TRACK 5. FLOWS AND NETWORKS

The track focuses on relationship among cities, food production and environmental implications and how food, crossing flows and networks, can contribute to define the wealth of society and the quality of urban space

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FOOD, TERRITORY AND SUSTAINABILITY: ALTERNATIVE FOOD NETWORKS. DEVELOPMENT OPPORTUNITIES BETWEEN ECONOMIC CRISIS AND NEW CONSUMPTION PRACTICES

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Abstract: The ongoing economic crisis and the growing concerns about food quality and safety are leading to an increasing awareness of consumption habits. Critical consumption is defining an alternative geography of consumption, distribution and production. Alternative Food Networks (AFNs) are expanding market niches based on the commitment and involvement of local actors. They add value to the relations between producers and consumers (Forno et al., 2013) by sharing a portion of their resources in order to obtain a greater mutual benefit (Sage, 2003; Graziano and Forno, 2012). By bridging the gap between producers and consumers, AFNs promote endogenous development, production relocalization and food system reterritorialization.
AFNs represent new forms of sustainable self-organized collective action (Migliore et al. 2014). In recent years, they have developed under the influence of (I) an increasing attention towards sustainability (II) the economic crisis (III) a more general loss of meaning due to consumerism and to the deterioration of relations (Castells et al. 2013). Moving from these assumptions, the paper reflects on the actual relevance of these economic practices and on their capability of resilience and resistance, while taking into account the main constraints and opportunities that foster/limit their spread. Data for the analysis came from several sources of information, such as interviews with key actors, participant observation, and an extensive mapping and in-depth analysis of key projects involved in the construction of the food supply chain systems in a medium sized town in northern Italy.

1. Introduction

The rise of Neoliberal economic systems meant a perspective shift from citizens perceived as producers (in the era of modernity) to citizen perceived as consumers (in the post-modernity age) (Harvey 1989; Clarke et al. 2007; Bauman 2007). Along with a change in social practices, social movements have also changed their priorities and methods of action, as they moved from class struggle to rights struggles. This led to the establishment of new rights in the environment and welfare domain. With the advent of large anti/alter-globalization mobilizations, the action repertoire of social movements has expanded: in the late Nineties and the early years of the new millennium, for example, boycott campaigns were quite effective along with a new focus on so-called "critical consumption" (Forno & Graziano 2014; Forno, Grasseni, Signori, 2013; Grasseni 2013; 2014).
Since the 90s the phenomenon of political consumption has become increasingly widespread, thus strengthening and consolidating experiences such as fair trade, responsible tourism and ethical finance. These practices are playing in the same arena as neoliberal globalization and market by using political consumerism as a tool to contrast its negative consequences (Micheletti, 2003). These practices allowed a certain level of stability over time in debates and practices, even when the no/new global mobilization lost intensity and newsworthiness.

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These trends show how citizens’ mobilization today seems to be fuelled by critical consumption, thus making it possible for new cooperation and co-production experiences to grow and consolidate.
In the recent years, the central theme of political consumerism has been represented by mobilizations around the food. Growing concerns about products impact, both on consumers’ health and the exploitation of workers and natural resources, are in fact encouraging a growing number of citizens to a greater awareness in their consumption habits (Nygård and Storstad, 1998; Murdoch et al, 2000). The choice for food from alternative supply chains is often influenced by personal requirements (i.e., access to food considered to be healthier and, in the case of “industrial” organic products, more convenient) and collective requirements (i.e., the rediscovery of conviviality and relations).
Often, these collective requirements lead to grassroots actions promoting a new integrated development of the territory arising from local problems and also aimed at having a global impact.
These growing responsible consumers niches and experiences appear to facilitate various forms of socio-territorial (re)connection: as we shall see, they are characterized for 1) their social innovation potential; 2) their potential to produce spaces in which the relationships between economy and territory are redesigned. By so doing, they stimulate and reinforce the relations among people who reside and operate in the same territory, thus increasing what has also been called the "spatial capital" (Soja 2010).
Within this changing context, we intend to analyse changes that seem to cross the varied range of movement defined "new economy".
In the research we present here, we postulated this changing context to depend on the tensions caused by the loss of purchasing power of a large part of the middle class. We also expected this to be linked to growing unemployment, as a result of the economic crisis of 2007-2008. Finally, we expected this changing context to depend on a growing “research of sense” (Castells, Caraça, Cardoso, 2012) that appears as a new angst of the "consumer society" (Bauman, 2010).
The paper is based on a mapping of grassroots organizations promoting "sustainable practices" (elsewhere identified as the acronym for SCMOs[3] - see Forno and Graziano, 2014) in the Bergamo area[4]. We analysed these through a series of in-depth interviews with the coordinators of some of the groups that are contriving an alternative food system.
The investigation focused on organization dynamic, internal and external governance dynamic, projects and what these groups expect from the "new economy". The local scale, which today seems to be basic for organizations of "critical consumption", imposes a research approach closer to the territory. In that context characterized by high contamination problems, high level of urbanization and huge loss of agricultural land and negative economic trend (de-industrialization and young unemployment), these new economies seem, the contrary to expectations, to sow the seeds for a territorial reconnection (reterritorialization) based on a more virtuous relationship between the economy and the environment, in which economic activities respecting environment and society can be a driving force for a new form of territorial development.

2. Between CFNs and AFNs. From deterritorialization to reterritorialization

In the scientific literature, the new economic arena growing around sustainable and quality food is referred to as Alternative Food Networks (AFNs). These are considered to be able to re-create

[3] Sustainable Community Movement Organizations.
[4] That includes Bergamo city and its surroundings, and that could (or not) coincide with the Province of Bergamo.

networks as well as social and spatial relations, to relocalize productions and reduce distances between producers and consumers, and to promote the endogenous development (Morgan et al., 2009).
These emerging experiences seem to be a possible answer to the sense of anomie generated by the processes of deterritorialization of the "Conventional Food Networks" (CFNs), which, in turn, are modern systems of production and distribution where often production costs are externalized into the territories in which it is practiced. This model has become dominant on a global scale and has driven farms to introduce capital-intensive technologies in order to intensify production. This involves a heavy capital investment in machinery, pesticides, chemical fertilizers and genetically modified crop varieties (Johnson, 1975 and 1993).
Currently, AFNs represent a smaller emerging market. The companies involved are described as marginal but high quality producers, typical of Western countries. AFNs bring together different critical points in a production and consumption network, by creating alternative systems of food production, distribution and consumption both in a social and geographical sense (Maye, D., Holloway, L., Kneafsey, 2007).
Often AFNs reconstruct ideal spaces (opportunities) for the rights of those who, in our affluent society, are pushed to the margins. An example of this would be a cooperative of citrus fruits producers from southern Italy selling their produce to Solidarity purchase groups of northern Italy or, on a global scale, the alternative supply chains of the fair trade: in both cases, the emphasis is on fair working conditions. In these networks, the idea is to share a portion of resources in order to achieve mutual benefits, which are greater than those that the conventional systems is able to guarantee (Sage, 2003; Schifani and Migliore, 2011; Graziano and Forno, 2012). Among the benefits found in most short supply chains are, for example, the promotion of bio-cultural diversity, the reduction of transaction costs, transportation and energy consumption, the reduction in consumer prices (compared to organic products sold in traditional commerce) and the enhancement of local and traditional quality products.
In short, these practices have a strong "embeddedness" within the social and territorial system, and can foster a process of reterritorialization of the food system.

3. AFN in a typical context of the Italian province of the North

3.1 Research design

Restricting the area of analysis to the province of Bergamo enabled us to capitalise on the knowledge accumulated through previous research on the same territory and connect it with research aimed to investigate the mechanisms of internal organizational and strategic decisions implemented by each organization.
Following a series of quantitative studies of specific groups within the "new economy" (Forno, Grasseni and Signori, 2013), this search analysed those grassroots organizations that promote sustainable practices with particular attention to the “meso level” (i.e. on associations or networks). This was achieved through research tools that allowed to investigate more deeply the dynamics intra and inter-organizational.
After a mapping of these experiences in the area, which took place during the first half of 2014, we carried out a series of interviews and focus groups based on a methodology inspired by the Participatory Action Research (PAR). This methodology is used to reveal opinions and difficulties perceived and experienced by the different actors, with the aim of understanding potentiality and limitations through a dialogic interview method (Forno and Maurano, 2014).

The mapping exercise revealed the existence of several organizations implementing "sustainability practices", also categorized as SCMOs. On the one hand, these experiences are oriented to increase citizens’ awareness of the negative externalities of individual and collective consumption and production. On the other, these experiences provide opportunities for actors to rebuild relations in order to influence the model of community development, where local development is the starting point. Examples can be found in groups and organizations promoting fair trade, ethical finance, critical consumption and new forms of swap and alternative food supply chains. The actors promoting these experience are both the so-called consum-actors and new organizations (networks and formal or informal associations) of "local" (usually small/medium sized) producers. Within these organizations, AFNs play an important role, acting as cultural facilitators and bringing the alternative food vision into the urban and the local space.
We carried out thirty-one in-depth interviews with representatives of the main organizations involved in the movement of creation of AFNs. These allowed us to look deeper into commonalities and differences between the organizations of the new economy and the “old” social movements, as well as to reflect on what lies behind these differences. In general, it emerged that some differences depend on the historical context in which these organisations were founded. The organizational characteristics of each company and its actors appear to depend very much on the historical period, or the mobilization cycle, within which these experiences are born and developed.

3.2 The local context

The province of Bergamo is traditionally a rich area. Like many other provinces in northern Italy, it has recently experienced deep processes of de-industrialization. Despite this, the province has high levels of per capita wealth, also thanks to a strong work and saving culture. Although agriculture only accounts for a small percentage of the province employment rate (as is often the case of industrialized Italian regions), the primary sector in the Bergamo area has several local specialties and high quality products to offer. This is thanks to the region’s unique geographical morphology, which is characterized by a great variety of landscapes: the territory is formed by plains (24.7%), hills (11.8%) and mountains (63.5%).
Plains are characterised by conventional monoculture, while hills and mountain areas are characterised by a tendency to multifunctional agriculture, where farmers integrate production with other services, such as wine tourism, cultural events and education. If on the one hand this multifunctionality is a necessity in such a terrain specific context, on the other hand it has brought along some interesting employment and tourism prospects in rural areas.
Politically speaking, Bergamo belongs to that political area defined as "white" (an area of Italy where Catholic parties were very strong). In the 80s and 90s Bergamo experienced an increase in per capita wealth thanks to an economy characterized by a strong presence of small and medium-sized enterprises. Interesting is also the fact that rising income levels in those years was not followed by an increase in the level of education. Below the national average is also the female employment rate. These factors reflect a somewhat novelty adverse culture that is typical of the area. The area is in fact historically considered "closed" at the cultural level but also "generous". It is traditionally characterized by a rich social fabric of voluntary associations and social realities of cooperation especially of Catholic footprint.
Like many realities in northern Italy, the city of Bergamo has also been undergoing important demographic changes. Since 2004, the population has grown. This is mainly due to the growth of the foreign population. In 2004 the proportion of foreigners was 5.3%, in 2013 it increased to 13.8%. This value is higher than its province (10.9%) and than the Italian average (7.4%).

On average, the city population is older than in the province: people over 65 account for 24.6% of the population in Bergamo city against 18.7% in its province. The composition families has also greatly changed in recent years: from 2001 to 2011 the rate of single-person households has increased from 34% to 41.6%. This is mainly due to the aging population (however, this percentage is lower, 22%, if we consider residents only). In 2013 the percentage of over 65 living alone is 33% of the Bergamo population.
It is clear how this social, cultural and economic fabric entails limits as well as opportunities for the development of organizations and experiences of the new economy.

4. Main results

4.1 AFNs in Bergamo: mapping and field analysis

In the area of Bergamo the (re) construction of community networks of production and consumption has recently become a matter of growing interest. As in other contexts, many different resources are at play, here. For example, we can count 70 farm parks with teaching activities for kids, 144 agritourisms, more than 350 farms with direct sell or "pick your own" initiatives and over 260 farms that work in the short supply chain. Furthermore, 243 companies are present on the territory that process milk directly, and 34 that have a vending machine (Provincia di Bergamo, 2004 and 2013). Bergamo is the second province in the Lombardy region for number of GAS, with its current 70 groups (Forno, Grasseni and Signori, 2013). There are a dozen urban garden initiatives, including interesting collaborations between schools and the municipal Botanical gardens.
However, these resources are often not connected to each other, which is why for a long time they remained outside the attention of both citizens and administrators. In Bergamo, however, the economic crisis that began in the years 2007-2008 seems to have imposed a different approach both by citizens and by the local political class, which has manifested growing sensitivity to these issues in the latest years.
The interviews have shown that behind the process of reconnection and territorial development of AFNs, a major role was played by some movement organizations that developed around the 90s and reached a point of relevant success from the late 90s. This is the case of organizations like Fair Trade (1990) and Banca Etica, which have been active in the territory since 2003. Time Banks (1997) and the Slow Food organisation (1987) are also important actors on the territory.
These early organizations have somehow created the social fabric within which the new organizations are born. However, the latter seem to have a different form of organization, which is less structured and more horizontal. This is especially true for the case of Solidarity Purchase Groups, but also for urban gardens (especially those driven by young people, such as the association Quarto Paesaggio [Fourth landscape]), the Movimento per la Decrescita Felice [Movement for Happy Degrowth], Gli Armadilli, Pedalopolis, and Regalo e Presto [Gift and Barter] and Mercato&Cittadinanza [Market & Citizenship].
Unlike the older organizations, which generally have a more defined structure, with a national and various local level, the organization of the new economy operate especially at the local level, with a structure generally consisting of a rather limited core of people which are the real driving force for the group. However, in some instances these organisations can include several hundreds of people, particularly - although not exclusively - through the web.
This is the case of "Regalo e Presto", a "P2P" organisation which was founded on the idea of "barter and reuse but [with] the idea that this could also help the relationship, [and] also create a network into the territory" [Regalo e Presto. Date of the interview 01/23/2014]". The organisation was

founded by two people, but quickly expanded to include hundreds of people, with the current network involving over 500 people across the Bergamo province. The network consists of six groups based on geographical proximity, some of which are active in the different Bergamo neighbourhoods, and others in the surrounding province. The socio-economic profile of its participants are also relevant: although young people are not entirely absent from these groups, our interviews outline a type of participation which is mainly by older, the middle class and educated people. Many associations, including those initiated by young people, also rely heavily on retired people.
Interestingly as one of our interviewees says,: "You will have noticed that we put great emphasis on older people ... The elderly are our greatest resource... They have much more time for us" Il Quarto Paesaggio [The Fourth landscape]. Interview with a founder of a community garden, Date of the interview 07/02/2014].
As stated above, the social context we are researching here is characterised by widespread prosperity and wealth often related to family savings, so those young people who are involved in setting up these practices are often few and supported by elderly people with greater economic stability. This is also a possible explanation for the mainly voluntary nature of these groups. These forms of new economy are in fact only rarely able to create new jobs, even in the cases of larger groups (as in the case of markets, groups of barter, solidarity purchase groups etc.).
In fact, these young “social innovators” are only rarely trying to develop these activities as a possible form of subsistence, often in the hope to find an alternative to traditional labour market employment. Labour market is, indeed, a critical issue that is becoming increasingly central into the debate within SCMOs and especially with the intensification of the crisis.
The situation is different in the case of small production companies (often with social cooperative status) which operate mainly in response to the new economy emerging demands of social inclusion. The research also confirms that in northern Italy, new economy experiences are activated in most cases by the demand of pro-active, responsible consumers. In less affluent areas such as southern Italy, producers usually have a more proactive approach (Andretta and Guidi, 2014).
A very good example of this is the experience of “Mercato agricolo e non solo” [Farmers market and beyond], a space promoted by a network of associations (Mercato e Cittadinanza [Market & Citizenship] - M&C) with the aim of bringing together small enterprises and sustainable producers with consumers in order to promote mutual acquaintance, information exchange and sharing of the values of sustainability and solidarity, as is evidenced by this piece of interview:
"*When we organize the markets, we always try to make it clear what sits behind the event" [...] "giving the opportunity to support them [the producers] also economically. They have a place where they can sell, where they are expected to be fair, transparent, In their transactions etc. "[...]" Many consumers ask for information on the products, and they know that the producers only sell the stuff that they make*”
[Mercato & Cittadinanza. Date of the interview 02/14/2014 – translation by the authors].
The use of shared, recurrent spaces (like in the case of markets always taking place in the same neighbourhood venue) is important for these organizations as a form of collective action providing opportunities for new, fertile connections. In Bergamo, for example, two informal networks of small organic producers originated (Orobiebio and Agrimagna) thanks to the experience of M&C. Both organisations aim to create new markets as arenas for better relationship among society, economy and environment.
The analysis of Solidarity purchase groups in Lombardy (Forno, Grasseni and Signori 2013) confirms the trends recorded in the areas of northern Italy in relation to socio-economic and demographic status of those who are active in these experiences: (a) there is a low presence of young people, which is explained by the fact that Bergamo remains a relatively rich area where the family

institution still represents a social safety network, and (b) there is a high representation of middle class members. This also means that young people rarely try to turn these initiatives into a proper job, as their perception is that these activities would be too risky to be their only source of income. Overall, the picture emerging from our research confirms that, at least in this area of Italy, these forms of self-organization do not tend to arise from lower socio-economic contexts or profit oriented cultures. Indeed, these initiatives tend to thrive through the action of people who are already active (or with previous experience) within social organizations and associations (Carfagna et al. 2014).
The current situation still presents several limitations: in particular, although these good practices often entail a social aspect aimed at helping people deal with the economic crisis, they rarely organize themselves into a “system", and this fragmentation reduces their impact on a political level. They do not manage to build practices of resistance against the cause of that crisis, which is not only economical, but also ecological, political and a crisis of care/meaning. In brief, this is a civilization crisis (see D’Alisa, Forno and Maurano, 2015)

