D5.1 (Update)

Metropolitan Footprint Analysis and Sustainability Impacts Assessment of SFC Scenarios

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Content

1 Editorial

This second version of the Deliverable Report 5.1 document includes an update of the *FOODMETRES* task 5.1 *'Assessment of Metropolitan FoodPrint and Sustainability Impacts of SFC Scenarios'* and presents final results of the Sustainability Impact Assessment carried out in *FOODMETRES* case study regions in Berlin, London, Ljubljana and Nairobi as well as European academic experts in an online survey. The report is organized in this way that we quote here again all parts of the first version (submitted in April 2014) and mark revised and new chapters with 'update'. This allows a comprehensive overview for the reader and presents all relevant information in its context.

The Metropolitan FootPrint (MFT) is planned as part of task 3.3 Indicators, Tools and Method for the Metropolitan Footprint Tool: Development of a Metropolitan Footprint Tool (MFT) and the respective deliverable report Deliverable Report 3.3 (due month 24) in order to optimize the workflow between task 5.1 and 3.3 and to avoid redundancies between the related reports.

Overview of the completed and remaining working steps

Empirical working step	**Scheduled finalization**
Online Expert Survey	Completed July 2014 Results submitted in Deliverable 5.1 version 2
Regional Stakeholder Workshop	Completed May-June 2014 Results submitted in Deliverable Report 5.1 version 2
Metropolitan Footprint Analysis (modelling part)	Pending, Month 24, September 2014 Results to be submitted in Deliverable Report 3.3
Metropolitan Footprint Analysis (Regional Stakeholder Workshop)	Pending, Month 24, September 2014 Results to be submitted in Deliverable Report 3.3

2 Sustainability Impact Assessment (SIA)

2.1 Objectives and Research Questions

Alternative or short food supply chains (SFSC) are commonly considered as being sustainable or sustainability occurs to be a part of the SFSC definition. However, there are a multitude of different concepts of short food supply, which spans from small-scale approaches, such as urban agriculture, self-harvesting concepts or box schemes, which often aim at social and environmental embeddedness to large-scale, logistics-oriented agro-industry solutions, which are characterized by transport and logistics efficiency. At this point sustainability impacts of the application of the different concepts of food supply chain, respectively their contribution to a sustainable development of urban regions occurs certainly in a completely uneven way, often contributing only to individual sustainability dimension, either in synergy with other or as trade-off on the expense of others.

Therefore, in terms of sustainability impact of different types of food chains, we apply the normative approach to focus on their contribution to sustainable development and policy goals. We apply a benchmarking method to assess the different food supply chains regarding the maximum benefits. The set of indicators covers three dimensions of sustainability and contains five indicators/aspects per dimension as shown below. In the following, the various impact areas are introduced. It is explained how they are affected at the different stages along the food chain.

The general objective of the *FOODMETRES* WP5 is, according to the DOW, “to explore the potentials of implementation of alternative Short Food Chains (SFC) in metropolitan regions and to assess the corresponding impacts on sustainability, quality of life and resilience.” Sustainability impacts, respectively the achievement of sustainability objectives should be (i) measurable, (ii) relevant to the attributes of interest, (iii) address the most important trends and impacts related to these attributes, (iv) sensitive/responsive to changes over time in physical conditions, (v) hierarchical (providing a clear overview, but amenable to expansion into detail or at finer scales) and (vi) promote learning and effective feedback to decision making.

As the impact model should be based on qualitative expert and stakeholder assessments, individual indicators rather function as representatives and semantic explanations. Further, it is important to note, that the different impact areas address different scales within the regional food system:

- Impacts related to individual food chains
- Impacts related to the regional food system

The objective of the participatory assessment of sustainability impact is to evaluate the sustainability impacts of innovative/alternative SFC, which have been identified in the regional case study regions. Sub-tasks for this are:

- Making different food chain alternatives comparable through benchmarking of highly distinct chain models
- Developing impact assessment applicable for practitioners and policy makers (discussion tool)
- Generating awareness about target system and trade-offs
- Identification of regionally applicable food policy options

Accordingly, research questions have been formulated:

- How is the sustainability performance of different chain types?
- Which SFC performs best regarding sustainability? (Benchmarking)?
- Do differences between the case study regions exist for the same food chain types?
- Is the given approach (SIA, MFA) feasible for answering research questions and work with regional stakeholders?

3 Methodology and Research Implementation Procedure for Sustainability Impact Assessment (SIA)

To enable the development of a functioning SIA in the end, which is relevant and useful for end-users in the case studies and elsewhere, it is necessary to have an early understanding of needed operational steps (incl. empirical work) and what data is required. For D5.1 the following operational steps were organised:

- Step 1: Specification of impact area/indicator set, previously developed in other *FOODMETRES* Work Packages (WP2, WP3, WP4, WP7) and application of a qualitative impact assessment of short food chains
- Step 2: Development of generic typology of different existing / in case study observed food chains

The process of impact assessment itself consists of two different steps (see Figure 1):

- Step 3: an expert panel assessment (online survey)

- Step 4: a regional stakeholder assessment (regional workshop)

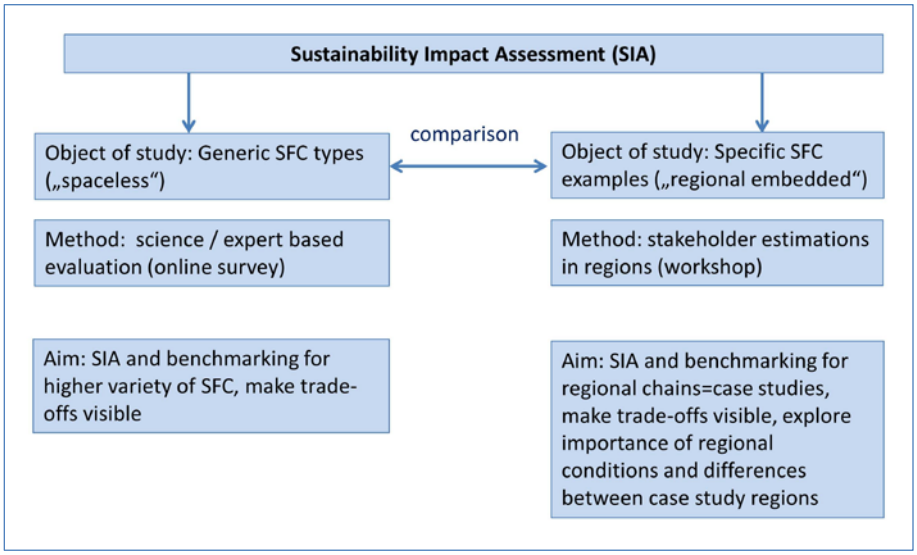

Figure 1. Overview about the strands of the SIA (step 3 and 4).

The integration of both, local stakeholders and practitioners as well as academic experts in the field shall ensure the mutual validation of the evaluation results and feasibility of the indicator set. The following research questions should be answered in the research process:

- Which chain types fit best for improving sustainability of the existing regional food system?
- What are their potentials? Which are hindering and fostering factors for their diffusion/ up scaling?
- What would be the implications (e.g. land use)? How do governance and rural development policies affect the SFC and its impacts?

3.1 SIA Step 1: Specification of Sustainability Impact Areas

3.1.1 Definition of impact areas

Despite the varying priority setting in the different assessment approaches, there is a broad consensus about the relevant sustainability issues and the respective selection of sustainability indicators. Regarding the environmental dimension, (efficient) resource use, environment and landscape as well as shortness of the food chain and therewith reduction of greenhouse gases are frequently considered. The economic dimension encompasses added value, growth and competitiveness, logistics efficiency and rural development. For the social and cultural dimension, employment, food security and safety as well as the local community embeddedness play a primary role among the different assessment approaches.

Together with the previous work in the different deliverables of the *FOODMETRES* project dealing with food chain organization and logistics (D3.1), food quality and safety (D3.2) as well as case study and data coordination (D4.1), a larger set of impact issues have been compiled for this task. Here, especially sustainable development policy goals are addressed and to a lesser extent the impact of the application of a certain food chain type. The objective is to compare different generic chain types regarding their contribution to these goals in a normative sense.

The set of sustainability impact areas is oriented towards the model of sustainability triangle and aims at the integration of the three dimensions: (i) environment, (ii) economy, and (ii) society. Based on preliminary work within the *FOODMETRES* project, screening of literature and the pre-test of the expert survey, the following set of Sustainability Impact Areas was developed (procedure see Figure 2). The following chapters provide descriptions of all 15 impact areas and a preliminary overview about effects and relations discussed in the literature. These points will be deepened and discussed in the final presentation of the results after the expert based survey.

Table 1 provides an overview of these impact areas.

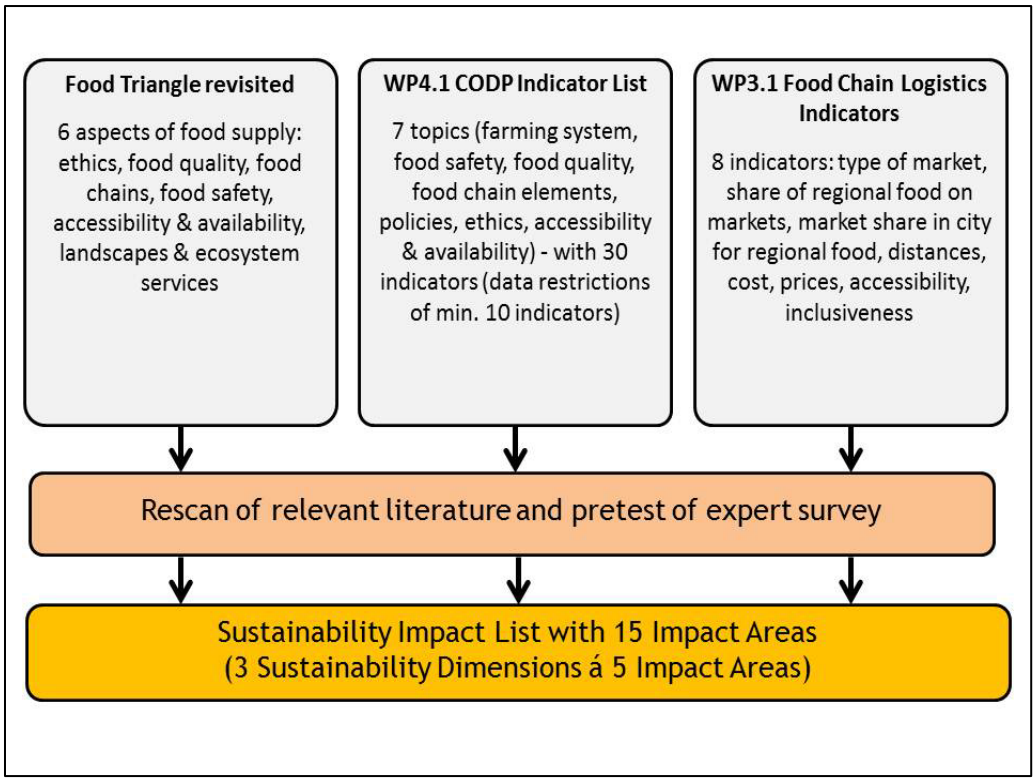

Figure 2. Procedure for developing a set of impact areas for sustainability impact assessment.

Table 1. Overview of sustainability impact areas.

1 Environment
1.1 Eco-efficiency in abiotic resource use (land/soil, water, nutrients) *Each food chain is related to certain farming or gardening system, which may use abiotic resources more efficiently and provide a good input-output-relation under given regional conditions).*
1.2 Provision of ecological habitats and (agro-)biodiversity *Each food chain type is related with farming practices, which may enhance the provision of ecological habitats (e. g. hedges, trees, cultivate of a wider range of crops and life stock incl. breeding of traditional or rare species and increase (agro-)biodiversity.*
1.3 Animal protection and welfare *Each food chain type is related to a farming system, which may result in different conditions for life stock, animal diseases and ethical considerations.*
1.4 Reduction of transportation distance *Each food chain type may be related with a shorter transportation distance from place of production to place of consumption ("reducing food miles").*
1.5 Reduction of packaging *Each food chain type may be related to the reduction of the amount of packaging along the whole chain from place of production to place of consumption.*
2 Economy
2.1 Employment along the food chain *Each food chain type may create new paid jobs (full- and part time) within the metropolitan region.*
2.2 Income and profitability *Each food chain type may generate income and surplus for the actors along the value chain, which can be reinvested and support the long-term economic viability of the food producers.*
2.3 Rural viability and competitiveness *Each food chain type may be related with regional multiplier effects through e.g. regional value added, income and employment generated, tax revenues etc.*
2.4 Transportation efficiency *Each food chain type may be related with an efficient mode of transport, which includes e.g. adequate vehicles, capacity utilization, reducing number of travels and unloaded drives etc.*
2.5 Reduction of food loss and waste along the food chain from producer to households *Each food chain type may support the reduction of food waste and harvest losses at production stage, but also along all other stages of the food chain, including consumption at home or out of home (e. g. restaurants).*
3 Society/culture
3.1 Food safety and human health *Each food chain type may result in the absence of pathogens and pollution in the food.*

Food complies with legal limits regarding microbiological, chemical or physical hazards.

3.2 Food quality (freshness, taste and nutritional value)

Each food chain type may result in the provision of food which is fresh, tasteful and has a good nutritional value.

3.3 Viability of food traditions and culture

Each food chain type may result in the increased preservation of cultural distinctiveness and local food including seasonal variation and local food traditions. This implies the knowledge about its preparation and cultural role (including religious, ethnic or spiritual purposes).

3.4 Transparency and traceability

Each food chain type may result in the increase of transparency and traceability. Transparency refers to information for the consumer about the way the food they is grown and distributed by direct trust-based consumer-producer relation, use of labelling schemes (e.g. regional & fair, PDO, PGI, organic). Traceability refers to availability of information at each stage of the supply chain (e. g. tracking of produce with smart codes).

3.5 Food security (availability and accessibility)

Each food chain type may result in the increase of food security, meaning that all people, at all times, have physical, social and economic access to sufficient food.

3.2 Environmental Dimension

Above all, in sustainability impact assessment of food supply chains, the environmental dimension first of all refers to the management of the natural resources (at agricultural production level) to ensure their future availability. As far as food production is addressed, the environmental dimension considers the encouragement of sustainable farming systems, the efficiency of soil, water, energy and nutrient resource use, the conservation of biodiversity and landscape, reduction of emission and pollution as well as animal welfare.

3.2.1 Eco-efficiency in abiotic resource use (land/soil, water, nutrients)

First of all in the land-based production part of food supply chains, abiotic resources, such as fresh water, soil, nutrients are used and depleted. These are depending on the type and intensity of the land use system. To compare different types of food production and supply systems, the concept of resource or eco-efficiency of agriculture has been developed, which contrasts the inputs and outputs of the agricultural system (De Wit 1992). Mainly through the application of synthetic and organic fertilizers as well as pesticides, nutrient metabolism products, such as nitrogen oxides/nitrate/ammonia (NO_x/NO_3/NH_3), sulfur oxides (SO_x), methane (CH_4) are discharged and contribute to soil pollution, acidification, salinization and eutrophication (Williams et al. 2006, Wilkins 2008).

These environmental impacts are generally assessed in the context of food production. (Kummu et al. 2012) for instance used fertilizer, freshwater consumption and cropland required for food production to assess impact of food loss and waste. Along the other environmental impacts, such as pollution and impacts on soil, (Williams et al. 2006) also use indicators, such as abiotic resource use, fertile land use and consumption of irrigation water within a calculation of a life cycle analysis. However, also dealing with the food supply chain in a more narrow sense, emission of PM10 micro-particles and other have been reported (Marletto & Sillig 2014).

Especially farming systems, such as extensified or organic production have been proven highly relevant to reduce environmental impacts and toxicity (Stolze et al. 2000). Organic production is considered minimizing the abiotic resources use, improving soil quality and contributing to greater soil carbon sequestration (Styles et al. 2012). Gilg & Battershill (2000) argue that through the direct marketing link between producers and consumers, environmentally friendly farming is encouraged, because consumers have the opportunity to choose the producer purposefully, which carry out environmentally friendly form of farming. However, at the same time, those more extensive schemes also require more cultivation land to produce equal food output, which needs to be taken into consideration when calculating the actual resource or eco-efficiency (Wilkins, 2008). Highly intensive, but efficiency-oriented food production and supply systems, such as agro-parks are considered as a solution to contribute to sustainable food supply (de Wilt & Dobbelaar 2005), whereas organic and more extensive productions schemes are suitable on marginal locations.

3.2.2 Provision of ecological habitats and (agro-)biodiversity

Agriculture for food production represents major land uses in the rural areas. Therefore as a land-based system, the farming is closely interlinked with the environment, nature and landscape. Farmland provides valuable habitats for animal and plant species. The conditions, however, depend on type and intensity of agricultural production. Followed by intensification of production, scale enlargement and land consolidation, changing land scape composition, homogenization and simplification of land use as well as vanishing of landscape elements lead to the erosion of the ecological habitat and niches and subsequently a decrease in biodiversity (Jongman 2002, Tscharntke et al. 2005). In terms of food supply, the notion of “ecological embeddedness” was coined to depict the relationship of a food chain with the type of production system and the place and landscape of production (Penker 2006, Morris & Kirwan 2011). Here it becomes relevant, whether production takes place in ecological conservation areas (Penker 2006) or whether organic production schemes are applied (Gibson et al. 2007, Kragten & de Snoo 2008).

3.2.3 Animal protection and welfare

The concept of animal welfare is rather multifaceted; including scientific, economic and ethical dimensions and its assessment requires knowledge form disciplines, like biological and veterinary science, ethology and psychology (Carenzi & Verga 2009), but considered as environmental impact (CEC 2009).It addresses the compliance with animal needs, such as environmental (housing, management of handling and breeding, hygiene and transport) and physiological (animal behaviour) to obtain physical and mental health of the individual animal (Odendaal 1998). Animal welfare is affected by many stressors, which occur along the food chain, from livestock husbandry and transport to slaughtering and processing (stress, pain, and suffering, Miranda-de la Lama et al. 2012).

3.2.4 Reduction of Transportation distance ("food miles")

Global food supply and distribution has led to physically lengthy food chains, which consist of many instances and intermediates between consumer and producer. Therefore, the shortness of food chains and limitations of the number of intermediates involved (SUSTAIN 2002, Parker 2005, Fondse et al. 2012, Brandenburg et al. 2014) as well as the organizational proximity, which refers to closeness of actors in the food supply chain defined either by membership of a group or by identity (Aubry & Kebir 2013), represent the main criteria for alternative and short food supply chains.

As we assume SFC to have already a reduced number of intermediates, we focus here on the geographic proximity. The performances of shortened geographic proximity of different food chains are usually measured by food miles (in metric tons per km), energy consumption (in Joule) and fuel use (litres, gallons) as well as CO_2 emissions (in metric tons) (Penker 2006, King et al. 2010).

3.2.5 Reduction of Packaging

Packaging represents an important share of the resource use (material and energy) along the food supply chain and increases its footprint (Pretty et al. 2005). So the reduction of packaging represents a main environmental impact area, considering the amount and type of packaging. On the one hand, high potentials to reduce packaging through application of reusable packages have been found, especially the regional marketing of food and supply chain types with direct consumer-producer contact (BayStMUGV 2005). It is stated in a report to the European Commission (Golding 2000) that in local food networks there is still some backlog in optimization of packaging as more uniformity of the packaging shape is necessary for reuse. On the other hand, organic, high-quality and regional food (especially which is marketed through regular grocery stores) tends to be distinguished from conventional food product by the packaging and labelling, which again requires a certain degree of packaging (Kullmann & Leucht 2011).

3.3 Economic Indicators

The economic dimension of sustainability assessment of food supply encompass aspects of rural viability, including competitiveness of agriculture and the food industry, income and profitability, productivity and employment, the efficiency of transportation and transaction as well as the reduction of food loss and waste along the food chain. Short food chains are considered to be beneficial in this sense, as more value added is realized in the region itself.

3.3.1 Employment in the different food chain steps

Several authors point out that with regional marketing of food and localizing of food supply additional income and employment for rural regions is generated, including encouragement of skills transfer and training (Roep & Wiskerke 2006, Chiffoleau 2009). Direct and regional marketing creates additional on- and off-farm employment opportunities for farm households. Other short food supply chains generate job opportunities in the regional food processing and distribution sector. Also multiplier benefits are found between regional food supply and marketing and opportunities for tourism and further positive associated economic impacts (Pearson et al. 2010). However, from a non-regional, global perspective, global supply chains also create these benefits in other regions, apparently also in regions and countries, where economy strongly depend on the export of primary production (Holt & Watson 2008). Employment effects occur in a regionally redistributive way. Especially for alternative FSCs, such as Community Supported Agriculture, Urban Agriculture or Self-harvesting problems certain fuzziness in terms of employment occurs, as paid and non-paid work are often equally applied, respectively unpaid work may even substitute paid employment.

3.3.2 Income and Profitability

Regionalizing the food supply ensures the income and value adding in the region. Shortening of the food supply chains also reduces the number of intermediaries, which in turn increases the product margins for the individual stakeholder, especially the producer itself (Govindasamy et al. 2003) as the value of the final product increases. (Hinrichs 2003) argues that the localization of food supply also presents a driver to promote receptivity to difference and diversity and so finally also to enhanced entrepreneurship. SFSC strengthen ties between producers and consumers, it reduces the risk of dependency on single outlets, of changing sales quantities and price pressure. However, it is also shown that regional marketing not necessarily leads to higher profits (Kneafsey et al. 2013). Another issue is the question of scale-effects. Often small-scale producers are limited in their profitability as they could not make proper use of scale economy due to the small quantities of production.

3.3.3 Rural Viability and Competitiveness

In re-connecting consumer and producer and so re-connecting cities with their rural hinterlands, short food supply chains are considered to contribute to rural viability and competiveness in several ways. It has been shown that more direct contacts between urban consumers and regional food producers help the latter to make better use of the nearby urban market nearby with high margins, decrease vulnerability to global market volatility as well as increase their capacity to flexibly adapt to changing consumer demands and requirements and to develop innovative product (DuPuis & Goodman 2005, Zasada 2012). Other scholars see in these more regional, place-based approach an alternative to global competitiveness (Horlings & Marsden 2012) and a contribution to endogenous regional growth (Trobe 2001, Renting et al. 2003). Therefore, rural viability and competitiveness are commonly considered as economic criteria to assess sustainability impacts and benefits (Yakovleva et al. 2010, FAO 2013).

However, it is also argued to ensure economic sustainability through SFC, regional production schemes needs to be combined with quality or organic production (regional specialty) (Sauter & Meyer 2003). Also the alternative food networks are critical in their function to encourage rural community integration, as they are also rather conservative, protectionist and closed (DePuis & Goodman 2005). Required are the willingness of actors to co-operate and a high degree of organization of local food systems (Chiffoleau 2009). Here, (Gilg & Battershill 2000) highlight the critical relationship between the requirements (unorthodox type of farm enterprise) and limited benefit (only small share of produce is marketed directly).

3.3.4 Transportation Efficiency

Transport is not the stage of the whole food chain, which causes the most significant environmental impacts (EEA 2012), but the distance food travels and the efficiency of its transportation system represents a major aspect in sustainability impact assessment as the transport sector, with food transport as an important part of it, accounts for a high and fast growing share of the energy consumption and greenhouse gas emissions. According to EUROSTAT, in 2006 the sector is responsible for more than 20% of the primary energy consumption in EU-25 and nearly 25% of its CO_2emissions. Therefore, the reduction of transportation distance (“food miles”) and the efficiency is acknowledged as measure to assess the sustainable food chains (Apaiah et al. 2006).

However, the contribution of transportation and energy efficiency of SFC has been discussed among scholars quite controversially (DePuis & Goodman 2005, Mundler & Rumpus 2012), with advocates for short and alternative food networks as well as for global ones. Whereas some argue, that due to the reduced distances and intermediate stakeholders local food chains represent a prime solution to increase transportation and energy efficiency (Demmeler & Heißenhuber 2004, Blanke & Burdick 2005), others set

against, that due to shortcomings in structural logistics optimization (i.e. small vehicle, low volumes, many individual routes, point of sale), the beneficial effects of shortening distances are jeopardized (Schlich & Fleissner 2005, Coley et al. 2009).

