Centre for Social Entrepreneurship.

Palmer, B. (2013). Please don't be hard on roaches. The guardian weekly, 24.05.2013, 34-35

Pannell, D.J. (1999) Social and economic challenges in the development of complex farming systems. Agroforestry Systems 45:393-409.

Paterson RRM, Lima N. (2010) How will climate change affect mycotoxins in food? Food Res. Int. 43:1902-1914.

Pearson, Craig J (2007) Regenerative, semiclosed systems: A priority for twenty-first-century agriculture. BioScience 57(5):409-418.

Phills J. A., Deiglmeier K.; Miller D. T. (2008) Rediscovering Social Innovation. In *Stanford Social Innovation Review* 6 (4), pp. 34–43.

Porter M. E. (1990). *The Competitive Advantage of Nations*. New York, Free Press, 780.

Pot F. and Vaas, F. (2008) Social innovation, the new challenge for Europe. In *International Journal of Productivity & Performance Management* 57 (6), pp. 468–473.

Pothukuchi, K., and J. Kaufman, J. (2000) The Food System: A Stranger to the Planning Field. Journal of the American Planning Association 66 (2): 113–123.

Rüede D., Lurtz K. (2012) Mapping the various meanings of social innovation: Towards a differentiated understanding of an emerging concept, EBS Business School, Research Paper Series 12-03 (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2091039)

Simms J. R. (2006) Technical and social innovation determinants of behaviour. In *Systems Research & Behavioral Science* 23 (3), pp. 383–393.

Svarstad, H., Petersen, L. K., Rothman, D., Siepel, H. and Wätzold, F. (2008) Discursive bias of the environmental research framework DPSIR. Land Use Policy 25:116-125.

Taylor, J.R.N., Schober, T.J. and Bean, S.R. (2006). Novel food and non-food uses for sorghum and millets. Journal of Cereal Science 44, 252-271

Van Asselt, E.D., Meuwissen, M.P.M., van Asseldonk, M.A.P.M., Teeuw, J., van der Fels-Klerx, H.J., 2010. Selection of critical factors for identifying emerging food safety risks in dynamic food production chains. Food Control. 21(6), 919-926.

Van der Fels-Klerx H.J., Olesen, J.E., Madsen, M., Naustvoll, L., and Dahl, E. (2012) Climate change impacts on natural toxins in food production systems, exemplified by deoxnivalenol in wheat and diarrhetic shellfish toxins. Food Additives & Contaminants A 29(10):1647-1659.

Van der Spiegel,M., Noordam, M.Y., Van der Fels-Klerx, H.J. (submitted). Safety of new protein sources and legislative aspects for application in food and feed production

Zapf W. (1987) On social innovations. Frankfurt am Main: Sonderforschungsbereich 3, Mikroanalytische Grundlagen der Gesellschaftspolitik, J.-W.-Goethe-Universität Frankfurt und Universität Mannheim; No. 254.

Zapf W. (1991) The role of innovations in modernization theory. In *International Review of Sociology* 1 (3), pp. 83–94.

ANNEX 1: Agenda of the Innovation Workshop at Alterra (March 14th, 2013)