4.2 AFNs and crisis: the relationship with the state and competing with the market

In the current economic recession of Western society, social movements are facing two different challenges: on the one hand, they must deal with institutions that are often unable or unwilling to meet new demands of environmental demands and social justice. On the other hand, they have to rebuild bonds of solidarity and cooperation within a highly individualized social context, where individual identities consolidate around consumption. This is in opposition to the past, where collective identities have been very important for the emergence of new initiatives.
Compared to the past, these new initiatives are more pragmatic. Their action is not only aimed towards the promotion of more sustainable consumption, but also to the creation of "spaces" where people can find information and also concrete answers to the daily problems (such as the supply of healthy food or "ethical" clothing). Within these experiences, active participation often takes the form of exchange, “downshifting”, or more conscious and responsible consumption. The main result is the creation of new relations and a new, shared sense of collective identity.
Generally, it seems clear from the interviews that the protagonists of the new economy think that the crisis led to a re-conceptualisation of the environmental and social conditions generated by consumerism and by the economy of unlimited growth. The crisis has also encouraged the emergence and proliferation of some new, context specific experiences.
All groups analysed reported an increase in sensitivity to the issues of environmental and social sustainability. However, only some of the initiatives reviewed were successful. Others suffered from the negative effect of the crisis. The most negative case is that of fair trade:
"[...] While the crisis was an eye-opener for many people [...] a downside is that there is less money around, so our cooperative has not been able to employ people in the last two years."[Il Seme. Interview Date 12.12.2014].
However, it is interesting to note that some groups recognize the positive influence of the crisis. For example, for the representative of Banca Etica representative we interviewed, the crisis seems to have fostered a new awareness, driven by the need to reduce expenses. Indeed, some Solidarity purchase group members have increasingly been turning to Banca Etica.
The same positive trend is can be seen in the case of collective gardens, the Farmers' Market and the new circuits of barter.
In fact, all these groups consider the crisis as the main driving force to the success of these initiatives groups. As in the case of Regalo e Presto, these times of recession led to people generally overcoming some of their prejudice about second hand items:

"*I think it was also favoured precisely by the difficult economic situation. Because if I am the only person that gets used clothes for my children, I feel a little '... I don't want to say like a beggar, but like someone who does not want to ... Instead, if you know others who do it, it becomes more... normal. Everyone else does it, or at least some people, so you can do that, too. The crisis, from this point of view, is a facilitating factor. Someone does it out of necessity, others do it by choice [...]* [Regalo e Presto. Date of interview 23/1/14].

The crisis has in some cases required a realignment of the goals of some organizations such as Time Banks, which now seem much more interested in the issues of inclusion and poverty than in the past.

"[...] We can say that there has been some sort of evolution: perhaps the bank is more open, now. For example, we have opened up to the territory. Now, the relationship with institutions has become one of our top priorities. In response to the current economic recession, our national association is now involved in a one year project aimed at social inclusion [...]" [*Officina del tempo*. Date of interview 09:02:14]

The development of the Orobiebio and Agrimagna organic farmers networks is an interesting case. These networks share many goals with work cooperatives. In times of economic crisis, where citizens' trust in traditional forms of market tends to falter, cooperatives offer a valid alternative to future uncertainty and long-term investment.

According to the coordinator of Orobiebio, the crisis "has not affected us. Personally, I think this is because we meet people's needs by keeping our prices competitive with those of the conventional market. Through participatory involvement, people come and collect produce directly from the farmers (or they even pick the product themselves), and this enables us to keep our prices competitive.

So, overall, we have not suffered from the recession" [Orobiebio, interview 07/04/2014].

As the coordinator of Agrimagna reports, their business has been thriving and expanding, and they even struggled to meet demand at times. The crisis, for him...

"*became a driving force for resuming agricultural activities. People are experimenting and building... In these 2-3 years I have seen the growing trend*. [...] *The number opportunities has actually increased. This is not to say that things are simple or easy. Far from it, but this is a real fact: our brand, "Il tesoro della Bruna" [...] our salves have increased by 20% over the last two years. And the demand was even greater than we could provide for*" [Agrimagna, interview 08/04/2014].

The company is currently hoping to collaborate with the public administration, and they have already had a promising response in terms of key aspects such as organization, promotion and education.

"*I think one of the main weaknesses in the system is that our industry is quite young. This means that we are not yet organised into a systemic structure like big industrial districts do. We are still such a new reality that we cannot reply on the same level of organization. And there are no organisations that could support us. In our Country, such systems do not exist, and we are not yet strong enough, economically, to be able to create this structure by ourselves*. "[Orobiebio - Focus group 19.05.2014].

One risk is that, after an initial phase of enthusiasm and participation, many of these alternative, volunteer based practices will fade away due to lack of human and economic resources. Alternatively, some of these initiatives lose sight of their initial mission and end up conforming to the laws of conventional market.

As is the case of other experiences (Bresnihan and Byrne, 2014), the difficulties relating to the sustainability of the new economic practices reflects an inequitable distribution of power, where private interests are favoured over public ones. Therefore, the fundamental problems of the contemporary economic, social and environmental crisis cannot be simply managed by creating alternatives within the current market system. Useful and necessary as they are, these practices need to be supported by a political action on public policies and government plans. Unfortunately,

this seems impossible until the general public attitude towards politics moves from a sense of indifference to a greater involvement.
The members of these groups often prefer to focus on small, concrete objectives, rather than trying to influence public policy:
"*We act as a local group with concrete objectives. These objectives may be perceived to be small, but they are not, if you think that last year we started out with a hundred seeds of Wipper Snapper tomatoes, and we now have a whopping hundred thousand!*"[Civiltà contadina, interview of 24/01/2014].
"*We have small goals [...] Active citizenship, responsible citizenship, lifestyle ... [...] An idea, a lifestyle linked to something else* ..." [*Circolo della Decrescita Felice di Bergamo*, interview of 04/02/2014].
A pragmatic approach appears to be the only way to achieve results in the short term. This is definitely a step forward, and might pave the way to other types of action.
"*Some political representatives will approach us, but I don't want to have anything to do with them. They are looking for votes, obviously. And we don't trust them"* [Il Seme, Fair Trade, interview of 12/12/13].
Even when other groups have been open to collaborating with national institutions (such as Banca Popolare Etica) or local institutions(such as Banche del Tempo, Civiltà contadina, Il Quarto Paesaggio, MDF), these collaborations have always been aimed at reaching small concrete objectives:
"*We pursue an idea, in the sense of a philosophy linked to lifestyle, self-production, culture, and you cannot address a single political party: that does not make sense. It has to be a project bringing a broader message, and that goes beyond political orientation. Moreover, you have to be open to working with local administrations, whichever their political orientation might be"* [MDF, interview of 02/04/14].

5. Conclusions

This article proposes a first reflection on the changes brought along by the current recession on the new economy organization.
As it emerged from the interviews, the development these forms of collective action have undergone in recent years appears to be driven by three main factors:

- the growing public attention to environmental, social and economic sustainability;
- the economic crisis and its negative impact on society, including members of the middle-class;
- a more general loss of meaning due to consumerism and degradation of social relations, together with the misalignment between happiness and GDP growth (as observed in the Easterlin paradox, 1974).

In this sense, our research confirmed what was already highlighted in other studies, namely that these forms of action create some interesting "spaces" of experimentation and social innovation where individual consumption is replaced by collective identity.
Among the main issues emerged, there is a new emphasis on production in times of crisis. While the emphasis on consumption is a product of consumer society and welfare, production is now becoming more central to the current debate.
The new emphasis on creating partnerships between producers and consumers within a local context also seems to bring these experiences to forms of commoning, already present in urban areas, as described by Bresnihan and Byrne (Antipode, 2014). At the core of these initiatives is a shared vision about environmental, social and economic sustainability. The experiences of Banche del Tempo, Civiltà contadina, Il Quarto Paesaggio and MDF reflect the core values of prosumption, but they add a

collective dimension to it, where collaboration is realized through a shared sense of product, service and experience design. Another central issue is the emphasis on the territory and reterritorialization of production, through exploitation of local resources at an integrated level, recruiting agriculture as a driving factor for strengthening the local economy.
Finally, it is also worth mentioning that some have criticised these emerging groups for their niche quality, as only middle and upper class citizens are able to afford involvement with these groups, and therefore also have access to healthier food (Goodman et al., 2012).
It is possible that these collective actions will continue to be just a symbol of an alternative way of life, operating only at the fringe of the market arena. The general attitude seems to be one of holding back until new generations will take over and develop a fairer society. Probably, this lack of participation in the political arena is due to a lack of trust in existing political parties and think that it is almost impossible to change the socio-economic context: at present, they prefer to achieve small, practical objectives than pursue greater political changes.
However, it is also possible (and indeed desirable), that this model will act as a driving force for a broader perspective shift on mass consumption and social innovation, and possibly lay the foundations for a more structured political action.

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SHORT FOOD SUPPLY CHAIN AND ENVIRONMENTAL "FOODPRINT": WHY CONSUMPTION PATTERN CHANGES COULD MATTER MORE THAN PRODUCTION AND DISTRIBUTION AND WHY IT IS RELEVANT FOR PLANNING

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Keywords: Foodprint, Green Eating, Sustainability Policy, Consumption Shifts

Abstract: Short Food Supply Chains (SFSCs), as defined by Kneafsey et al. (2013) have been presented by many regional and urban planning works as a major potential contributor to food's environmental footprint ("foodprint") reduction and natural allies to local sustainability policies. Yet, these positive impacts have not always been assessed systematically and part of the enthusiasm among scholars and practitioners seem to rely on untested assumptions, bearing important risks for planning and policy elaboration (Edward-Jones, 2010). This knowledge gap is therefore to be bridged.
After having tackled definition issues in the introduction, the first part explores the potential opportunities (in production, distribution and consumption) of foodprint reduction, trying to single out the most promising ones. The second part of the review is dedicated to studying more in depth how consumption shifts are influenced by SFSC. In the final part, potential implications for planning and sustainability policies. Paths for future research are also exposed.
The literature reviewed seems to indicate that, contrary to what is commonly emphasized in planning literature, the change of consumption patterns (i.e. reducing meat intake) might be the greatest "foodprint" reduction contributor (Garnett, 2011) and that SFSCs greatly contribute to them through the reconnection to the agricultural territory, the routinization of sustainable behaviors and educational processes.

1. Introduction

Major European metropolis such as Paris and Milan already engaged in paths of environmental reduction of their environmental impact, driven by political will and strong external pressures such as:

- growing interest from citizens with both individual (quality of living environment) and social (overcoming the environmental crisis) driving forces;
- pressure coming from states and EU, who committed to reduce emission (Kyoto) and reduce water pollution (EU framework directive) and likely to increase with decentralization of environment related competences to regions.

Their objectives are often translated into quantified indicator reduction targets. The use of indicators of major environmental indicators is not straightforward and their role in local sustainability policy has been criticized.

However, reviewing the existing literature on local sustainability indicators and their relationship with governance, Holman (2009) noticed that indicators could facilitate the dialogue between central and local government, help picturing concretely what sustainability means and offer learning opportunities to stakeholders.

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The choice of indicators remains debatable and some authors argue for the co-construction of local indicators, enabling stakeholder engagement. However, relying on major –internationally recognized – such as GreenHouse Gases emissions (GHGe) and Water Footprint could prove more efficient for dialoguing with upper levels (national and international) and setting up international comparisons. Besides, the vast literature and databases available on such indicators would make it easier to assess precisely the environmental impact of human activities.

The food system, understood as the production (including processing), distribution and consumption (including waste) of Food is responsible for a considerable share of human activities' impact on environment. For instance, roughly 25% of total Green House Gas emissions (Vermeulen et al., 2012) come from it and agriculture accounts for about 70% of total water withdrawals worldwide[2]. Food became an object of interest at the city/regional level and a relevant topic for planning to address, both at the theoretical and practical level (Ilieva, 2013). It has already been identified by many major cities as a promising field for acting on GHGe[3].

The expression "foodprint", has gained popularity in the literature of the past few years. The term however encompasses a variety of realities and is often used as replacement for "footprint" when talking about food, without being defined more precisely (such as in Stoessel et al., 2012 or Billien et al., 2009 – where it is wrote "food-print"). For the sake of clarity, the present article considers "foodprint" as the impact of food system over major environmental indicators, mainly GHGe and Water Footprint. Other secondary indicators, such as energy use and nitrate release will also be mentioned, as they have a direct influence on the formers.

Among other solutions for reducing foodprint, the shortening of supply chain, or reconnection between production and consumption sites, have gained considerable momentum both in the scientific literature and in the media (Edward-Jones et al., 2008).

Academic interest on the topic has also experienced a tremendous development in the past two decades, some authors even talking about a "disproportionate interest" of the literature when compared to the actual size of the phenomenon (Deverre & Lamine, 2010). It therefore seems relevant to dedicate particular attention to them when considering the phenomenon as a whole. Besides its media and academic visibility, local food movement's intrinsic diversity is an excellent illustration of how hard it is to delimitate precisely these object, being for policy or research purposes. As a matter of fact: "Local food systems", "locavorism", "short food supply chain", "city farms", "urban farming", "alternative food systems", "community supported agriculture" (and many others), have all raised interest, support and critiques in recent debates.

Heated debates are still taking place: some argue not to focus only on niche initiatives and to "move beyond the alternative" (Franklin et al., 2011), others claim that loose definitions could lead to nonsenses (such as considering Wal-Mart as a local food actor, see Delind, 2011). We will retain the quite ample, but functional, notion of "Short Food Supply Chains" (SFSCs) and the definition proposed by Kneafsey et al. (2013) "The foods involved are identified by, and traceable to a farmer. The number of intermediaries between farmer and consumer should be 'minimal' or ideally nil."

[2] http://wwf.panda.org/what_we_do/footprint/agriculture/impacts/water_use/

[3] See for instance Paris' "Plan Alimentation Durable", supporting the "Plan Climat Energie" and focusing on collective restauration. http://observatoire.pcet-ademe.fr/action/fiche/154/le-plan-d-alimentation-durable-de-paris

The first part of the paper (section 2) will be dedicated to exploring, building on the available literature, opportunities for foodprint reduction within the food system. The following section (3) will then, based on these conclusions, see how SFSCs could contribute to tapping these opportunities. Section 4 will be dedicated, in an exploratory effort, to envision more broadly the potential implications of such a relationship for sustainability planning.

2. Foodprint reduction opportunities

Given the importance of the food system in the total footprint of human activities over the environment, many authors have tried and identify the most promising fields for effective and achievable foodprint reduction. One of the most remarkable efforts of gathering the existing evidence has been achieved by Tara Garnett in her 2011 article.

Building on her analysis, and for the sake of analytical purposes, the available evidence on foodprint reduction opportunities will be considered in each of the different components of food systems: production (including processing), distribution and consumption (including waste). These distinctions should not be taken as a clear-cut separation, for the items presented separately are often overlapping (especially for consumption), but rather as a lens-shifting exercise, putting the focus on different sides of the issue.

2.1 Distribution

When dealing with foodprint, the questions of scale and distance between producer and consumer (also called "food miles") are the ones that immediately come to mind. A widespread idea in the local food literature is that reduced food miles lead to reduced energy consumption and C02 emission, for they would involve less transportation. Yet, authors such as Avetisyan et al. (2014), point out that food miles are an "over-simplified way to address the environmental problem of carbon emissions associated with food consumption"(p.418).

It is first important to notice that in most cases, even for conventional food, the last miles of transportation are the ones having the greatest greenhouse gas emission and energy consumption impact, and that distribution accounts for roughly 5% of the food sector total energy consumption (Avetisyan et al., 2014) and 10% of the total carbon foodprint (Brodt et al., 2013). Therefore, interstate or international transportation can be found as being negligible (ibid). Studying the carbon footprint of common groceries in a Swiss retailer, Stoessel et al. (2012) reached the conclusion that: "it is necessary to reexamine the supposed energy advantages of 'localism' in the food sector". Coley et al. (2009) also showed the relevance of distribution format, proving that if buying organic required the customer to drive an extra 6.7 kilometers, it would annihilate any potential greenhouse gas emission benefit.

In an effort of summing up the available literature on the topic, Mundler & Rumpus (2012) gathered articles both relying on theoretical links and case studies. They reached the conclusion that "all this research converges to challenge the presumed advantages of geographical proximity in terms of food distribution energy efficiency" (p.610). Although they also underline several limitations resulting from methodological differences and the considerable margin for improvement many authors mentioned, these quite counterintuitive findings could prove insightful for the planning literature. To

put it in Coley et al.'s (2009) words, "some of the ideas behind localism in the food sector may need to be revisited".

2.2 Production

Production modes of foods may vary considerably between places and types of productions, therefore the results are likely to change drastically from one case to another. Yet, for illustrative purposes, we took the example of organic production, which has been studied more extensively, with varied conclusion. Including carbon sequestration in the equation and building on the existing literature, Lynch et al. (2011) found that organic (vs conventional) production had a positive impact on energy consumption but nuanced their conclusions by stating that the effect on Green House Gas emission was not necessarily favorable.

Moreover, the particularities –especially climatic ones - of each locality have a considerable impact on production foodprint, blurring the picture even more. Brodt et al. (2013) for instance demonstrated that processed tomatoes were more energy and GHGe efficient in California, but much more water efficient in Michigan.