3.3.5 Reduction of Food loss and waste

Along the supply chain, food is necessarily and unnecessarily lost and wasted. The (FAO, 2011a) distinguishes five system boundaries in the food supply chain, where food losses and waste occur, including (1) agricultural production, (2) post-harvest handling, (3) processing, (4) distribution and (5) consumption in households and catering service. In agricultural production, losses occur to mechanical damage and/or spillage during harvest operation (e.g. threshing or fruit picking), crops sorted out postharvest, etc. In postharvest handling and storage, food loss is caused by spillage and degradation during handling, storage and transportation between farm and distribution. During industrial or domestic processing, e.g. juice production, canning and bread baking, losses may occur when crops are sorted out if not suitable to process or during washing, peeling, slicing and boiling or during process interruptions and accidental spillage. Further food loss in distribution includes the market system (shelf-life), e.g. wholesale markets, supermarkets, retailers (FAO 2011a). According to (Buzby & Hyman 2012) the estimated annual per capita amount of food loss at the retail and consumer levels in the US sums up to 29% or 188 kg per capita and a calculated cost of 545 US Dollar. However, the (FAO 2011a) estimate that in Europe one third of the food is wasted in private households, whereas the rest is incurred in the actual food chain. So the reduction of food waste can contribute to lower food prices (Rutten 2013) as well as to the reduced amount of agricultural inputs (Kummu et al. 2012).

However, in reducing the number of intermediaries, shorting of geographic distance, but first of all creating direct contacts between consumers and producer and enhance relationship of consumers to agricultural production, SFCs are considered to make an impact on reduction of both food loss and waste (CEC 2013). Due to higher consumer flexibility in term of acceptance of non-standard products and varieties (CEC 2013) efficiency of distribution is improved compared to conventional distribution channels. Additionally, it is argued that due to the direct consumer interaction with food production and increased knowledge also behavioural changes are encouraged, leading to a decreased likelihood to unnecessary food waste by the consumer (Pascucci et al. 2011).

3.4 Social Indicators

The social dimension of sustainability refers to human welfare aspects related to food supply, including food safety and human health, quality, traditions and culture, transparency and traceability as well as food security in terms of availability and accessibility of food. To

this end the definition of social impact embarks on the notion of social embeddedness of food supply, as an important determinant of local and short food supply chain. Social embeddedness refers here to a process of increasing de-commodification, community-orientation, shared relationships and responsibilities and is seen as an alternative to global market logic and pressure (Hinrichs 2000, Lockie 2009).

3.4.1 Food safety and Human health

Generally, short chains in the European Union are subject of regulation EC No. 852/2004 and 853/2004, which regulate hygiene measures for the production of foodstuff. Additionally, according to the International Standardisation Organisation norm ISO 22000 food safety is defined as followed: "The basic food safety concept is this: food will not harm the consumer so long as intended use guidelines are followed when it is prepared or eaten. Conversely, food is potentially harmful whenever it has been exposed to hazardous agents and intended use guidelines have not been followed." Thus, food safety deals with the management of possible hazards, such as pathogens or chemical pollutions in food controlling systems, such as the Hazard Analysis and Critical Control Points (HACCP) can improve the traceability and the risk management.

The aspect of food safety in short food chains has been rarely studied so far (FASFC 2012). In the case of human health, Edwards-Jones et al. 2008) have shown the difficulties to quantify the impacts of food on health by measuring chemical constituency of food from different supply chains, as those require large analytical efforts and amounts of data as well as methodological problems identifying the effects of individual food as part of a whole diet.

3.4.2 Food quality (Freshness, Taste and Nutritional value)

Food quality is distinguished into commercial and nutritional quality. Whereas "commercial" refers to cleanliness, firmness, lack of damage, freedom from disease as well as some surface and constitution related criteria, "nutritional" criteria encompass nutrient and biologically active contents (Edwards-Jones et al. 2008). Degradation of food quality is thereby influenced on all instances of the food chain, including production, processing and packaging, distribution and retail (shelf-life) by chemical deterioration, temperature, microbial spoilage and nutritional losses or mechanical stresses (Manzini & Accorsi 2013). Edwards-Jones et al. (2008) state that food quality strongly depends on the time between harvest and type of processing, but less on the sheer distance between producer and consumer. However, it has been argued that with the "turn in quality", the increasing interest of consumers in local and high quality food and for the produces to escape the cost-prize-squeeze of the global food market, quality is increasingly linked with the local territorial context (Murdoch et al. 2000), the domain of short food supply chains. Local food may diminish the time between harvest and consumption thus resulting in a higher food quality provided that the products are properly stored.

3.4.3 Food traditions and Culture

Conventional and global food systems generally focus on efficiency and yield quantity as well as the focus on products on few, standardized products which meet the demand and requirements of a large share of the consumer market. As a consequence increasing marginalization of traditional local and regional food varieties is discussed (FAAN 2010). Here, local food systems aim to restore and re-introduce a larger agri-food diversity respecting the local food culture, production methods and traditional knowledge. Brunori 2007 argues that local food strategies try to build upon cultural traditions, characteristics of the place of origin and the related specifics of the food product. In this sense, the Slow Food movement and the increasing number of regional indications of agri-food products can be seen as indictors for the rising consumer awareness.

3.4.4 Transparency and Traceability

Recurring food scandals, public health concerns and limited consumer trust related to agro-food products has increasingly called for enhanced transparency and traceability of the food supply chain (Renting et al. 2003). According to the ISO standard (ISO 8402), traceability is generally defined as "the ability to trace the history, application or location of an entity by means of recorded identifications". A more logistics-oriented definition sees food traceability is an integral part of logistics management. It is the aim to ensure upward and downward tracking of safety and quality control at all supply chain stages (Bosona & Gebresenbet 2013). Reviewing the literature, Bosona & Gebresenbet (2013) have distinguished different types of benefits from traceability, including the improvements of customer satisfaction, of food crises management, of supply chain management, competence development, technological and scientific contribution as well as agricultural sustainability. Transparency and traceability is mainly addressed either by face-to-face contacts or by the use of labels ISO 14021-25 (e.g. for environmental and eco-labels, organic, fair-trade production as well as regional indications, such as PDO (protected designation of origin), PGI (protected geographical indication) and TSG (Traditional Specialty Guaranteed).

3.4.5 Food Security (Availability and accessibility of food)

Generally, various working definitions of food security have been used recently. The Food and Agriculture Organization (FAO 2003, p.28) refers to a notion, that "Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." Here the main aspects of the geographic and social accessibility and affordability of food is taken into consideration, which is not only an issues of developing countries, but which is also observed in the global north, as the observation of so-called "Food deserts", the urban neighbourhoods with limited access to healthy food, show (Choi & Suzuki 2013, Gordon et al. 2011). It is argued on the one hand that local agri-food networks represent a measure to improve food sovereignty, the equal

access and availability to food also for the social disadvantaged groups (McCracken et al. 2011). On the other hand, due to efficient production and distribution systems methods based on scale-economies, conventional global agro-food systems are able to provide lower consumer prices for a long time, but more recently face an increasing food price trend and are subject to high volatility (FAO 2011b).

4 SIA Step 2: Typology of Short Food Chains

In academic debate and politics, different approaches and paradigms on how to solve the problems in the current agri-food system exist, like sustainable intensification of agriculture (e.g. Garnett & Godfray 2012), sustainable / integrated chain management in logistics, food sector (e.g. Seuring & Müller 2007) or alternative food networks (e.g. Renting et. al. 2003). While the first two represent the agri-industrial paradigm (hypermodern food geography) which is characterized by intensive production, technological solutions for environmental problems, up-scaling, standardization, regulation and quality assurance schemes, the second – the integrated and territorial agri-food paradigm (alternative food geography) that follows the principles of the economies of scope, localized food networks, regional nutrient cycles, organic or low input production and transparent food chains mainly by personal trust relations (Wiskerke 2009, Morgan & Murdoch 2000). The alternative food system/geography is mainly associated with short and local food chains (see Table 2).

Table 2. Solutions for the problems in the current food system according to the agri-industrial and territorial agri-food paradigm in comparison.

Problem/issue addressed	Agri-industrial paradigm (hypermodern food geography)	Integrated territorial agri-food paradigm (alternative food geography)
Economic position of primary producers	Intensive production 'lock-in'; economies of scale approach; cost price reduction;	Economies of scope approach; increase producers' share in consumers' food spending
Environmental sustainability	Technical solutions for environmental problems: agri-industrial parks, pest and disease resistant GMO crops, low/zero emission livestock housing systems; eco-efficient systems for mass distribution of food products	Localized/regionalized food networks; nutrient cycles at regional level; traditional plant varieties and animal breeds adapted to local conditions; organic or low external input production; seasonal products
Organoleptic quality and diversity	End-of-chain diversification; Created by the food processing industry based on standardized primary product	Created by farmers and/or artisanal food processors; quality linked to region (*terroir*)/tradition/nature
Consumers' trust	Quality and safety assurance schemes; industry and retail labels and hallmarks; tracking and tracing	Personal trust based relations; denomination of origin labels; transparent food supply chains
Health	Nutritionism: nutritionally engineered functional food (food as a carrier of vitamins, calories, proteins, nutrients, etc.)	Focus on lifestyle, dietary pattern and eating habits: more fresh food and less convenience & processed products, more physical exercise; organic products

Source: Marsden (2003); Lang & Heasman (2004); Nosi & Zanni (2004); Sonnino & Marsden (2006); Scrinis (2007).

Source: Wiskerke 2009.

As the SIA will be carried out for different types of short food chains, it is necessary to develop a consistent set of SFC (see Figure 3). This typology is based on previous work carried out in *FOODMETRES* WP2.1 (Analysis and evaluation of the characteristics of local food demand and supply). For this task has explored food chains types including (i) on farm sale, (ii) online sale, (ii) vending machines, (iv) farmers' markets, (v) community supported agriculture (CSA), (vi) box schemes, (vii) ethical purchasing groups (EPGs), (viii) large-retail distribution as well as (ix) public procurement and public catering. In the 5.1 task at hand, these food chain types have been taken up and further refined by conducting a literature review. Also the localization of SFC in agro-food systems carried out in deliverable 2.1 was tested for the description of SFC examples from all *FOODMETRES* case study regions (Annex I).

According to *FOODMETRES* Document of Work (DoW, part B, p. 12) "Shortening the supply chain […] is defined as:

- (A) Shortening the total distance (in physical distance and time) between the producers and the final customers, i.e. the consumers or other clients, and
- (B) Bringing the consumer closer to the producers and/or by making some chain members redundant."

The criteria for SFC are: spatial proximity and/or closer relation between actors (not necessarily consumers!) by reducing chain length / members / processing links. They are characterized by an "or-relation", which means that these two options can interact, but they do not necessarily have to (DoW Part B, p 14 and 20 and RIP).

Dealing with practical examples of regional food supply for Metropolitan regions it is useful to differentiate regarding the length of chains and use the criteria of the spatial and social proximity (see also Galli & Brunori 2013). Therefore, we characterize the regional chains according their length regarding the number of involved actors into:

- **Long Regional Food Chains (occurring in MAS):** means regional purchasing of food, where the food is regionally grown, processed, sold and consumed within a certain territorial unit=region (no matter how the region is defined). In comparison to global food chain the total transport distance is shortened (as physical and time distance). Long regional chains including a number of intermediaries/chain steps like wholesale and retail etc. within this region. Long regional chains are connected with the spatial concept of the Metropolitan Agri-food System (MAS).
- **Short Regional Food Chains (occurring in LAS):** means local purchasing of food, where the food is regionally grown, *(processed),* sold and consumed within a certain territorial unit=region (no matter how the region is defined). By reducing the number of intermediaries, SFC allows a closer/personal interaction between producer and consumer (social proximity). Short regional food chains are connected with the spatial

concept of Local Agri-food System (LAS). They are comparable with concepts like "alternative food chains" and "local food (systems).

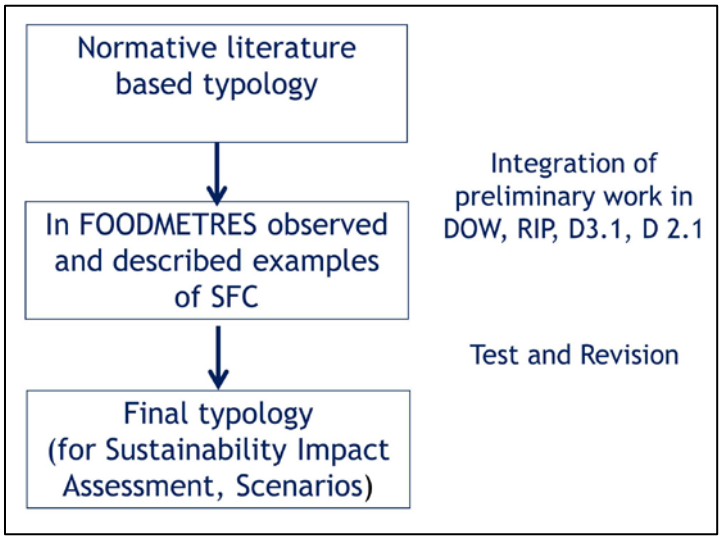

Figure 3. Procedure for developing the SFC typology.

Within the reviewed agri-food studies and policy documents about short food (supply) chains, local food and related concepts (e.g. Goodman 2004, Hinrichs 2000, Jarosz 2008, Marsden et. al 2000, Renting et al. 2003, Renting et. al. 2012, Tregear 2011, Watts et al. 2005, Wiskerke 2009, Kneafsey et al 2013, Galli & Brunori 2013, CR 2011, Peters 2012) we found no precise and consistent definition of a short chain, but a "common set" of characteristics of short chains, which include:

- Spatial proximity and
- Personal interaction of producer and consumer (face to face) and/or
- Goal/intention: adding value and/or
- Effects: changing food processes by re-embedding, re-connecting, re-localising and re-socialising

While the first two criteria can be seen as minimum definition the last two are extended definitions. Long regional chains fulfil only the first criterion, short regional the second. In order to classify or categorize short food chains according to the social proximity between consumer and producer many authors refer to Marsden et al. (2000), and Renting et al. (2003), which identify three main types based on different connection or proximity between producer and consumer, namely: (i) face-to-face, (ii) spatial proximity, and (iii) spatially extended.

As short chains are embedded in a territorial and social context, there exists a diversity of how regional food is produced, processed and distributed in supply chains. Therefore, we choose an approach which puts the consumer-producer relation into the focus. The types have a certain "affinity" to LAS, MAS and GAS as well as commodity groups (see D 2.1). Not all of them can be found / will be studied in the *FOODMETRES* case study regions. This

approach is oriented on the definition of the Committee of the Regions (2011), which categorize short chains like this: producers as consumers, where consumers grow their own products

- producer-consumer partnerships, where consumers share the risks and rewards of production with the producer(s) and a written agreement regulates the direct sale of the product,
- producers' direct sale to consumers without preliminary agreements between the two categories, as is the case for sales at farmers' markets, regular or occasional local open-air markets or at on-farm shops
- producers' sales through local outlets or collective marketing mechanisms, including sales through new media such as online sales portals on the internet, allowing more direct or easier delivery of the produce to the final consumers than via traditional channels;

Although this CR categorization focuses mainly on the distribution aspect of food ("from farm to fork") and do not consider all aspects/steps of the food chain steps (processing, packaging etc.) it is quite a useful starting point, because it is focusing on the market-relation and allows the integration of the new emerging phenomenon of Urban Gardening etc., where consumer become (co-)producers. First of all, we differentiate between four categories of market relation between consumer and producer as well as and related commercial transactions schemes:

- Consumers as producers (transaction scheme: not existing)
- Producer-consumer partnerships (transaction scheme: business-to-consumer)
- Producer direct sales to consumer (transaction scheme: business-to-consumer)
- Producer direct sales to intermediates / no direct consumer-producer relation (transaction scheme: business-to-business and business to administration).

These four main categories for chain types can be further differentiated according to a certain chain length, the kind of intermediate chain actors (retail, hospitality industry, public procurement) and the location of the point of sale LAS/MAS/GAS affinity (see Table 3). Finally, we differentiated between eight main types of regional and short food chains and related subtypes and venues. The place of production can be urban, peri-urban or rural, as place of consumption, we considered only the urban area. Each of them has been checked, if they exist within the six case study regions and if they were part of more detailed (case) studies (see Annex I)

The developed SFC typology represents mainly chain types, which are associated with “alternative food networks / geography”, but also integrates with the AgroParks/MFC, an example from the “hypermodern food geography”. But following Wiskerke (2009) one can conclude that most of the real food chains in the current food system combine both paradigms and create a “hybrid food geography”.

Table 3. Typology of regional food chains providing food for urban population.

Regional Chain Type	Chain length	Definition	Subtype and venues	Market relation between consumer and producer	Transaction scheme	LAS/MAS/GAS affinity	Location of the Point of sale
a) **Urban gardening for self-supply / private consumption (subsistence)**	short regional	Food production in the urban setting for own consumption.	allotments, community gardens, self-harvesting gardens (offered by a farmer).	consumers as producers	No	Only LAS	urban area
b) **Urban gardening for commercial purposes**	long regional	Profit-oriented food production in the urban setting.	Sale to shops and restaurants	no direct consumer-producer relation	Business-to-business	(LAS, MAS)	urban area
c) **Consumer-producer-partnerships**	short regional	Network or association of individual consumers who have decided to support one or more local farms and/or food producers/processors	Community Supported Agriculture (CSA), Ethical Purchasing Groups (EPG), Solidarity Purchasing Groups (SPG), and food-coops.	consumer-producer-partnership	Business-to-consumer	LAS	urban, peri-urban and rural area
d) **Direct sales/marketing on-farm to the private consumer**	short regional	Farmer sell directly their products on their farm.	farm shops and stands, pick-your-own.	direct consumer-producer relation	Business-to-consumer	LAS, (MAS)	peri-urban and rural area

e)	**Direct sales/marketing off-farm to the private consumer**	short regional	Farmer sell directly from a farm on market in the urban area.	farmers and weekly markets, market halls, home delivery, box schemes, online sales, vending machines	direct consumer-producer relation	Business-to-consumer.	LAS, (MAS)	urban area
f)	**Sales to regional enterprises like retail or hospitality industry**	long regional	Sale of products from a farm to retail and industry (e.g. restaurants, hotels, pubs), which provide food for urban population.	Service stations Shelf in retail shop	no direct consumer-producer relation can include wholesale or intermediaries	Business-to-business	LAS, (MAS)	mainly urban area
g)	**Sale to public procurement and public catering**	Long regional	Preparation and delivery of meals for collective consumers in the urban area. Include intermediaries like wholesale		no direct consumer-producer relation include wholesale or intermediaries	Business-to-administration	LAS, (MAS)	mainly urban area
h)	**AgroParks / Metropolitan Food Clusters (MFC**	Long regional-or even global	"spatially clustered agro-food systems in which several primary producers and suppliers, processors and/or distributors cooperate to achieve high-quality sustainable agro-food production…" MFC are oriented towards the markets in the Metropolitan Region providing food for the urban population, but also to the world market.		no direct consumer-producer relation	Business-to-business	MAS, GAS	urban area and world market

5 SIA Step 3: Expert Evaluation – Online Survey

In the first step of processing an SIA, an online expert survey is carried out to make use of scientific knowledge of experts in the fields of food marketing, logistics, geography and rural development to assess the sustainability impact areas as policy objective. It is the objective to evaluate generic types of food supply chains in terms of their capacity to contribute to policy objectives (e.g. reduction of food miles, food loss and waste, employment and income generation or food safety). Also the relative relevance of individual impact areas should be evaluated. The result of the expert survey will represent the basis for the sustainability impact model, and respectively for the tool development.

5.1 Sampling

Relevant experts and scholars are identified using systematic search via the literature databases *Scopus (Elsevier)* and *Web of Knowledge (Thompson Reuters)*. We searched for peer-reviewed articles published between 2000 and 2013 in English language, using following search terms: “short food supply”, “alternative food networks”, “alternative agro-food networks”, “direct marketing” AND “agriculture”, “assessment” AND “food supply chain*”, “sustainability” AND “food supply chain*” (see Table 4).

From the two databases we got 599 hits and excluded duplicates[1] and not relevant articles. As a result, we got a list of 226 publications covering Europe, USA; Canada, Australia and New Zealand. Based on this second list, a contact database (email address) including all first and second authors, who are based in Europe (*N*=178) was compiled. Authors, which are partners in *FOODMETRES* were not considered for the survey, but they took part in the pre-test.

[1] Scopus and ISI Web of Knowledge have around 90% overlap in their documented publications.

Table 4. Overview about results from literature research (conducted on 6th February 2014).

Search terms	Number of hits in Scopus database	Number of hits in Web of Science database
"short food supply"	28	19
"alternative food networks"	71	67
"alternative agro-food networks"	8	5
"direct marketing" AND "agriculture"	42	35
"assessment" AND "food supply chain*"	92	63
"sustainability" AND "food supply chain*"	72	31

The expert sample featured the following characteristics: 107 of the experts are male, 71 are female. The identified experts work in 23 different European countries, whereas they origin mainly from United Kingdom (58), the Netherlands (18) and Italy (18) (see

Figure 4). The identified experts held positions mainly at universities and public research institutes, but also at research units in enterprises and they are experts in the fields of agricultural, environmental, social, economic, and life sciences.

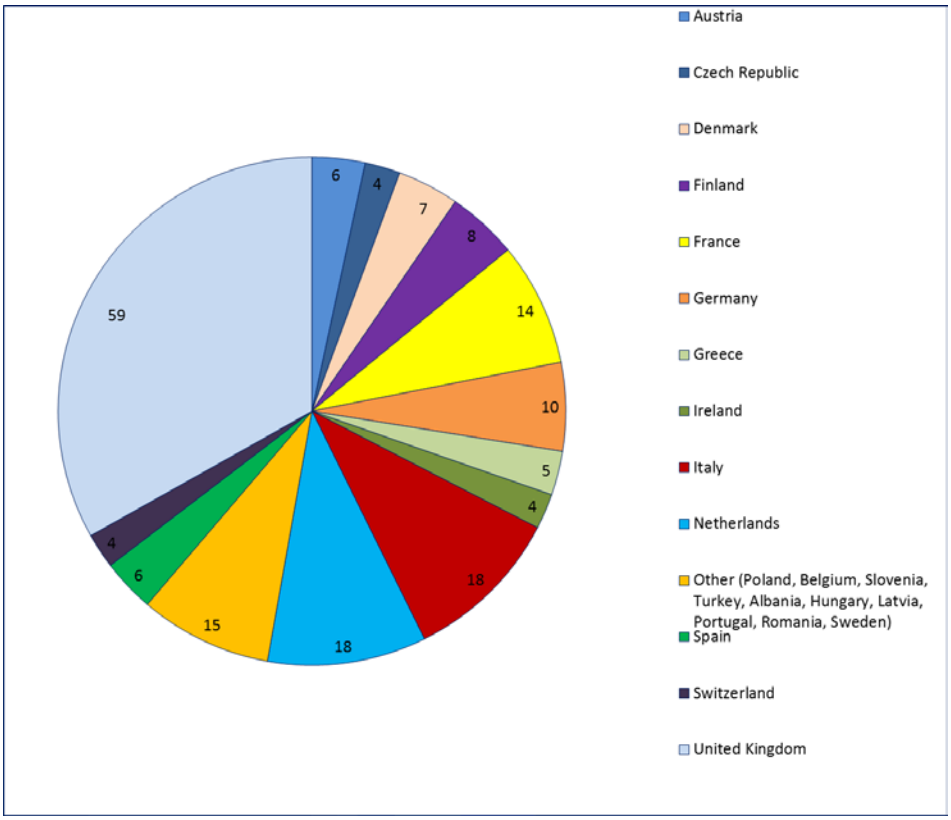

Figure 4. Country of origin of the expert in the sample.

5.2 Online Survey

The survey is carried out applying software package SoSci Survey (https://www.soscisurvey.de/). The questionnaire consists of seven questions regarding the person and her/his (previous) knowledge about short food chains and sustainability aspect of food chains information as well as 15 closed questions, each focusing on one sustainability impact area. Evaluations are along a seven-point scale, whereas the differences between the various short food chain types are of specific interest. For the complete survey see Annex II.

Score cards with a seven-point-scale are used to allow experts a quantification of their qualitative assessment. The scale ranges from values of -3 (very negative impact) to +3 (very positive impact), whereas the value zero means no impact or balance out. Besides this, experts can mark, if they can't estimate the potential impacts. The online survey started at 10th of April 2014 and runs till 30th April. Depending on the participation rate till this date, we would extend the maximum run time till 9th of May.

5.3 Pre-testing

A preliminary version of the survey has been tested among the scientists in the *FOODMETRES* project. The pre-test aims at technical and logical feasibility and tested the comprehensiveness of the questions and the feasibility of the chain types and impact areas. Partner scientists were also asked to evaluate the relevance and feasibility of the impact areas. The pre-test was carried out in the time between February 19th and March 4th and generated 14 valid cases that could be analysed and provided a lot of useful comments. The results are presented in Annex IV. After the pre-test and a pilot workshop about specific regional food chain in Berlin in March (see chapter 8), the (online) survey needed a little revision. The number of impact areas was reduced from 18 to 15, also their order and the chain types more differentiated (see Table 5). The chain type "sale to regional enterprises and public institution" was divided into two types - "sale to regional enterprises like retail or hospitality industry" (type f) and sale to public procurement and public catering (type g) - because of the different actor groups and chain organization.