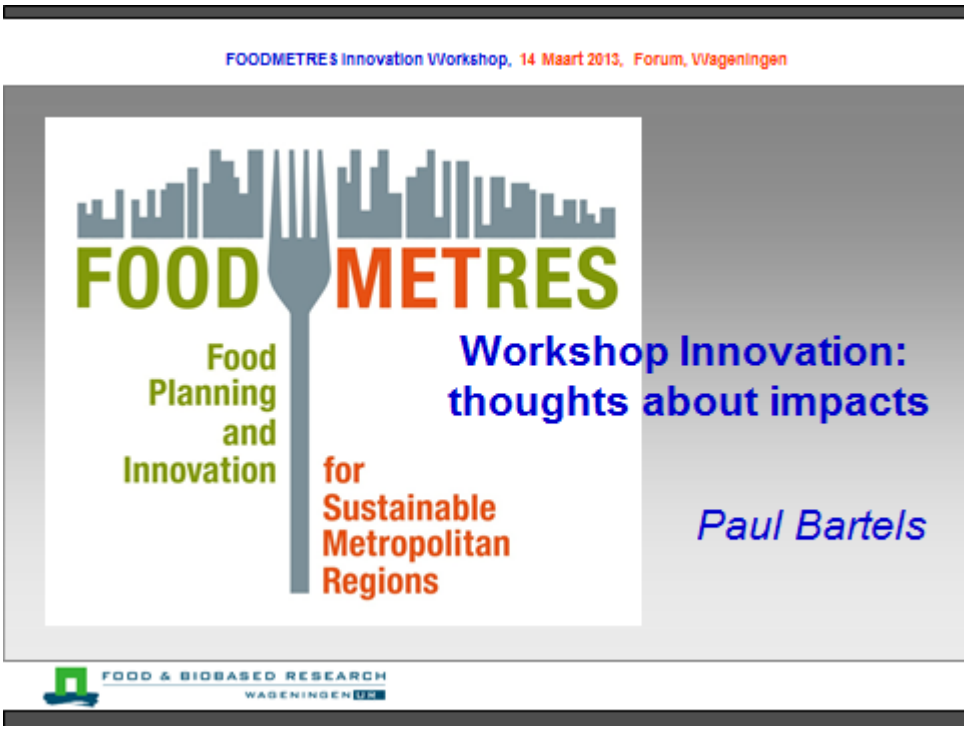
Innovation Workshop
March 14th, 2013

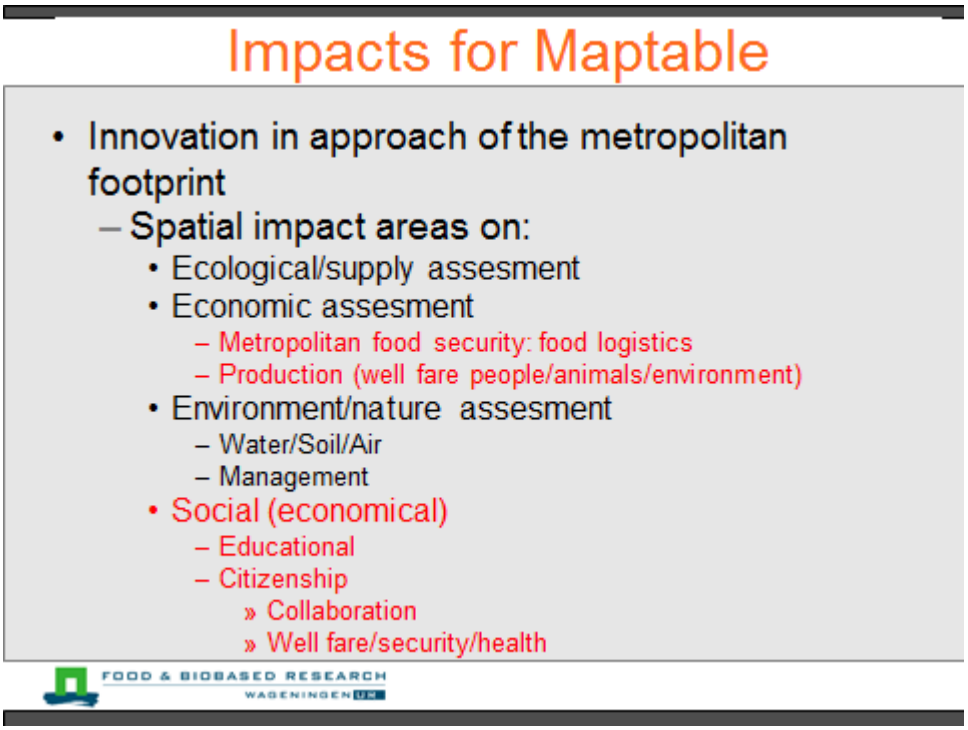
Agenda

10:15	**Arrival & Coffee**
10:30	Introduction to FOODMETRES Innovation Issues (D. Wascher)
10:45	Approaches to Innovation – The TransForum Experience (Rik Eweg)
11:15	The institutional dimension of Innovation (Wim de Haas)
11:30	Discussion
12:30	**Lunch**
13:15	Introduction to Innovation Trajectories (Paul Bartels)
13:45	Discussion on Innovation Trajectories
14:30	**End**

Participants:	Joost Snels, Wim de Haas, Rik Eweg, Dirk Wascher, Arjan de Jong, Stefano Corsi, Paul Bartels, Jim Groot and others
Location	Forum Room C204, Wageningen Campus
Time	10:30 – 16:00

ANNEX 2: Workshop Innovation: Thoughts about impacts (Paul Bartels, FBR)





Food

- Food in the city:
  - Security of the supply in the city (life)
    - Enough food in the city
    - Quality of the food (fresh like and safe)
    - Informal market (Nairobi/East Europa): price
    - Food production in the city (LED's, food park...)
  - Food as an experience: social well behaviour
    - knowledge about food (tracking the source)
    - how to use food (educational)
    - Social quality of the food (the story)
    - Contact with the food: own production
    - Citizenship: Nature, including food, as a social group activity (city management)

FOOD & BIOBASED RESEARCH WAGENINGEN UR

How to supply the city with food?