Beyond these illustrative examples, presenting only particular cases, authors such as Edward-Jones (2008) put forward and Garnett (2011) put forward mitigation techniques carrying potential for meaningful foodprint reduction. Garnett also mentions "non-conventional" tools, such as agro-forestry. Yet, in the same article, she stressed the fact that, instead of allowing the food production system to shifting to a more sustainable organization, it might increase its reliance over technology and energy intakes (p.S29). More importantly, both authors underline that the effects would probably not be sufficient to achieve foodprint reduction at levels that would match what is demanded to cope with the current ecological crisis.

2.3 Consumption

Consumption patterns evolution has direct (waste reduction) and indirect (effect on production and distribution) effects. Waste reduction has been identified has capable of bringing forward a potential reduction of 10% of GreenHouse Gases emissions (Berners-Lee et al., 2012). But greater impacts are to be found in the evolution of diets and eating habits.

It is actually in meat, and especially red meat consumption reduction (reducing total calorie input or substituting with other meats, dairies or plants – also called "protein transition") that the greatest environmental impact could be achieved. Vanham et al. (2013) for instance found that, in Europe, a 23% water-footprint reduction could be achieved only from reducing meat consumption to "healthy" levels.

Reviewing the available literature, Garnett (2011) indicated that, contrary to what is commonly emphasized, the change of consumption patterns might be the greatest "foodprint" reduction contributor. Those findings have since been confirmed by separate evaluations pointing out the great footprint reduction potential of reducing meat intake – also called "protein transition" (Vanham et al., 2013), eating seasonal products (Stoessel et al., 2012) and reducing waste (Berners-Lee et al., 2012).

In order to compare this impact with the ones evoked previously, we can quote Weber & Matthew (2008) who demonstrated, thanks to an input-output model that a (roughly) 20 % red meat consumption reduction in the US would be equivalent to total re-localization (that is cancelling transportation) regarding GHG emission reduction.

A positive correlation between eating seasonal products and reducing foodprint has also been found, especially in terms of carbon and water consumption, both in production and distribution steps (Stoessel et al., 2011).

The picture here appears as more straightforward than for distribution (2.1) and production (2.2), with more consistent and significant impact of identified actions. Moreover, contrary to production and distribution, the conclusions for consumption seem to be less sensitive to local variation and valid at the global level (Tilman & Clark, 2014).

3. SFSCs and consumption shifts

The literature reviewed in the previous section therefore seems to indicate that, contrary to what is commonly emphasized, the change of consumption patterns (i.e. reducing meat intake) might be the greatest “foodprint” reduction contributor (see Garnett, 2011 and 2014; Bajželj et al., 2014).

However, the consumption side seems to have been relatively less exploited than other. This is even more perceptible when dealing with SFSCs. Actually, if the positive environmental impact of SFSCs has often been put forward, authors have mainly insisted on food miles reduction or the potential benefits of non-conventional cropping techniques, leading authors like Edward-Jones (2010) to seriously question the environmental benefit of such schemes.

That relative negligence of the consumption side might be rooted in the quite complex and indirect way SFSCs influence consumption shifts, which does not appear as straightforward as others (in particular food miles reduction), with causalities sometimes hard to determine.

In order to address that point, the present section will be dedicated, relying on theoretical works and case studies, to bringing evidence on how participation in SFSCs and sustainable consumption practices are linked.

3.1 Consumption shifts / Green Eating

Weller et al. (2014) defined Green Eating as follows: ‘‘eating locally grown foods, produce that is in season and limited intake of processed foods, consuming foods and beverages that are labeled fair trade certified or certified organic and consuming meatless meals weekly and (if consuming animal products) selecting meats, poultry, and dairy that do not contain hormones or antibiotics.’’ A comparable definition is proposed by The Food Climate Research network and its “Sustainable Healthy Diets (Food Climate Research Network, 2015).

This definition seems too wide for the scope of the present work, as it refers to sustainability in general and not environmental sustainability in particular. A narrower definition of “Green Eating”, focusing on environmental impact would concentrate on factors affecting directly the foodprint of individuals and chiefly protein transition, seasonal eating and waste reduction. We therefore define

"Green Eating" as the set of behaviors contributing the reduction of foodprint through the evolution of consumption practices.

In the figure below (fig. 1), Garnett (2011), building up on Garnett (2008) gives a more precise idea of what is included in that notion by summing up links between eating behaviors and the reduction of major environmental indicators.

Priority	Action	Impact area addressed	Problems
High	Eat fewer meat and dairy products	N_2O and CH_4 emissions; lost carbon sequestration from possible land clearance overseas; fossil fuel use	Reductions in both UK production and imports will be needed or else the problem will be shifted overseas; risk that fish takes the place of meat in people's diets, so increasing pressure on fish stocks
High	Eat no more than needed to maintain a healthy body weight)	Eating more food than needed stimulates the production of more food than is needed, and hence GHG emissions	Risk that individual people are victimised; overconsumption of food needs to be situated within an overall approach to consumption and consumerism
Medium, possibly high	Do not waste food and manage unavoidable waste properly	Less food waste permits lower levels of food production	The waste issue raises structural, system questions that are linked to the whole *consuming less* debate
Medium	Eat seasonal, robust, field grown vegetables rather than protected, fragile foods prone to spoilage and requiring heating and lighting in their cultivation, refrigeration, and rapid modes of transport	Tackles areas of refrigeration, transport, food spoilage	Measures to reduce air freighted foods may clash with international development objectives
Medium	Prepare food for more than one person and for several days	Efficiencies of scale – reduced energy use	Requires a measure of pre-planning. Trends in how people actually live and average household size make this approach difficult
Medium	Accept different notions of quality	Less waste permitting lower levels of production	Food that is edible but deemed of lower quality or undesirable goes to food processing or animal feed, or can go for export, so it may not always actually be wasted
Medium	Accept variability of supply	Tackles the problem of needing to supply foods even when the environmental cost of doing so is high	Variability within a complex food system may lead to bottlenecks and knock-on impacts which in turn can contribute to food waste; this approach may require a simpler food chain than the kind found in the developed world – one where foods are less processed
Medium	Consume fewer foods with low nutritional value e.g. Alcohol, tea, coffee, chocolate, bottled water	These 'unnecessary' foods are not needed in our diet and need not be produced	Raises major questions around free choice. Many of these foods (tea, coffee, chocolate) provide livelihoods to vast numbers of people in the developing world
Medium	Cook and store foods in energy conserving ways; possibly smart metering	Energy use in the home	Simple to do; saves money; impacts limited but useful
Lower	Shop on foot or over the internet	Reduced energy use	Research into the benefits of internet shopping is cautiously optimistic Edwards et al. (2009)

Figure 1. Green Eating behaviors, from Garnett (2011:S30)

3.2 How SFSCs favour Green Eating

Links between SFSCs and consumption shifts might not appear obvious at a glance, and so is the sense of causality between the two. One might actually argue that people participating in SFSCs already have adopted Green Eating behaviors and that the effect is therefore marginal.

We can however gather scattered yet persuasive evidence, coming from different literature bodies, and make a quite solid case pleading for a strong effect of participation in a SFSCs and greener eating practices for the consumer.

The major issues here are: being able to understand what is influencing attitudes, and what is allowing attitudes to be translated into behaviours (Annunziata & Scarpato, 2014).
SFSC schemes, such as Community Supported Agriculture (CSA) seem to offer the possibility to their participants to develop, implement and maintain green eating behavior over time. There is strong evidence in the literature correlating positive appreciation of local foods and healthier/greener eating behaviors (Pelletier et al., 2013), and some clues of a direct correlation between participation in such schemes and greener food consumption practices (Russell & Zepeda, 2008).

Studying a collective purchase group (GAS) in Rome, Fonte et al. (2013) reached the conclusion that the participation in such a local food scheme lead to the development of a "conscious reflexivity" among members. Not only did this allow them to adopt greener eating behaviors, it also triggered interrogations and change on non-food-related habits. The authors also reckon that participation in such a scheme had a particular importance in the routinization of behaviors, that is a crucial component of their sustainability overtime (Hormes et al., 2013). Connelly et al. (2011) also found "structural change" happening in individual behaviors thanks to the feeling of belonging in a community, in a study of two Canadian cases.

Interestingly enough, the behavior change noticed among participants to CSA does not necessarily come only, or even principally, from the establishment and enforcement of social norm but also – maybe mainly- from "structural elements" such as exposure to farm works, exchanges with producers, etc. (Russell & Zepeda, 2007). If these results were to be confirmed, it would suggest innovative paths for policy, differing substantially from the traditional communication campaigns and allowing to engaging with a wider array of consumers, which will be tentatively explored below (section 4.2).

4. Potential implications for local sustainability policy and planning

This section will tentatively aim at developing some potential implications of the observations realized in sections 2 and 3.

4.1 Detaching "local foods" from the local understood as geographical proximity

A first consequence of shifting could be to unburden the existing debate of scale questions that would become secondary, which might have some positive effects. Actually, a stream in planning literature has seen authors being quite critical what they saw as an excessive confidence in the virtues of the local (Clancy & Rhuf, 2010), arguing that there was "nothing inherent to scale" (Born & Purcell, 2006) and that the alleged benefits of local foods should be tested case by case (Edwards-Jones et al., 2008). Other authors even went further in their critique of the benevolent approach of their colleagues, warning that our understanding and judgment could be blurred by "conflation of observation with desired outcomes" and "inconsistent use of concepts" (Tregear, 2011).

Focusing on consumption rather than on production or distribution (or, as often, both), The notion of "Short Food Supply Chains" proposed in the introduction could therefore appear as one carrying less positive and negative a priori than the one of "local food", allowing for a more detached analysis.
Noticeably, this could feed in not only reflections on local foods, but also on the wider movement of "localism". A recent book edited by Madanipour & Davoudi (2015) precisely aim at triggering the debate by interrogating systematically the current trend for preferring smaller scale. In a chapter of that work, Cowell (2015) developed quite critical thoughts on the idea (for instance defended by Rees, 2015) that small scale necessarily equated increased environmental sustainability, concluding that "we need[ed] to be more modest and nuanced about the connections [between the two]" (232).

In that configuration, however, local continues to matter at least in two dimensions. The first one being the cultural aspect, for it carries an emotional load that is likely to influence the behavior of consumers. Mount (2012) for instance underlined the importance of "reconnecting consumer and place" in SFSCs. The second one probably is the spatial side, since, were such changes to happen

beyond the marginal scale, they would have important spatial consequences (Edward-Jones et al., 2008, p.272). If not only local, that impact would nevertheless be *localized* and should be taken into account (and even forecasted), as much as it is possible.

4.2 Citizens and consumers

Another potential implication of shifting the focus towards consumption lies in the change of perception of who might be the primary interlocutor of sustainability policies.
Traditional communication – persuasion – campaigns based on information, encouragement of positive behaviors and stigmatization of undesirable ones only have effects on a very limited audience and that are hard to maintain overtime (Hormes et al., 2013). One of the explanations of such a limited impact could stem from the fact that such awareness raising campaigns are primarily addressed to citizens, not consumers. De Bakker & Dagevos (2012) emphasized that if any meaningful –beyond niche evolution - shift towards green eating behaviors were to be achieved, it would imply "a broad view on alliances with consumers that surely must not be restricted to consumers as responsible and engaged ''food citizens'' (882). They went on by suggesting a typology of consumers and potential strategies for "protein transition" (replacement of meat by other protein sources) summed up in the table below:

	Weak sustainable consumption		Strong sustainable consumption
	Sustainability by stealth	Moderate involvement	Cultural change
Characterization of consumer alliance	Fairly passive relationship, oriented on minor shifts in consumption behavior	A discussion partner with whom an open dialogue is maintained	A loyal partner from whom severe criticism may be expected
Examples of eating habits and food culture	Regular eating of hybrid meat analogues or meat replacers that are perfect "taste-alikes"	Attracted to meatless or low-meat dinner as "normal" and healthy alternatives	Food citizens: vegetarian life style or a low level of (organic) meat consumption

Figure 2. Consumer typology for protein transition, from De Bakker & Dagevos (2012:886)

Fig. 2 allows us to understand the practical implications such a focus change could have on the elaboration on sustainability policies tackling food. It could be matched with the list of sustainable eating behaviors presented in Fig. 1 in order to get a more precise understanding of what kind of behaviors could be promoted to the different audiences targeted.

5. Conclusions

The literature reviewed in the present paper seems to indicate that consumption shifts are a very promising field as far as foodprint reduction is concerned, that has not yet been fully explored. This is particularly valid in the case of SFSCs, where distribution (especially through food miles reduction) and production have received much more attention than consumption. That fact of the matter is hardly surprising, if we are to take into account two essential elements: 1) That the planning literature on SFSCs has been widely focusing on physical proximity (sometimes excessively, as Born & Purcell already pointed out in 2006) and on alternative production; 2) That relationships between SFSCs and consumption does not appear straightforward at first sight, and that causality is

sometimes hard to determine. That field therefore appears to be to some extent under-researched, especially given its demonstrated high potential for environmental footprint reduction (see section 2.3 above).

Yet, there are convincing clues of that participation in SFSCs positively influences green eating behaviors. Beyond the recognized correlation between the two, some studies single out potential causality mechanisms. The first one would be the traditional "awareness raising" function that is not to be either over or under-estimated. In addition to this, SFSCs seem to enable a significant part of their participants to turn pre-existing attitudes into actual behaviors; that they could or would not have previously adopted. By offering concrete solutions (availability of the product, information on recipes/diets, etc.), such schemes seem to unlock sustainable behaviors; Participation in SFSCs could also be a way to maintain these behaviors, that often are quite volatile and following trends (see Hormes et al., 2013).

Potential implications for planning and local sustainability policies are still unclear at this point of the exploration of the topic. On the one hand, shifting the focus on the consumer could lead us to pay less attention to questions of scale, to put more emphasis on debates such as the "citizen – consumer" dichotomy . However, were such consumption shifts to happen beyond a marginal scale, they would have important impacts on the production and distribution systems, carrying a bundle of spatial consequences that are not to be neglected. Scholars should therefore beware, as much as the "local trap", the "disconnection trap", which would lead them to consider only the consumer, without paying attention to consequences on distribution, production and their spatial implications.

Further research therefore appears as particularly needed in the following fields:

1. Evaluate more precisely the relationship between SFSCs and consumption shifts, paying careful attention to what elements of SFSCs positively influence the adoption or maintenance over time of green eating behaviors.
2. Try and quantify this relationship, to have a more precise understanding of the potential impact of such evolutions.
3. Investigate, on the basis of these results, what could be potential policy implications for SFSCs support, if these policies were to aim at maximizing environmental footprint reduction.
4. Exploring case studies try and anticipate the potential structural (including spatial) consequences of significant consumption shifts towards green eating behaviors.

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HARVEST TO HARVEST: RECOVERING NITROGEN, PHOSPHORUS AND ORGANIC MATTER VIA NEW SANITATION SYSTEMS FOR REUSE IN URBAN AGRICULTURE

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Keywords: Urban Agriculture, New Sanitation, Urban metabolism, Urban Harvest Approach, Nutrients

Abstract: To maintain the city as a viable concept for human dwelling on the long term, a circular metabolism needs to be adopted which relies on recovering, reusing and recycling resources, in which output ('waste') from one metabolic urban conversions equals input for another. Urban Agriculture (UA) and source-separation-based New Sanitation (NS) are gaining momentum as measures for urban resource management. UA aims to localize food provisioning while NS aims to reorganize wastewater and organic waste management to recover valuable and crucial resources. The objective of this research is to assess the match between the supply by NS systems and the demand from UA for nitrogen, phosphorus and organic matter, in terms of quantity and quality, to foster a circular metabolism. The research is contextualized in the city of Rotterdam. The methodology used is based on the Urban Harvest Approach (UHA), developed previously for the urban water cycle. Novel to this research is adapting the UHA to nitrogen, phosphorus and organic matter loads for two practiced UA typologies (ground-based and rooftop) and four NS concepts for the treatment of domestic urine, feces and kitchen waste. Results show that demand for nutrients and organic matter from UA can be minimized by 65-85% and a self-sufficiency of 100% for phosphorus can be achieved, while partial self-sufficiency for nitrogen and organic matter. This research reveals that integration of NS and UA maximizes urban self-sufficiency.

1. Introduction

Cities depend on regional and global hinterlands for the supply of water, energy, nutrients and materials and for the disposal of wastes (Brunner, 2007, Kennedy et al., 2007, Agudelo-Vera, 2012, Hodson et al., 2012), deeming cities hotspots for resource conversion. This conversion follows a linear chain of high quality resource inputs and low quality waste outputs (Figure 1a.). Few resources are currently recovered for reuse. This linear chain leads to two major challenges: first, cities' high rate of consumption puts stress on resource availability (e.g. phosphorus, fossil fuels), and second, the disposal of vast amounts of waste causes pollution (e.g. water and resource contamination, biodiversity loss, deforestation, and pollution in air, water and land). For example, cities currently import large quantities of food not only from their hinterlands, but also from locations across the globe. At the same time, they produce low or even negative value waste loads containing disposed and excreted nutrients. These are often mixed and collected via large-scale engineered infrastructures that endorse this linear tendency and make it difficult to effectively recover resources (Balkema et al., 2002, Hodson et al., 2012). With more than half of the world's population currently residing in cities, this linear tendency is further intensified (United Nations, 2014).

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As hot-spots of resource conversion, however, cities also present an excellent opportunity to adopt a circular metabolism for these resources, in which output ('waste') from one process equals input for another. As opposed to the current linear urban metabolism, a circular urban metabolism aims to recover and reuse (recycle) resources within or between urban functions to reduce the external input of virgin resources and the output of waste (Agudelo-Vera et al., 2012) (Figure 1b). To move towards a circular urban metabolism, resource input-output flows of urban functions need to be identified, described and matched in terms of quantity and quality. New Sanitation and Urban Agriculture are currently gaining global interest individually as measures to improve urban resource management (Mougeot, 2006, Food and Agriculture Organization of the United Nations, 2014). Two urban functions that could be matched for mutual benefit.