Table 5. Revision of impact areas.

Impact Areas for the pre-test and pilot study (regional workshop)	Revision	Revised Impact Areas after pre-test and pilot study
1. Environment		
1.1 Environmental friendly farming system	Deleted	
1.2 Efficient resource use (water, energy, nutrient, land)	Kept, but specified to abiotic resources	1.1 Eco-efficiency in abiotic resource use (land/soil, water, nutrients)
1.3 Animal protection and health	Kept, but renamed	1.3 Animal protection and welfare
1.4 Ecological preservation and (agro-) biodiversity	Kept, but renamed	1.2 Provision of ecological habitats and (agro-)biodiversity
1.5 Reduction of emission and pollution (NOx, SOx etc.)	Deleted	
1.6 Reduction of transportation distance	Kept	1.4 Reduction of transportation distance
	New impact area	1.5 Reduction of packaging
2. Economy		
2.1 Efficient transport from producer to consumer	Kept	2.4 Transportation efficiency
2.2 Increase income / profits for the producers	Kept, but renamed	2.2 Income and profitability
2.3 Generating employment along the food chain	kept	2.1 Employment along the food chain
2.4 Reduces of food losses and waste along the food chain	kept	2.5 Reduction of food loss and waste along the food chain from producer to households
2.5 Improve human health and reduces diet-related diseases	Deleted	
2.6 Improve rural viability	Kept, but renamed	2.3 Rural viability and competitiveness
3. Society/Culture		
3.1 Food safety	Kept, but renamed	3.1 Food safety and human health
3.2 Food quality	Kept, but specified	3.2 Food quality (freshness, taste and nutritional value)
3.3 Viability of food traditions and culture	kept	3.3 Viability of food traditions and culture
3.4 Transparency and traceability	Kept	3.4 Transparency and traceability
3.5 Availability of food	Merged under the impact areas “food security”	3.5 Food security (availability and accessibility)
3.6 Affordability and accessibility of food	Merged under the impact areas “food security”	

5.4 Final Results of the expert-based online survey (update)

The survey among 178 European experts was carried out between April and May 2014, conducted as an online survey. The invitation was posted via e-mail with link and serial number (personal key for every participant). It was undeliverable to 21 persons and new valid addresses needed to be identified, what failed in two cases. All in all 176 persons could be reached. Although 52 people started with the survey, only 37 completed it. Till end of April (30-04-14) 26 people answered the questionnaire. Subsequent to an e-mail reminder at the beginning of May additional 11 experts responded. The response rate of 21% lies within a typical range of e-mail questionnaire response rates (Deutskens et al. 2004).

5.4.1 Characteristics of the Respondents

For representativeness reasons, respondent's demographic information was analysed. Regarding the aspect of gender the respondents well represent the full sample composition of 176 experts (see Table 6). Regarding the country of origin some countries are overrepresented (e.g. Italy) and other underrepresented (e.g. Austria, Germany). To some extent this is also the case for the type of institution where the experts recently held a position. The far majority is working at universities.

Table 6. Characteristics of the sample and respondents in comparison.

	Characteristics	**Sample (176 experts)**	**Respondents (37 experts)**
Gender (*N*=35)	Male	106 (60.2%)	22 (62.9%)
	Female	70 (39.8%)	13 (37.1%)
Country (*N*=36)	Austria	6 (3.4%)	0 (0%)
	Czech Republic	4 (2.3%)	2 (5.6%)
	Denmark	7 (4.0%)	1 (2.7%)
	Finland	8 (4.5%)	2 (5.6%)
	France	14 (8.0%)	3 (8.3%)
	Germany	10 (5.7%)	0 (0 %)
	Greece	5 (2.8%)	3 (8.3%)
	Ireland	4 (2.3%)	1 (2.7%)
	Italy	18 (10.2%)	7 (19.4%)
	The Netherlands	18 (10.2%)	3 (8.3%)
	other*	15 (8.5%)	4 (10.8%)
	Spain	6 (3.4%)	1 (2.7%)**
	Switzerland	4 (2.3%)	1 (2.7%)
	United Kingdom	59 (32.4%)	8 (22.2%)
Institution (*N*=36)	University	139 (79.0%)	26 (70.3%)
	Public Research Institute	24 (13.6%)	7 (18.9%)
	Enterprise in agri-food business	2 (1.1%)	1 (2.7%)
	Consultancy	1 (0.6%)	1 (2.7%)
	Other (NGO, association, private research institute, public administration etc.)	10 (5.7%)	1 (2.7%)

**Poland, Belgium, Slovenia, Turkey, Albania, Hungary, Latvia, Portugal, Romania, Sweden; **actually in Australia*

The aim of asking the experts about their previous knowledge was to check the "quality" of the selection and eventually to weight the statements given in the survey. The data (see Figure 5) show that the large majority possess very good knowledge about the two studied topics, whereas more experts declare this for the aspect of sustainability. In this sense, the method for the selection of the experts for the survey was successful.

Figure 5. Self-estimations of the experts about their previous knowledge regarding short food chains and sustainability (N=36).

The majority of the respondents have also long experience (>10 years) in their field of expertise, only 19 % worked less than 5 years on the subject (see Figure 6). There is a remarkable higher share of people with long lasting experience in the fields of economic sciences and rural sociology (87.5% and 70.0%).

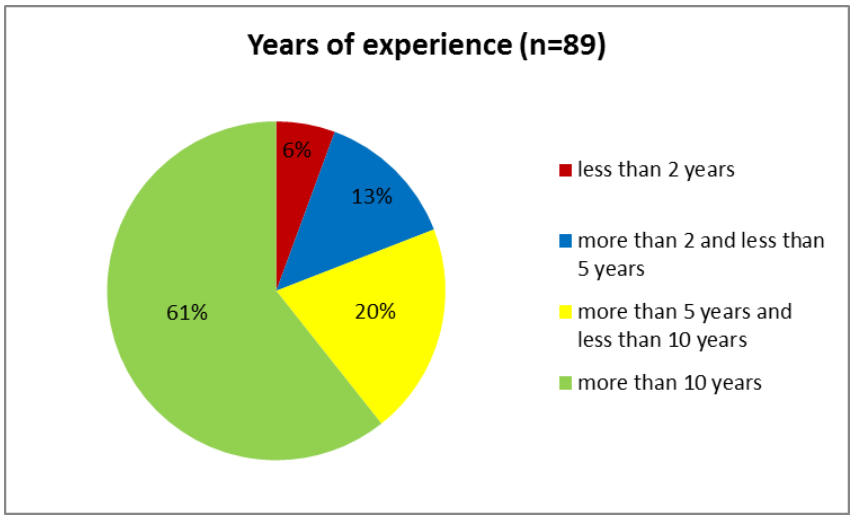

Figure 6. Experts years of experiences in their main fields (multiple answer, N=89).

From their professional background the experts represent different disciplines, whereas agricultural sciences, marketing, geography, environmental sciences and logistics

were indicated most frequently (see Table 7). 24 of the 37 experts indicated more than one field of expertise. All in all there were 89 entries.

Table 7. Experts fields of expertise (multiple answers possible).

Main fields of expertise (sorted according number of indications)	Combined with other fields of expertise…
1 Agricultural Sciences: 14	Logistics (6x), Marketing (4x), Sociology (2x), Geography (3x), Environmental Sciences (7x), Urban Planning (1x), Economic Sciences (2x)
2 Marketing (e. g. of agricultural products, food): 13	Logistics (5x), Sociology (4x), Geography (3x), Environmental Sciences (3x), Agricultural Sciences (4x) Urban Planning (1x), Economic Sciences (4x), Food Sciences (2x), Other (2x: tourism, Agricultural Economics and Policy)
3 (Rural) Geography: 11	Logistics (1x), Marketing (3x), Sociology (5x), Environmental Sciences (6x), Agricultural Sciences (3x) Urban Planning (3x), Food Sciences (3x), Other (1x: tourism)
3 Environmental Sciences: 11	Logistics (2x), Marketing (3x), Sociology (4x), Geography (6x) Agricultural Sciences (3x) Urban Planning (3x), Food Sciences (3x),Other (1x: tourism)
4 Logistics/Supply Chain Management: 10	Marketing (5x), Geography (1x), Environmental Sciences (2x), Agricultural Sciences (6x), Economic Sciences (3x), Food Sciences (1x), Other (2x: Agricultural Economics and Policy, Teaching)
4 (Rural) Sociology: 10	Marketing (4x), Geography (5x), Environmental Sciences (4x), Agricultural Sciences (2x), Urban Planning (1x), Economic Sciences (2x), Food Sciences (1x), Other (1x: tourism)
5. Economic Sciences: 8	Logistics (3x), Marketing (4x), Sociology (2x), Environmental Sciences (1x), Agricultural Sciences (2x)
6 Other: 5	Logistics (2x), Marketing (2x), Sociology (1x), Geography (1x), Environmental Sciences (1x), Agricultural Sciences (3x), Food Sciences (1x)
7 Food Sciences or Nutrition: 4	Logistics (1x), Marketing (2x), Sociology (1x), Geography (3x), Environmental Sciences (3x), Agricultural Sciences (3x), Urban Planning (2x), Other (1x: Food Standards)
8 Urban Planning: 3	Marketing (1x), Sociology (1x), Geography (3x), Environmental Sciences (2x), Agricultural Sciences (1x), Food Sciences (2x)

5.4.2 Sustainability impacts of the different chain types in comparison

Among the seven generic chain types[2], Community Supported Agriculture (CSA) performs best regarding all three sustainability dimensions, followed by direct sale on-farm and MFC (Metropolitan Food Clusters) (see Figure 7). These three chain types also show good performance in environmental sustainability. In addition, Urban Gardening for self-supply features a positive overall impact in this field in contrast to direct sales off-farm and sale to enterprises. Regarding economic sustainability, CSA and MFC are considered having highest contributions, followed by direct sale on-farm and sales to enterprises. Remarkably, experts see only a very low economic impact of urban agriculture for self-supply compared to other types. There is also a disproportion between the three aspects of sustainability.

In the field of social sustainability CSA, on-farm sales and urban agriculture for private consumption perform best. All chain types, besides sale to enterprises score the highest impact values in the social dimension.

[2] Due technical reasons there is no data for the chain type "public procurement" available in the online survey.

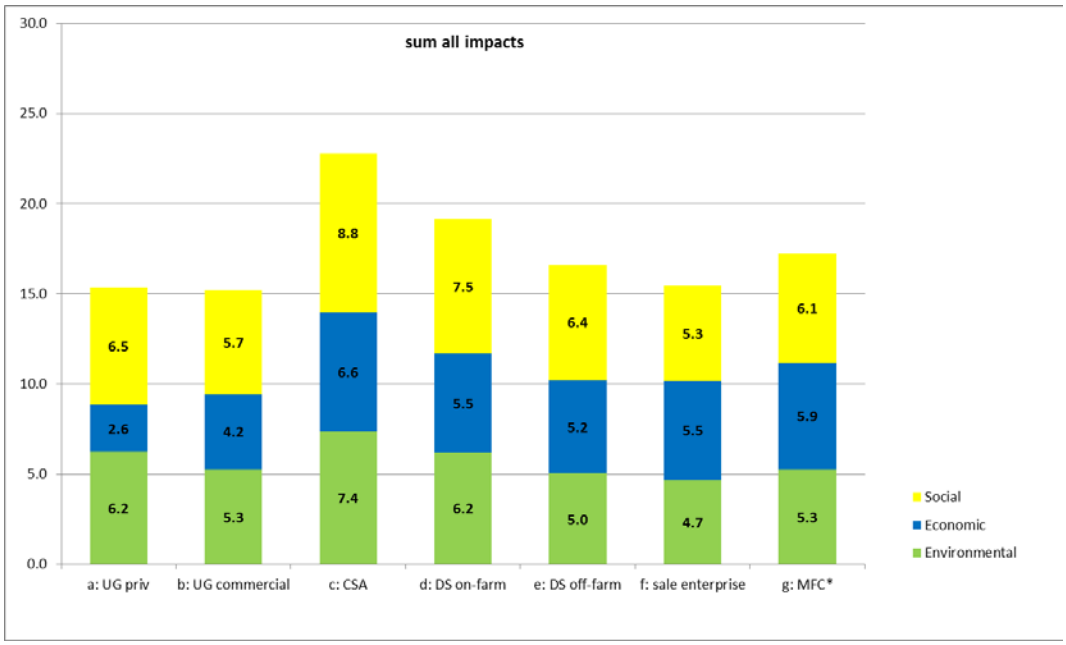

Figure 7. Potential impacts of the seven generic chain types in all sustainability dimensions (final results, N=37).

5.4.3 Sustainability profile of food chain types (strength and weaknesses)

In order to identify strengths and weaknesses of the different short chain types at a glance we developed a sustainability profile and grouped the results into four classes based on the average mean of all experts evaluations. These classes are: low negative impact (<0), low positive impact (>0 and </=1), moderate positive impact (>1 and </=2) and high positive impact (>2).

Table 8 illustrates that except for Urban Gardening for private consumption the surveyed expert expect all in all positive impacts from regional food chains in comparison with global long chains. The strengths (high positive impact) consist in the reduction of packaging (Urban Gardening for self-supply) and transparency and traceability (CSA and direct sale on-farm). Low negative impacts (weaknesses) were only stated for three impact fields, namely employment generation, rural viability and competiveness and animal protection and welfare (whereas animal husbandry is not widespread in the case of urban agriculture in Europe and therefore can hardly be estimated). Although the effects of small-scale urban production on rural viability are quite unclear so far, the surveyed experts suppose negative or very low positive influence from it. Especially for the very low positive values (<1.0) (yellow cells) can be seen as potentials for improvements in the chain exist. This concern the income and profitability situation and transportation efficiency.

Table 8. Online Survey: Overview about strength (positive impacts) and weaknesses (negative impacts) of food chain types.

	UG self-supply	UG commercial	CSA	DS on-farm	DS off-farm	Sale to enterprise	MFC
Env 1.1 Eco-efficiency in abiotic resource use	1.10	1.16	1.68	1.33	1.30	1.39	1.54
Env 1.2 Provision of ecological habitats and (agro-) biodiversity	1.09	0.91	1.24	1.00	0.63	0.54	1.07
Env 1.3 Animal protection and welfare	-0.03	0.07	1.39	1.03	0.71	0.68	0.97
Env 1.4 Reduction of transportation distance	1.92	1.76	1.67	1.26	1.29	1.46	0.96
Env 1.5 Reduction of packaging	2.17	1.36	1.38	1.58	1.11	0.62	0.73
Eco 2.1 Employment along the food chain	-0.34	0.76	1.03	0.76	0.82	1.22	1.43
Eco 2.2 Income and profitability for chain actors	0.09	0.85	1.53	1.65	1.45	1.30	1.31
Eco 2.3 Rural viability and competiveness	-0.12	0.21	1.47	1.59	1.41	1.33	1.28
Eco 2.4 Transportation efficiency	1.20	1.06	0.82	0.19	0.43	0.97	1.12
Eco 2.5 Reduction of food loss and waste	1.79	1.30	1.76	1.29	1.06	0.67	0.77
Soc 3.1 Food safety and human health	0.60	0.71	1.35	0.91	0.94	0.88	1.22
Soc 3.2 Food quality (freshness, taste, nutritional value)	1.72	1.57	1.91	1.72	1.44	0.97	1.19
Soc 3.3 Viability of food traditions and culture	1.36	1.03	2.00	1.79	1.47	0.90	1.28
Soc 3.4 Transparency and traceability	1.71	1.44	2.27	2.11	1.51	1.52	1.37
Soc 3.5 Food security (availability and accessibility)	1.08	1.00	1.28	0.91	1.03	1.00	1.00

<0 low negative impact; > 0 and </=1 low positive impact; >1 and </=2 moderate positive impact; >2 high positive impact.

5.4.4 Importance (ranking) of the different impact fields

As shown above for the seven chain types positive effects were assumed mainly for social and environmental aspects than for economic, but there are differences between the impact fields within the three sustainability dimensions (environment, economy and society). Three of the five social impact fields rank in the first half of all impact fields, in contrast three of the economic impact fields in the second half (see Table 9). 'Transparency

and traceability' (1.71) was rated highest across all studied food chain types, followed by 'food quality' (1.50), 'reduction of transportation distance' (1.47) and 'viability of food traditions and culture' (1.41). Only a low positive impact were estimated for 'transportation efficiency' (0.83), 'employment' (0.81) and 'animal protection and welfare' (0.69), whereupon animal husbandry is not very common among private and commercial urban gardeners and farms close to the cities and therefore have no high relevance.

Table 9. Online Survey: Ranking of the sustainability impact fields (N=36).

Rank	Impact field	Impact (average mean of seven chain types)*
1	Soc 3.4 Transparency and traceability	1.71
2	Soc 3.2 Food quality (freshness, taste, nutritional value)	1.50
3	Env 1.4 Reduction of transportation distance	1.47
4	Soc 3.3 Viability of food traditions and culture	1.41
5	Env 1.1 Eco-efficiency in abiotic resource use (land/soil, water, nutrients)	1.36
6	Env 1.5 Reduction of packaging	1.28
7	Eco 2.5 Reduction of food loss and waste	1.23
8	Eco 2.2 Income and profitability for chain actors	1.17
9	Soc 3.5 Food security (availability and accessibility)	1.04
10	Eco 2.3 Rural viability and competiveness	1.02
11	Soc 3.1 Food safety and human health	0.95
12	Env 1.2 Provision of ecological habitats and (agro-) biodiversity	0.92
13	Eco 2.4 Transportation efficiency	0.83
14	Eco 2.1 Employment along the food chain	0.81
15	Env 1.3 Animal protection and welfare	0.69

**chain types: UG private/self-supply, UG commercial, CSA, DS on-farm, DS off-farm, sale enterprise, MFC.*

6 SIA Step 4: Stakeholder Evaluation – Regional Workshops

As a second step, regional, endogenous knowledge of practitioners and stakeholder is used to carry out the sustainability impact assessment for specific food chain examples, as they are found in the *FOODMETRES* case study region. It is the main objective to validate the expert assessment on generic food chain types and to bring in a regional differentiation of

the impact assessment. This is important as regional manifestations of same or similar food chain types and their sustainability impacts might vary substantially. The stakeholder assessment is carried out in the form of workshops in the case study regions. In principle workshop participants will evaluate the food chain examples using the same set of impact area/indicators as used in the expert survey.

Results from the regional workshops for vegetable chains were presented per case study region in the following chapters. Additional material like SIA results for other commodity groups than vegetables is presented in the Annex VI.

6.1 Berlin pilot workshop (update)

6.1.1 Background: SIA Preparation and Implementation

The pilot workshop for testing the methodology of the SIA with regional stakeholders took place on the 5th of March in Berlin and lasted half a day. Nine actors representing five chain types, namely urban agriculture (community gardens and self-harvesting garden), community supported agriculture, farmers market and sale to retail joined the meeting. The detailed methodology and experiences obtained are described in the SIA guidelines (see Annex III). In contrast to with the planned workshops in the other case study regions, we used for the pilot a different baseline scenario, because in the Berlin case study we focus on organic short food chains. The baseline scenario was an organic long global food chain with distribution via supermarkets for vegetables. We also adjusted the scale for the impact assessment to a five-point scale (+2 =very positive to -2= very negative, 0=no impact).

6.1.2 Results

Regarding their environmental impacts, CSA and self-harvesting garden were rated highest (sum six and five points). Most of the chain examples are estimated to perform better than the baseline, except Urban Gardening (self-supply) in the fields of protection of natural resources and efficient resource use, because of the estimation that urban consumers producing their own food tend to have less experience and practise in gardening than professional farmers and gardeners. Besides retail, all chain types are expected to reduce packaging and increase biodiversity (see Figure 8).

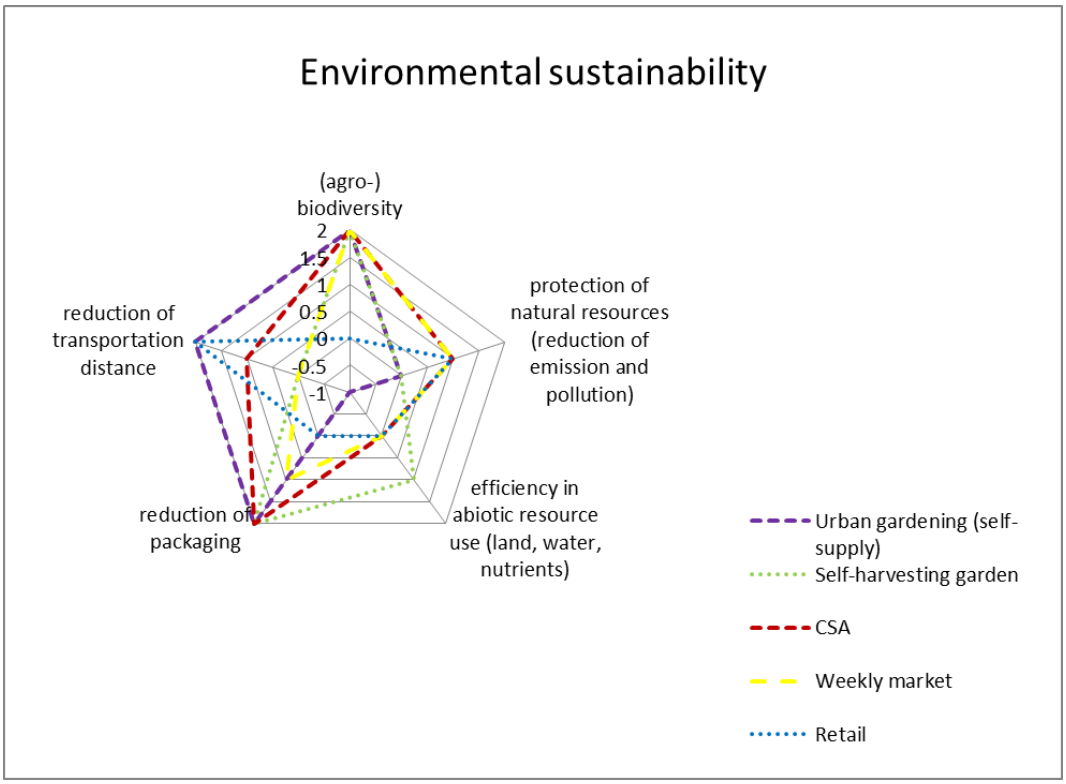

Figure 8. Estimation of the environmental impacts by each chain actor(s) for his/her chain (1st round, vegetables).

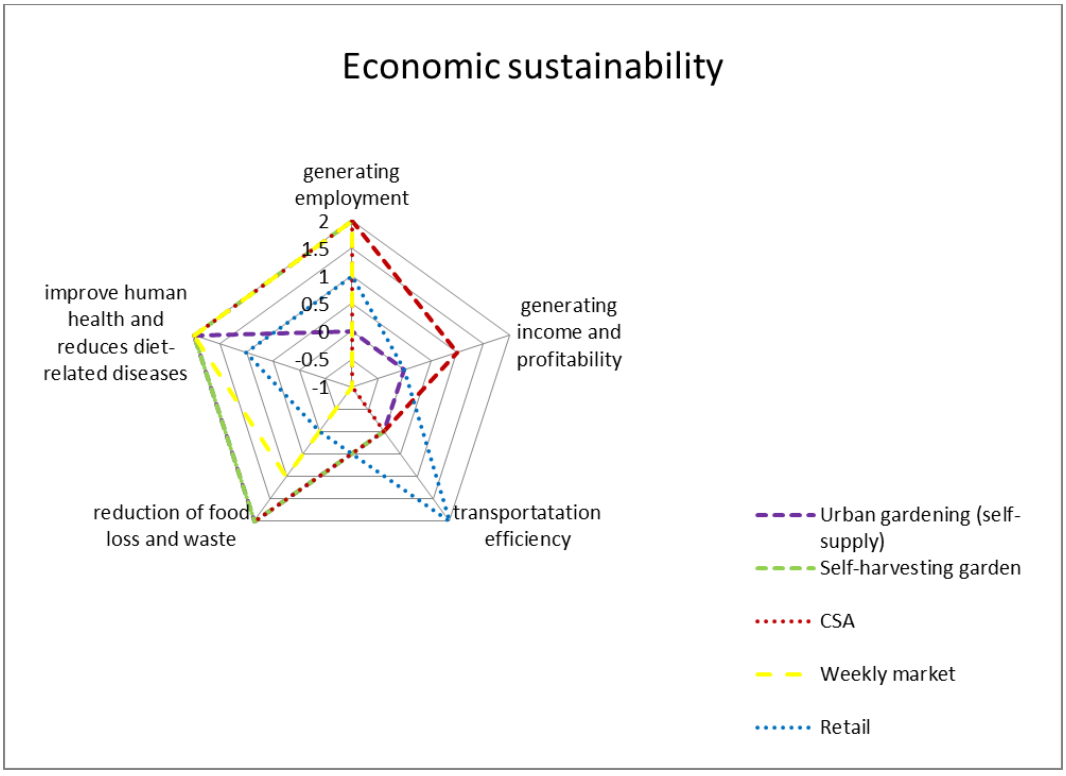

Figure 9. Estimation of the economic impacts by each chain actor(s) for his/her chain (1st round, vegetables).