- How to come into the city:
  - Use of bike, truck/vans/electrical cars, train/metro/tram, (electrical) boat
  - Transport for all products together, or transport per company? (electrical etc., moment during the day)
  - Distribution centres outside the city with contact to other transport regional/national/international
- Using weighing factors for the indicators
- Scenario's for the cases:
  - Informal market
  - Entering the big city
  - products

FOOD & BIOBASED RESEARCH WAGENINGEN UR

Food production

Innovation trajectories:

- International: staple food, but also fruit and vegetables
- Meat market (mega&central / medium&integrated)
- Regional, around the city: fresh production, informal
- In the city: fun/educational/social production, informal production, very fresh production on demand
  - Glass houses/LED's in the city
  - Gardens
- Comparing the different distances to obtain impact scores in separate formula/calculation with indicators

FOOD & BIOBASED RESEARCH WAGENINGEN UR

Products to use

- Global-local: production potatoes – fresh vegetables/herbs
- Large scale – small scale: grain - fresh lettuces
- Efficient – sustainable: mega production – organic recycling production
- Processed – non processed commodities
- Commodities all partners use: examples can be tomatoes, grain, chicken meat, flowers

FOOD & BIOBASED RESEARCH WAGENINGEN UR

Example Mega stables

- At places with high density of people (cities)
  - Manure
  - Feed for animals
  - Diseases
  - Air pollution (smell)
  - Other proteins (fish/plants)

  Multifunctionality with input to different impacts
  - Food print
  - Water
  - Logistics
  - Rest flows
  - Protein supply

FOOD & BIOBASED RESEARCH WAGENINGEN UR

Methods

- Methods:
- Base by impact assessment based on land use (SUSMETRO, maptable, Zalf)
- Logistic effects on impacts by operational research methods using critical paths network optimizing (used by FBR)
- chain optimizing protocols (HACCP/Food Safety)

FOOD & BIOBASED RESEARCH WAGENINGEN UR

ANNEX 3: Complex Innovations: lessons learned (Rick Eweg, WUR/TransForum)

Complex Innovations: lessons learned

Rik Eweg
Project director Regional Development 2006-2011, TransForum

)

TransForum: Innovation programme 2004-2011

- The Dutch Agriculture is a global front runner on Metropolitan Agriculture;
- Organize break-troughs which connect People, Planet and Prosperity, not doing things better, but doing better things;
- Develop new business and network that really add values: Shared Value Development;

www.transforum.nl

2

TransForum: Innovation programme 2004-2011

Through supporting:
- 30 innovative projects (IP's)
- 30 scientific projects (SP's)
- Learning from and between projects (LP's)

3

Innovation according to Michael Porter (1990):

"Innovation is a new way of doing things (inventions) that is commercialized"

4

The role of scientists

Reputational system
-Publications in A-journals
- Number of PhD's
- key-note speeches etc.

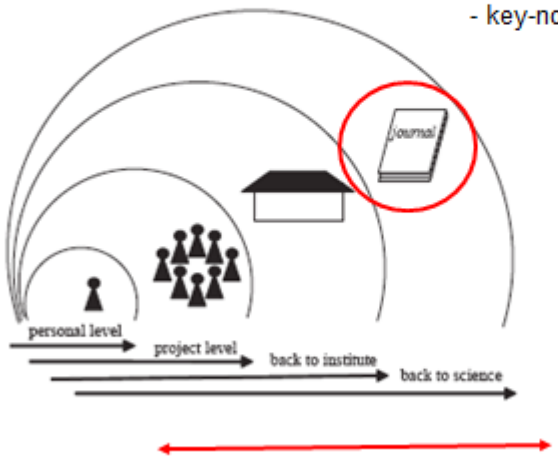


Fig. 5: Four levels of reflection in integrative research projects
(Tress et al. 2003)

vrije Universiteit amsterdam

TransForum : sustainable development of Agricultural sector in metropolitan area's