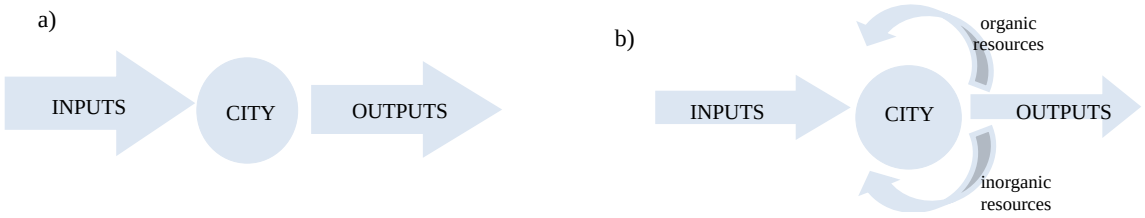

Figure 1. a) A linear metabolism of inputs and outputs. b) A circular metabolism reuses, recycles and recovers resources from urban waste streams, reducing resource inputs and outputs.

Urban agriculture (UA) is the *local* production of food within (peri-)urban areas, which in addition fosters education, employment, place-making, community building and/or closing organic resource cycles (Mougeot, 2000, Smit et al., 2001). UA assimilates a wide variety of activities, locations, scales, purposes and engagement (e.g. community gardens, roof-top farming, commercial farming and animal husbandry). UA involves intensive cultivation/breeding methods that yield a diverse selection of flora and fauna, and integrates it with the local urban economic, social and ecological systems. New sanitation (NS) systems manage the collection, transport, treatment, and recovery of solid waste and wastewater streams (e.g. urine deviated vacuum toilets, anaerobic digesters, struvite precipitation) with the aim to recover resources at local scales (i.e. water, nutrients, organic matter, energy), increasing efficiency, reducing energy costs, and/or offering local solutions to waste management (Lens et al., 2001, Kujawa-Roeleveld and Zeeman, 2006, Zeeman, 2012). NS systems often include source separation of waste and wastewater streams (e.g. black water (urine and feces) and grey water (shower, sink, laundry)).

Re-establishing a partnership between agriculture and sanitation is not a new phenomenon. Various studies have looked at the possible connection between sanitation and crop production including: wastewater reuse/irrigation for crop production (Smit and Nasr, 1992, Strauss, 2001, Beuchler et al., 2006), treatment, recovery and reuse of fertilizers from wastewater (Lens et al., 2001, Jenkins, 2005, Mihelcic et al., 2011, Tervahauta et al., 2013), reuse of urine (Maurer et al., 2003, Maurer et al., 2006), bioavailability of recovered products to crops (Jönsson et al., 2004, Oenema et al., 2012), guidelines on urine and feces reuse in agriculture to ensure safe handling (Jönsson et al., 2004, Heinonen-Tanski and van Wijk-Sijbesma, 2005), risks of micro-pollutants, pathogens and heavy metals (Heinonen-Tanski and van Wijk-Sijbesma, 2005, Winker et al., 2009, Tervahauta, 2014), and the link between urban agriculture and sanitation systems as an economic and food security measure in developing countries (Streiffeler, 2001, Kone, 2010, Cofie et al., 2013).

However, the feasibility to match input and output flows between UA and NS systems should not be overlooked. To start, data on the quantity and quality of the input demands from UA systems is lacking, as UA is for the most part unregulated. Second, data on the quantity and quality of the products produced by NS systems has, and continues to be, researched (Lens et al., 2001, Zeeman

and Kujawa-Roeleveld, 2011, Tervahauta et al., 2013). However, the extent of their reuse in UA is uncertain (e.g. fertilizer quantity in terms of slow release vs quick release, or contaminants). To match resource flows and fine-tune both UA and NS systems, these values need to be uncovered.

1.1 Scope of Research and Research Objectives

The scope of this research focuses on the recovery of nitrogen (N), phosphorus (P) and organic matter (OM) from domestic wastewater and kitchen waste to determine the extent to which these resources can cover the demand from UA, in Rotterdam, the Netherlands. The reason for this focus is three-fold. First, the global concern regarding resource depletion and environmental pollution due to current consumption and disposal of nutrients, N and P, and OM. Second is the increased regional interest in the Netherlands for the professionalization of UA and the recovery of resources from waste streams. Third is Rotterdam's interest in improving local resource management and implementing UA.

The overall goal of this paper is to model combined UA and NS systems to evaluate the degree to which N, P and OM input-output flows can be matched and quantify the degree of self-sufficiency. This will be done in three steps: a) select and characterize relevant UA typologies and quantify the demand of nutrients and organic matter for each selected typology, b) select the NS technologies (proven at lab and pilot scale) most appropriate for the recovery nutrients from residual waste streams and quantify the harvested nutrients and organic matter, c) quantify the extent to which the demand for nutrients from UA can be met by recovered nutrients from the selected NS systems.

1.2 Methodological Framework: Urban Harvest Approach

The methodology used in this research is an adaptation of the Urban Harvest Approach (UHA) developed at the Sub-department of Environmental Technology (ETE) at Wageningen UR. It has been most extensively applied to the urban water cycle to improve urban resource management towards self-sufficiency by applying three management strategies: demand minimization, output minimization (by resource cascading, recycling and recovery), and multi-sourcing (Agudelo-Vera et al., 2012, Agudelo-Vera, 2012). In this research, these strategies are shown in Figure 2 and are defined as follows:

- *Step 0: Baseline Assessment:* This describes the existing situation, including demand inventory and current technologies. Here the baseline identifies the quantity and type of nutrient input demand for each UA typology, and the output of nutrient flows from domestic sanitation waste flows.
- *Step 1: Demand minimization:* This strategy reduces the demand for nutrients via the implementation of new technologies or via changes in human behavior. Here the demand for N, P and OM fertilizer can be reduced by using different farming technologies or by reducing fertilizer application or patterns.
- *Step 2: Output minimization:* This strategy minimizes outputs via three strategies: cascading (direct use of outputs for a purpose with lower quality demand), recycling (the reuse of a resource flow after a quality upgrade, which generally costs energy) and/or recovery (the extraction of valuable resources from waste streams) from the outputs. Cascading will not be used because primary and/or secondary treatment of human excreta is needed to secure the removal of pathogens (Jönsson et al., 2004).

– *Step 3: Multi-sourcing:* Satisfying the remaining demand by harvesting local, renewable resources. Multi-sourcing will not be included in this research as there are few renewable sources of N, P and OM.

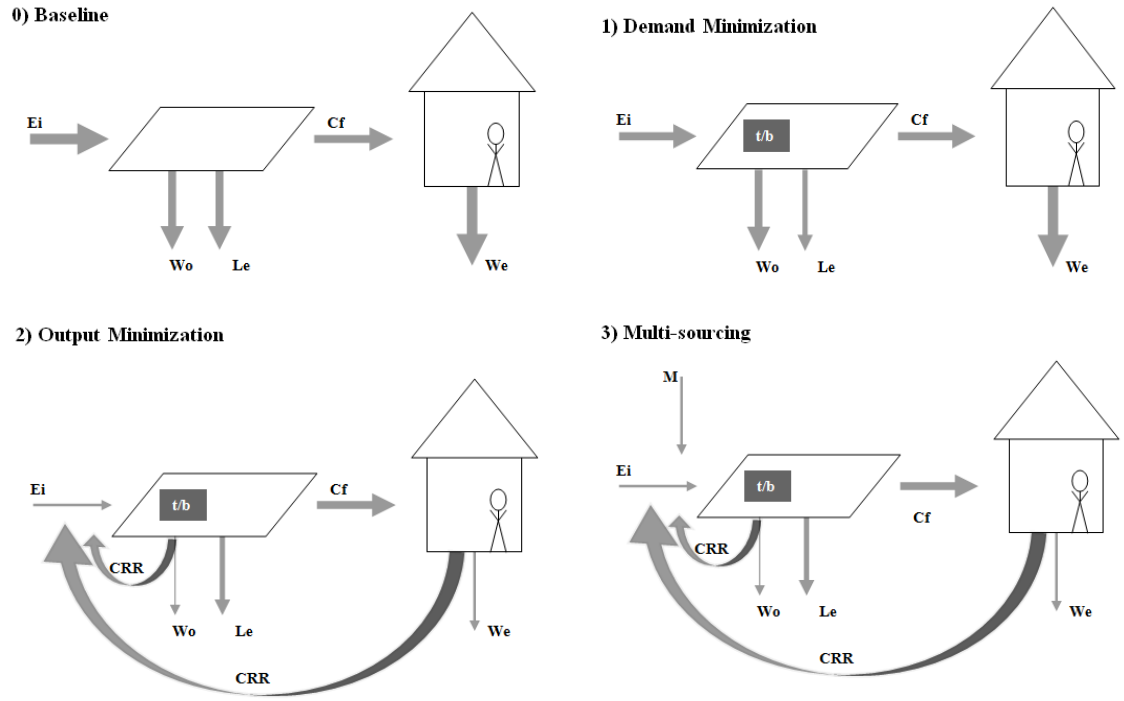

Figure 2. Schematic of the UHA adapted to flows between urban agriculture and new sanitation. Ei= External input, Wo= Waste agriculture exported, Le= Losses environment, Cf= Consumed food, We=Waste exported via sanitation, t/b= technology and behavioural changes, CRR= Cascading, recycling and recovery (harvesting strategies), M= Multi-sourcing

This research uses the UHA to match N, P and OM flows between selected UA typologies and NS concepts for the treatment of domestic urine, feces and kitchen waste (described later). The designed systems are evaluated using the indices developed by Agudelo-Vera et al. (2012), including: Demand Minimization Index (DMI and Self-Sufficiency Index (SSI).

Demand Minimization Index (DMI): The DMI describes the change in demand in reference to the baseline demand. Baseline demand (D_o) reflects the current resource demand (status quo) from UA and the minimized demand (D) describes the demand adjusted to reflect equilibrium fertilization values. A DMI of 0 indicates that no demand minimization has taken place. The DMI is calculated using Equation 1.

$$DMI = \frac{Baseline\ demand\ (D_o) - Minimized\ demand\ (D)}{Baseline\ demand\ (D_o)} * 100$$

Self-Sufficiency Index (SSI): The SSI is a measure of the self-sufficiency of a system: in this case, to what extent can nutrients from NS systems provide sufficient nutrients to fulfill the demand from UA. The SSI is measured by the resources harvested and reused (Rr) against the minimized demand (D). The SSI is calculated using **Equation 2.**

$$SSI = \frac{Resources\ reused\ (Kr)}{Minimized\ demand\ (D)} * 100$$

2. Urban Agriculture Typologies and New Sanitation Concepts

2.1 Urban Agriculture and the Selected Typologies

UA is diverse in form and purpose, which for this study requires that UA typologies be clearly defined to identify respective input and output flows. The nutrient demand for each typology is dependent on various factors including nutrient retention, nutrient extraction, precipitation, individual plant demand, and soil type. In addition, different plants have varying demands. For example, lettuce may require 165-180kg/ha of nitrogen, while chicory may only need 100kgN/ha, and cauliflower up to 210-230kgN/ha (Rijksoverheid, 2014a). The soil pH also influences the availability of nutrients to plants, for example, the maximum availability of phosphorus occurs in the 6.0-7.0 pH range (College of Agricultural Sciences, 2014).

Two UA typologies were selected and defined, namely, ground-based urban agriculture (ground-based UA) and rooftop urban agriculture (rooftop UA). These were selected because both ground-based and rooftop UA initiatives can be found in Rotterdam, which could serve as reference case-studies for this research. Ground-based UA grows edible plants at ground level in soil (e.g. Small Plot Intensive (SPIN) farming, community gardens/farms, permaculture farms and forest gardening)

Rooftop UA involves cultivating crops on the rooftops of urban buildings, usually flat roofs that are most suited to carry additional weight. This typology can cultivate plants in soil or in a soil-like substrate. The benefit of this typology is similar to that of green roofs: building insulation, urban cooling effect, water retention, etc. A rooftop's appropriateness for urban farming depends on the height and capacity to sustain weight. High rooftops are exposed to strong winds and may be limited in the kinds of crop varieties, while the building needs to be strong and be able to hold between 60-150kg/m^2 of additional weight. (Dumitrescu, 2013).

2.2 New Sanitation and the Selected Concepts

Sanitation is the promotion of hygiene via the management and treatment of wastes, including the physical and organizational structure (Brikké and Bredero, 2003, Mihelcic et al., 2011). Sanitation systems in developed countries are mostly centralized: extensive networks for the collection and transport of mixed and diluted waste streams, treated at one central point, with little intention to recover valuable resources (Wilderer and Schreff, 2000). These are contrasted with decentralized systems: stand-alone systems used for treating more concentrated waste streams sourced from smaller areas either on-site or close to the point of generation (Wilderer and Schreff, 2000, Tchobanoglous and Leverenz, 2013).

NS is a new paradigm for the collection, transport, treatment, and recovery of solid waste and wastewater that aims to reconfigure waste management at local scales: recovering resources, increasing efficiency, reducing energy consumption and improving health and environmental protection (Lens et al., 2001, Kujawa-Roeleveld and Zeeman, 2006, Zeeman, 2012, Tervahauta et al., 2013). NS systems are local systems (source, recovery and reuse are in close proximity) and the technical design completely serves the above aim. The design often includes source separation of waste and wastewater streams, collecting black water (urine and feces), grey water (shower/bath, sink, laundry, dish washer) and/or urine separately. The different types of streams are outlined in Table 1. Depending on the types of streams separated and the local context, NS concepts can be configured for treatment and recovery to achieve reuse or discharge parameters.

Table 1. Wastewater sub-streams and their sources

Stream	Sub-stream	Source
Black water	Yellow water	Urine, with or without water
	Brown water	Feces and toilet paper, with or without water
Greywater	Light grey water	Shower, bathtub, bathroom basin
	Dark grey water	Kitchen sink, dishwasher, washing machine

For the recovery of nutrients, urine, feces and kitchen waste are the most promising streams for this research since they have the highest load of N, P, and OM (measured as COD), as shown in Figure 3. It is noted that urine contains most N and P, followed by feces. Feces and kitchen waste contain most organic matter, suitable for making compost and soil conditioners. Therefore, urine, feces, black water (BW) and kitchen waste (KW) were used in this research, while greywater (GW) was not considered.

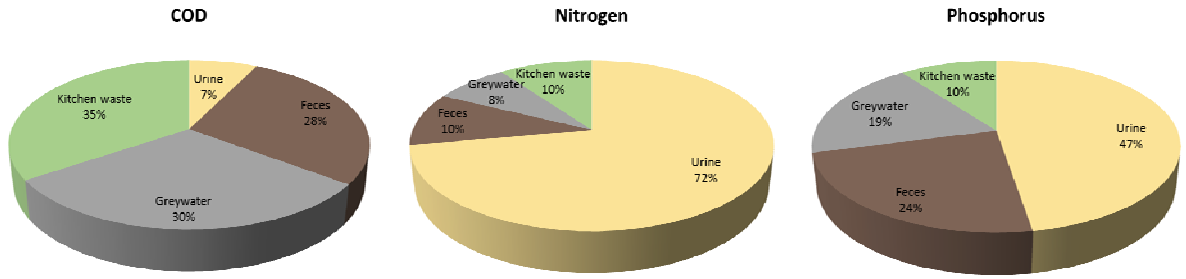

Figure 3. Distribution of nitrogen, phosphorus and organic matter (COD) across domestic waste and wastewater streams (Refer to Table 4 for numbered values)

New Sanitation systems can be divided into subsequent sub-systems, from collection to reuse/disposal/discharge. These sub-systems are described below, specifically with reference to NS (Maurer et al., 2012):

- *User interface/collection:* the user access to the sanitation system, usually via the toilet. For example, low flush and vacuum toilets, urine-diverting toilet and composting toilets.
- *Conveyance and transportation*: the transport of the waste streams from one sub-system to the other, for example via human powered or motorized pathways.
- *Storage and treatment:* the collected waste streams are stored and/or treated, requiring appropriate technologies and facilities. For example, urine storage, composting kitchen waste, anaerobic treatment (ie. up-flow anaerobic sludge blanket (UASB) reactor), nitrification and denitrification (ie. oxygen limited anaerobic nitrification denitrification (OLAND) and disinfection.
- *Recovery*: the harvesting of resources from waste streams such as water, metals or nutrients. Struvite recovery, using a struvite precipitation reactor, from urine and black water is used for the recovery of P and N.
- *Reuse/disposal:* the use of recovered and treated products from prior sub-processes in which resources are returned to the ecological or anthropogenic environment.

The configuration of technologies across the sub-processes determines the extent to which resources can be recovered, in terms of quantity and quality. For example, removal efficiencies, methanization levels, and precipitation efficiencies influence the amount of nutrients that can be harvested and the quality of the product for human and environmental hygiene.

3. Results

3.1 Baseline Nutrient and Organic Matter Demand, and Demand Minimization

The nutrient demand was calculated for each typology (kg/ha) by comparing data from primary and secondary sources, including interviews with present urban farmers in Rotterdam, - the actual amount of fertilizer applied- as well as fertilizer regulations for conventional agriculture in the Netherlands, and values for equilibrium fertilization – the advised amount of fertilizers -, as further described in the following sections.