According to the workshop results, social sustainability represent the main strength of the studied chain examples. In comparison with the baseline scenario all chain types besides retail show high values in the sum of all impact fields (i.e. seven points for Urban Gardening, six points in the case of the self-harvesting garden, CSA and weekly market). Retail is estimated weaker in terms of social sustainability, while performing better in the field of economic sustainability. The aspect of food security was estimated very critically. Despite long chains with a complex logistical organisation underlying certain other risks, stakeholders assumed that a long chain with global purchasing of food shows better performance, as regional short chain based on local food cannot respond properly to full dietary requirements. Another critical point is food safety in Urban Gardening, where only little is known about heavy metal concentrations in urban soils and unprofessional gardening practises which might endanger the safety of the grown food. In summary, Urban Gardening and retail show certain weaknesses in two of the three sustainability dimensions, whereas the other chain examples address all three sustainability dimensions quite well.

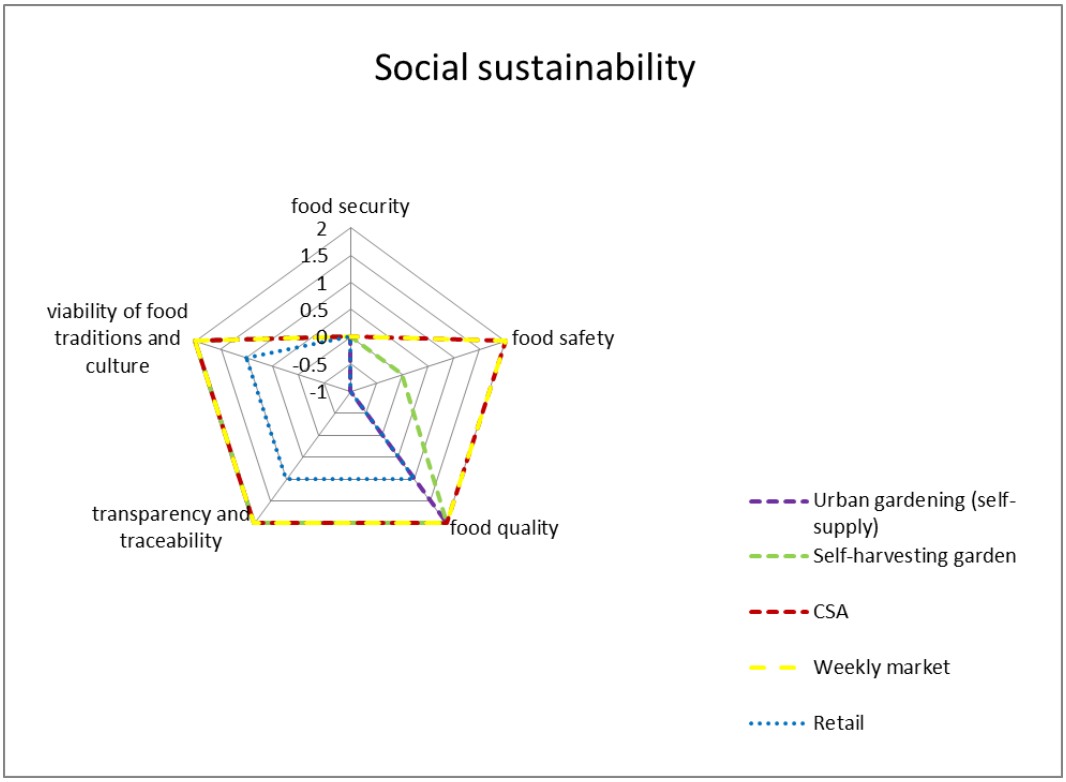

Figure 10. Estimation of the social impacts by each chain actor(s) for his/her chain (1st round, vegetables).

Preliminary results from the workshop and the online survey (pre-test) led us to the assumption, that certain chain types like CSA and direct sales of farmers address sustainability objectives better than other chain types.

6.2 London workshop (update)

6.2.1 Background: SIA Preparation and Implementation

On the 31st of March 2014 the first *FOODMETRES* case study workshop was held in the Town Hall of the London borough of Lambeth. The aim of the SIA (Sustainability Impact Assessment) activity at the Lambeth workshop was to find out how stakeholders rank the impacts of different types of "short food supply chains" and how they compare against the current baseline scenario, where most of the vegetable supply comes from supermarkets, long food chains and large-scale producers.

The impact scale is what participants (citizens, food activists, entrepreneurs, academic experts) would expect to realistically happen if we were to increase the amount of vegetables supplied through the different types of short food supply chains. The time frame for this to happen was set at the workshop at approximately medium term (= 5 years). The potential impacts are therefore relative to the baseline scenario and can be from very negative (-3) to very positive (+3). There can also be no impact (0) or positive and negative impacts may cancel each other out (0). The activity in Lambeth was specifically concerned with vegetable food supply chains and rated five different short food supply chains, namely: CSA, Urban Gardening (commercial), Urban Gardening (self-supply), direct sale off-farm and direct sale on-farm.

6.2.2 Results

The analysis is based on 17 experts (14 participants, three researchers). This is justified as researchers are also stakeholders and experts, but also because the difference in the researcher and stakeholder average was very small (we have calculated both averages and will later discuss one singular clear difference between researcher and participant rating). This result may already show that the method, despite a small sample size, can produce robust results in terms of impact assessment, which will always remain a "forward looking statement" of potential impacts over a medium-term time frame.

The results showed the highest overall impact rating of 1.98 for the short food supply chain 'CSA - Community Supported Agriculture' (Consumer-producer partnerships/cooperatives). This was followed by 'Urban Gardening for commercial purposes' with a rating of 1.8 and 'Urban Gardening for private consumption' and 'Direct sales off farm to private consumer' both with 1.7. The lowest overall rating (1.55) was for the supply chain 'Direct sales on farm to private consumer'.

Table 10. SIA results of London workshop for the different chain types.

Rank	Urban short food chain type	Environmental	Economic	Social	All
1	CSA	1.81	1.83	2.29	1.98
2	Urban Gardening (commercial)	1.69	1.56	2.15	1.80
3	Urban Gardening (self-supply)	1.74	1.05	2.31	1.70
4	Direct sale off-farm	1.51	1.71	1.86	1.70
5	Direct sale on-farm	1.38	1.29	2.00	1.55

All five short food supply chains rated highest on their social aspects of sustainability. The economic and environmental aspects were rated considerably lower with not much difference in economic and environmental impacts. However, there was one notable exception the economic impact of 'Urban Gardening for private consumption' was rated a lot lower than the environmental impact (1.05 economic and 1.74 for environmental).

It is also interesting to note that this was the only major difference where the expert average rating differed clearly from the participants' rating; experts rated the economic impact of 'Urban Gardening for private consumption' a 1.6 while participants only rated it 0.87. This large discrepancy of the sustainable impact of this specific food chain is, no doubt, worth further investigation.

6.2.3 Sustainability profile of food chain types (strength and weaknesses)

In the London workshop the regional stakeholders stated all in all only positive impact for the five considered short chain types. The strength of the chains were assumed clear for the social impacts, especially for food quality, transparency and traceability as well as food security for most of the examined chain types (see Table 11). The highest positive impacts can be noticed for food quality in the case of Urban Gardening for self-supply (value of 2.75) and transparency and traceability for CSA (value of 2.73).

Concerning employment and direct sales on-farm regarding transportation efficiency Urban Gardening for self-supply is considered to weakly contributing to sustainability performance (low positive impact <0.5). In comparison with the international scientific experts in the online survey the London workshop participants have a more positive view on the studied short chain types. Very seldom the participants scored in their single ratings negative impacts at all. And if mainly for the chain type Urban Gardening for self-supply and for the transport efficiency of direct selling on farm. This might be an effect of the different

background (scientists vs. practitioners like urban gardeners and food activists) and the data gathering method (anonymous online survey vs. workshop with direct interaction).

Table 11. London SIA-workshop: Overview about strength (positive impacts) and weaknesses (negative impacts), N=16, 1 participant incomplete).*

	UG self-supply	UG commercial	CSA	DS on-farm	DS off-farm
Env 1.1 Eco-efficiency in abiotic resource use (land/soil, water, nutrients)	1.69	2.00	2.33	1.75	1.94
Env 1.2 Provision of ecological habitats and (agro-) biodiversity	1.81	1.56	2.00	1.56	1.63
Env 1.3 Animal protection and welfare	0.75	0.88	1.20	0.81	0.75
Env 1.4 Reduction of transportation distance [1]	2.06	2.25	1.80	0.94	1.50
Env 1.5 Reduce of packaging[1]	2.38	1.75	1.73	1.81	1.75
Eco 2.1 Employment along the food chain	0.06	1.69	1.60	1.50	1.94
Eco 2.2 Generating income and profitability[1]	0.56	1.38	1.73	1.44	1.75
Eco 2.3 Regional viability and competitiveness	0.56	1.31	2.07	1.75	1.94
Eco 2.4 Transportation efficiency	1.75	1.69	1.60	0.31	1.31
Eco 2.5 Reduction of food loss and waste	2.31	1.75	2.13	1.44	1.63
Soc 3.1 Food safety and human health	1.63	2.00	2.00	2.00	1.81
Soc 3.2 Food quality (freshness, taste, nutritional value)	2.75	2.31	2.47	2.31	2.06
Soc 3.3 Viability of food traditions and culture	2.50	1.75	1.80	1.50	1.44
Soc 3.4 Transparency and traceability	2.56	2.56	2.73	2.44	2.06
Soc 3.5 Food security (availability & accessibility)[1]	2.13	2.13	2.47	1.75	1.94

<0 low negative impact; > 0 and </=1 low positive impact; >1 and </=2 moderate positive impact; >2 high positive impact.

[1] different description of the impact fields in the London case study: Env 1.4 Reduction of transportation distance and emissions, Env 1.5 Recycling and reduce of packaging, Eco 2.2 Generating long-term profitability, Soc 3.5 Food security (availability & accessibility) and food sovereignty

6.2.4 Ranking of the sustainability impact fields according to their impact for vegetable chains

As already discussed the social dimension of sustainability was rated highest across the urban food chains and within 'Social' it was 'Transparency and traceability' (2.46) closely followed by 'Food quality' (2.38) and 'Food security and food sovereignty' (2.09) which came out on top. This was then followed by 'Eco-efficiency of resource use' (1.94) and 'Food safety and human health' (1.89).

Table 12. London SIA workshop: Ranking of the sustainability impact fields according to their impact for vegetable chains.

Rank	Impact field*	Impact (average mean of summarized five chain types)**
1	Soc 3.4 Transparency and traceability	2.46
2	Soc 3.2 Food quality	2.38
3	Soc 3.5 Food security and food sovereignty	2.09
4	Env 1.1 Eco-efficiency of resource use	1.94
5	Soc 3.1 Food safety and human health	1.89
6	Env 1.5 *Recycling and* reduce of packaging	1.88
7	Eco 2.5 Reduction of food waste	1.85
8	Soc 3.3 Viability of food traditions and culture	1.80
9	Env 2.1 Provision of ecological habitats & biodiversity	1.71
9	Env 1.4 Reduction of transport distance *and emissions*	1.71
11	Eco 2.3 *Regional* viability and competitiveness	1.53
12	Eco 2.2 Generating *long-term* profitability	1.37
13	Eco 2.1 Generating employment along the food chain	1.36
14	Eco 2.4 Transportation efficiency	1.33
15	Env 3.1 Animal protection and welfare	0.88

**Different description of the impact fields in the London case study in italic letters.*
***chain types: UG private/self-supply, UG commercial, CSA, DS on-farm, DS off-farm.*

The economic impact was generally rated low: 'Animal protection and welfare' is less applicable to vegetable supply chains and the effects are mainly indirect through low-meat and meat-free diets and their expected effect on demand for low-welfare animal husbandry systems. Therefore, it is concluded that a low impact is expected on transport efficiency in urban short food supply chains. In addition, 'Transport efficiency' also had the lowest rating overall 0.3, and this was for the particular food supply chain of 'Direct off-farm'. In other words, participants appear to agree that the current mainstream of supermarket food supply chain has a relative strength in 'Transport efficiency', especially if compared to other impacts of the current food supply mainstream. Another low impact (0.1) was expected on 'Generating employment along the food chain' for the supply chain 'Urban Gardening (self-supply)'. This may relate to the phrasing of the question 'along the food chain' and may not consider that successes in self-supply can also be classed as part-time self-employment rather than just subsistence.

6.3 Ljubljana workshop (update)

6.3.1 Background: SIA Preparation and Implementation

In the Slovenian case study all chain types for three different commodity groups: pork meat, fruit and vegetable were assessed regarding their potential sustainability. The research team from Ljubljana organized so far three workshops with four different stakeholder groups:

- Monday 28th April 2014: pork chains with 11 participants from pig sector (enterprises, associations and farmers/producers)
- Wednesday 21st May 2014: vegetable with 17 participants (enterprises, urban gardeners, farmers/producers) and fruit sector with 7 participants (enterprises, associations and farmers/producers)
- Thursday 22nd May 2014: Urban gardeners

The Sustainability Impact Assessment (SIA) was applied among 35 participants from the pork, vegetable and fruit sector. The workshop with urban gardeners was used to conduct the survey about Urban Gardening

The SIA exercise started with an explanation of the research aims and of the terminology / expression used before the participants filled in the table on their own. Subsequently a short discussion of 20 minutes about the topic took place. The evaluation of the chain types was based on existing food chains in the Ljubljana region, only the case of the MFC / AgroParks was hypothetical. In comparison with the other case study regions, the first chain type included not only Urban Gardening for self-supply, but also family farming (subsistence), which is not very common in Berlin or London, but typical for many post-socialist countries and African countries. Below we present only the results for the commodity group 'vegetable', the results for the other studied commodity groups (pork and fruit) are part of the Annex VI.

6.3.2 Ranking of food chain types according their overall sustainability performance

According to the Slovenian experts estimations, vegetable food chains with direct consumer-producer-relation (direct sale on-farm, CSA and direct sales off-farm) feature the highest positive sustainability impact (see Table 13). The lowest impacts were expected from MFC/AgroParks and public procurement. Like in the London case study the social and environmental impacts were rated higher than the economic.

Table 13. SIA results of Ljubljana workshop for the different chain types (vegetable).

Rank	Urban short food chain type	Environmental	Economic	Social	all
1	Direct sales on-farm	2.29	1.54	2.04	1.96
2	Consumer-producer partnerships (CSA)	1.82	1.39	1.82	1.68
3	Direct sales off-farm	1.63	1.55	1.64	1.61
4	Urban Gardening/farming for commercial purposes	1.71	1.09	1.47	1.43
5	Urban Gardening/family farming for self-supply	2.21	0.31	1.74	1.42
6	Sale to regional enterprises	0.94	1.42	1.49	1.29
7	MFC/AgroParks	0.81	1.31	1.51	1.21
8	Public procurement	0.32	0.61	0.76	0.57

6.3.3 Differences between commodity groups

The results of the SIA for the three studied commodity groups (pork meat, fruit and vegetable) indicate only little differences between the chain types for pork chain and larger differences for fruit and vegetable chains (see Annex VI). On the other hand the experts for pork gave higher ratings than the other for fruit and vegetable, but this is also the group which has fewer difficulties with the SIA exercise than the other. It is also worth to mention that especially urban / family farming for self-supply has a distinct different sustainability profile than the other chain types for all three commodity groups.

6.3.4 Sustainability profile of the food chain types (strength and weaknesses)

The Slovenian participants of the SIA exercise for vegetable chains estimated predominantly positive impacts, but they rated the impacts more differentiated than the European experts in the online survey and the experts from the London case study. This becomes particular visible for the economic impacts and for the impact field 'reduction of transportation distance' which were assessed as 'very positive' for more chain types. Negative impacts are related to employment and income in the case of Urban Gardening / family farming for self-supply and to the reduction of food waste and loss for MFC/AgroParks and Public procurement. This leads us to the estimation that especially large scale and long (regional) food chains tend to produce more food waste and loss, on conformity with the in the literature claimed contribution of short chains to the reduction of food waste. If and how this is really the case could be an interesting question for further investigations.

Among the chain types ‘public procurement’ is scored with notable low effects in most of the impact fields. We assume that the recent chain organisation is not favourable to reach a more sustainable mode of urban food provision at the moment. But because of the high relevance of public procurement in the urban food system (demand for food products, amount of prepared food, number and diversity of supplied consumers etc.) the potential impact on sustainability of the food system could be very high.

As strengths of the studied chain types, we can identify the reduction of transportation distance (type a-d), the potential to generate income and profitability (type d-g) and enhancing viability of food traditions and culture (type a, d, e). The highest positive impact (value of 2.65) feature Urban Gardening / family farming for self-supply, because of the potential to reduce packaging (environmental impact) and direct sales on-farm related to food quality (social impact).

6.3.5 Ranking of the sustainability impact fields according to their impact for vegetable chains

As already mentioned the social dimension of sustainability was rated highest across the urban food chains, followed by the environmental and economic dimension. Within this dimension ‘food quality’ (1.79) closely followed by ‘viability of food traditions and culture’ (1.74) are estimated to have the highest benefits. The impact field ‘food safety’ ranks on the fifth position. The lowest social impact was rated for ‘food security’ on rank 11.

Concerning environmental sustainability the ‘reduction of transportation distance’ features the highest impact (1.72). This is decoupled from transportation efficiency of short food chains with a comparable low positive impact (1.32). The other environmental impact fields rank on a medium level. The examined food chains have low impacts on the economic situation. They are considered to improve income and profitability with a relative high impact value of 1.63, but other aspects are addressed only marginal in comparison with the baseline scenario. The notable low impact regarding the reduction of food waste can be explained with the inclusion of large scale chains like MFC and public procurement into the SIA, which account negative effects (see Table 14)

Table 14. Ljubljana SIA-workshop: Overview about strength (positive impacts) and weaknesses (negative impacts) of different vegetable chains (N=17, for AgroParks and impact field 1.3 Animal protection and welfare N=16).*

	UG self-supply / family farming	UG commer-cial	CSA	DS on-farm	DS off-farm	Sale to regional enter-prises	MFC/ AgroParks	Public procure ment
Env 1.1 Eco-efficiency in abiotic resource use	2.06	1.59	1.88	2.35	1.65	1.18	1.00	0.41
Env 1.2 Provision of ecological habitats and (agro-)biodiversity	1.94	1.71	1.82	2.18	1.41	0.76	1.13	0.29
Env 1.3 Animal protection and welfare	1.80	1.20	1.80	2.00	1.27	0.53	0.93	0.20
Env 1.4 Reduction of transportation distance	2.59	2.24	2.18	2.47	2.00	1.35	0.44	0.53
Env 1.5 Reduction of packaging	2.65	1.82	1.41	2.47	1.82	0.88	0.56	0.18
Eco 2.1 Employment along the food chain	-0.76	1.06	1.18	1.06	1.53	1.59	2.56	1.41
Eco 2.2 Generating Income and Profitability	-0.29	1.12	1.71	2.29	2.18	2.35	2.44	1.24
Eco 2.3 Rural viability and competitiveness	0.35	0.76	1.65	1.76	1.94	1.29	0.75	0.35
Eco 2.4 Transportation efficiency	1.06	1.41	1.53	1.59	1.65	1.53	1.13	0.65
Eco 2.5 Reduction of food loss and waste	1.18	1.12	0.88	1.00	0.47	0.35	-0.31	-0.59
Soc 3.1 Food safety and human health	1.59	1.53	1.94	1.88	1.65	1.53	1.63	0.94
Soc 3.2 Food quality (freshness, taste, nutritional value)	2.47	1.88	2.00	2.65	1.82	1.65	1.31	0.53
Soc 3.3 Viability of food traditions and culture	2.53	1.65	1.82	2.41	2.06	1.29	1.56	0.59
Soc 3.4 Transparency and traceability	1.35	1.18	1.88	1.88	1.12	1.59	1.44	0.76
Soc 3.5 Food security (availability and accessibility)	0.76	1.12	1.47	1.35	1.53	1.41	1.63	1.00

<0 low negative impact; > 0 and </=1 low positive impact; >1 and </=2 moderate positive impact; >2 high positive impact.

Table 15. Ljubljana SIA workshop: Ranking of the sustainability impact fields according to their impact for vegetables (N=17, for AgroParks and impact field 1.3 Animal protection and welfare N=16).

Rank	Impact Field	Impact (average mean of eight chain types)*
1	Food quality (Freshness, Taste and Nutritional value)	1.79
2	Viability of food traditions and culture	1.74
3	Reduction of transportation distance	1.72
4	Generating Income and profitability	1.63
5	Food safety and human health	1.59
6	Eco-efficiency in abiotic resource use (land/soil, water, nutrients)	1.51
7	Reduction of packaging	1.47
8	Provision of ecological habitats and (agro-)biodiversity	1.41
9	Transparency and traceability	1.40
9	Transportation efficiency	1.32
11	Food security (availability and accessibility of food)	1.28
12	Animal protection and welfare	1.22
13	Generating employment along the food chain	1.20
14	Rural viability and competitiveness	1.11
15	Reduction of food loss and waste	0.51

**chain types: UG self-supply/ family subsistence farming, UG commercial, CSA, DS on-farm, DS off-farm, sale to regional enterprises, public procurement, MFC/AgroParks*

6.4 Nairobi workshop (update)

6.4.1 Background: SIA Preparation and Implementation

The SIA session was held in Makadara sub-county, Nairobi City County on the 26th June 2014 with 24 urban farmers and officials from the Ministry of Agriculture. Our main concern when planning for and actually carrying out the Sustainability Impact Assessment (SIA) activity was the low literacy levels of the participating urban farmers (most of them were semi-illiterate), and more so, how to make them understand the terminologies and concepts. The implication of this was that the participating urban farmers could not fill in the forms on their own and therefore required some assistance. As such, and given the number of farmers we expected (about 30 of them) and our intention to carry out the exercise in groups of five or six farmers, we recruited and inducted some post-graduate students from the Department of Geography and Environmental Studies to assist the research team in explaining to the farmers the various concepts in the language they could understand best and in guiding the farmers through the exercise of filling in the forms.

We started off by explaining to the farmers about what the SIA exercise entailed, and with their participation we established the baseline scenario for Nairobi vegetable supply against which the sustainability impact of the various food chain types would be assessed. Most vegetable supplies in Nairobi emanate from individual farmers from the rural hinterland and reach Nairobi vegetable markets through an elaborate logistical organization, involving many actors along the chain as well as a series of packaging and repackaging and, owing to poor transport network, this leads to wastages and spoilages. The majority of the urban residents get their vegetable supplies either directly from the vegetable markets or from grocery kiosks or vegetable vendors in their neighbourhoods. Only a small population source their vegetable supplies from the supermarket chains (baseline scenario).

After a pre-SIA session about the baseline scenario and organization of different commodity chains in Nairobi region, we highlighted to the participants the three main impacts associated with urban farming within the city boundaries (as alternative to baseline scenario) – namely, environmental, economic and social impacts – and opened a general discussion on the same. The participants listed the environmental, economic and social significance of urban farming, which are presented in Table 16.

Table 16. Perception of the Nairobi workshop participants about the environmental, economic and social relevance of urban farming.

Sustainability Dimension	**Impacts**
Environmental	• It makes the environment green. • Animal wastes can be used to produce manure by recycling, thus reduces urban wastes. • Promotes bio-diversity whereby crops are grown alongside trees and rearing of livestock on the same farm. • Reclamation and use of waste land. • Reduces the urban heat effect
Economic	• Income from selling the crops. The selling of farm products takes place mostly on-farm. • Creation of jobs. Some farmers have employed people on casual and permanent basis, and others consider urban farming a form of self-employment. • Saves on food expenditure.
Social	• Cultivation of ornamental crops for therapeutic reasons • Reduced crime and insecurity because the idle youth engage in constructive activities • Medicinal value. • Environmental education • Improving nutrition standards • Food security at household and community level • Social support (as was the case with a group of farmers with disabilities).