How? Hardware, orgware and software innovations

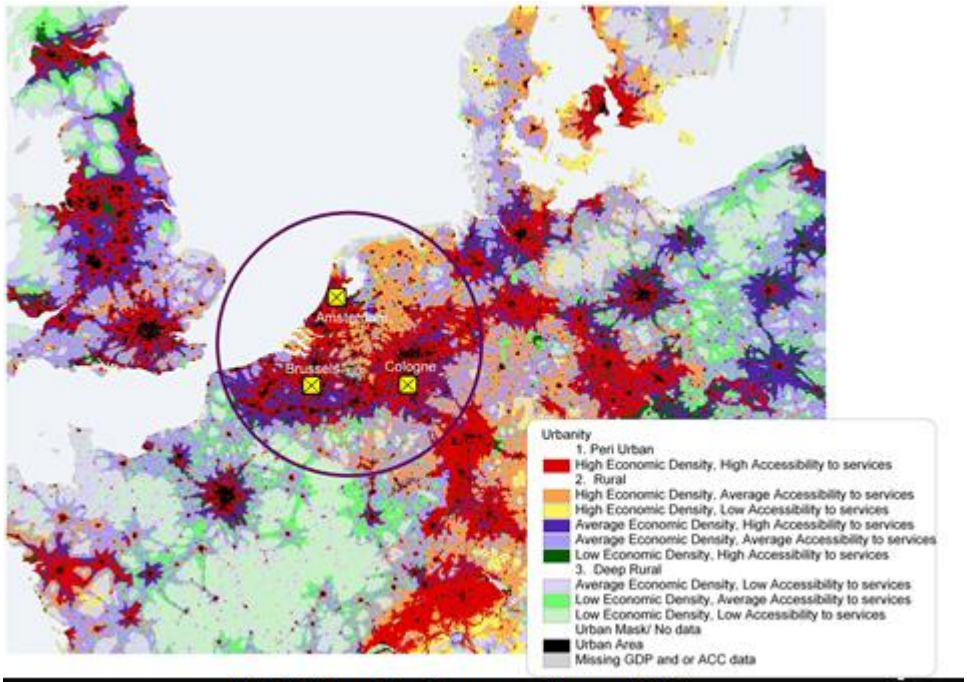
- New collaborations between partners
- Share experiences with others: Monitoring and Reflection

6

Focus on Metropolitan Areas:

"There are no rural areas in the Netherlands, only green spaces in a metropolitan region"

7

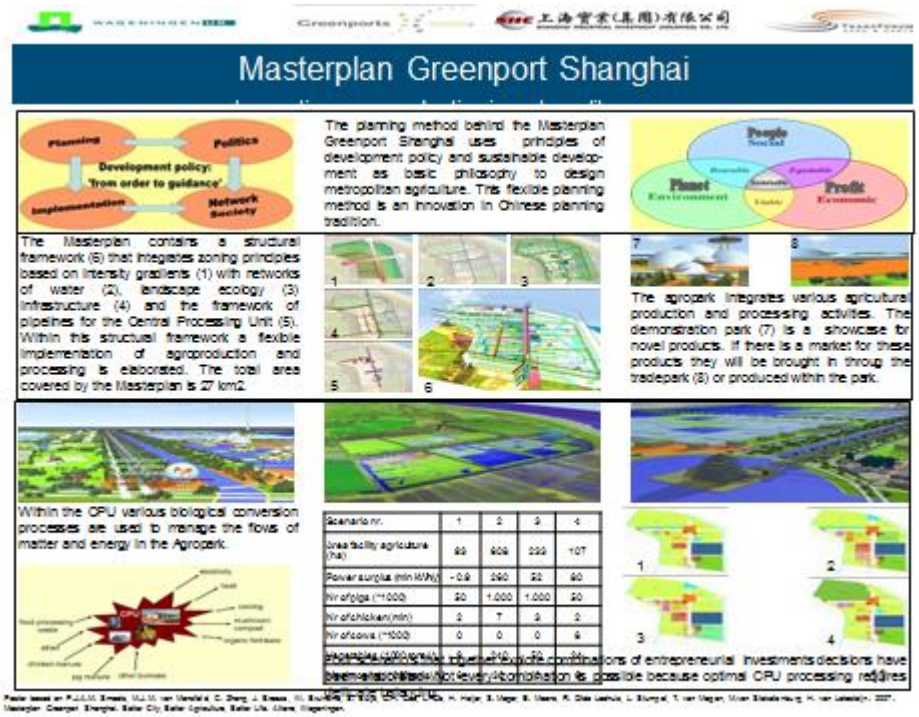


FARO Rural topology, van Eupen 2009

Sustainability: Wicked Problems

- No definitive formulation of the problem.
- Stakeholders have different frames of reference concerning the problem.
- Constraints and resources for solution change over time.
- Impact in space and time are unpredictable.
- Solutions are not true or false but better or worse.
- Wicked problems are never solved.