3.1.1 Ground-based Urban Agriculture

The baseline demand for ground-based UA was gathered from interviews with an UA farm in Rotterdam and the fertilization regime they follow. This fertilization regime included the use of both slow release and quick release fertilizers distributed in a compost mixture, chicken manure, and a liquid fertilizer. Table 2 compares the baseline demand with conventional norms and regulations for N and P use in the Netherlands and with equilibrium fertilization values. The conventional norms and the equilibrium fertilization values were averaged from 22 different types of horticultural crops (Fink et al., 1999, Rijksoverheid, 2014b, Rijksoverheid, 2014a). Equilibrium fertilization reflects the nutrients contained in the total harvested fresh matter (harvest residues and marketable yield) assuming an optimal yield per hectare (Fink et al., 1999). These values were used because it reflects what a plant actually takes up, as opposed to the conventional regulations for fertilization in the Netherlands.

Table 2. Annual Nutrient Demand Ground-Based Urban Agriculture

Source	N available* (kg/ha)	P_2O_5 available* (kg/ha)	Organic matter[4] (kg/ha)
Baseline Demand[1] (D_o)	109.3	217.3	7861
Conventional norms[2]	178.3	65	-
Equilibrium fertilization[3]	202.7	32.2	-
Minimized Demand (D)	**109**	**32.2**	**2685**

[1] Table on fertilizer advice (Van Ierssel, 2013)
[2] Averages calculated from nitrogen and phosphorus use norms and regulations (Rijksoverheid, 2014a, Rijksoverheid, 2014b).
[3] Averages calculated from data on fertilizer recommendations and nutrient balances (Fink et al., 1999)
[4] OM=32% of dry matter. From: Samenstelling en werking van organische meststoffen (de Haan and van Geel, 2013).
* Nutrient values for nitrogen and phosphorus are usually expressed by weight of N and P_2O_5. The actual phosphorus content, however, is then 44% of the P_2O_5 value. Nitrogen is simply expressed as elemental N or mineral nitrogen, Nmin. Both N and P_2O_5 are calculated using the "werkings coefficient" for compost and animal manure. N available is 10% in compost and 55% from chicken manure. P available is 50% in compost with a maximum of 3.5g P_2O_5/kg dry matter of compost

Noticeable from Table 2 is that for P the baseline demand exceeds the conventional norms by a factor 3 and the equilibrium fertilization values by even a factor 7, meaning strong over fertilization is taking place. The equilibrium values were used as the minimized demand assuming an ideal scenario

in which the fertilization regime could reflect the amount of nutrients that crops take up, and not more. Over fertilizing results in either increased nutrients in the soil or their release to the environment. The baseline demand was used when it was below the equilibrium fertilization value, as is the case with N for ground-based UA. OM was minimized to reflect that contained in 15,000 kg of compost as suggested in literature (Goed boeren in kleinschalig landschap, 2011).
The DMI is then calculated using Equation 1. For ground-based UA the DMI for N is 0, for P is 85% and for OM is 66%. The N demand does not need to be minimized because it lies well below the equilibrium fertilization value. The amount of P and OM minimized for this typology is significant and highlights the degree of over-fertilization, especially of P, a finite resource (Cordell et al., 2009).

3.1.2 Rooftop Urban Agriculture

The baseline demand for rooftop UA was gathered from a rooftop UA farm in Rotterdam that used a growing substrate and drainage system that is light in weight to adhere to the 180kg/m^2 capacity of the roof. The substrate is low in organic matter to make it as light as possible, and therefore no compost is added in their fertilization regime, but rather slow release granulates. No quick release fertilizers are used. The N, P and OM values for the baseline demand are shown in Table 3, in comparison to the conventional norms and the equilibrium fertilization values. Again, the equilibrium fertilization values were assumed for the minimized demand, except in the instances that the baseline demand was below these values.
For rooftop UA the N demand is below the equilibrium fertilization value, meaning that minimization is not needed. OM is kept as the baseline demand. For P, however, the DMI (Equation 1) is 65%, meaning that the demand is minimized significantly.

Table 3. Nutrient Demand rooftop Urban Agriculture

Source	N available* (kg/ha)	P_2O_5 available* (kg/ha)	Organic matter (kg/ha)
Baseline Demand[1] (D_o)	112.5	92.3	1742.5
Conventional norms[2]	178.3	65	-
Equilibrium fertilization[3]	202.7	32.2	-
Minimized Demand (D)	**112**	**32.2**	**1742.5**

[1] Calculated from: Technische Fiche ECO-MIX 1 (DCM Nederland BV, 2014) and Organische Gedroogde Koemest (Humuforte, 2014)
[2, 3, 4] Same as in **Table 2**
*calculated using the "werkingscoefficient" for compost and animal manure. N available is 40% in purchased grass-fed animal-derived fertilizers

3.2 Baseline Nutrient and Organic Matter Supply from Waste and Wastewater

Rotterdam, with an area of 319.35 km^2, has a population of approximately 620,000 people (Gemeente Rotterdam, 2013). There are a total of 317,549 households in the city housing approximately 1.94 individuals per household (Gemeente Rotterdam, 2013). The city produces a total of 76,000 tons of household organic solid waste. However, most of this organic solid waste is collected together with municipal solid waste and incinerated for the generation of energy. A smaller fraction, 1% of household organic solid waste, called "groente, fruit en tuin (GFT) afval" is collected separately at source, composted and sold via a third party to the agricultural sector.

The city's wastewater is managed and treated by the Waterschap Hollandse Delta and Hoogheemraadschap Schielanden en Krimpenerwaard. Using Table 4, the loads of the nutrients can be calculated for the whole population of Rotterdam. Household black water and kitchen waste generated daily represent a load of 1,356 kg of P and 316,850 kg of N. OM is 32% of the total dry matter, which is 88,764 kg per day. Using NS systems, these nutrients and OM are recovered with a respective efficiencies.

Table 4. Mean compositions of urine, feces, black water and kitchen waste calculated based on European data as reported in literature, including respective standard deviations (Kujawa-Roeleveld and Zeeman, 2006, Magid et al., 2006, Daigger, 2009, Friedler et al., 2013, Tervahauta et al., 2013)

Parameter	unit	Urine	s.d.	Feces	s.d.	Kitchen waste	s.d.	total
Volume	L/p/d	1.3	0.12	0.13	0.06	0.2	0.00	86.83
COD	g/p/d	12.5	1.91	47.9	12.23	59	0.00	171.10
Dry matter	g/p/d	46.5	16.26	35.5	7.78	75		211.80
TN	g/p/d	10.2	1.10	1.4	0.38	1.4	0.52	14.10
TP	g/p/d	1.1	0.34	0.5	0.05	0.2	0.06	2.20
K	g/p/d	2.6	0.15	1	0.09	0.3	0.12	4.50

3.3 Output Minimization

3.3.1 New Sanitation Concepts 1-4

In Rotterdam the collection sub-system widely used for urine and feces is still the standard flush toilet. The low flush, vacuum toilet and urine-diverting toilet are currently the only proven technologies for the collection of concentrated black water. The collection system, or rather the composition(s) of the stream(s) collected, then influences the proceeding treatment steps possible.
The recovery/reuse sub-systems need to provide at least similar comfort compared to current sanitation systems, produce little nuisance (odors), and have to be included into the current urban fabric taking up relatively little space. This study is concerned with the recovery of resources, and therefore, post-recovery treatment steps are not further outlined or quantified. The source separated streams of interest include urine, feces, and kitchen waste, and the combination of these.
Four NS concepts (Figure 4) were selected based on systems demonstrated on lab and pilot scale, separating urine, feces, black water and/or kitchen waste with respective treatment systems. Concept 1 includes source-separation of black water combined with kitchen waste and is based on the system in place in Sneek, the Netherlands separating GW from BW and KW (grinded), (Waterschoon, 2011, Tervahauta et al., 2013). The BW and KW are treated anaerobically in an UASB reactor, followed by an OLAND reactor and struvite precipitation. Concept 2 includes the same treatment steps as Concept 1 with the exception of KW, which is collected separately for composting (Fricke and Vogtmann, 1994, Eklind and Kirchmann, 2000, Hargreaves et al., 2008, Dekker et al., 2010). Concept 3 is similar to Concept 1 with the exception of urine, which is collected separately and stored (Jönsson et al., 1998, Jönsson et al., 2004, Maurer et al., 2006). Concept 4 separates KW for compost and urine for storage (a) or struvite precipitation (b). Feces join the GW.

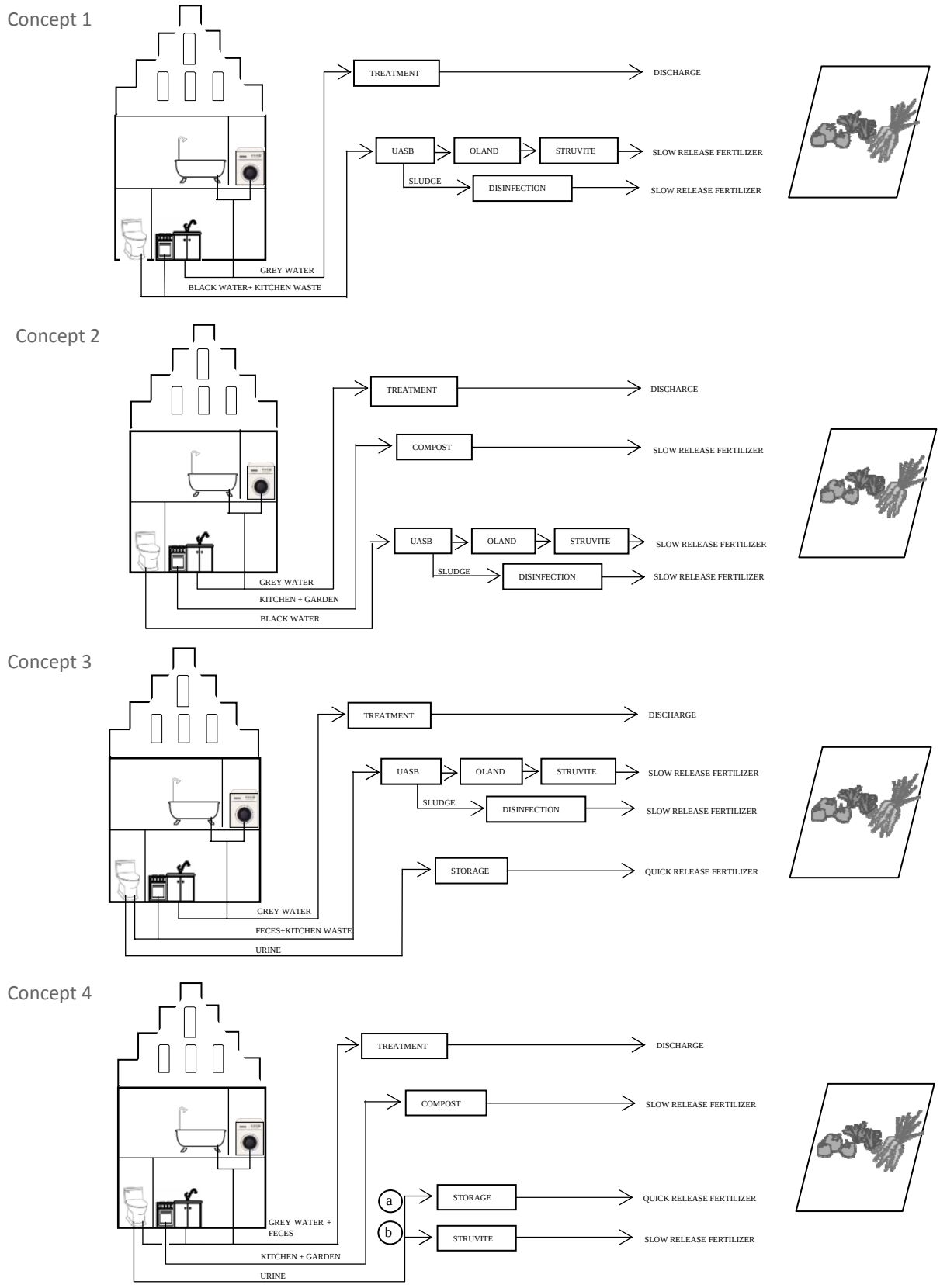

Figure 4. New Sanitation concepts, including sub-streams and recovery technologies

In Concepts 3 and 4, urine is separated at source via a urine-diverting toilet using 0.2L of water per flush. This concentrated stream is stored in Concept 3 and 4a and undergoes struvite precipitation in Concept 4b. The separated urine in Concept 3 does not undergo struvite precipitation because the treatment of the feces and KW stream already includes a struvite precipitation step.

3.3.2 Combined Urban Agriculture and New Sanitation

The demand for N, P and OM from each UA typology was compared with the supply generated by each NS concept. In total eight combinations were evaluated for the degree of self-sufficiency. However, for the evaluation of possible UA and NS combinations, both self-sufficiency (SSI) and the number of persons needed to provide that SSI is relevant. While a high SSI is preferable for the sourcing of local resources, the efficiency of the NS concept also reflects the potential to implement the NS concepts requiring the least amount of individuals. Figure 5 show the SSI for each combination.

The scenarios coupling ground-based UA with NS concept 3 and 4a provide 100% self-sufficiency of P. System 4a, however requires 10 times as many persons/ha, meaning that to fertilize the available 2363 ha almost the entire city of Rotterdam (94%) would need to be connected to NS systems. Moreover, due to the topography of the city (high rises), the collection of GFT from 94% of the city's inhabitants is not realistic. The other scenarios fail to supply the quick release demand for P and N. Therefore, ground-based UA and concept 3 provides the best combination.

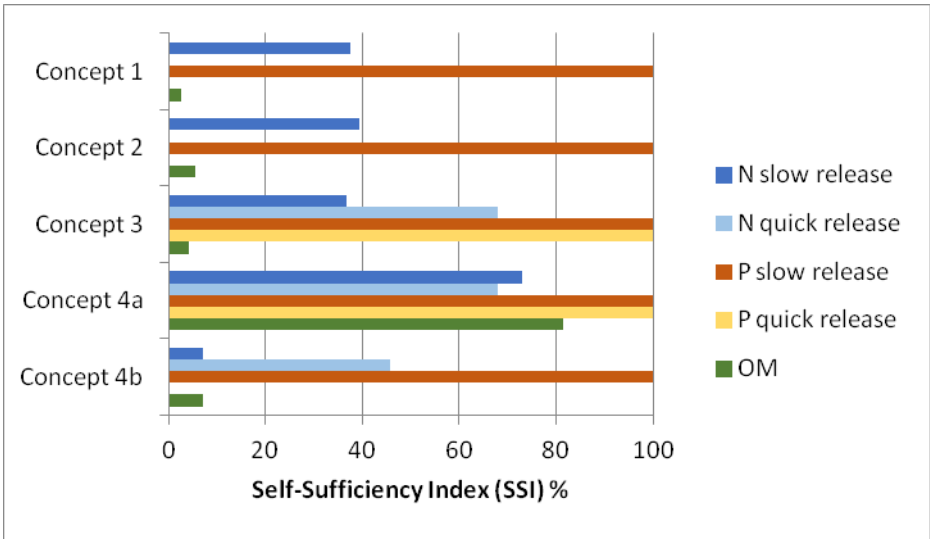

Figure 5. Self-Sufficiency in N, P and OM for Ground-based UA and NS concepts

Rooftop UA, as identified in section 3.1.2
Noticeable from Table 2 is that for P the baseline demand exceeds the conventional norms by a factor 3 and the equilibrium fertilization values by even a factor 7, meaning strong over fertilization is taking place. The equilibrium values were used as the minimized demand assuming an ideal scenario in which the fertilization regime could reflect the amount of nutrients that crops take up, and not more. Over fertilizing results in either increased nutrients in the soil or their release to the environment. The baseline demand was used when it was below the equilibrium fertilization value,

as is the case with N for ground-based UA. OM was minimized to reflect that contained in 15,000 kg of compost as suggested in literature (Goed boeren in kleinschalig landschap, 2011).
The DMI is then calculated using Equation 1. For ground-based UA the DMI for N is 0, for P is 85% and for OM is 66%. The N demand does not need to be minimized because it lies well below the equilibrium fertilization value. The amount of P and OM minimized for this typology is significant and highlights the degree of over-fertilization, especially of P, a finite resource (Cordell et al., 2009).

Rooftop Urban Agriculture, does not have a demand for quick release fertilizer. Therefore the SSI for both quick release N and P is not applicable, even though Concepts 3 and 4a produce quick release N and P from urine. The SSI for scenarios coupling rooftop UA with the NS concepts are low for slow release N and OM. The scenario combining rooftop UA with Concept 4b is the most self-sufficient for N and P, although Concept 4a is most self-sufficient for OM, compared to the other combinations. To produce enough compost for the 906ha of rooftop area appropriate for UA, household organic solid waste needs to be collected from 40,500 inhabitants, a mere 6.5% of the population of Rotterdam. This is realistic considering that Rotterdam is striving to collect 6% by 2018 anyway. Following Concept 4b, Concept 2 would best be combined with rooftop UA of slightly lower SSI but requiring only 26.8 p/ha (less intervention than Concept 4a).