For purposes of the SIA exercise, both the farmers and non-farmers were segregated and split into groups of five to six persons each, to discuss and fill the Sustainable Impact Assessment form. The four main groups of participants included: (1) individual urban farmers; (2) self-help groups of farmers; (3) institution-based urban farmers, and (4) government officials from the Nairobi City County's Department of Agriculture and Livestock. All the groups had a mixture of livestock keepers and agriculturalists.

Each group was guided through the process of filling in the SIA forms, although even among the literate participants (e.g. agricultural officials), some of the terms like "traceability" were noted as being difficult to grasp and explain. Other terms where participants had problems were "ecological", "abiotic", "viability" and "competitiveness". This group of literate participants too, was guided in completing the SIA forms.

In difference to the European case study regions, Kenyan experts assessed instead of type c ('CSA') another type, namely community-based urban agriculture ('CBA'- understand as a solidarity group of farmers for poverty reduction in urban area), because the model of community supported agriculture (CSA) as a solidarity based consumer-producer-partnership between mainly urban consumers and rural producers is not prevalent in Nairobi. All assessed chain types are related to vegetable production and distribution within the city boundaries of Nairobi (incl. Makadara sub-county).

6.4.2 Ranking of food chain types according to their overall sustainability performance

All five vegetable chains assessed by Kenyan experts rated highest in their social aspects of sustainability. Overall, per food chain type, Urban Gardening for self-supply had the highest positive impact with an average mean of 2.11 (see Table 17). This was followed by Urban Gardening for commercial purposes (2.04) and closely related to this, direct sales on-farm (1.96).

The results show than urban farming for self-supply in Nairobi has a quite low positive economic, but a high social impact. This can be explained by that most urban farmers in Nairobi do not practice UG for commercial purposes, rather for social reasons associated with first, food quality, followed by safety and health, security and sovereignty), transferability and traceability, as the detailed analysis of the different impact fields demonstrate. However, whenever there is surplus, the urban gardeners sell the extra produce for generating and boosting their income. Thus, the commercial aspect is very small scale, happens on the farm and to regular established clients, mostly neighbours from the surrounding region, and other well established clients.

Table 17. SIA results of the Nairobi workshop for the different chain types (vegetable).

Rank	Urban short food chain type	Environmental	Economic	Social	All
1	Urban Gardening (self-supply)	2.11	1.86	2.37	2.11
2	Urban Gardening (commercial)	1.90	2.11	2.12	2.04
3	Direct sales on-farm	1.73	2.00	2.14	1.96
4	Direct sales off-farm	0.80	1.73	1.77	1.44
5	Community-based urban agriculture (CBA)	1.15	1.40	1.68	1.41

Urban Gardening (self-supply): N=21; Urban Gardening (commercial): N=22; Direct sales on-farm: N=24; Direct sales off-farm: N=19; CBA: N=20.

Direct sales off-farm and community-based urban agriculture (CBA) scored comparable low overall sustainability impacts. The low ranking for the former relates to the fact that off-farm sales has only limited relevance for urban farmers in Nairobi, who sell mostly to immediate neighbours and well-established regular clients. For the second chain type of community-based farming (Nairobi's variant of CSA) should be mentioned that this model is still a relatively new phenomenon in the city and as such it could be assumed that its real impact has yet to be felt, more so given that most of the participating groups had been in existence for only short periods and were still in the process of establishing themselves as serious farming groups. So we assume the low scores of off-farms sales and CBA are

influenced to some extent by the limited experience of the experts with these two models of urban farming.

The lowest sustainability impact was rated for the environmental dimension, for nearly all the food chain types. However, Urban Gardening for self-supply scored slightly higher here than the economic dimension. All in all, the lowest score, direct off-farm (0.8) came from the group. In comparison with the other case study regions, the economic impacts were rated higher than the environmental in Nairobi. This results amongst other from a higher importance of urban food chains for the creation of employment opportunities especially for young people

6.4.3 Sustainability profile of food chain types (strength and weaknesses)

Table 18 presents the assessment results from the Nairobi case study for each urban food chain type. The experts expect for all chain types positive impacts on sustainability in comparison with the baseline. Like in the London case study only a few respondents gave negative ratings at all and if so, mainly for the environmental and social impact fields and the chain type 'direct sales off-farm'.

As strengths (high positive impacts) we can identify 'food quality' (all chain types except CSA), 'food safety' and 'food security' as well as 'reduction of food waste and loss' (type a, b and d). This was expected given the transport inefficiencies and multi-actor logistical organization along the vegetable supply chain that result into spoilages, waste and loss; and given the large proportions of income spent on food by the urban poor, as well as widespread concerns about the possible use of untreated waste water and sewage for vegetable production in some parts of the city.

The generation of employment is more related with direct sales on- and off-farm and commercial oriented Urban Gardening, and is seen mostly in terms of self-employment for urban farmers, keeping vegetable vendors in business and, to some extent, providing on-farm employment for some unemployed youths. Urban Gardening and on-farm sales also registered a higher impact on income and profitability of the producers. Interestingly Urban Gardening for self-supply is seen as very efficient in the use of abiotic resources in Nairobi (like in Ljubljana), whereas the European experts in the online survey and the London case study came to a different estimation. While this may be atypical of urban farming in Kenya more generally, this finding in the particular case of Nairobi's Makadara sub-county could be explained in terms of the involvement of agricultural extension service personnel who, among other things, educate urban farmers on the adoption of sustainable farming methodologies including recycling of waste, composting, etc. The Nairobi people seem to also attribute food production in urban areas stronger with the provision of ecological habitats than the European. This might be a result of the more general positive impact rating in Nairobi or the fact that in the densely populated Nairobi region green (production) space is of great value for the inhabitants.

Table 18. Nairobi SIA-workshop: Overview about strength (positive impacts) and weaknesses (negative impacts).

	UG self-supply	UG commercial	Community based urban agriculture	DS on-farm	DS off-farm
Env 1.1 Eco-efficiency in abiotic resource use (land/soil, water, nutrients)	2.57	2.00	1.25	2.21	1.00
Env 1.2 Provision of ecological habitats and (agro-) biodiversity	2.29	2.05	1.30	1.79	0.83
Env 1.3 Animal protection and welfare	1.76	1.86	1.30	1.46	0.74
Env 1.4 Reduction of transportation distance	2.29	1.86	1.00	1.88	0.61
Env 1.5 Reduction of packaging	1.67	1.73	0.90	1.33	0.83
Eco 2.1 Employment along the food chain	1.76	2.14	1.85	2.13	2.21
Eco 2.2 Income and profitability for chain actors	1.76	2.18	1.25	2.21	1.84
Eco 2.3 Rural viability and competiveness	1.71	2.05	1.25	1.71	1.68
Eco 2.4 Transportation efficiency	1.48	1.73	1.00	1.54	1.22
Eco 2.5 Reduction of food loss and waste	2.57	2.45	1.65	2.42	1.71
Soc 3.1 Food safety and human health	2.71	2.38	1.90	2.67	1.79
Soc 3.2 Food quality (freshness, taste, nutritional value)	2.81	2.52	1.95	2.50	2.16
Soc 3.3 Viability of food traditions and culture	1.81	1.52	1.20	1.67	1.33
Soc 3.4 Transparency and traceability	2.00	1.86	1.55	1.79	1.79
Soc 3.5 Food security (availability and accessibility)	2.52	2.33	1.80	2.08	1.79

<0 low negative impact; > 0 and </=1 low positive impact; >1 and </=2 moderate positive impact; >2 high positive impact. Urban Gardening (self-supply): N=21; Urban Gardening (commercial): N=22; Direct sales on-farm: N=24; Direct sales off-farm: N=19; community-based urban agriculture: N=20.

6.4.4 Importance (ranking) of the different impact fields

As mentioned before, positive sustainability effects were assumed mainly for social and economic aspects than for environmental. The highest value within social sustainability sub-dimension was rated for food quality 'freshness, taste and nutritional value' at (2.39), followed by 'food safety and human health' at (2.29). This concurs with the fact that most urban farmers start growing their own food to save income, and in the process, they ensure the quality and safety of the food. Thus, when they expand to selling to outsiders, they usually have already set the standards. For their well-known clients, the comfort of buying the food knowing the source has a high impact. This is because the food in the small

groceries stores comes from vegetable markets far away and usually has the lowest quality vegetables. The third highest score in the social dimension was 'food security and availability' at (2.11) followed by 'transparency and traceability' scoring (1.80). 'Viability of food traditions and culture' scored lowest (1.51), in part because urban residents mostly grew 'exotic' vegetables and continued to rely on rural supplies for 'traditional' vegetables. However, this was still a higher impact than some of the items in the economic and environmental dimensions.

Along the three sustainability dimensions, participants perceived the economic impacts of vegetable farming higher than the environmental impacts. The highest economic impact was the 'reduction of food loss and waste along the food chain' (2.16). This was followed by 'generating employment along the food chain' (2.02). Many unemployed youth had got opportunities either as farmers themselves or as casual employees for other urban farmers. For many who engaged in urban farming, 'generation of income and profitability' scored high at (1.85). The lowest impact was 'enhancing transportation efficiency from producer to consumer' at (1.39), with 'enhancing rural viability and competitiveness' scoring higher at (1.68).

The economic impact of farming in the urban area on transportation on transportation efficiency does not seem to be much in the Nairobi Case Study. Reliance on motor vehicles coupled with poor road infrastructure, connectivity and networks make transportation of food inefficient even for short distances.

The item that received the highest score for the environmental dimension from the respondents of the vegetable commodity questionnaire was 'Eco-efficiency in abiotic resource use' (1.81). This was followed by 'enhancing provision of ecological habitats' (1.65) and 'reduction of transportation distance' (1.53). The lowest impact was the 'reduction of packaging costs' (1.29). This can be explained by the fact that packaging materials and cost increase with selling of smaller quantities. 'Animal protection and welfare' had a slightly higher impact (1.42) than 'reduction of packaging costs', because the organic vegetable and crop waste is usually used by the urban farmers to feed their animals and save costs. This practise is also a way to manage waste and close the cycle for materials.

The environmental impact of reducing transportation distance did not have a high impact as we thought it would, maybe because of transport connectivity and road network inefficiencies in Nairobi, even for short distances, which force people to rely on motor vehicles. It may also be attributed to the fact that the various short food chain types could not meet the urban vegetable demand so that the urban residents continued to rely on food supplies from the rural areas.

Table 19. Nairobi SIA workshop: Ranking of the sustainability impact fields according to their impact for vegetable chains.

Rank	Impact field*	Impact (average mean of five chain types)**
1	Food quality (freshness, taste and nutritional value)	2.39
2	Food safety and human health	2.29
3	Reduction of food waste and loss	2.16
4	Food security (availability and accessibility of food)	2.11
5	Generating employment along the food chain	2.02
6	Generating Income and profitability	1.85
7	Eco-efficiency in abiotic resource use (land/soil, water, nutrients)	1.81
8	Transparency and traceability	1.80
9	Rural viability and competitiveness	1.68
9	Provision of ecological habitats and (agro-)biodiversity	1.65
11	Reduction of transport distance	1.53
12	Viability of food traditions and culture	1.51
13	Animal protection and welfare	1.42
14	Transport efficiency	1.39
15	Reduce of packaging *costs*	1.29

** Different chain types and definitions in the Nairobi case study in italic letters.*
***chain types: UG self-supply, UG commercial, community-based urban agriculture, DS on-farm, DS off-farm*

6.5 Synthesis: Comparison between Expert survey and Regional Case Study Workshop Results

The comparison between the results from the expert survey and the various regional workshops in London, Ljubljana and Nairobi (Berlin has been excluded due to methodological differences), which is presented in the figures 11 to 25, reveals substantial differences of the perceived contribution of Short Food Chains (SFC) to sustainable food supply in Metropolitan regions despite the consensus about the existence of a positive impacts. Generally, it occurs that participants in the regional workshops have a significantly more positive perspective towards SFCs in comparison to conventional food chains. This is hardly surprising, as there to a large extent activists and stakeholders directly involved in regional food supply, having close insights and sharing more direct experiences with the effects of SCF, whereas among academic experts at least neutral perspectives prevail. The differences are particularly obvious among social impact areas, such as food safety and health, food security and employment, but also for some economic (e.g. employment) and

environmental (e.g. provision of ecological habitats) aspects. Much more consensus exists, in contrast, for other impacts areas, such as reduction of packaging, improvement of transparency and traceability as well for rural viability to some extent. Regarding the different food chain types, similarly results have been obtained for on-farm direct marketing and Community Supported Agriculture (CSA). The highest discrepancy between the workshop and expert survey results exist for the SFC types of urban gardening, both for self-supply and commercial purpose. Here the workshop participants considered a much higher (positive) contribution in most of the impact areas.

Differences exist not only between expert opinions and those of regional food stakeholder and activist, but also across the regional workshops. In the Nairobi case short food chains are considered to generally contribute positively to sustainable food supply throughout all impact areas. Especially economic categories, such as employment, income generation and economic viability as well as social aspects such as food safety and security are ranked substantially higher than in the other regional case studies and expert survey. These results need to been seen against the background of the regional socio-economic situation. Here concepts of (´traditional´) regional and short food supply are playing a more serious role in addressing issues such as food security and employment, especially for the urban poor, whereas supermarkets connected with longer chains and international products are the source of supply for the middle class. In this sense, particularly the high appreciation of both forms of urban gardening (self-supply and commercial) is reasonable.

The Ljubljana workshop identified the highest sustainability contributions by the rather agri-business types of SFC, like Metropolitan Food Clusters (MFC) or the direct sale to regional companies. Also on and off-farm direct marketing was seen important in some impact areas. Compared to the other workshops, from the Ljubljana perspective, reduction of packaging and transport distance, animal protection and viability of food traditions are relatively more important than in the other cases. In contrast, the reduction of food waste, food security as well as transparency / traceability play a less important role.

In terms of food chain differences, the participants in the London workshop considered comparably strongest positive contribution by CSAs as well as forms of Urban Agriculture. Direct marketing schemes, however, are seen much less important for sustainable development, while MFC and direct sale to companies have not been discussed here at all. Particularly food quality, transparency and traceability and (a bit surprisingly) food security represent the impact fields, where SFCs contribute most. Animal protection, income and profitability play are least important.

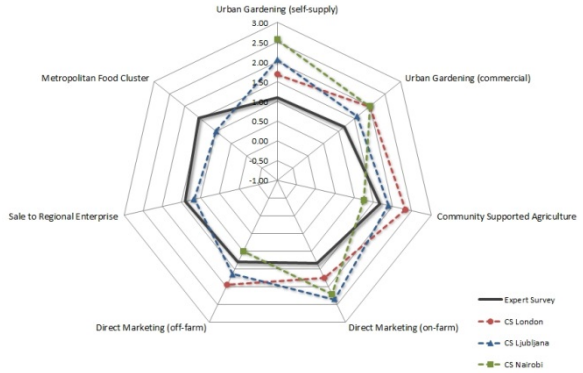

Figure 11. Env 1.1 Eco-efficiency in abiotic resource use (land/soil, water, nutrients).

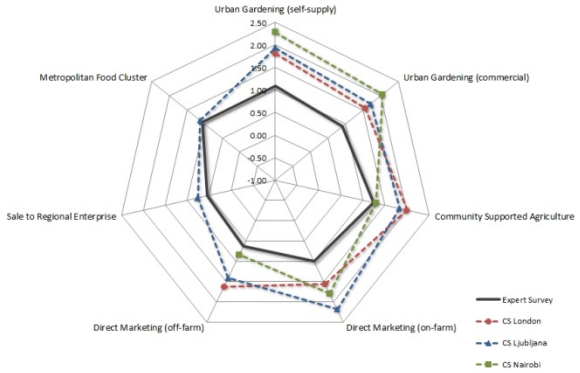

Figure 12. Env 1.2 Provision of ecological habitats and (agro-)biodiversity.

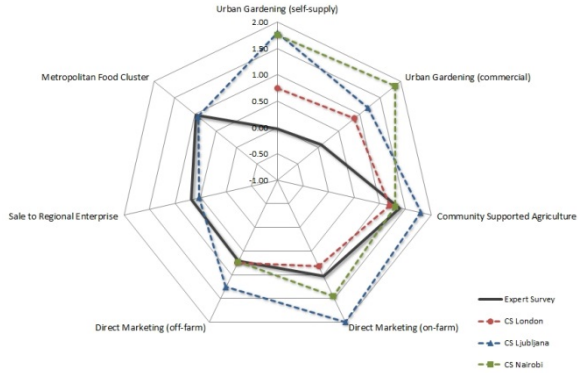

Figure 13. Env 1.3 Animal protection and welfare.

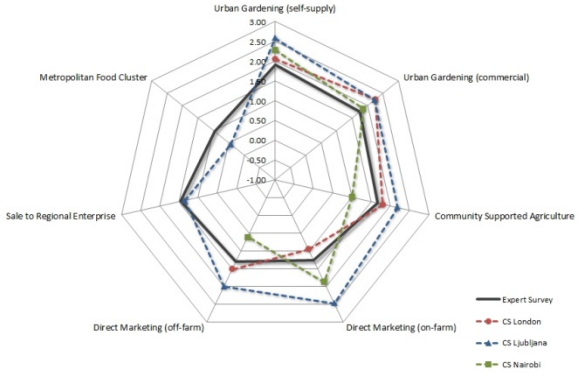

Figure 14. Env 1.4 Reduction of transportation distance.

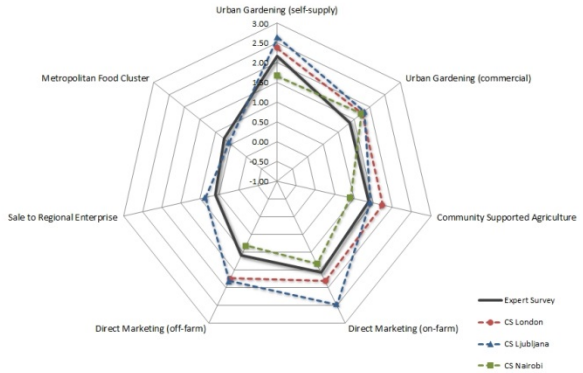

Figure 15. Env 1.5 Reduction of packaging.

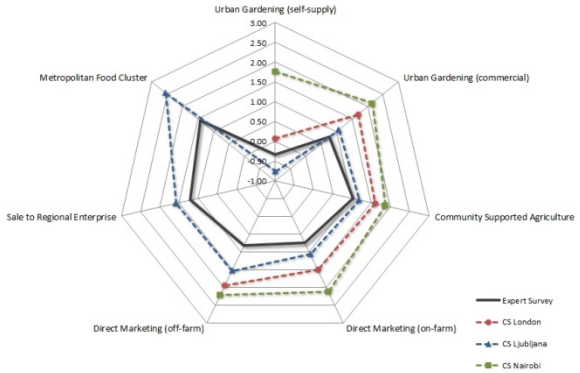

Figure 16. Eco 2.1 Employment along the food chain.

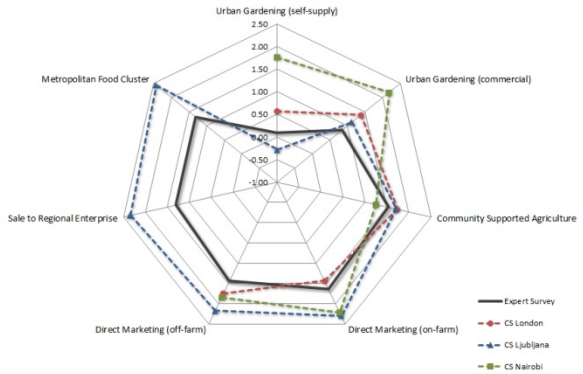

Figure 17. Eco 2.2 Generating income and profitability.

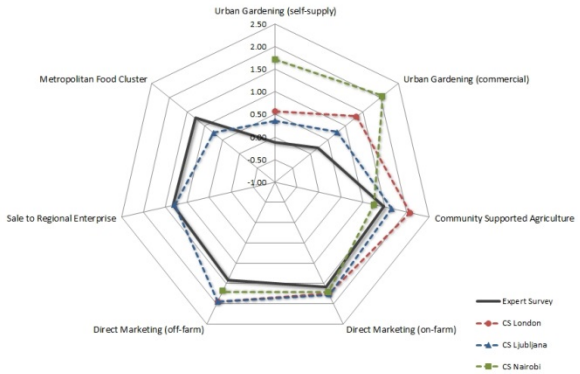

Figure 18. Eco 2.3 Rural viability and competitiveness.

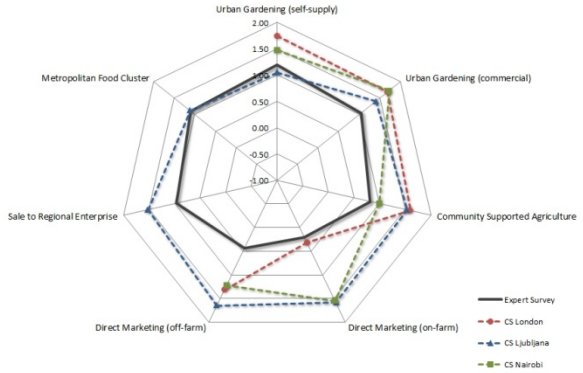

Figure 19. Eco 2.4 Transportation efficiency.

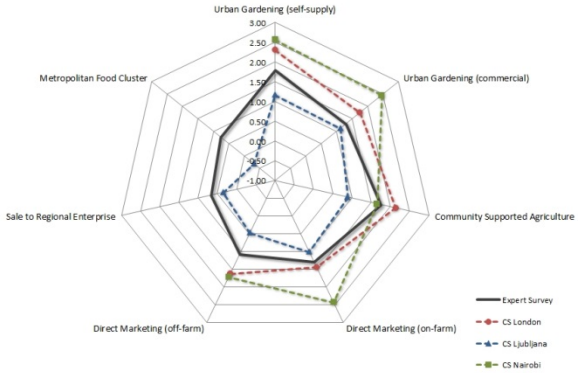

Figure 20. Eco 2.5 Reduction of food loss and waste.

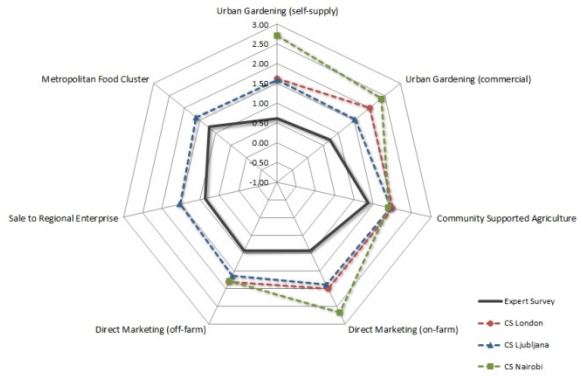

Figure 21. Soc 3.1 Food safety and human health.

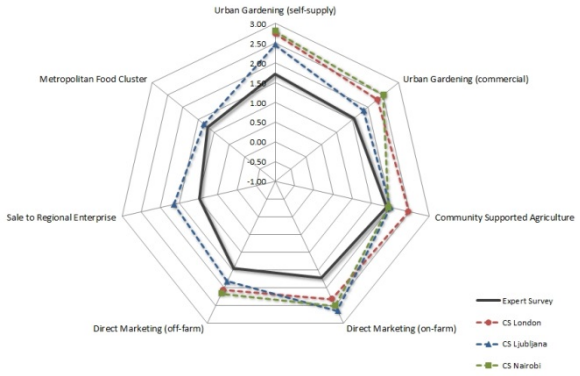

Figure 22. Soc 3.2 Food quality (freshness, taste, nutritional value).

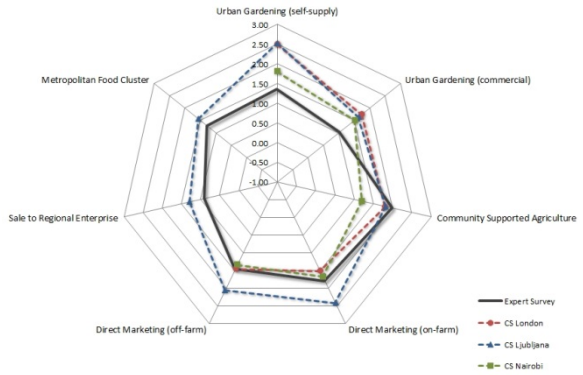

Figure 23. Soc 3.3 Viability of food traditions and culture.