9


Masterplan Greenport Shanghai
Planning
Politics
Development policy:
'from order to guidance'
Implementation
Network Society
The planning method behind the Masterplan Greenport Shanghai uses principles of development policy and sustainable development as basic philosophy to design metropolitan agriculture. This flexible planning method is an innovation in Chinese planning tradition.
People
Planet
Profit
The Masterplan contains a structural framework (6) that integrates zoning principles based on intensity gradients (1) with networks of water (2), landscape ecology (3) infrastructure (4) and the framework of pipelines for the Central Processing Unit (5). Within this structural framework a flexible implementation of agroproduction and processing is elaborated. The total area covered by the Masterplan is 27 km2.
The agropark integrates various agricultural production and processing activities. The demonstration park (7) is a showcase for novel products. If there is a market for these products they will be brought in throug the tradepark (8) or produced within the park.
Within the CPU various biological conversion processes are used to manage the flows of matter and energy in the Agropark.
Scenario nr.
Urea facility agriculture (ha)
Power surplus (mln kWh)
Nr of pigs (*1000)
Nr of chicken (mln)
Nr of cows (*1000)
1
2
3
4


TransForum
Ondernemers
Overheid
Omgeving
Greenport
Onderwijs
Onderzoek
Project
Proces

Findings: New roles for partners

- Government: take risks, learn.
- Entrepreneurs: think in value chains, change from product oriented to market oriented approach.
- Societal organisations: put yourself in other parties.
- Knowledge institutions: engage in regional processes, develop new assessment mechanisms.

13

Three strategies for entrepreneurs

- Sustainable intensification: license to operate for new sustainable production methods
- Sustainable valorisation: cooperation with new chain partners to open up existing markets
- Sustainable diversification: cooperation for new products and markets

14

Aproach: Shared Value Development

- Develop innovative business cases for urban markets by new *connections* between sectors, streams.
- Facilitate sustainable development by *connecting* knowledge, government, societal groups and companies (connecting values).
- Create enthousiam and engagement by an attractive visionary perspective.
- Societal embedding by engaging in an active dialogue with the environment
- Create feasible 3P business plans.
- Bring parties together in a safe, creative, non-strategic envrionement: create **'Third spaces'.**

15

3P Business model innovation

- Phase 1 Plan *(partners and roles differ in phases)*
  - STEP 1: Reconnaissance: potential value propositions
  - STEP 2: Value-creation model: business case
  - STEP 3: Business planning: business plan
- Investment phase
- Implementation phase

16

Investment phase

- Process (entrepreneur): agreements with investors based on business plans; communicate; licenses; plan realization.
- Result (projectleader): 3P business & independent check on 3P performance.
- Interventions (project facilitation): support entrepreneur in network management and learning.

17

Realization phase

- Process: (3P) produce revenues
- Result: (3P) Return on investment
- Project facilitation: platform for exchanging best practices

18

Obstacles for 'ideal approach'

(1) Financing structures and regulations and involvement knowledge institutes;
Solution: Challenge often is 'assembling knowledge' with the right people, Research if necessary, but considers also involving consultants, advisors or experts.

(2) Inflexibility of project plans, which leave no space for changing insights, necessary changes in consortia and roles;
Sol.: flexible project plans with clear goals and emphasis on process approach

(3) Competences and knowledge of (SME) entrepreneurs (do not take the lead in projects) and researchers) (considers projects as research case);
Sol.: INIDIVIUAL S. Look for entrepreneurs who want to initiate complex processes & select researchers who are willing and allowed to do social relevant research

4) Conflicting interests and cultures (researcher: project= research project entrepreneur: project=business).
Sol.: SYSTEM. Result oriented spaces for experiments are needed