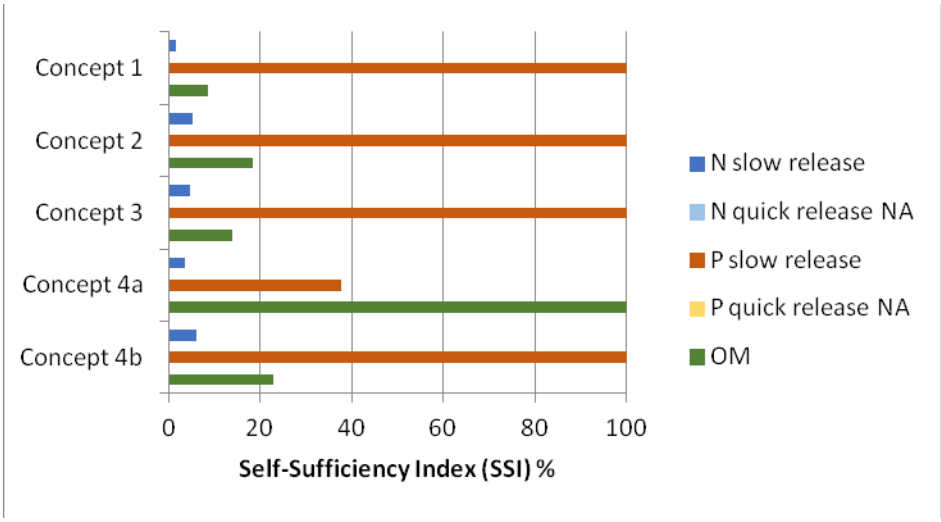

Figure 6. Self-Sufficiency in N, P and OM for Rooftop UA and NS concepts

4. Discussion and Conclusion

The UHA offers a step-by-step methodology to gain insight into the opportunities that lie in integrating urban agriculture and new sanitation. However, its application to N, P and OM input-output flows presented challenges at each step of the methodology.

4.1 Baseline Demand

The baseline N, P and OM demand from urban agriculture was based on two existing urban agriculture initiatives in Rotterdam. While their demand was actual, they are not telling for fertilizer regimes of all UA initiatives within those typologies. Different reference studies would

have provided different data on baseline demand, in terms of quantity but also fertilizer type (ie. slow release vs quick release).
In this research, both fertilization regimes showed over-fertilization of P. Considering that conventional agriculture in the Netherlands is heavily regulated in their N and P use to reduce pollution of water resources, and that P is a finite resource of increasing scarcity, urban agriculture fertilization regimes should also take measures to prevent over-fertilization and the mismanagement of N, P and OM. For instance, regulations could be formulated for UA, although the range of UA typologies requires a more context specific tool to help initiatives make substance flow analyses. In addition, UA also changes the nutrient loads discharged to the urban water cycle, such as the increase of nutrient loads to the sewer system via rooftop UA. Therefore, expanding urban agriculture across cities has various implications for urban resource cycles.

4.2 Demand Minimization

Minimizing the demand for N, P and OM from urban agriculture is achieved by behavioral changes, simply by administering less of these resources to equilibrium fertilization values. While this is a novel point of departure for the application of nutrients, further research is needed to identify the optimal fertilization regime for each UA typology, considering that nutrients mineralize in the soil and runoff may occur. Here UA pilot studies should be open to monitoring, collecting and sharing data. In addition, technological options for the administration of fertilizers that minimize the demand (ie. injection fertilization at the plant base as opposed to sprinkler systems) were not considered in this research. These technological changes could administer fertilizers where and when the plant needs it, and thereby minimize the demand.

4.3 Output Minimization

The harvested N, P and OM from the new sanitation concepts were found in stored urine, GFT compost, struvite and disinfected sludge. The selection of the concepts was based on lab and pilot scale technologies and data. For ground-based UA, Concept 3 and 4a provided a SSI for P of 100% with both slow and quick release fertilizers. For rooftop UA, most concepts could provide a SSI for P of 100% because the typology only had a demand for slow release fertilizer. Again, this reflected the reference case study selected and not a definitive fertilization regime for these UA typologies. Moreover, the ratios of N:P:OM in the demand did not match the ratios in the harvested products from NS systems. The matching of these ratios is another topic for future research.
This research concludes that combining UA and NS offers the possibility to increase urban self-sufficiency, and that the city of Rotterdam can fertilize the number of ha of available arable land (2363 ha) and rooftop area (906 ha) with the current population in terms of P and partly in terms of N and OM. However, many uncertainties still remain when determining the extent to which UA and NS can be integrated, including risk analysis for pathogens and micro-pollutants, spatial requirements, effectiveness of recovered fertilizer products in agriculture, and social acceptance.

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SYSTEMIC DESIGN GOES BETWEEN DISCIPLINES FOR THE SUSTAINABILITY IN FOOD PROCESSES AND CULTURES

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Keywords: Systemic Design, sustainability, food processes

Abstract: An healthy and safe feeding is the key element to ensure a sustainable development for the entire planet. The theme of food is one of the major challenges for the near future, indeed it involves every aspect of our lives. The paper investigates how the Systemic Design approach applied to the food sectors can contribute to decent life and, better, well-being for all, maintaining the planets ecological capacity for future generations.
This research shows the social, economical and environmental benefits generated to real cases that apply the Systemic Design methodology in different food sectors and in different local context. One case is "EN.FA.SI.", in which the value chain related to one PGI bean endorses the entire area involving the small family producers and the local SMEs. The other one is "Fondo Noir", in which the spent coffee ground from the coffee bars in the metropolitan city centre are collected in order to generate many new businesses.
The purpose is to give empirical and theoretical contributions, arising how the complexity of food systems impacts the simplicity of the everyday life solutions. The complexity involved in that kind of design processes interested a wide range of players and it aims to contribute the scientific debate on the role of design as mediator and facilitator among different specific disciplines. The polytechnic culture, at the base of design disciplines, guarantees a model for the eco-innovation also in food sector, with strong and solid approach.

1. Introduction

An healthy and safe feeding is the key element to ensure a sustainable development for the entire planet. The theme of food is one of the major challenges for the near future, indeed it involves every aspect of our lives: a correct behaviour in relation with the territory means respect for ourselves and our health.
The environmental sustainability related to the complex system of food involves the entire food's life cycle and every stakeholders who takes part in it. That includes food's production, transformation, conservation, transport, direct sell to the final consumer, consumption habits and disposal (Figure 1).
In food production phase, the hegemony of intensive farming and livestock have caused huge social, ethic and environmental debates (Shiva, 1993), like the consideration for animals and ecosystem exploitation, workers' rights defence and care of consumers health. These needs of huge amount of food force some risky adulteration in production, like the massive use of chemical pesticides or the use of organisms genetically modified, with the consequences related to the food security.
The market request for ready-to-eat, long-lasting meals has determined the actual food processing system. Frozen, long-lasting and freeze-dried meals are worldwide sold in supermarkets, one of the social consequences is the lost of cultural and geographic peculiarities. The transformation fakes and flattens out the appearance of the food that everybody eats. Food's flaws disappear and it's not that rare to get to the phenomena of sophistication and food fraud. Other aspects to be considered in the

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transformation phase are the high level of industrialization in all the processes, with great attention in the sanitation of food (Collins, 2010), that is not bad from itself but should be managed in a sensitive way in case of high migration fluxes like nowadays.
Processed foods are moved among the five continents following fixed roads defined by a highly vertical distribution system. In order to assure to the food a fictitious freshness and a good shape despite the long time and space transportation, sophisticated systems are required. In that situation, the large-scale distribution has a big power.
For sure, the consumer has a crucial role because decides what to eat and consequently what the food system should produce. The main problems related to the consumption phase of food are the loss in the perception of food seasonality, and in the culinary traditions, furthermore people are asking more and more for low-cost food. At global level the contradiction between obesity and malnutrition should be faced in a long term and serious programme for the health and wellbeing of local communities.
Last, but not least, is the disposal phase: every year one third of the food intended for human consumption is thrown away. The struggle against food waste and losses is one of the challenges of this century.
The change in human diet habits can have the power and the responsibility to modify the entire system. The increase of awareness in the personal food and nutritive choice will lead that change. A great possibility consists in the promotion of new behaviours and new model of consumption: re-discovery the culinary practices of waste reuse, well known to the previous generations, it becomes essential to create new ethical systems to share the nourishment in excess as well as to avoid upstream the food over-production.
The paper investigates how the Systemic Design approach applied to the food sectors can contribute to decent life and, better, well-being for all, maintaining the planets ecological capacity for future generations (L. Bistagnino, 2009).

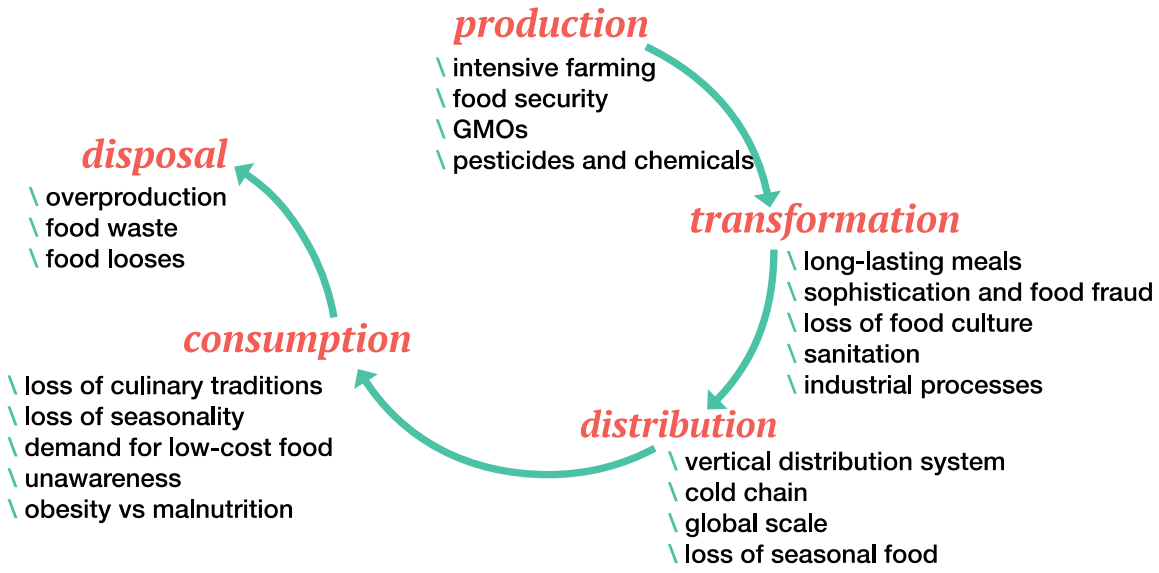

Figure 1. The main problems related to the life cycle of food system.

2. Justification

The problems expressed in the introduction are interrelated each others in a complex network of relations and implications, hence, it is needed a new way facing the food productive processes in order to obtain multi-benefits for the environment, the society and the economy.
The theories about complexity help the management of the entirely food systems and the design approaches help the planning of different divergent elements.
The complexity theories evolved on the basis that living systems continually draw upon external sources of energy and maintain a stable state of low entropy, as the physicist Erwin Schrödinger asserted after the WWII, on the basis of the General Systems Theory by Karl Ludwig von Bertalanffy. Some of the next rationales applied those theories also on artificial systems: complexity models of living systems address also productive models with their organizations and management, where the relationships between parts are more important than the parts themselves. Treating productive organizations as complex adaptive systems allows a new management model to emerge in economical, social and environmental benefits (Pisek & Wilson, 2001). In that field, Cluster Theory (Porter, 1990) evolved in more environmental sensitive theories, like Industrial Ecology (Frosh & Gallopoulos, 1989) and Industrial Symbiosis (Chertow, 2000).
The design thinking, as Buchanan said in 1992, means the way to creatively and strategically reconfigure a design concept on a situation with systemic integration. This needs a strong inter- and trans-disciplinarity during the design phase (Fuller, 1981), with the increasing involvement of different disciplines including urban planning, public policy, business management and environmental sciences (Chertow, Ashton, & Kuppali, 2004). However, the design thinking doesn't explicitly include the social aspects, so new evolution in the discipline is needed: the Systemic Design (Jones, 2009). Food is an overarching social phenomenon that incorporates the very essence of the humanity (Maffei, 2015).
The Systemic Design is planning the flows of matter and energy that flow from a system to another one towards zero emissions, creating a new economic-productive model, a community of strongly related people and a conscious connection with the territory. According to comprehensive approaches, as Systemic Design and Blue Economy (G. Pauli, 2010), they define many eco-guidelines, based on different practices and systems of goods production, transformation and consumption. This would allow defining new food systems, promoting social and environmental development.
The purpose of this paper is to give empirical and theoretical contributions with developed, developing and transition perspectives. From two of the case studies, directly developed by the authors in the last five years, arise how the complexity of food systems impacts the simplicity of the everyday life solutions. Its role is crucial in the environmental context and in the development of the local territory.

3. Methodology

Before dealing with the projects, it is necessary to clarify the applied methodology: Systemic Design.
The first step in planning with that methodology is the holistic survey of the current state of affairs: it clearly outlines all the steps and actions undertaken and/or undergone by the context in question. In order to do so, the description of what enters the system (input), its origins, what happens inside it and, finally, what comes out of it, its destination and its possible use (output) is done. The analysis of these inputs and outputs will have to be of two different kinds: quantitative, so as to know the quantities that are moved around; qualitative, to know exactly what can be fully used.
In addition, the identification the players involved in the system, their nature, their know-how and their reciprocal relations is crucial.

These actions help to understand the relationship occurring between the parties and the context, as well as the communication they have, one with the others and with the production, transformation and marketing sites.
These steps enable to have a clear idea of:

- the needed resources, their features and origins;
- processing waste, their specific qualities and their final destination;
- what occurs throughout the processes, comparing the specific differences of inputs and outputs.

The result is a chart with the global vision of the process and of the overall relationships that characterize and make the system work. At this point one can notice how useless and contradictory it is to focus merely on the individual parts, ignoring the links with the elements existing inside, outside and all around the process. Moreover, an approach by single parts has proved to be in contrast with the dynamism of the whole and with the "traditional" efficiency of the natural systems.
At the state of affairs, one can ascertain that, within the current intensive productions, many choices are made uncritically, sometimes according to maintain a linear-oriented tradition which has proved, at present, to be rather defective.
The safeguard of this global vision, beneficial to the sustainable transformation of the processes, can be attained by drawing a graphic chart, allowing us to retrace both with eyes and mind, the flows of matter and energy, their use, the knowledge capitals, the relationships between the actors, and the contextualization of the system in analysis. These graphic schemes allow simultaneous synoptic views of the values at stake, and for the overall number of criticalities to be faced and solved. Particularly the latter are represented within a process and are to be taken into account in comparison with it. The causes of problems can be ascertained when they occur, or in the light of previous choices or phases, or because of their misinterpretation, or even within the value generated in the course of the following steps. Every problem is assessed according to different parameters, such as advantages and economic value, environmental sustainability, correlation with the territory and production flexibility. Each of these parameters is evaluated both from a quality and quantity point of view. In turn, the study of the quantity allows to outline an economic scheme of the whole, giving conclusive evidence of the fact that the entire process, besides being based only on the production focus, can only be improved by increasing the number of products considerably.
This peculiarity of the present economic/productive system, and the consequential on-going increase in the quantity of waste, are real issues to be dealt with in the forthcoming future, if we wish to develop our society in a positive and satisfactory way (Campagnaro, 2011).
Identifying the problems and trying to understand them leads to a clearer perception of the phenomena they have arisen from. Physics, biology, chemistry, mathematical sciences, history and economy, are the indispensable tools for this analysis. A designer is asked to coordinate, enhance and harmonize their contributions and to change the faults in the dynamic flow of the production.
Nature is the system par excellence, following nature‘s footsteps the designer reorganize the starting point of the current situation, to identify less energy-consuming processes and productions, and to emphasize the neglected qualities of the outputs as much as possible. By doing so, all kinds of matter may be turned into input for other productions or systems, via connections that may be entwined with the productive realities carried out on the territory.
A systemic project prevents focalisation only on one product and tends to privilege complexity, local dimension and flexibility. This enables to revitalize and resume the normal links between each firm and its own context, based on the outputs it has produced, and to prioritise the decrease in the number of items that have not been adequately enhanced (waste).

Thinking by connections is the only applicable solution when attempting to solve the problem of the environmental impact, a burden placed on the territory, on account of intensive productions. In conformity with the consistency between outputs available and required inputs, a designer may conceive useful connections and interactions, and think of more innovative ways to employ matter. This will enable one to arrive at new productions and forms of energy generation, and will commit the many players of a territory to modern, flexible and multipolar economic models.
The heart of the project is set on very specific assumptions. The presence of pollution and disposable waste, implies that human and material resources are being misused. A more adequate employ of the same may result in new production processes, new opportunities to make profits and new forms of coexistence between production and reproduction activities, in compliance with the new parameters for a modern and sustainable balance within the ecosystem.
A new graphic table can be done with the systemic view, so it shows a remarkable increase both in the flows of the energy production and metabolized materials.
This designing methodology has different types of positive outcomes: a decrease in the number of individual products, focussing on building a balanced relationship with the resources of the territory; an exponential growth of production capacity of the territory; new and more useful material assets; better quality services, administered to the community; increased productivity; more job opportunities. These outcomes, which are not detrimental to the quality of life, should also prove that, a positive dialogue with the territory, involves taking notice of the material culture and enhancing knowledge that one needs to place within the historical context of reference.
The field of research regards multidisciplinarity, which provides the foundation for the systemic approach, as the only way to go for future development. The possibility of observing real examples of systemic integration on the ground, starting new scientific, economic, sociologic and politic research partnerships with the other actors from the territory, leads towards an open dialogue among the players, a strong sense of collective sharing and triggers a highly innovative territorial development that takes its components into account.
Systemic design opens up the possibility of innovative and virtuous business models in which the waste, that is today a burden, tomorrow can become a resource for new industrial systems offering numerous opportunities of development in the region, in productive areas and in connected services.

4. Analysis and discussion of findings

This paper shows the social, economical and environmental benefits generated to real cases that apply the Systemic Design approach in different food sectors and in different local context, in order to enforce the potentialities of the application of this methodology.
The first one is “EN.FA.SI.” (co-funded by the Piedmont Region) in which the value chain related to the PGI bean, Fagiolo Cuneo, endorses the entire area involving the small family producers and the local SMEs.
The second one is “Fondo Noir” (funded by Lavazza company) in which the spent coffee ground from the coffee bars in the metropolitan city centre are collected by cargo-bike in order to generate many new businesses.
Thinking about a food territorial system means the guidance of politic, scientific, organisational, designing processes, based on the generation of increased relationships, shared visions and strategies (cross, pervasive, and fundamental ones).