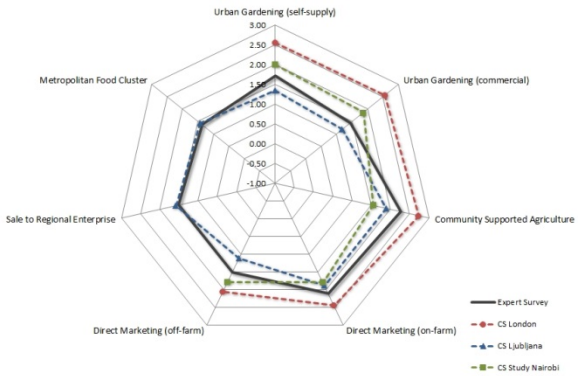

Figure 24. Soc 3.4 Transparency and traceability.

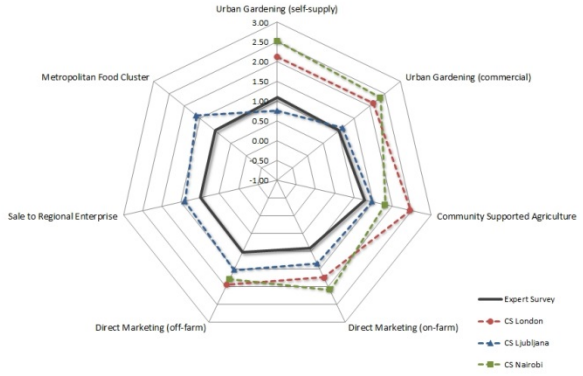

Figure 25. Soc 3.5 Food security (availability and accessibility).

6.6 Experiences with SIA implementation in the online survey and the case study regions (update)

The *FOODMETRES* SIA approach was new developed following the requirements in the *FOODMETRES* project but aiming at a general applicability to asses systematically the sustainability impacts of different food chains types and commodity groups. We found it also a good discussion tool in local governance and decision making processes and tested it therefore in the workshops. The (self-)assessment procedure can be a valuable step for actors in the a food chain or a regional food system when engaging into a forward-looking exercise at which end new ways of cooperation, self-critical reflection, openness for innovation, a new look at future opportunities, new capacities when dealing with sustainability along the food chain are the objectives.

The SIA was conducted for chain types without a regional context (online survey) and for concrete chains in their regional setting (SIA workshops in case study regions). The chain typology was feasible and could be adapted to regional conditions, if necessary (e. g. family subsistence farming in Slovenia). Nevertheless the SIA has also some weaknesses which evoke some criticism by the participants.

Some European experts in the online survey found the topic and the research questions valuable. Critical feedback concern the questions (1.) how the different chains types are organized in practice (intensity of production, chain organization etc.) and their regional setting, which might lead to different evaluations and (2.) the relation between the actual impact and the potential / future relevance/impact on the food system. One expert made the suggestion also to focus on the aspect of soil fertility (e. g. compost, recycling). Beside this, data analysis reveals that the participants had some difficulties to assess the impact of animal health and welfare and of MFC/AgroParks. Here they more often gave no answer.

The feedback during the Berlin pilot workshop to the SIA was very good and the research team found it a useful tool for a structured discussion. The participants got a comprehensive overview about impact assessments, the chain typology and the research objectives before they started with the SIA. The only difficulty they have had concerned the aspect of ‘food security’ which was hard to estimate for the workshop participants.

In the London case study the general feedback of the exercise was positive, however it took quite some time to explain the concept and for an evening activity it requires very active participation and brainpower from the participants. Some participants did clearly not quite understand the conceptual framework for the exercise and produced invalid responses or, in one case, rated all with 3 = very positive (this response, we have nevertheless included in the analysis, despite the lack of discrimination in rating from one person point of view regarding the impacts). Further feedback was a certain randomness of the questions and the definitions. Participants wanted to know more detail on how we had come up with the

selected indicators. Our participants also asked what the time frame was (next 5-10 years or 50 years?) and suggested that this should be made clear in the document. Verbally at the meeting we suggested to them to settle on medium term = 5-years. In addition, there was also some disbelief (and/or underlying mistrust) why an EU funded project would want to collect such information, and why "normal" citizens were asked to voice an opinion on such an issue anyway. Despite all this, all participants managed to fill in the rating and following on from this had a lively discussion in each group on why and how they have rated the impacts like they did. This really focused the discussion and also led to the discussion of different worldviews.

The research team from Ljubljana used the experiences and material (workshop templates) from the London team and adapted it to their needs. Participants with professional background (big producers from pig, fruit and vegetable sector) in the agri-food business had no problems with understanding the SIA table, whereas the urban gardeners (even highly educated) had similar problems as in London as they are not familiar with food chain type terminology. The activity and template therefore needed a lot of explanation. On some tables, discussions were around definitions and the purpose of the activity rather than focusing on the activity. The workshops participants liked most the presentation of the guest speaker and the discussion about SIA and short food chains after the exercise. The discussion on types of food chains and which type is the best was turbulent and pointed to the powerlessness of producers in the race with supermarket chains. It was recognized by the research team that they needed to link the workshop activities with the project research questions and the relevance to the EU and communicate is to the participants.

The major challenge for the Nairobi research team was the literacy level of the workshop participants, because a lot of urban farmers in the case study region are semi-illiterate. Therefore a lot of preparatory work and guidance was necessary. Students from the department helped with the SIA exercise by translating, explaining and filling in the English SIA form. Nonetheless even the experts (e. g. government officials) had some difficulties with the used terms and concepts.

As far as the conditions and the background of the participants (Berlin, Ljubljana, Nairobi: food chain actors and other stakeholders, London: urban gardeners, food activists) in the SIA were workshops were not the same, the results cannot compared directly. But results show some tendencies which were visible also in the expert based online survey.

From the made experiences we conclude, that the application and explanation of the SIA needs to adapt to the previous knowledge and literacy level of the workshop participants. It should be presented in their project and political context and applied in a more interactive manner.

The case of Nairobi demonstrates furthermore that participants would have chosen different impact fields in order to assess the sustainability impacts of food chains. Some of

the participants from London also criticized the scientific top-down approach. But a participatory process in each case study region for the development of a common sustainability assessment framework would have not been feasible in the given time for this work package. Apparently larger differences between the urban food systems in Kenya and the European countries exist, which would lead to another target system for sustainability and therefore to another set of relevant impact fields for assessing.

6.7 Sustainability Impact Assessment (SIA) of short food chains: Final results and discussion (update)

Claims about the environmental, economic and social impacts are numerous in the literature, but seldom proved by empirical research. The majority studies which support evidence are case studies from different regions and countries often based on qualitative estimations, representing the perception and experiences of farmers or consumers etc. (Kneafsey et al. 2013).

The SIA in the *FOODMETRES* project brings in a new facet into this kind of qualitative studies by the assessment of a common set of sustainability aspects for different food chain types, approved and applied by scientific experts at European level (without regional context) and regional stakeholders and practitioners in case studies.

The SIA presented in this report can be understood as a pilot study testing another methodological approach. We are aware that the general estimations about possible impacts represent the perception and opinion of experts and are related with "uncertainties" and the "real" impacts depend on various different factors including: scale, product, location and chain organization etc., but we can contribute some new knowledge to the existing short food chain research.

All in all, the studied short and long regional food chains types account mainly for positive impacts in comparison with the conventional global long food chains. As whole they were associated particularly with benefits for society and environment. The different chain types feature quite specific sustainability performance profiles.

From this one might conclude that these types are more or less feasible to achieve a more sustainable food system, but some of the chain types currently have only little relevance (number of involved consumers and farmers, amount of supplied food etc.) like consumer-producer-partnerships or they exist only as prototype (MFC). So the overall effect on the existing food system would be marginal. The relevance of these short food chains reside in the fact that they offer a variety of alternative models and pathways for urban food supply which might contribute to more resilient urban food systems in future. The studied

chain types differentiate in their potential to address certain policy targets like biodiversity, rural development or employment etc.

Alternative food chains tend to rely on diversified agricultural activities and products as well as ecologically sound farming practices (like organic production or permaculture). They can provide ecological habitats and can contribute towards (agro-) biodiversity. Based upon the results of the SIA the potential impact seems to be moderate and not only related to small alternative chains, but also to large scale efficient production modes like assumed for MFC.

For example, many studies suggest that short food chains can contribute towards rural development and generate employment opportunities (e. g. Karner 2010, Kneafsey 2013). The results from the *FOODMETRES* SIA confirm with this, but also show that the expected benefits for regional chains as whole are comparable low. They differ across the seven chain types and the scorings by different expert groups (e. g. scientists, practitioners).

Several authors (e. g. Roep & Wiskerke 2006, Chiffoleau 2009) point out that additional income and employment opportunities in regional food production, processing and distribution were generated through localized food supply and regional marketing.

Results from in the online survey and the Ljubljana case study show interestingly that strongest employment effects were assumed for the Metropolitan Food Cluster (MFC) – a chain type which is characterized by large scale intensive (regional) production and distribution. We expected the employment effect rather for small-scale “alternative” food chains, which tend to apply more labour-intensive practices in production. Otherwise such chains like community supported agriculture or urban agriculture combine often paid and non-paid or volunteer work and may even substitute paid employment. Nevertheless they also offer opportunities for new entrants to agriculture and horticulture and paid work in production and downstream branches (e. g. restaurants, shops), respectively (Saltmarsh 2011).

Another remarkable result is the acknowledgment that short food supply might lead to a reduced transportation distance on the one hand, but also possess some inefficiency depending on the scale and mode of transport on the other hand (see e. g. Coley 2011, Blanquart 2010). Especially the chain types, where the place of production is located in the peri-urban or rural area (CSA, direct marketing) feature some weaknesses in the transportation efficiency in comparison with large scale conventional chains, which reached their maximum efficiency (Blanquart 2010) or MFC/ AgroParks.

Chain actors (producers, consumers) and policy makers should be aware of the logistic leverages of SFC and should try to find solutions in order to improve the sustainability performance in the field of logistics. Beside this, production in the urban space (Urban Gardening for self-supply and commercial) offers some interesting options.

In the perception of the experts the strength of regional and short chains consists in their transparency and traceability. They were related with a good quality, but notable not necessarily with food safety (defined as absence of pathogens and pollution in the food and compliance with legal limits). Here the academic experts in the online survey score relative low positive impacts, while the regional experts (stakeholders) connect SFC with a more positive effect on food safety. As far as the aspect of food safety of short food chains has been studied rarely and as the previous knowledge of the respondents is different, the results should be interpreted carefully.

Generally, food safety in SFC is covered by the same regulations as for food production in conventional large scale chains (see also FOOMETRES deliverable 3.2), but SFC feature certain strengths and weaknesses related to their chain characteristics:

Advantages:

1. Reduced risk for the introduction of certain microbiological hazards due the local sourcing of inputs and local processing (e. g. on the farm)
2. Good microbiological quality and safety due short time storage (short and direct link between production, distribution and consumption)
3. Larger responsibility and commitment due personal contact between producer and consumer and shared values

Disadvantages:

1. Risk of (cross) contamination of end productions, because of the transfer from pathogens from animals, if production, processing and distribution takes place on the same site or close neighbourhood (especially farms with animals and fresh plant produce through contaminated irrigation water).
2. Lack of adequate food safety knowledge in small food enterprises (no specialized personal)
3. Challenges for food safety for temporary food services (like farmers markets) regarding facilities for washing, disinfection and cooling capacity etc.
4. Non-sufficient risk awareness of employees
5. Relative high costs for microbiological testing for small scale producers

Also the experts in the SIA online survey gave divergent estimations. CSA representing small scale production and MFC representing a large scale type got both a higher scoring than other chain types. And especially the Urban Gardening for self-supply is seen quite critical concerning food safety. This might be due the fact that often non-professional people deal with food production on the one hand and there is only very little (scientific) information about food safety questions in Urban Gardening on the other hand.

A concluding estimation about the influence of a short chain type upon food safety is quite difficult, also because the risks are not only related with the chain organisation or scale, but in the first instance linked with the commodity group (e. g. vegetable, milk, meat) and the processing stage, which was not studied in detail.

6.8 Summary and conclusions (update)

Based on the literature review and the empirical studies (SIA online survey and regional workshops), we can answer the outset research questions and present following findings. The overall results show, that short food chains address social aspects prior and to a lesser extent environmental and economic objectives. These social aspects reflect mainly needs and preferences of (individual) consumers and society objectives than the situation of the food producers.

The different food chain types (short and long regional) account mainly positive impacts in comparison with the conventional global long food chains and feature quite specific sustainability performance profiles. The best sustainability performance feature short chain types (short regional) with direct consumer-producer-interaction like CSA and direct sales on-farm. Also from the concept of MFC/AgroParks positive impacts of the overall chain sustainability can be expected, though there is only limited practical experience.

Thus, potential solutions for the problems in the current urban food systems can be found in food chain types which are related to the integrated territorial agri-food paradigm (alternative short food chains) as well as in long, large-scale, (eco)-efficient types like Metropolitan Food Clusters AgroParks which present the agri-industrial paradigm (see Table 2). Regional (short and long) food chains are not per se more sustainable than conventional global chains. The Sustainability Impact Assessment (SIA) reveals also that certain food chains types (short alternative) possess typical weaknesses (e. g. transportation efficiency or profitability), which might be inherent with to chain system and scale. Therefore further research is required in order to identify existing (practical) solutions or to develop new solutions (innovations) which can improve the sustainability in this field. This can be done only on the level of existing (regional) food chains in their systemic context.

To some extent the SIA results for vegetable chains feature quite large differences among the case study regions, but also between the European experts in the online survey and regional experts in the SIA workshops. This can be explained by the use of different methods (survey vs. workshop, group discussion), assessment situation (anonym and individual vs. public and collective estimations), previous knowledge and professional background of the participants. Besides this, it might be the case that regional context and the actual performance of the studied chains have influence on the outcome of the Sustainability Impact Assessment in the case study regions.

The developed approach of a qualitative expert-based sustainability impact assessment of food chain types fills a gap between quantitative evaluations of certain commodity chains which focus mainly on environmental effects (e.g. LCA or carbon accounting) and qualitative estimations for one specific short chain type (e. g. CSA by Saltmarsh et al. 2011) and offers the possibility of a direct comparison of different types of short food chains. The achieved results are valuable and can be proved by results from the existing literature. The advantage of the approach is that it allows not only statements about the direction of an expected/perceived effect, but also about its intensity.

The SIA approach is quite feasible to assess food chain types within and without their regional context (regional SIA workshops for concrete chains and online survey at European level) and was very useful as a discussion tool in the regional workshops. Nevertheless the SIA requires further methodological development, because some participants in the online survey and the regional workshops had some difficulties (e.g. with the terminology, selection of the impact fields) and assumptions for the evaluations were not made explicit.

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8 Annex

Annex I Food Chain Types and their occurrence in the *FOODMETRES* case study regions.

Regional Chain Type	Chain Length	Subtype and venues	Market relation between consumer and producer	Transaction scheme	LAS/ MAS/ GAS affinity	Location of the Point of Sale	Exist in case study area?	Analysed in Case Study Regions (data avail.)	Commodity affinity in case studies
a) Urban gardening for self-supply / private consumption (subsistence)	short regional	allotments	consumers as producers	None	LAS	Urban area	Berlin Rotterdam London Ljubljana Milano Nairobi	yes no yes yes data availability only for municipal urban gardens Nairobi: no	Mainly vegetables, herbs, fruits
		community gardens	consumers as producers	None	LAS	Urban area	Berlin Rotterdam London Ljubljana Milano	yes no yes no no	Mainly vegetables, herbs, fruits
		Self-harvesting gardens (e. g. offered by a farmer).	consumers as (co-) producers	business-to-consumer	LAS	Urban and peri-urban area	Berlin Rotterdam	yes no	Mainly vegetables, herbs (organic)

Regional Chain Type	Chain Length	Subtype and venues	Market relation between consumer and producer	Transaction scheme	LAS/ MAS/ GAS affinity	Location of the Point of Sale	Exist in case study area?	Analysed in Case Study Regions (data avail.)	Commodity affinity in case studies
b) Urban gardening for commercial purposes	short regional	Sale to shops and restaurants	no direct consumer-producer relation	Business-to-business	LAS	Urban area	Berlin Rotterdam Nairobi (Family commercial urban gardening	no no yes	Mainly vegetables, mushrooms, sprouts, herbs Rotterdam: also chicken
c) Consumer-producer-partnerships	short regional	Community Supported Agriculture (CSA)	consumer-producer-partnership	Business-to-consumer[3]	LAS	Urban area	Berlin Rotterdam London	yes no no	Mainly vegetables, fruits, herbs, eggs
	long regional	Ethical Purchasing Groups (EPG), Solidarity Purchasing Groups (SPG), food-coops	consumer-producer-partnership	Business-to-business	LAS, (MAS)	Mainly urban area	Berlin (food coops) London Milan	no no yes	Different types of commodities (fresh and stable / unprocessed and processed)

[3] Some CSA aims to operate outside the existing market logic and developed an alternative economic system (solidarity economy).

Regional Chain Type	Chain Length	Subtype and venues	Market relation between consumer and producer	Transaction scheme	LAS/MAS/GAS affinity	Location of the Point of Sale	Exist in case study area?	Analyzed in Case Study Regions (data avail.)	Commodity affinity in case studies
d) Direct sales/marketing on-farm to the private consumer	short regional	farm shops and stands, pick-your-own.	direct consumer-producer relation	Business-to-consumer	LAS, (MAS)	Peri-urban and rural area	Berlin Rotterdam Milan (all but PYO) Ljubljana London Nairobi	no yes yes yes yes yes	Different commodities (Processed unprocessed food)
e) Direct sales/marketing off-farm to the private consumer	short regional	farmers and weekly markets, market halls, home delivery, box schemes, online sales, milk vending machines	direct consumer-producer relation	Business-to-consumer.	LAS, (MAS)	Mainly urban area	Berlin (all, besides milk vending machines) Rotterdam Milan Ljubljana	yes yes yes no	Different commodities (Processed unprocessed food)

Regional Chain Type	Chain Length	Subtype and venues	Market relation between consumer and producer	Transaction scheme	LAS/MAS/GAS affinity	Location of the Point of Sale	Exist in case study area?	Analyzed in Case Study Regions (data avail.)	Commodity affinity in case studies
f) Sales to regional enterprises like retail or hospitality industry	Long regional	Service stations kiosks Shelf in retail shop	no direct consumer-producer relation, sometimes including wholesale or other intermediaries	Business-to-business	LAS, (MAS)	Mainly urban	Berlin Rotterdam Ljubljana Nairobi (to kiosks)	yes yes yes yes	Different types of commodities (fresh and stable / unprocessed and processed)
		to large-retail distribution	no direct consumer-producer relation sometimes including wholesale or other intermediaries	Business-to-business	MAS	Mainly urban	Berlin Rotterdam Milan	yes yes yes	Fruits and vegetables
		Delivery to restaurants, pubs, hotels…	no direct consumer-producer relation sometimes including wholesale or other intermediaries	Business-to-business	LAS, (MAS)	Mainly urban	Berlin Rotterdam Ljubljana London	yes yes yes yes	Different types of commodities (fresh and stable / unprocessed and processed)

Regional Chain Type	Chain Length	Subtype and venues	Market relation between consumer and producer	Transaction scheme	LAS/MAS/GAS affinity	Location of the Point of Sale	Exist in case study area?	Analyzed in Case Study Regions (data avail.)	Commodity affinity in case studies
g) Sale to public procurement and public catering	long regional		no direct consumer-producer relation including wholesale or other intermediaries	Business-to-administration	LAS, (MAS)	Mainly urban	Berlin Ljubljana London Milan Nairobi	yes yes yes no no	Different types of commodities (fresh and stable / unprocessed and processed)
h) Metropolitan Food Cluster (MFC) / Agro Parks	long regional	Metropolitan Food Cluster (centralized) Spatial and functional integration of different chain steps in one place (middle and large scale enterprises)	no direct consumer-producer relation	Business-to-business	MAS, GAS	Urban and world market	Rotterdam: London:	Yes, various elements of MFC exist, study is underway planned for Enfield CS	Different types of commodities (fresh and stable / unprocessed and processed)

Annex II. Questionnaire for the expert based online survey

Introduction

Dear Sir or Madam,

Welcome to the online expert survey of the *FOODMETRES* project!

The scope of the survey is a qualitative evaluation, assessing strength and direction of different types of short food chains regarding their contributions to normative environmental, economic and social policy objectives of sustainable food provision. The differences between the various short food chains are of specific interest in the study.

To complete the survey, please think about how each of the eight chain types may contribute to a more sustainable mode of food provision in comparison with the current baseline scenario, in which most of the food comes from large-scale producers, long global food chains distributed in supermarkets. The actual extension and relevance of these chain types in the current food system is not of interest at this point, but the expected potential effects in relation to the baseline scenario in general.

Evaluation can be made along a seven point scale, which reaches from very negative impact (-3) to very positive impact (+3). There can also be no impact or negative and positive impacts balance out (0).

Besides questions about your person, the survey consists of 15 closed-ended questions, each focusing on one sustainability impact area. Evaluations are expected to be along a seven-point scale. In total completing the survey **will not take longer than 25 minutes.** It's possible to pause the survey if needed.

To ensure confidentiality, the survey will be anonymous. Participation is entirely voluntary but we'd be very grateful for your contribution.

Please fill in the survey completely till Wednesday, 30th April 2014.

If you have any questions and comments regarding the survey or if you prefer a printed version of the survey, please contact me.

Kind regards,

Alexandra Doernberg

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tel +49 33432 82 372, email doernberg@zalf.de

http://www.zalf.de

Survey

1. Welcome to the *FOODMETRES* Survey. Do you want to check definitions of regional and short food chains used in the survey before starting? [FD01]

Please mark yes, if you want to check definitions.

❍ yes, check definitions

❍ no, start the survey directly

Part 1: Demographic information

2. What is your main field of expertise? And how many years you have been working in your field(s) of expertise.

Please tick as appropriate. Multiple answers possible.

	less than 2 years	more than 2 and less than 5 years	more than 5 years and less than 10 years	more than 10 years	no answer
	(<2)	(>2 and <5)	(>5 and <10)	(>10)	
❍ Logistics / Supply Chain Management	❍	❍	❍	❍	❍
❍ Marketing (e. g. of agricultural products, food)	❍	❍	❍	❍	❍
❍ (Rural) Sociology	❍	❍	❍	❍	❍
❍ (Rural) Geography	❍	❍	❍	❍	❍
❍ Environmental Sciences	❍	❍	❍	❍	❍
❍ Agricultural Sciences	❍	❍	❍	❍	❍
❍ Spatial or Urban Planning	❍	❍	❍	❍	❍
❍ Economic Sciences	❍	❍	❍	❍	❍
❍ Food Sciences or Nutrition	❍	❍	❍	❍	❍
❍ Other: (please specify) ……	❍	❍	❍	❍	❍
❍ Other: (please specify) ……	❍	❍	❍	❍	❍

3. What is your current position?

Please tick as appropriate. Multiple answers possible.

❍ Teaching / Research assistent or junior scientist (incl. PhD candidate)

❍ Staff Scientist / Senior Scientist (incl. Post-doc)

❍ (Full) Professor

❍ Consultant

❍ Chief Executive Officer / Manager

❍ Other: (please specify)……

4. In which kind of institution you hold your current position?

❍ University

❍ Public Research Institute

❍ NGO (non-governmental organization)

❍ Enterprise in the agri-food business

❍ Consultancy

❍ Public administration

❍ Other: (please indicate)……

5. Please indicate your gender

❍ female

❍ male

6. In which country do you hold your current position?

Please check all that apply. Multiple answer possible.

❍ Austria

❍ Czech Republic

❍ Finland

❍ France

❍ Germany

❍ Greece

❍ Italy

❍ The Netherlands

❍ Spain

❍ United Kingdom

❍ Other: (please indicate)……

7. Please estimate your previous knowledge about regional and short food chains

❍ excellent knowledge

❍ very good knowledge

❍ good knowledge

❍ little knowledge

❍ no knowledge

8. Please estimate your previous knowledge about sustainability aspects of food chains general.

❍ very good knowledge

❍ good knowledge

❍ little knowledge

❍ no knowledge

Part 2: Sustainability Impact Assessment

What are the potential impacts of these regional chain types towards a more environmental sustainable food system? What can each of them contribute in particular to enhance…

9. ... Eco-efficiency in abiotic resource use (land/soil, water, nutrients)?

10. … Provision of ecological habitats and (agro-)biodiversity?