(5) Monitoring and reflection culture (in stead of evaluation) is methodologically not matured yet;
Sol. Training and developing of methods (monitoring and reflection is not benchmarking and evaluation)

(6) Amount of time available in projects;
Sol.: Limit the number of projects. Quality is more important than quantity

19

ANNEX 4: Innovation as challenge for national policies (Wim de Haas, Alterra)

Innovation

Innovation as challenge for national policies

March 14, 2013, Wim de Haas

ALTERRA WAGENINGEN UR

Wim de Haas

- Alterra team Governance
  - Analysis top sector policy
- KNAW
  - Secretary 'COP' Captains of Science
  - Innovation Platform: Knowledge Investment Agenda (KIA)
- LNV
  - Answer to parliamentary question on coherence in agro - innovation policy (motion vd Vlist)

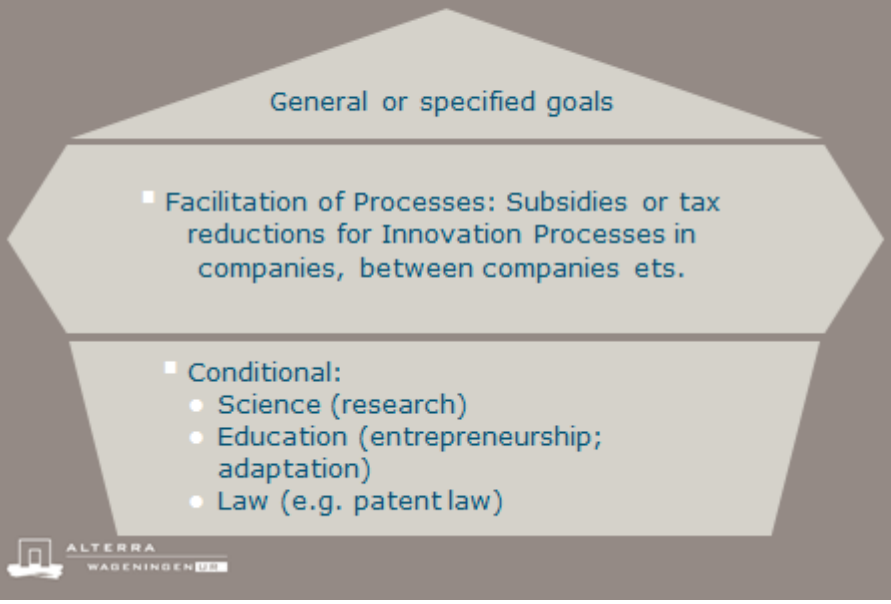
ALTERRA WAGENINGEN UR

Contents

- NOT:
  - Innovation process in / between industries / regions / sectors
  - Innovation theory: Schumpeter, Rogers, etc.
- How to stimulate innovation in society?
  - Viewpoint national government
- Topics
  - Dutch national innovation policy
  - Instruments of innovation policy
  - Discourses behind the national policy on innovation

ALTERRA WAGENINGEN UR

Innovation policy: three levels



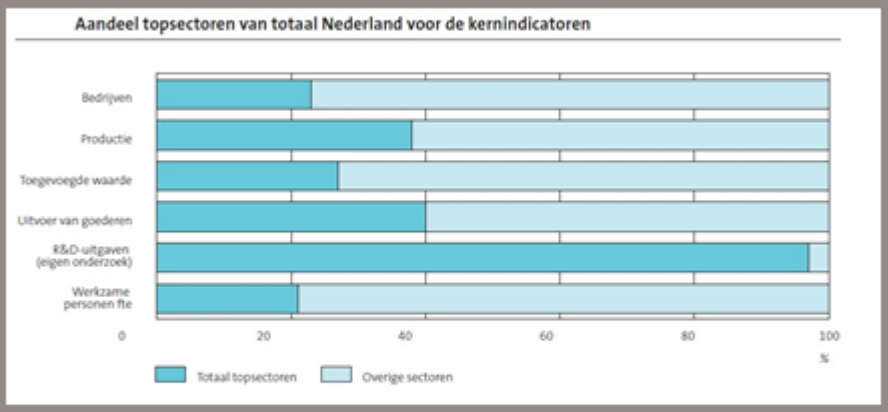
ALTERRA WAGENINGEN UR

Goals: history of Dutch innovation policy

- 40 – 60: general conditions: regional policy, low wages; technology pushed innovation; large investment projects
- 60 – 80: restructuring industry; supporting large companies in difficulties
- 80 – 00: first picking winners; later generic innovation and technology policy; three new basic technologies micro-electronics, biotechnology and new materials.
- 10 - ?: backing winners; 'the Olympic athletes of economy'