4.1 EN.FA.SI

The agri-food sector is proving to have particularly high impact because of the use of pesticides and fertilizers, the consumption of energy and natural resources, the emissions of greenhouse gases and the large amount of waste produced.

Recently, Politecnico di Torino has engaged in research activities in the agro-food industry, using the Systemic Design methodology, especially in the Cuneo Bean cultivation because it showed several conceptual criticalities and a production system which required redesigning, initially employing an excessive use of natural and artificial resources, such as synthetic products, energy, as well as waste of secondary raw materials (Fiore & Tamborrini, 2014). The project included a feasibility study, followed by the industrial testing of each stage of production. This involved many local SMEs (in some cases family-owned businesses).

The design of a complex system in which outputs are valued as input of other production sectors, ensures environmental benefits such as the reducing of wastes. It evolved also economic benefits, such as the development of several new economies in the area. A graphical view of the system complexity with all the interconnected activities helps to underline material and energy flows, inputs and outputs (Figure 2).

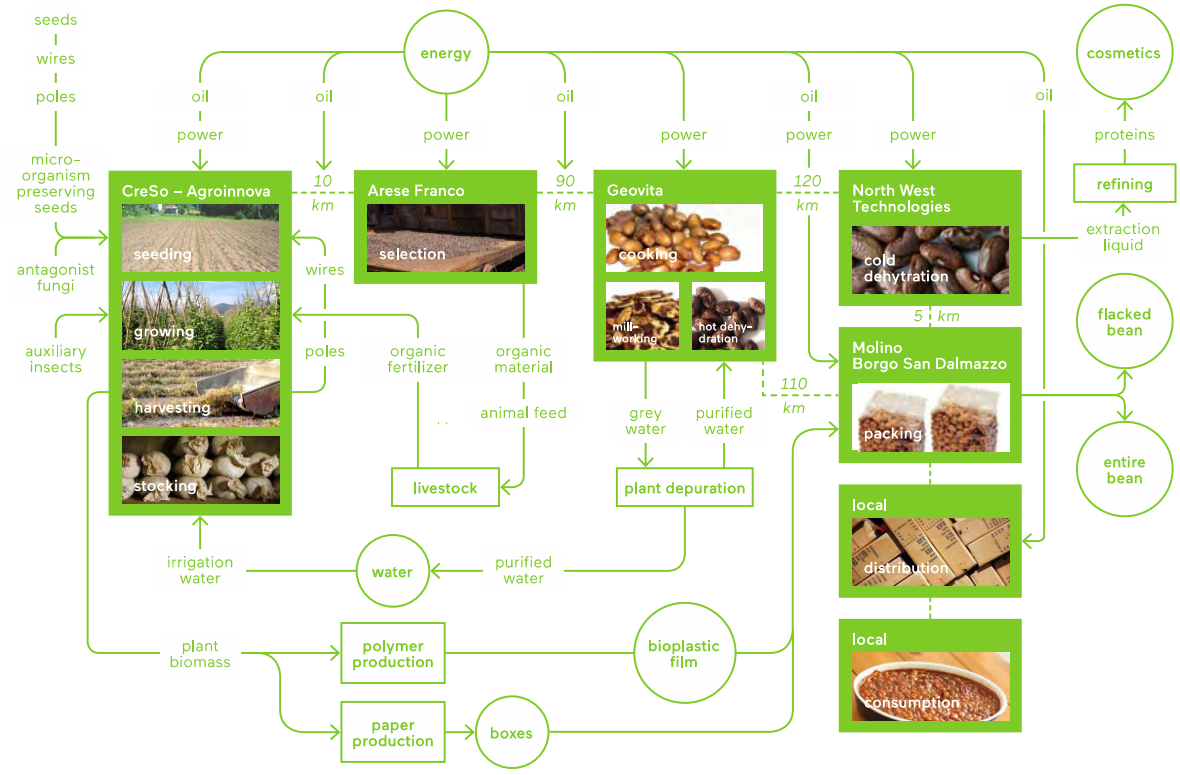

Figure 2. The complex system designed for the EN.FA.SI project.

4.2 Fondo Noir

Annual generation of Spent Coffee Grounds (SCG) is estimated around six million tonnes per year. They currently do not have a commercial value and are disposed of in landfills or as compost. The Systemic Design project provides a holistic vision in which these production are linked together through relationships, output and input, flows of energy and materials, in order to make the SCG recovery activity complex, with almost no waste.

Nowadays, SCG need to be disposed of in a controlled way, because the residual caffeine, tannins and polyphenols could have negative effects on the environment (Panusa et al., 2013). In addition to the elements listed, SCG contain also other elements such as minerals, melanoidins, lipids and waxes, lignin, proteins, ashes and polysaccharides (cellulose and hemicellulose are a little less than 50% in the anhydrous SCG). These components have high quality and physical characteristics that can be exploited.

The objectives of the work are not only the creation of a system that gives new life to the SCG but also the educational and social aspects related to the valorisation of waste. The project is carried out by Politecnico di Torino (Department of Architecture and Design), in collaboration with the biggest Italian coffee roasted company (Lavazza SpA) (Barbero, Fiore, 2014).

SCG should be split into their two constituent elements: the oils and the exhausted coffee grounds, each of which finds different application sectors. The first one can be used in cosmetics, energy and cleaning sectors; the second one in agronomy, print, energy, plastics and building sectors. It is necessary to systematize the activities, to understand what should be done first, the necessary working operations and the characteristics of the material after such operations (Figure 3).

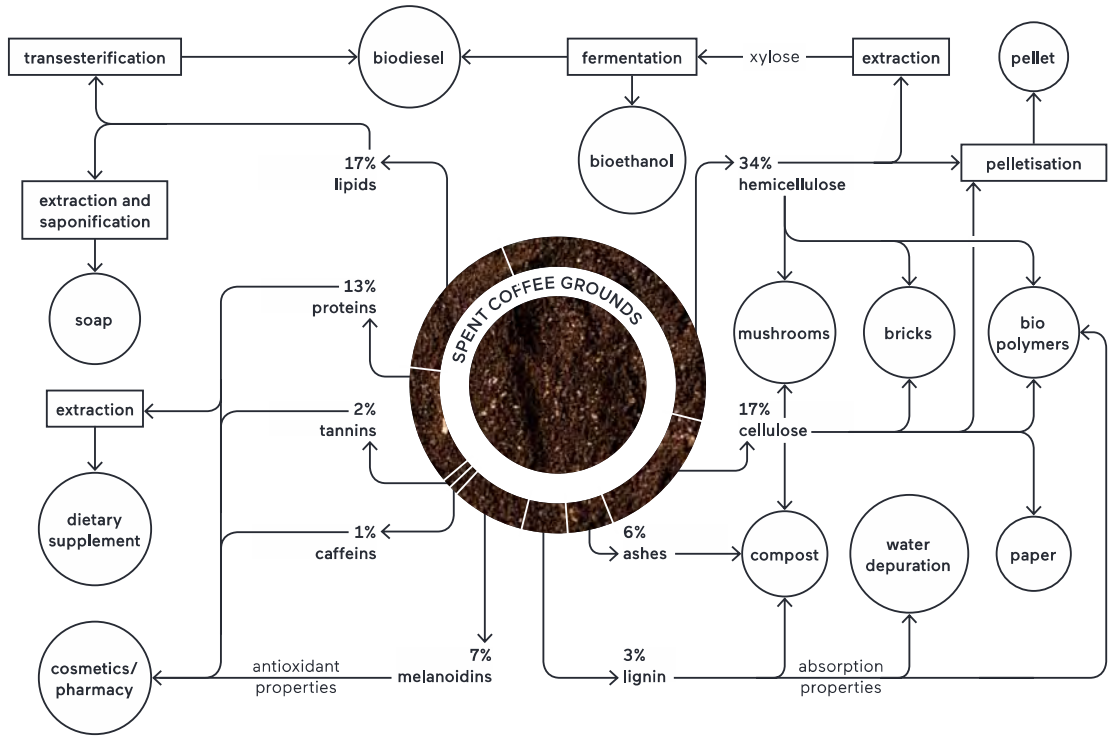

Figure 3. The complex system designed for Fondo Noir project.

5. Conclusions

Data show that major levels of overproduction, waste, surplus and underutilization are consequential to intensive productions, in addition to its core business. Turning these features into resources for the territory means giving new opportunities to all those who are more likely to incur the costs of their disposal. If we exploit the sense of territorial belonging of the resources we may boost a type of development that favours the local dimension and allows the sprouting of self-sufficient realities, able to produce, supply and generate energy autonomously, and there will be a dramatic decrease in the number of long haul transportation.
The complexity involved in that kind of design processes interested a wide range of players and it aims to contribute the scientific debate on the role of design as mediator and facilitator among different specific disciplines (Germak, 2009). The polytechnic culture, at the base of design disciplines, guarantee a model for the eco-innovation also in food sector, with strong and solid approach.
This methodology can be fostered because it is proven and gives answer to the problems listed in the introduction. It has the promising ability to deliver new diplomas in this field.

6. Acknowledgements

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LOCAL PRODUCTIVE SYSTEMS PLANNING TOOLS FOR BIOREGIONAL DEVELOPMENT

Gianni Scudo[1], Matteo Clementi[2]

Keywords: bioregion, food and energy integrated planning, renewable energies, energy efficiency.

Abstract: The paper introduces to bioregion concept and describes territorial metabolic flows tools usefull to identify and evaluate strategies and appropriate actions to increase the eco-efficiency of local productive systems. Bioregion concept recently re-emerged involves also better eco-efficiency conditions by directing production and consumption flows towards locally available resources use and therefore contributing to basic resources cycles closure. Tools presented support the application of the methodology Elar (Ecodynamic Land Register). In accordance with the bioregional paradigm, this methodology is used to assess the self-sufficiency achievement of trans scalar territorial systems. This approach requires integrated measures effectiveness assessment, particularly with regard to energy use and food consumption categories. Therefore Elar can be considered one of the effective tools to support Food and Energy Integrated Plans (FEIP) development. Energy and material flows related to residential sector, food consumption, and private transport are considered.
The method uses open-source Geographic Information Systems (GIS) and is articulated in the following processing phases:

1) *Locally defined territorial boundaries identification.*
2) *Renewable Local Energy Potential assessment - Analysis of contextual conditions and local renewable energy potential.*
3) *Local Energy-Matter Demand and Supply assessment for residential, agricultural, food and private transport activities. Aggregated impacts evaluation with environmental impact indicators (NRE non-renewable primary energy, Local Productive Land).*
4) *Local self-sufficiency scenarios assessment based on best practices transfer, filtered on the basis of local factors mapped on the GIS (climate, use, existing buildings shape and technology).*

1. Introduction

Global agro-food system contributes to about 30% of GHG - Global Heating Gasses- emission (Tim Lang 2009), due mainly to long distance transport and detail purchasing by car. Bioregional approach (Sale K. 1985; Fanfani D. e Saragosa C. 2011), promotes transcalar Regional supply and demand chains where food and energy are grown, produced, sold and consumed within a certain territorial unit.
In this paper we define a "bioregion" as the land required to achieve food and energy supply self-sufficiency over the long term and we describe how to use support tools to plan locally appropriate self –sufficiency strategies.
The intensive use of locally available renewable resources reduces drastically the use of non renewable resources increasing eco efficiency of local systems in term of Non Renewable primary Energy/Renewable primary Energy ratio (NRE/RE in MJ) and reducing environmental impact (for instance CO_2eq emissions).
The tools presented here promote an experimental tool for territorial metabolism planning called FEIP, (Food and Energy Integrated Plan).

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2. FEIP - Food and Energy Integrated Plans

FEIP is an experimental ("ad hoc" defined) planning tool. The aim of FEIP is to promote integrated local agro-food and energy systems able to give self sufficiency in food and a contribution to meet the energy demand for housing, transport and services, while providing anyway an adequate income from agriculture practices.
FEIP stands for Food and Energy Integrated Plan. The fact that the term Food precedes that of Energy, has a specific meaning. It means that in self-sufficiency scenarios, food sovereignty has to be guaranteed; namely strategies are oriented primarily to cover the local demand for food, the rest of the territory and wastes from agricultural production are used to cover the demand of the other categories, in particular housing and transport.
FEIP is proposed as a tool which complements food planning in the energy oriented planning tools developed by Covenant of Mayors.
The massive participation in the Covenant of Mayors has encouraged the development of initiatives towards energy efficiency and use of local renewable resources, directly involving individual mimunicipalities. The tools adopted in the covenant such as SEAP - Sustainable Energy Action Plan - are promoting GHG (Global Heating Gasses) emissions reductions activities in housing, transportation, and public facilities (at least 20%) (www.covenantofmayors.eu).
The FEIP is proposed as a possible planning tool based on the data collected and the strategies adopted in the SEAP, that aims to achieve higher targets to reduce greenhouse gas emissions, integrating food consumption in the considered categories. It allows an integrated assessment of adoptable solutions starting from the need to ensure local self-sufficiency for food and housing. It offers solutions to increase energy efficiency and the use of local renewables resources to achieve high levels of environmental sustainability and to increase the use of local workforce.
In this experimental phase, which focuses on territory analysis and scenarios development tools implementation, a small territorial system has been chosen: the Albairate municipality in Milan County, within the South Milan Agricultural Park (PASM).
Nevertheless the optimum scale for local self-sufficiency effective strategies is generally more extensive, (Metropolitan Area, County, Region).
FEIP is supported by the methodology Elar (Ecodynamic Land Register) (Clementi 2008) (Clementi, Scudo, 2009) (Scudo et al. 2014).

2.1 ELaR – Ecodynamic Land Register

In accordance with the bioregional paradigm, this methodology is used to assess the self-sufficiency achievement of trans scalar territorial systems - from the municipal to larger areas scales.
This approach requires measures effectiveness integrated assessment, particularly with regard to energy use and food consumption categories. Therefore Elar can be considered one of the effective tools to support integrated food and energy plans development.
Energy and material flows related to residential sector, food consumption, and private transport are considered.
ELaR aims to highlight and rethink energy and materials flows which feed people activities through analysis carried out by open-source Geographic Information Systems. It highlights the dynamic relations between energy and matter demand and local renewable potential which, in a self-sufficient system, should necessarily be maintained in equilibrium. The local demand for energy and materials analyzes the consumption categories of housing, food and marginally of private transport; data are expressed in terms of general amount referred to the local context or in terms of per capita data.
As already mentioned in the abstract the method is articulated in the following processing phases:

1) locally defined territorial boundaries identification.
2) Renewable Local Energy Potential assessment - Analysis of contextual conditions and local renewable energy potential.
3) Local Energy-Matter Demand for residential, agricultural/food consumption and private transport activities assessment. Aggregated impacts quantification through environmental impact indicators (Local productive land, NRE MJ non-renewable primary energy).
4) Local self-sufficiency scenarios assessment based on best practices transfer, filtered on the basis of local factors mapped on the GIS (climate, use, existing buildings shape and technology, and local agriculture practices).

Good practices effectiveness evaluation of is carried out through specific tools, (resources / impact geographies and “user histograms”). They are used to verify the proposed choices by calculating the local energy and materials demands through two specific indicators and related reference thresholds:
- Productive land demand compared with the locally available land.
- Primary renewable and non-renewable energy consumption, compared with threshold values, borrowed from the 2000Watt-Society program (1500W from renewable sources and 500W from not renewable ones).

The Elar methodology is currently being applied in two specific cases study.
The first one is the research "Bioregione" funded by Fondazione Cariplo, which proposes different scenarios to match public procurement local catering demand (school and hospitals ect..) with potential Lombardy region agricultural production supply (Caputo et al. 2014).
The second is the application of the Elar methodology in Albairate a small settlement nearby Milano (Scudo et al. 2014). The aim is to draw up an initial prototype of “Food and Energy Integrated plan” (FEIP) starting from the formulation of self-sufficiency scenarios. The data presented briefly in the text show a possible example of local food and energy supply self-sufficiency.
The elaboration and communication of the results are provided by two basic tools:
- " Resources / impacts geographies."
- " User histograms"

2.2 Resources / impacts geographies

Resources and impacts geographies are obtained by collecting on the same territorial support information on Local Demand of Energy and Matter (LDEM), and on the Renewable Energy Technical Potential (RETP).

Information on Local Demand of Energy and Matter (LDEM) are collected in the form of impact geographies, while information on Renewable Energy Technical Potential (RETP) are collected as resources geographies related to local supply.