11. … Animal protection and welfare

12. … Reduction of transportation distance

13. … Reduction of packaging

Please rate the impact/effect of each chain type for achieving this objective

	Very negative	Negative	Little negative	No impact	Little positive	Positive	Very positive	Don't know
	-3	**-2**	**-1**	**0**	**+1**	**+2**	**+3**	**?**
a) Urban gardening for private consumption	❍	❍	❍	❍	❍	❍	❍	❍
b) Urban gardening for commercial purposes	❍	❍	❍	❍	❍	❍	❍	❍
c) Consumer-producer-partnerships (e. g. CSA)	❍	❍	❍	❍	❍	❍	❍	❍
d) Direct sales on-farm to the private consumer	❍	❍	❍	❍	❍	❍	❍	❍
e) Direct sales off-farm to the private consumer	❍	❍	❍	❍	❍	❍	❍	❍
f) Sale to regional enterprises	❍	❍	❍	❍	❍	❍	❍	❍
g) Sale to public procurement and public catering	❍	❍	❍	❍	❍	❍	❍	❍
h) AgroParks / Metropolitan Food Clusters	❍	❍	❍	❍	❍	❍	❍	❍

What are the <u>potential</u> impacts of these regional chain types towards a more <u>economic sustainable food system</u>? What can each of them contribute in particular to enhance…

14. ... Employment along the food chain

15. … Income and profitability for chain actors

16. … Rural viability and competiveness

17. … Transportation efficiency

18. … Reduction of food loss and waste

Please rate the impact/effect of each chain type for achieving this objective

	Very negative	Negative	Little negative	No impact	Little positive	Positive	Very positive	Don't know
	-3	-2	-1	0	+1	+2	+3	?
a) Urban gardening for private consumption	❍	❍	❍	❍	❍	❍	❍	❍
b) Urban gardening for commercial purposes	❍	❍	❍	❍	❍	❍	❍	❍
c) Consumer-producer-partnerships (e. g. CSA)	❍	❍	❍	❍	❍	❍	❍	❍
d) Direct sales on-farm to the private consumer	❍	❍	❍	❍	❍	❍	❍	❍
e) Direct sales off-farm to the private consumer	❍	❍	❍	❍	❍	❍	❍	❍
f) Sale to regional enterprises	❍	❍	❍	❍	❍	❍	❍	❍
g) Sale to public procurement and public catering	❍	❍	❍	❍	❍	❍	❍	❍
h) AgroParks / Metropolitan Food Clusters	❍	❍	❍	❍	❍	❍	❍	❍

What are the potential impacts of these regional chain types towards a more social sustainable food system? What can each of them contribute in particular to enhance…

19. ... Food safety and human health

20. … Food quality (freshness, taste, nutritional value)

21. … Viability of food traditions and culture

22. … Transparency and traceability

23. … Food security (availability and accessibility)

Please rate the impact/effect of each chain type for reaching this objective

	Very negative	Negative	Little negative	No impact	Little positive	Positive	Very positive	Don't know
	-3	-2	-1	0	+1	+2	+3	?
a) Urban gardening for private consumption	❍	❍	❍	❍	❍	❍	❍	❍
b) Urban gardening for commercial purposes	❍	❍	❍	❍	❍	❍	❍	❍
c) Consumer-producer-partnerships (e. g. CSA)	❍	❍	❍	❍	❍	❍	❍	❍
d) Direct sales on-farm to the private consumer	❍	❍	❍	❍	❍	❍	❍	❍
e) Direct sales off-farm to the private consumer	❍	❍	❍	❍	❍	❍	❍	❍
f) Sale to regional enterprises	❍	❍	❍	❍	❍	❍	❍	❍
g) Sale to public procurement and public catering	❍	❍	❍	❍	❍	❍	❍	❍
h) AgroParks / Metropolitan Food Clusters	❍	❍	❍	❍	❍	❍	❍	❍

24. Do you have any remarks or questions regarding this survey?

……

……

……

25. Are you interested in the results of this survey? Please indicate your name and email address.

Name:

……

Email address:

……..

Thank you very much for completing this questionnaire

We would like to thank you very much for supporting our research.

Annex III. Guidelines for SIA in the *FOODMETRES* case study regions

Overall objectives of the Sustainability Impact Assessment (SIA) in WP 5:

- Assess of non-spatial aspects, dealing with the qualitative side of the food chain itself
- A comparative benchmarking of highly distinct chain models on the level of generic chain types and regional examples
- Identify applicable food policy options
- Provide data based on **qualitative, expert and stakeholder-based estimations** for modelling procedures and avalidations (will be carried out by ZALF)
- Development of impact models to operationalize:
    - the cause-effect-relationships and trade-offs of food system changes
    - and their consequences on sustainability including ecosystem services and quality of life (mainly consumers)

Research questions for Sustainability Impact Assessment (SIA)

- How is the sustainability performance of different chain types?
- Which perform best regarding sustainability? (benchmarking)
- Do trade-offs exist?

Procedure:

- **Part A: Online Survey** with selected European experts for generic chain types (organized by ZALF)
- **Part B: SME consultation** with regional stakeholders or *FOODMETRES* partners for specific regional chain examples like urban agriculture or farmers markets (organized by case study leaders in the regions, WP 4 contribution) → see following pages

Part B:

Objectives of the Sustainability Impact Assessment (SIA) in the case study regions:

- Participatory impact assessment to evaluate the sustainability impacts of innovative/alternative SFC, which have been developed in the regional case study regions
- Focusing on concrete examples of food chains and on in-depth knowledge of the local situation in the FOOMETRES case study regions
- Making different food chain alternatives comparable
- Holistic perspective (sustainability, embeddedness, governance, quality of life, etc.)
- Developing impact assessment applicable for practitioners and policy makers (discussion tool)
- Generating awareness about target system and trade-offs

Research questions

- How is the sustainability performance of different chain examples (types)?
- Which perform best regarding sustainability? (Benchmarking)
- Do differences between the case study regions exist?
- Is the set of impact areas feasible for answering research questions and work with regional stakeholders?

Some explanatory notes:

- For the implementation of the Sustainability Impact Assessment (SIA) exists two alternatives:
    1) You organise a SME-consultation with your SME partner or a mini-workshop with SME partner and other regional stakeholders (in Berlin we did it this way)
    2) Or the SIA become part of the KB workshops in May, where different regional topics and research themes were addressed
- The SIA for regional food chain examples (SME consultation) should take place as soon as possible, because the results are part of the deliverable 5.1. (due March 2014)
- ZALF provide you with guidelines and templates

- All in all the SIA would last not more than 2,5 hours, which means including preparation and wrap –up not more than 6-7 hours of work.
- In Berlin we rated five chain types: urban agriculture (community gardens and self-harvesting garden), community supported agriculture, farmers market and sale to retail
- We choose vegetables as commodity group
- We did the calculation always parallel on the board and in an excel chart during the discussions
- We made very good experiences with the mini-workshop (SME consultation) in Berlin:
    - People were very interested and engaged in the SIA exercise
    - Some of them signalized us in advance their special interest in the sustainability topic. That's why we prepared an overview about this topic in the mini-workshop.
    - We could collect the data we needed for the Sustainability Impact Assessment, but also got very detailed and concrete background information (we would not get in single interviews), because of the direct interaction and comparison of chain types/examples in group.
    - We found the SIA a very useful tool for a structures discussion.

SIA Procedure: step by step

1. **Invite your SME partners or other regional stakeholders which represent a minimum of one chain type (example agenda see Annex 1, chain types see Annex 2)**
2. **Prepare three tables with the impact areas (one for each sustainability dimension) on paper or whiteboard etc. and extra paper strips for each chain representative (example see Annex 3)**
3. **Introduce impact areas (see Annex 4) and chain types including definitions (see Annex 2)**
4. **Explain the "rules" of impact assessment exercise**
    a) Decide for minimum of one commodity group (e.g. vegetables, milk…)
    b) Baseline / reference system: large scale global food chain with distribution via supermarket (GAS-model), which provide urban population with food

Question: What are the potential impacts of these short and local food chain types towards a more sustainable food system (in comparison with baseline)? What each of them can contribute in particular to…? =>Focus on general estimations or expectations regarding the potential impacts! Please indicate, if not relevant for a certain chain tye example

c) Use a 7-step scale (-3 to +3)

-3 very negative, -2 moderate negative, -1 little negative

0 no impact

+3 very positive, +2 moderate positive, +1 little positive

5. Start Sustainability Impact Assessment of regional short food chain examples

d) Every representative estimate all the impacts from his/her chain example in advance on paper (max. 10 minutes)

e) Every representative presents his/her estimations to the audience and explain the reasons for the rating (max. 20 minutes depending from the number of studied chains)

f) Count sums chain examples according to their preliminary results in the SIA

g) Group discussion and final rating as a group decision (10-20 minutes)

"Do we agree or disagree with this estimation? How do we estimate the chain examples in direct comparison with each other?" Evt. additional rating from group

6. Count sums and rank chain examples according to their results in the SIA group rating

7. Mark hot spots (positive impacts) and cold spots (negative impacts) with different colors and discuss them, also if there trade-offs exists (one sustainability aspect increases, while a other decreases =>goal conflict)

8. Discuss results

Which chain example performs best regarding environmental, economic and social aspects? Which one has the best performance at all? ...In which fields they perform all good? How this could be explained (e.g. scale, target system of the actors?...)

9. You can use the prepared excel template in order to visualize the results in a different way

10. Please document the results in all stages (single and group assessment etc.)

11. Submit the results of the regional SIA to the ZALF team and your participants

If you have any questions, please contact me:

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Annex IV A. Example agenda from the SIA mini-workshop (SME consultation) in Berlin

9:30	Start of the mini-workshop: round of introductions, presentation of the agenda (Dr. Annette Piorr)
9:45 – 10:15	General introduction into sustainability impact assessment of food chains and food systems (Alexandra Doernberg)
10:15-10:30	Explanation of the impact areas used in the workshop (Dr. Annette Piorr)
10:30-10:45	Description of the food chain types and the regional examples (Alexandra Doernberg)
10:45-11:15	Sustainability Impact Assessment (SIA) for 4-5 regional food chain examples
11:15	Break
11:30	Presentation of intermediary results (benchmarking), continuation SIA
13:00	Presentation of final results and discussion

- Which chain types fits best for improving sustainability of the existing regional food system? What are their potentials? Under which conditions they can develop their potentials?

13:30	Next steps and outlook on the next *FOODMETRES* workshop in May
13:45	Lunch

Annex IV B. Food Chain Types

a) **Urban gardening for self-supply / private consumption (subsistence)**: food production in the urban setting for own consumption.
   - *Relation type: Consumer as (co)-producer*
   - *Subtypes: allotments, community gardens, self-harvesting gardens (offered by a farmer).*

b) **Urban gardening for commercial purposes: profit-oriented food production in the urban setting.**
   - *Relation type: business-to-business.*

c) **Consumer-producer-partnerships/cooperatives: network or association of individual consumers who have decided to support one or more local farms and/or food producers/processors.**
   - *Relation type: Consumer-producer-partnerships/cooperatives*
   - *Subtypes: Community Supported Agriculture (CSA), Ethical Purchasing Groups (EPG), Solidarity Purchasing Groups (SPG), and food-coops.*

d) **Direct sales/marketing on-farm to the private consumer: farmers sell directly their products on their farm.**
   - *Relation type: business-to-consumer.*
   - *Subtypes: farm shops and stands, pick-your-own.*

e) **Direct sales/marketing off-farm to the private consumer: direct selling of products from a farm on the market in the urban area.**
   - *Relation type: business-to-consumer.*
   - *Subtypes: farmers and weekly markets, market halls, home delivery….*

f) **Sale to regional enterprises like retail or hospitality industry (e.g. restaurants, hotels, pubs), which provide food for urban population.**
   - *Relation type: business-to-business*

g) **Sale to public procurement and public catering: Preparation and delivery of meals for collective consumers in the urban area. Include intermediaries like wholesale.**
   - *Relation type: business-to-business*

h) **AgroParks / Metropolitan Food Clusters (MFC): are "spatially clustered agro-food systems in which several primary producers and suppliers, processors and/or distributors cooperate to achieve high-quality sustainable agro-food production…" MFC are oriented towards the markets in the Metropolitan Region providing food for the urban population, but also to the world market.**
   - *Relation type: business-to-business*

Annex IV C: Examples for SIA tables on paper

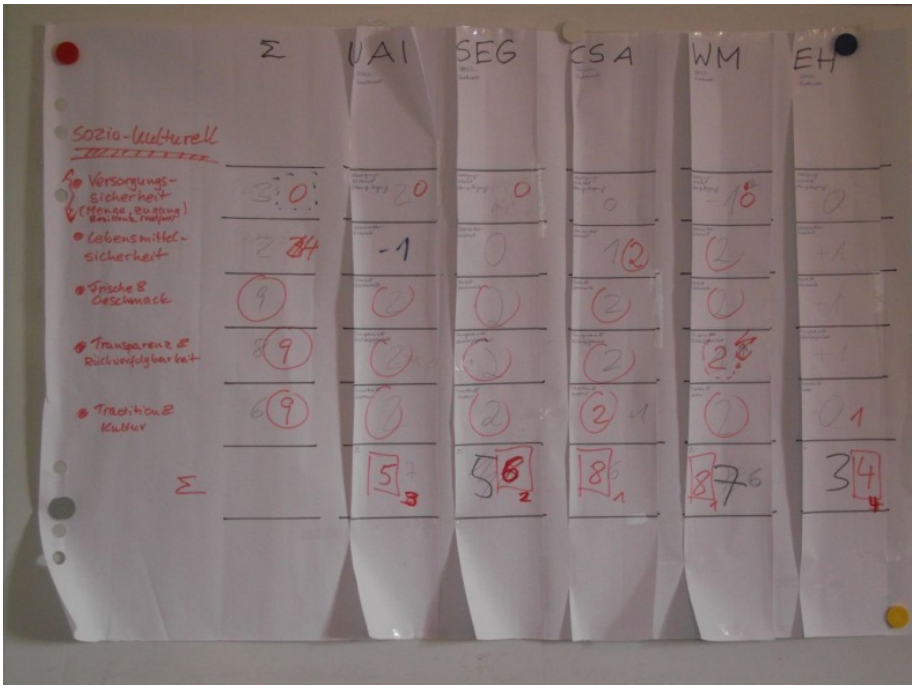

Figure 26. Columns on the left side show the impact areas for the social-cultural dimension of sustainability, first line represent chain types and related regional examples.

Figure 27. Each representative of a chain type estimate the impacts first alone and present it later with some explanation to the whole group.

Annex IV D: Sustainability Impact Areas and Definitions

Environmental sustainability

1. **Enhance eco-efficiency in abiotic resource use (land/soil, water, nutrients):** Each food chain is related to a certain farming or gardening system, which may use abiotic resources more efficiently and provide a good input-output-relation under given regional conditions)
2. **Enhance provision of ecological habitats and (agro-)biodiversity:** Each food chain type is related with farming practices, which may enhance the provision of ecological habitats (e. g. hedges, trees, cultivate of a wider range of crops and life stock incl. breeding of traditional or rare species and increase (agro-)biodiversity
3. **Animal protection and welfare: Farming system** Each food chain type is related to a farming system, which may result in different conditions for life stock, animal diseases and ethical considerations
4. **Enhancing the reduction of transportation distance**: Each food chain type may be related with a shorter transportation distance from place of production to place of consumption ("reducing food miles")
5. **Enhancing the reduction of packaging:** Each food chain type may be related to the reduction of the amount of packaging along the whole chain from place of production to place of consumption

Economic sustainability

1. **Generating employment along the food chain**: Each food chain type may create new paid jobs (full- and part time) within the metropolitan region
2. **Generating income and profitability:** Each food chain type may generate income and surplus for the actors along the value chain, which can be reinvested and support the long-term economic viability of the food producers
3. **Enhance rural viability and competitiveness:** Each food chain type may be related with regional multiplier effects through e.g. regional value added, income and employment generated, tax revenues etc.
4. **Enhance transportation efficiency from producer to consumer**: Each food chain type may be related with an efficient mode of transport, which includes e.g. adequate vehicles, capacity utilization, reducing number of travels and unloaded drives etc.
5. **Reduces of food loss and waste along the whole food chain:** Each food chain type may support the reduction of food waste and harvest losses at production stage, but also along all other stages of the food chain, including consumption at home or out of home (e. g. restaurants)

Social sustainability

1. **Food safety and human health:** Each food chain type may result in the absence of pathogens and pollution in the food. Food complies with legal limits regarding microbiological, chemical or physical hazards.
2. **Food quality (freshness, taste and nutritional value):** Each food chain type may result in the provision of food which is fresh, tasteful and has a good nutritional value
3. **Viability of food traditions and culture:** Each food chain type may result in the increased preservation of cultural distinctiveness and local food including seasonal variation and local food traditions. This implies the knowledge about its preparation and cultural role (including religious, ethnic or spiritual purposes)
4. **Transparency and traceability:** Each food chain type may result in the increase of transparency and traceability. Transparency refers to information for the consumer about the way the food they is grown and distributed by direct trust-based consumer-producer relation, use of labeling schemes (e.g. regional & fair, PDO, PGI, organic). Traceability refers to availability of information at each stage of the supply chain (e. g. tracking of produce with smart codes).
5. **Food security (availability and accessibility of food):** Each food chain type may result in the increase of food security, meaning that all people, at all times, have physical, social and economic access to sufficient food

Annex V. Summary of pre-test results

For the analysis of pre-test results (*N*=14) only descriptive statistics were used. Due the low number of cases, we calculated arithmetic mean, maximum, minimum, range and differences between arithmetic means. Results show, that the chain types and impact areas are all in all feasible and produce distinct results, which allows a benchmarking between the different generic chain types. The intensity of impact (measured by arithmetic mean) varies between chain types and impacts areas ranging from -0.3 (in the case of employment generation in urban agriculture) to +2.0 (in the case of income generation in off-farm sales). In nearly all the cases, the studied food chain types have positive potential impacts. The biggest differences between chain types we have found for the impact areas: rural viability, income and employment, where urban agriculture for private consumption cannot contribute to these targets.

Among the seven generic chain types, Community Supported Agriculture (CSA) performs best regarding all three sustainability dimensions, followed by Metropolitan Food Clusters (MFC) and direct sale off-farm (see Figure 28). These three chain types have also a good performance in environmental sustainability whereas MFC featured the best values (see Figure 29). Regarding economic sustainability, sales to regional enterprises, CSA and off-farm sales have the highest contributions (see Figure 30). In the field of social sustainability CSA, on-farm sales and urban agriculture for private consumption perform best (see Figure 31).

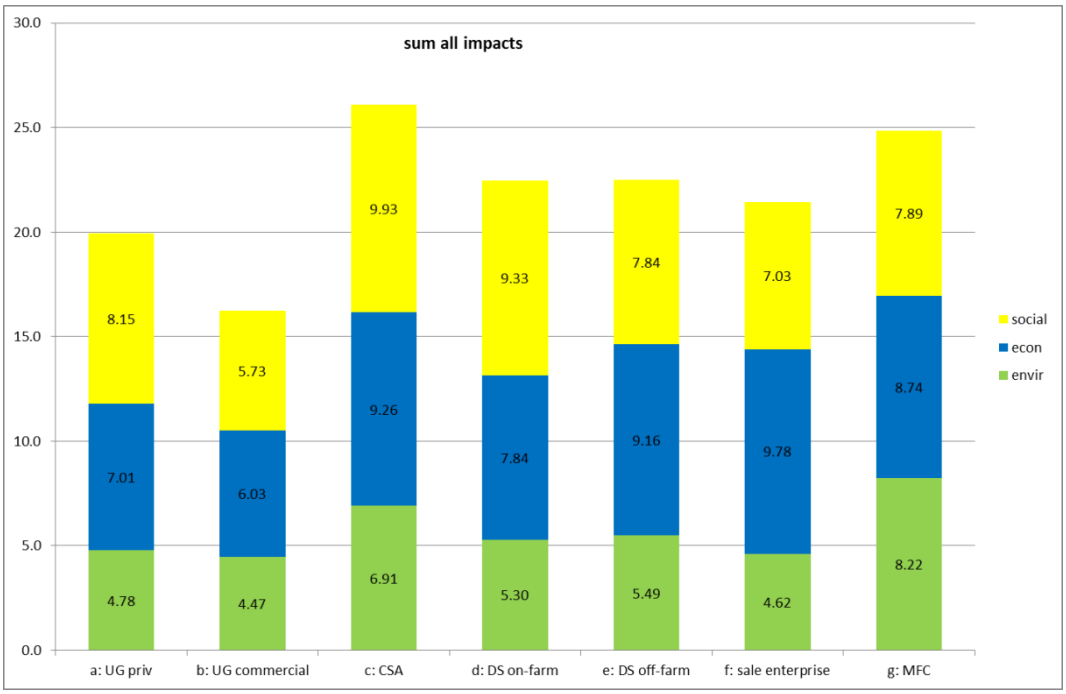

Figure 28. Potential impacts of the seven generic chain types in all sustainability dimensions (pre-test, N=14).

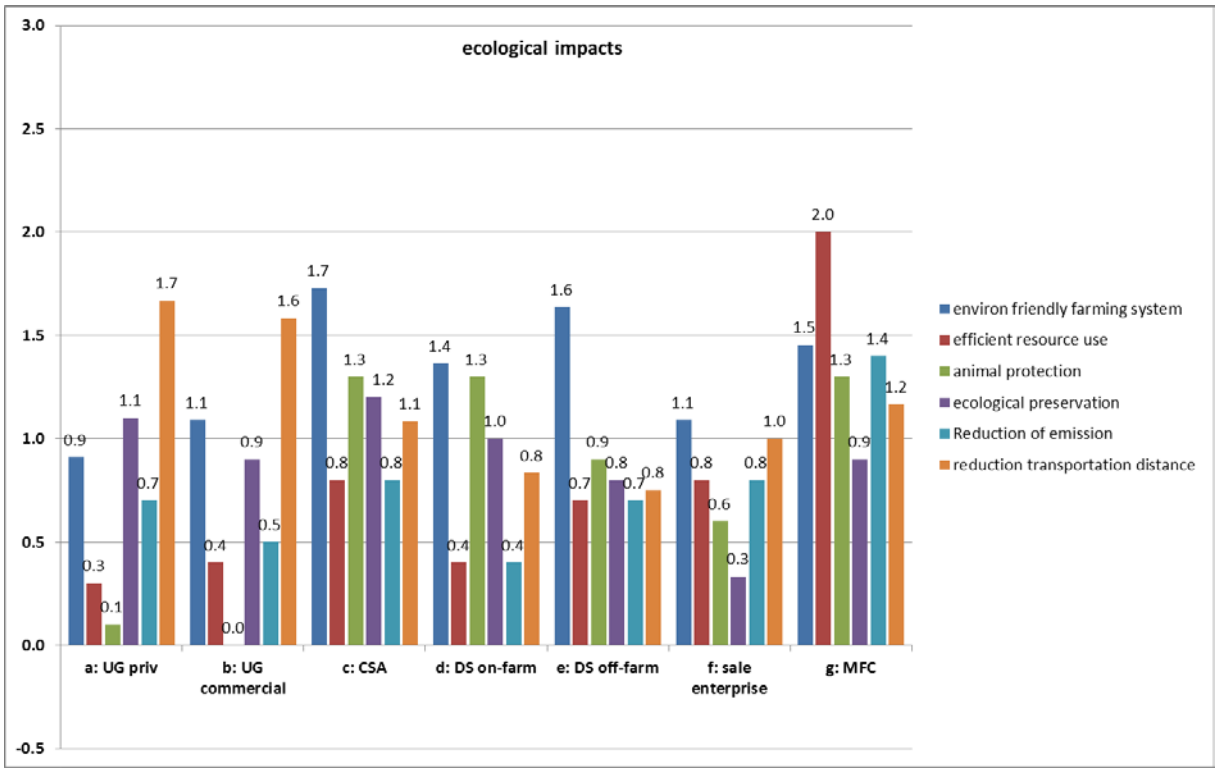

Figure 29. Potential impacts of the seven generic chain types regarding environmental sustainability (pre-test, N=14).