Backing winners: nine top sectors

- Criteria Top sectors
  - Knowledge intensive
  - Export oriented
  - Contribution to societal problems
- But: three real top sectors
  - Agro, chemical sector, high tech
- Two additional sectors
  - Logistics, creative industry



ALTERRA WAGENINGEN UR

Character of innovation policy in several countries

	Specific	Generic
Backing Winners	Nederland Zwitserland	Zweden Finland Denemarken Japan
Backing Challengers	Israël VS	China Duitsland

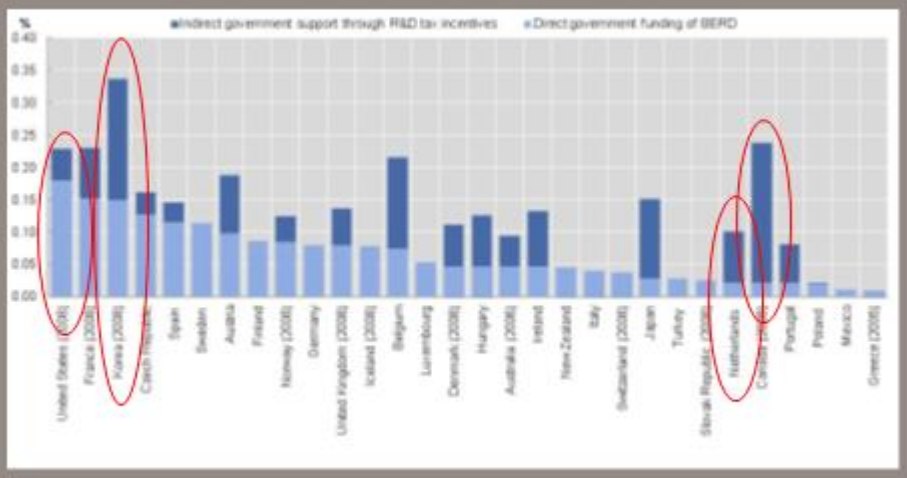
ALTERRA WAGENINGEN UR

Instruments for stimulation of innovation process in / between companies

- Subsidies for research and development, pilot projects, introductions, etc.
- Tax reduction for R&D
- Loans & guaranties (large leverage effect)
- Facilitating organizations: Topconsortia for knowledge and innovation (TKI)
- Innovative procurement by the government

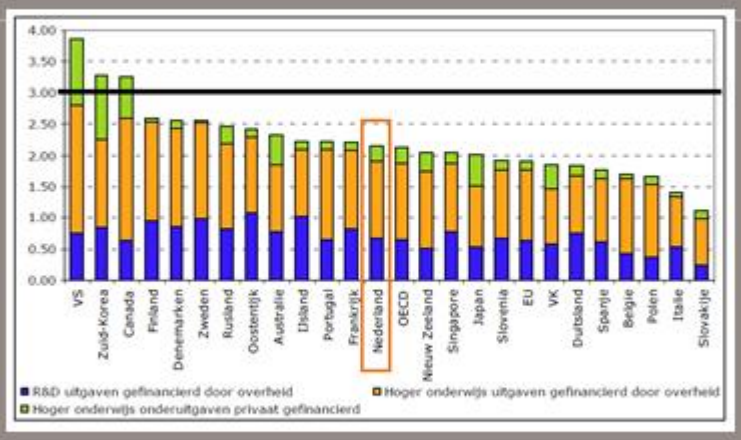
ALTERRA WAGENINGEN UR

Direct of indirect?



ALTERRA WAGENINGEN UR

Conditional: government investments in research and education



ALTERRA WAGENINGEN UR

Top sector policy as coalition of three discourses

- Combination of
  - Backing Winners: choice for top sector
  - More room for entrepreneurs: generic support, level playing field
  - Golden triangle, triple helix: cooperation between government, companies, knowledge organisations

ALTERRA WAGENINGEN UR

Missed opportunities?

- Open innovation using small cognitive distance
  - not: demand oriented programming on specified areas
  - but: human mobility between theory and practice
  - Supported by spatial policy: living lab SE NL
- Pentagonal diamond: companies, knowledge organisations, government, civilians, societal organisations
- Social innovation