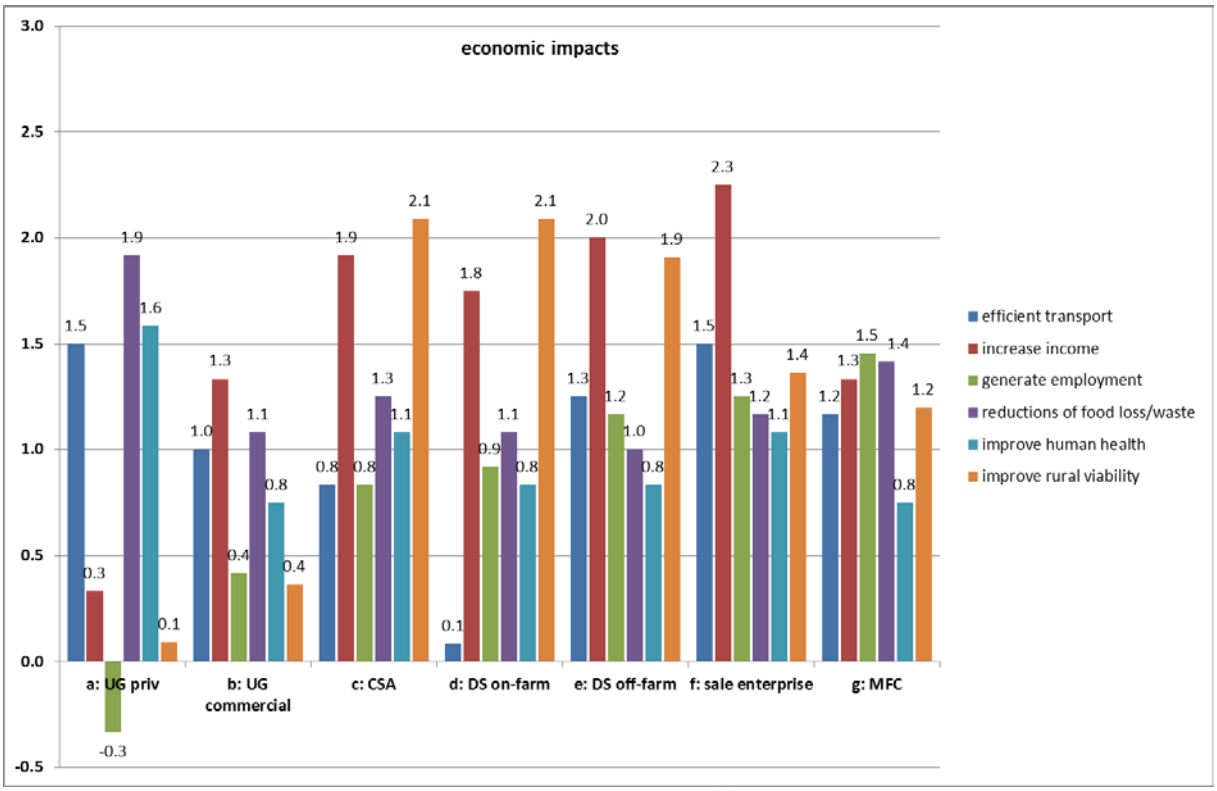

Figure 30. Potential impacts of the seven generic chain types regarding economic sustainability (pre-test, N=14).

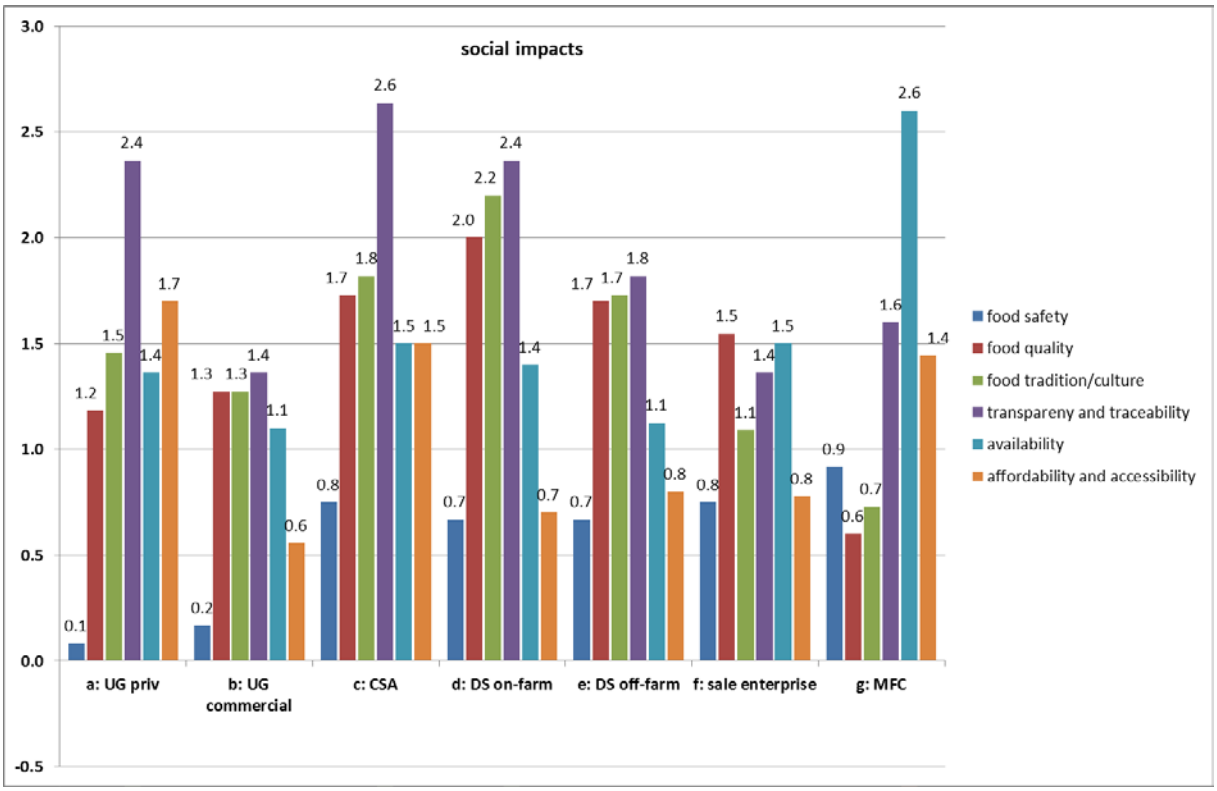

Figure 31. Potential impacts of the seven generic chain types regarding social sustainability (pre-test, N=14).

Annex VI. SIA Results from Regional Case Study Workshops

London, commodity group vegetables

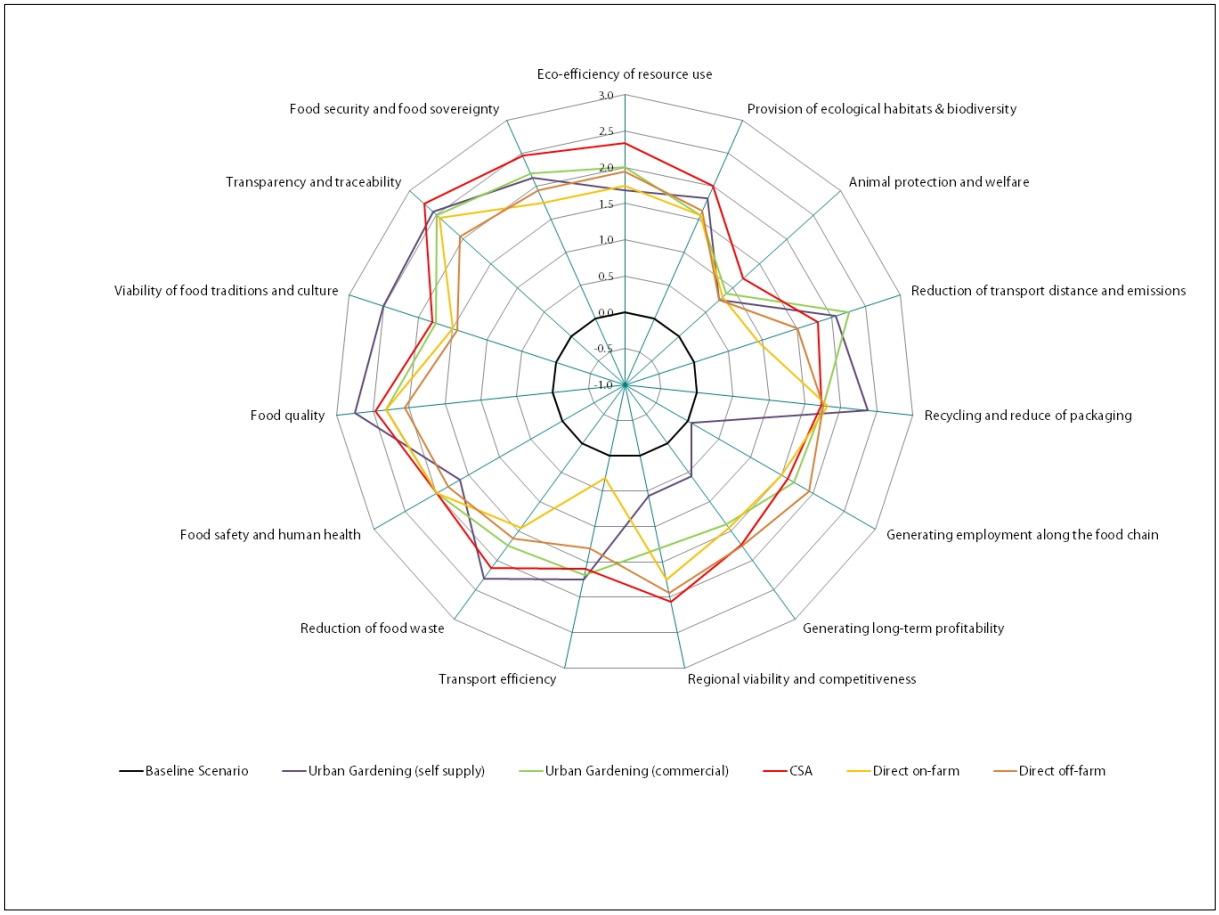

Figure 32. Estimation of the environmental impacts by participants of the London workshop for vegetables (N=14 +3 from team).

Ljubljana, commodity group vegetable

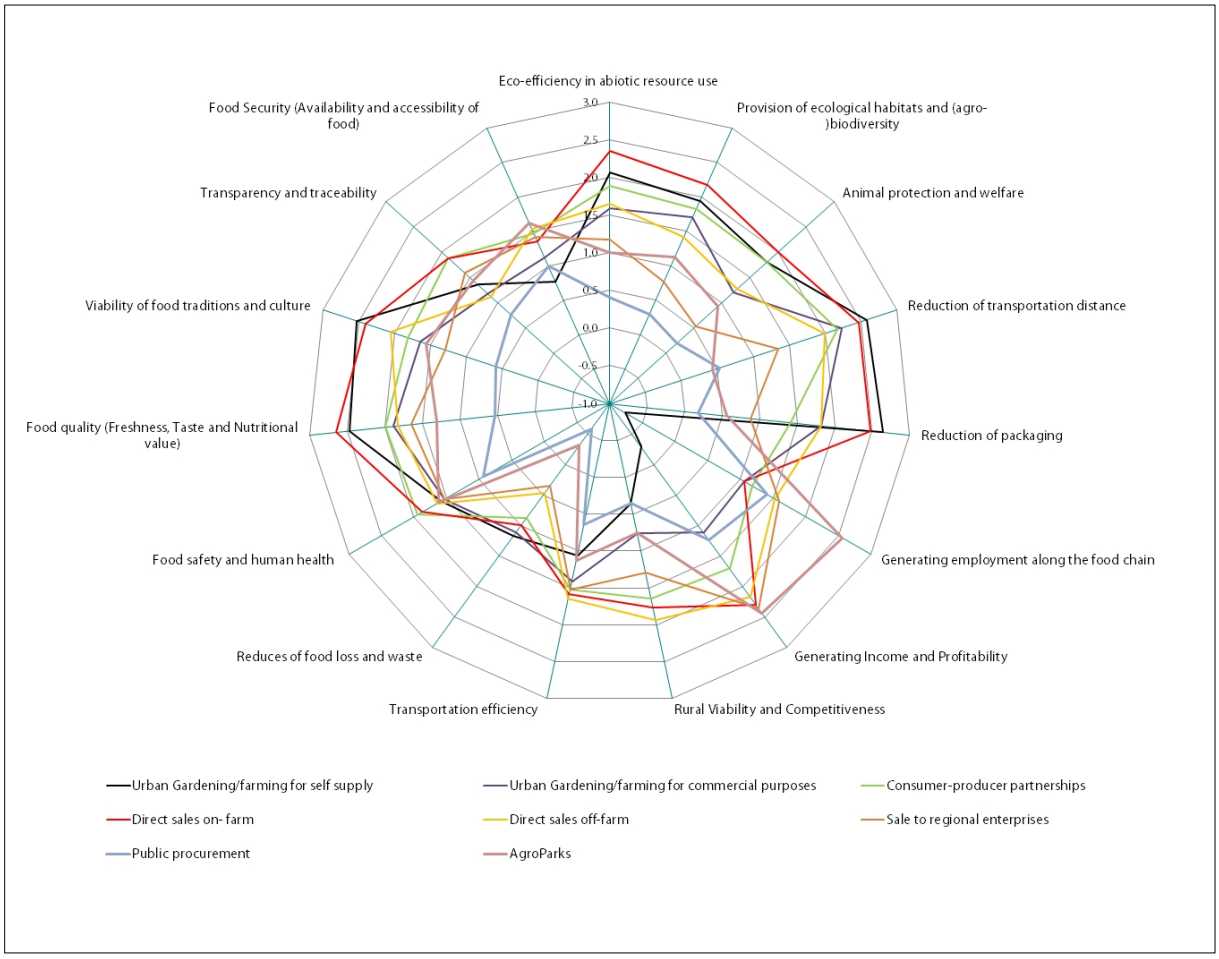

Figure 33. Estimation of the environmental impacts by participants of the Ljubljana workshop for vegetable chains (17 participants, N=17 for all impact fields, but animal protection and welfare: N=16 and MFC/Agroparks: N=16).

Ljubljana, commodity group fruit

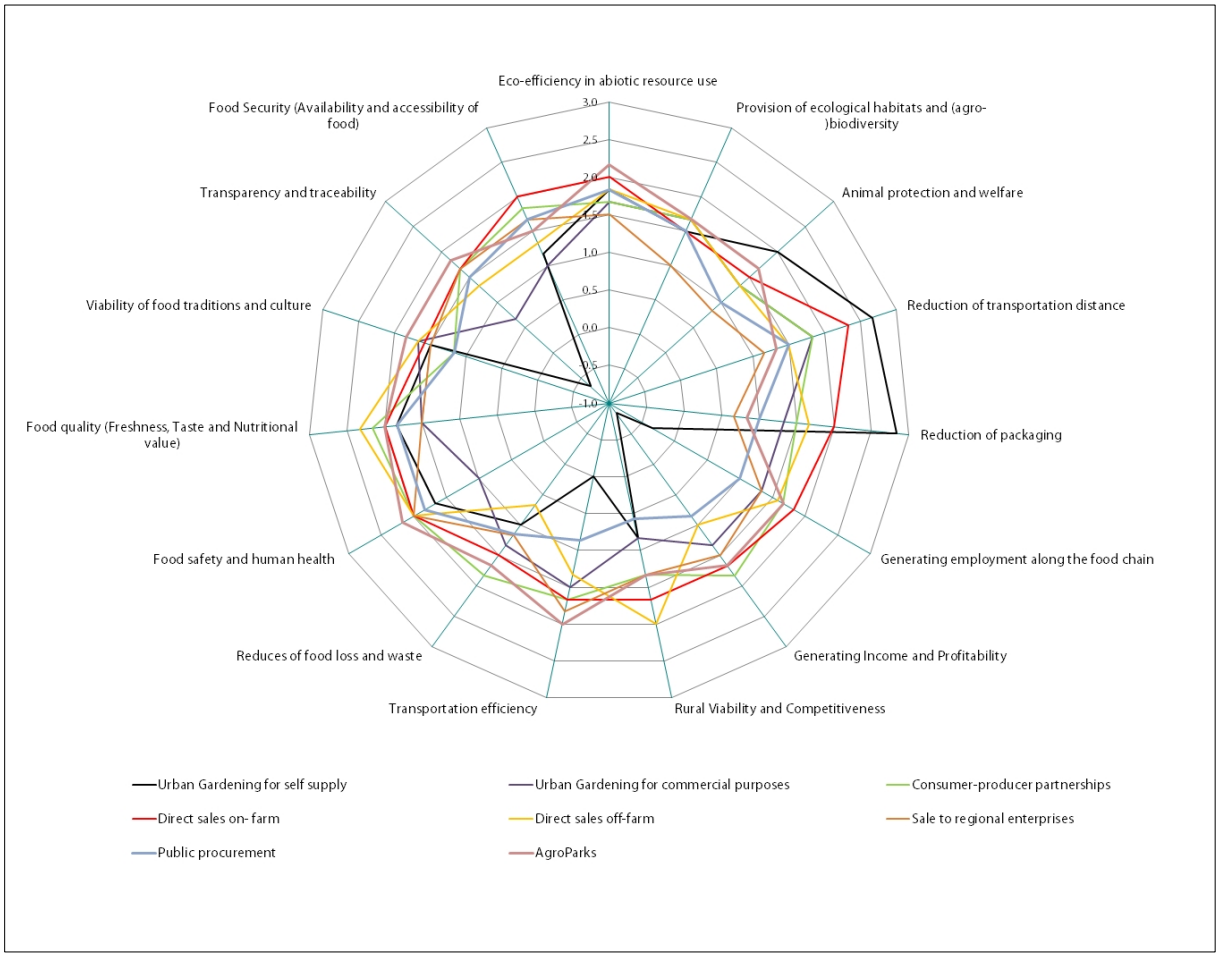

Figure 34. Estimation of the environmental impacts by participants of the Ljubljana workshop for fruit chains (7 participants, 1 incomplete, N=6).

Ljubljana, commodity group pork

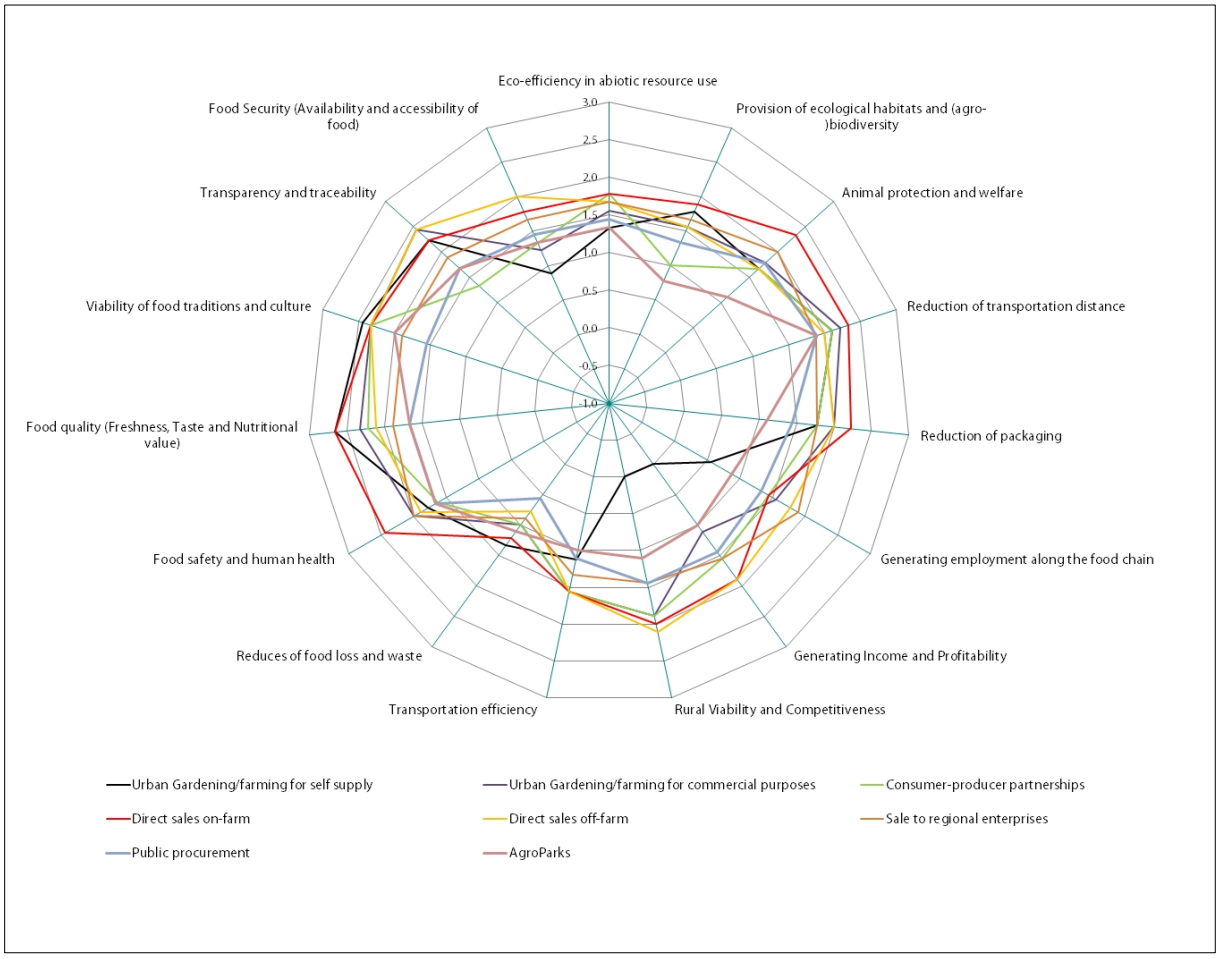

Figure 35. Estimation of the environmental impacts by participants of the Ljubljana workshop for pork chains (11 participants, 2 incomplete ratings, N=9).

Nairobi, commodity group vegetable

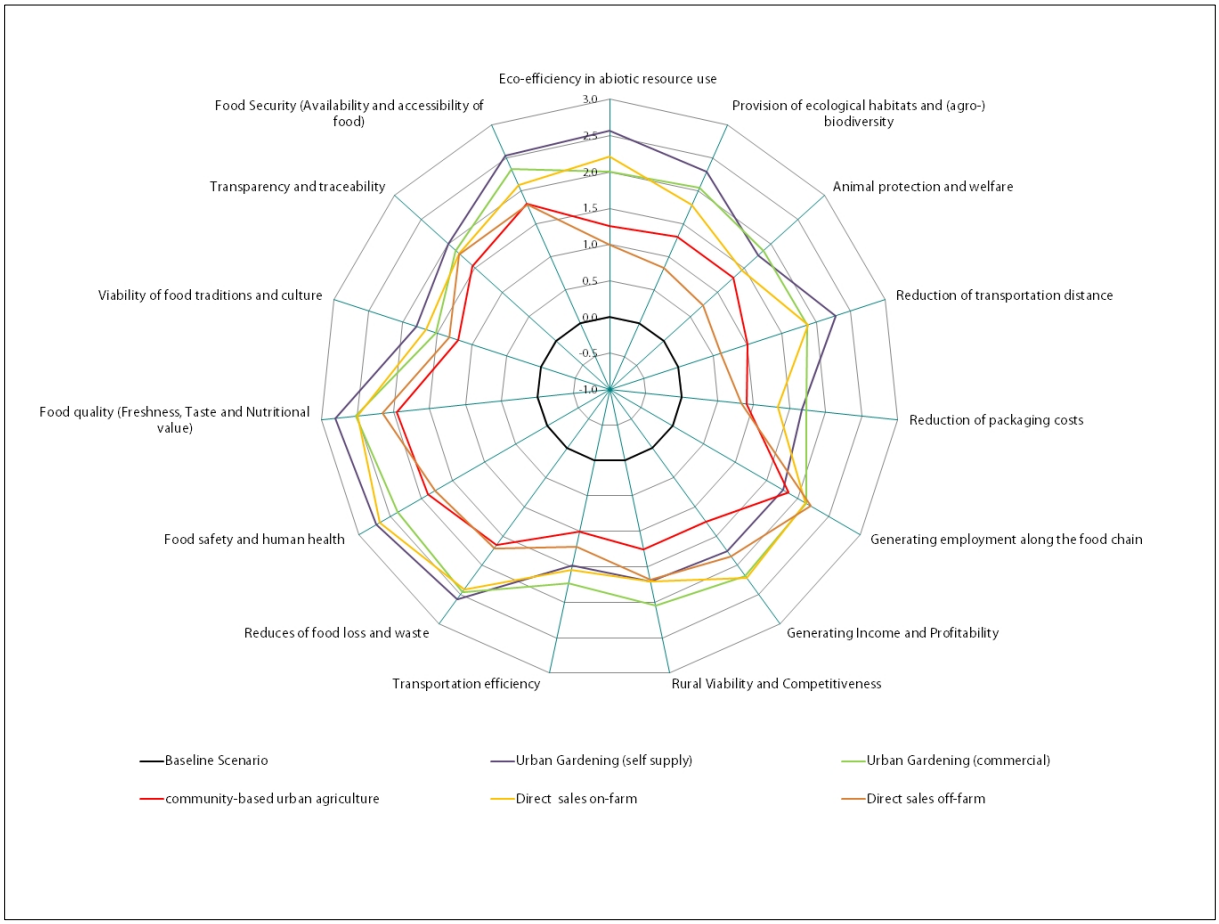

Figure 36. Estimation of the environmental impacts by participants of the Nairobi workshop for vegetable chains (24 participants, 3 incomplete, N=21).