2.3 Impact geographies

The first tool (impacts geographies), represent the supply chains of production and consumption through geo-referenced vectors which locate supply chain different nodes. Two different indicators quantify the environmental impacts associated to the different nodes of the supply chain, the use of primary non-renewable and renewable energy sources, expressed in MJ equivalent;

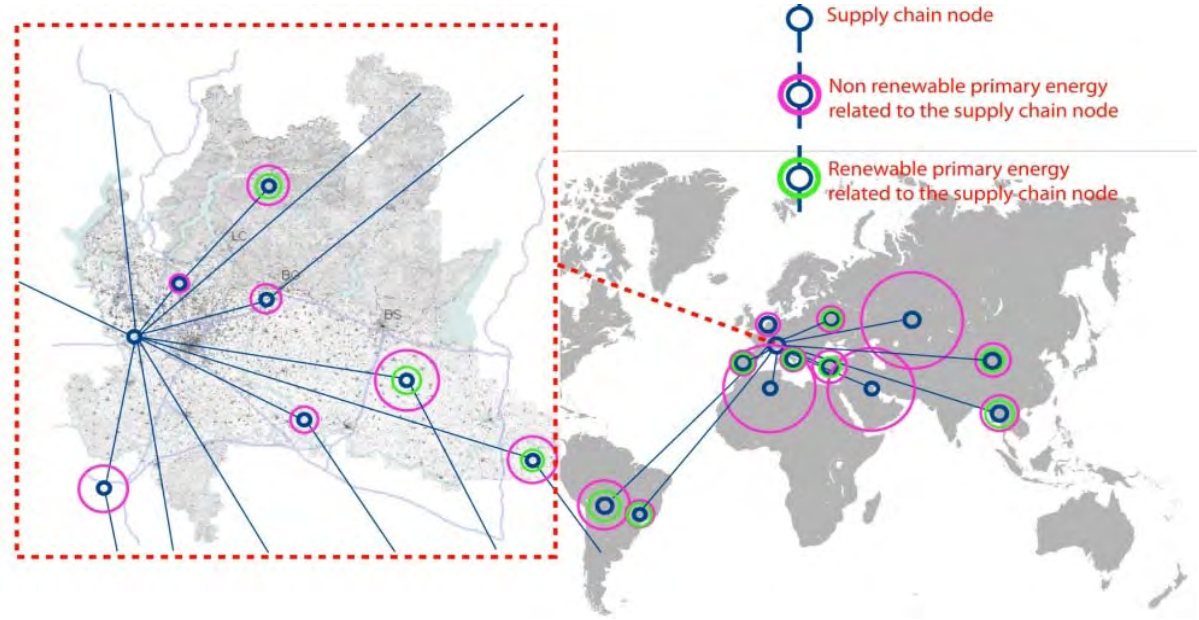

Figure 1. Impact Geographies associated with the consumption of primary energy, concerning the Local Demand of Energy and Matter (LDEM) in Albairate. Mapped supply chains are representative of the scenario 1 presented in the results of this paper.

As example the following text presents the data associated with the supply chain of the bread , including the related accounting of non-renewable energy sources.

Description of the supply chain

Here is the brief description of the supply chain of bread. The mode for cultivation of wheat for flour is conventional (non-organic). The territorial reference is international (intercontinental supply chains were not taken into account).

The main steps of the supply chain can be summarized as follows:

1. wheat production in field ;
2. wheat transport to the mill;
3. flour grinded from wheat;
4. flour transport to the bakery ;
5. bread production;
6. bread transport to store or canteen.

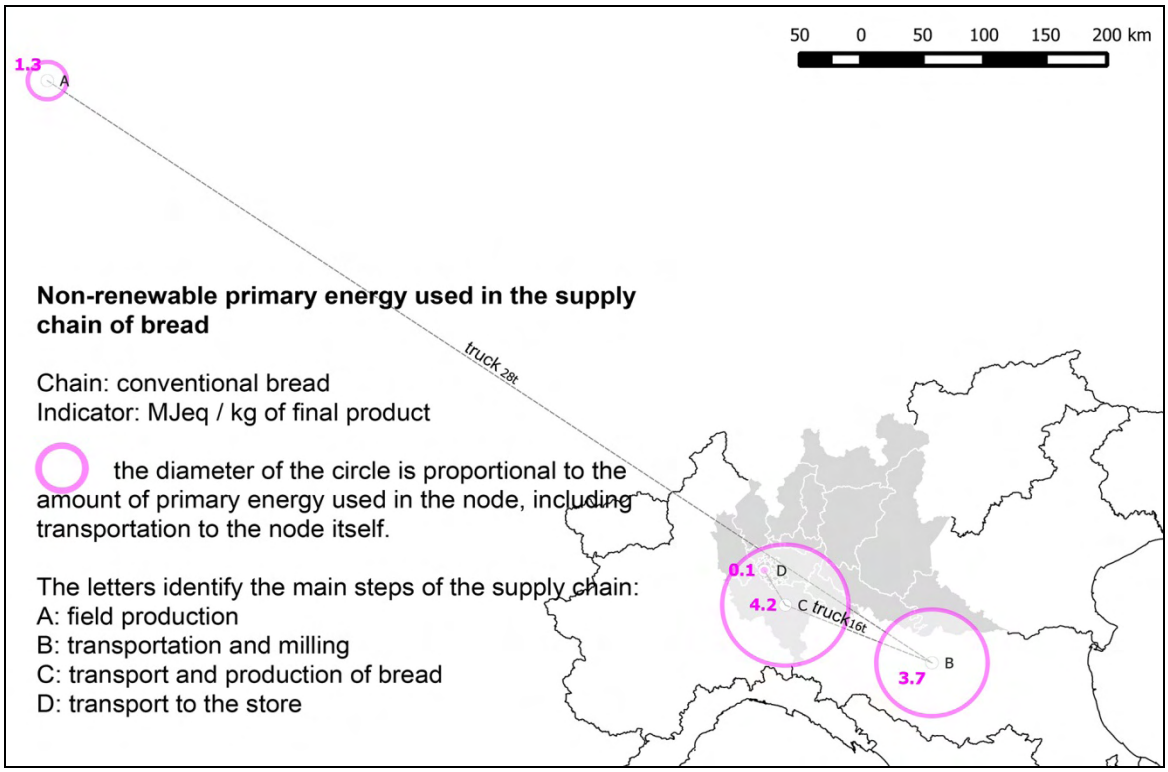

Figure 2. Impact Geography concerning the consumption of non-renewable primary energy for the production of 1 kg of bread from wheat conventional agriculture.

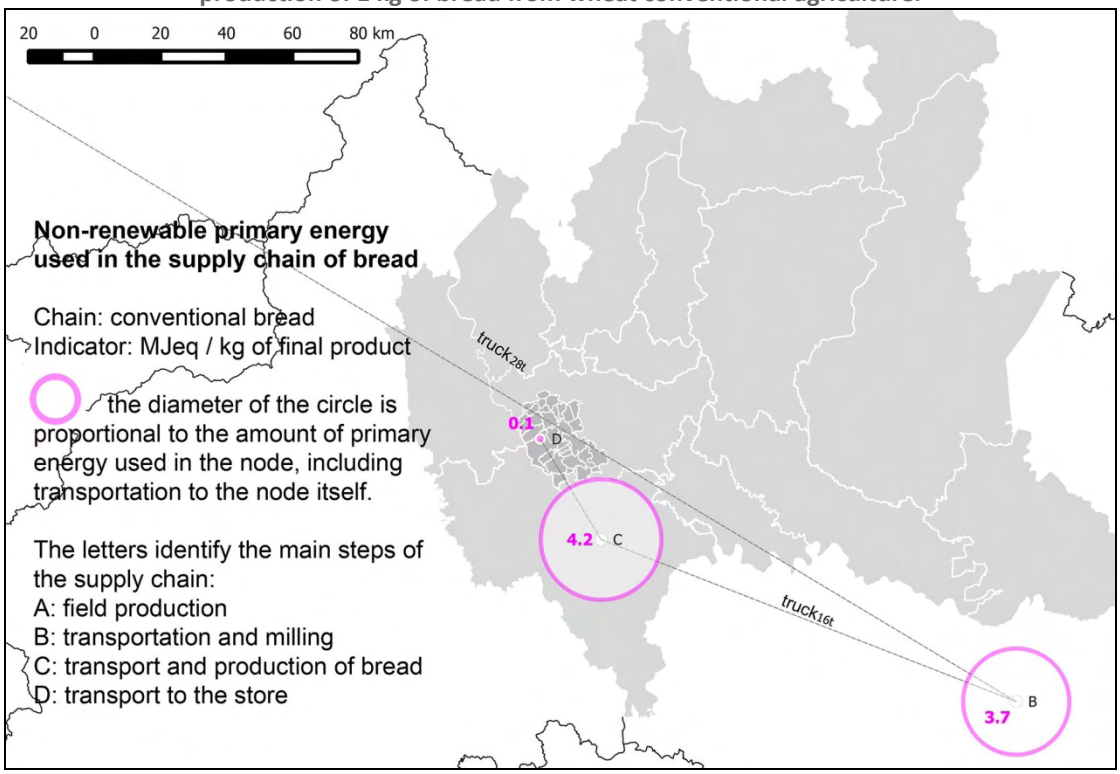

Figure 3. Extract of the Impact Geography concerning the consumption of non-renewable primary energy for the production of 1 kg of bread from wheat conventional agriculture.

2.4 Resources Geographies

The second tool (resources geographies) is obtained by collecting in specific thematic maps quantitative data related to the locally available renewable resources. Once defined the boundaries of the local context, this phase of the methodology processes and stores in the same Geographic Information System data on local physical and biological/agricultural environment. This data-base provides descriptive information on the climatic conditions (solar potential mapping at different scales, pluviometric conditions, windiness, humidity and air temperature throughout the year), on actual land uses, on geo morphological aspects etc. (Fig. 4). The main goal of such a data archive is to provide useful information to identify the current local renewable potential supply and develop possible local sustainable scenarios for good practices transferability.
Good practices transferability depends on the assessment of similarity between territories under analysis and good practices territories. This information, as part of one single Geographic Information System (GIS) can be associated to different portions of land, as example a cadastral land or urban parcel.

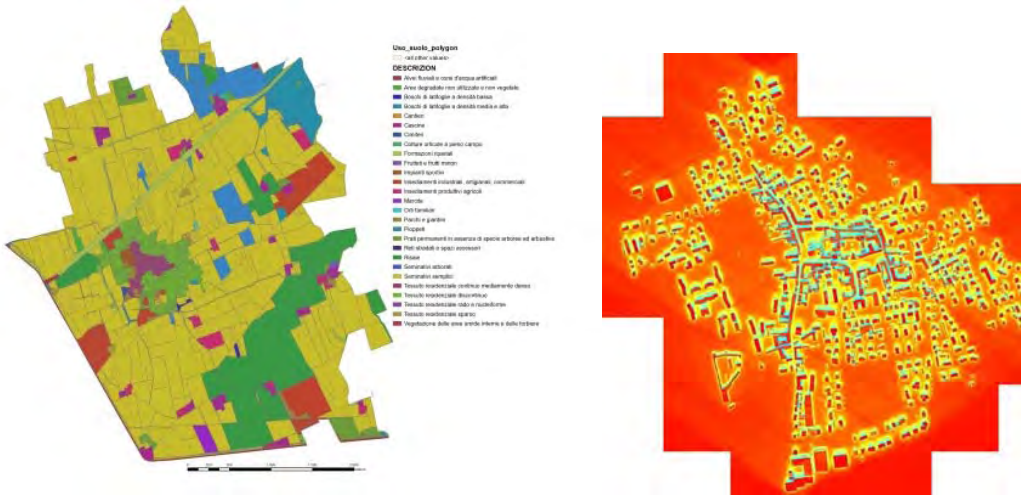

Figure 4. Some maps that make up the resources geographies of Albairate (Lombardy region), to the left a land use map, to the right a solar radiation map.

The association of such information to geometric particles using GIS, enables identifying the vocational characteristics of local territory portions.
Geo-referenced information allows to use Geographic Information Systems to carry out assessments at different scales, from the whole local context, to portions of it or to individual particles (buildings or land parcel).
The minimum reference unit to assess supply and demand balance is the census units, adopting datamaps from Istat - Italian Institute of Statistics (ISTAT, 2012).

2.5 User histograms

The user histograms build the connecting structure between the information collected in the geographies, in order to check different design choices. They report in terms of per-capita flows local energy and matter demand and relate them with the extension of productive land per-capita. Histogram general structure can be easily understood looking at the following diagrams (Fig. 5 and Fig. 6).

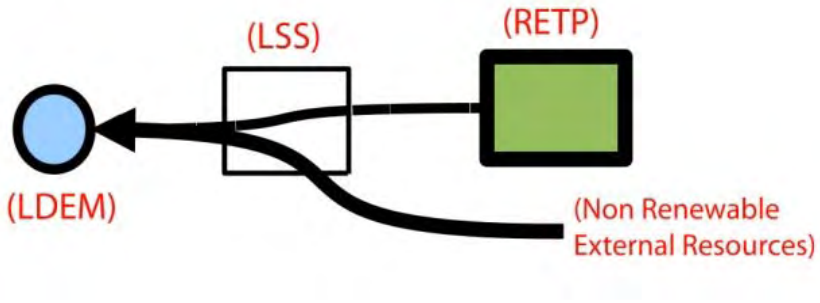

Figure 5. General synthetic structure of a user histogram.

As shown by the arrows, the histogram describes energy and matter flows direction from the right to the left. Consequently, the right side of the histogram contains information on the resources supply (RETP Renewable Technical Potential, locally available), where information on local renewable supplies are given.
The left side shows information about Local Demand of Energy and Matter (LDEM).
The central part houses strategies as possible design choices in between local renewable energy/matter supply and demand (LSS Local Self-sufficiency Scenario). They perform the main function to connect local demand and supply.
The image below shows an example of user histogram describing the main components.

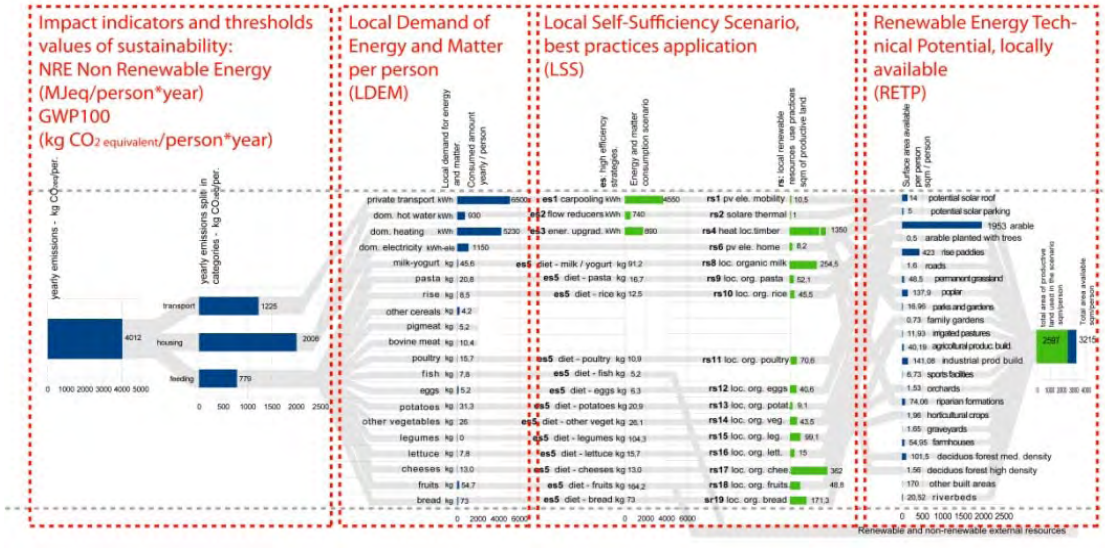

Figure 6. Example of user histogram describing the main components

The extreme left of the graph shows data of energy and matter demand expressed in terms of the adopted indicators, in this case the CO_2 equivalent emissions. The quantities of energy and materials are aggregated into the consumption categories of housing, food and, marginally, of private transport, to compose the total amount of energy and impact per person (on the extreme left) (Fig. 6). Such option gives the possibility to compare the data with reference threshold values per person (15800MJ of primary non-renewable energy - NRE per year as sustainability goal suggested by the 2000W Society program (www.2000watt.ch), and between 1000 and 2000 kg of CO_2 per year).

The right part of the graph represents the local renewable supply; it shows the extension of the productive surfaces in the local context, expressed in square meters per person . The productive surfaces are intended to be the productive portions of land for agriculture and forestry, as well as the built-up portions showing relevant features such as high solar vocation surfaces.
The far right part of the histogram brings together the extensions of productive land per capita identifying the amount of productive land available. The different colors refer to the extension of productive land available per person (darker color) and the extension of the available productive land interested by the application of good practices assumed in the scenario (Fig. 6).
The structure of information allows in the design phase to operate a useful and immediate comparison between productive land necessary for local self-sufficiency and land actually available. Such condition of immediate comparison drives the design choices among the good practices, in order to find out the ones more suitable to the real conditions of the territory.

3. Scenarios

In this part the data for the entire municipal area are briefly reported; they are related to housing, food and private transport. The structure of the information in Elar enable further scaling. Indeed evaluation can be made for each census section, so as to take better account of buildings geometry and age.
The cost of reducing the energy in existing buildings may vary depending on the geometry and age of the buildings (this information is mapped in the resources geographies database).
To assess food requirements, age and number of persons per census section are considered. (ISTAT, 2012).
To assess different inhabitants-mobility attitudes Istat data on daily moves inside and outside the municipal boundaries are used.
The results proposed in this text refer to the following scenarios:

1. Current status, no use of local renewable sources, full import of all resources.
2. Current demand of energy and materials, exclusive use of local resources.
3. Strategies for energy and material efficiency and exclusive use of locally available resources.

3.1 Scenario 1: Current state

The histogram presented in the diagram shows the non-renewable primary energy concerning the main items considered by the user-histogram. The graph shows from top to bottom the categories of private transport, food and housing.
When the data in the user histogram are associated with a single indicator, (as in fig.7 the primary non-renewable energy) the values of different items can be added up for each category (middle graph), and then aggregated to constitute the total value per person. This option allows to check how much the values emerged in the case study differ from the bench mark sustainability values.
In this case, the total amount of non-renewable primary energy consumed per person annually measures 52129MJ_{eq}, more than five times the sustainability value proposed by the Swiss community research project 2000 Watt-Society. In particular, housing is the mainly responsible of this very high value by weighing 61.2% of the total, followed by private transport (22.1%) and food consumption (16.7%).

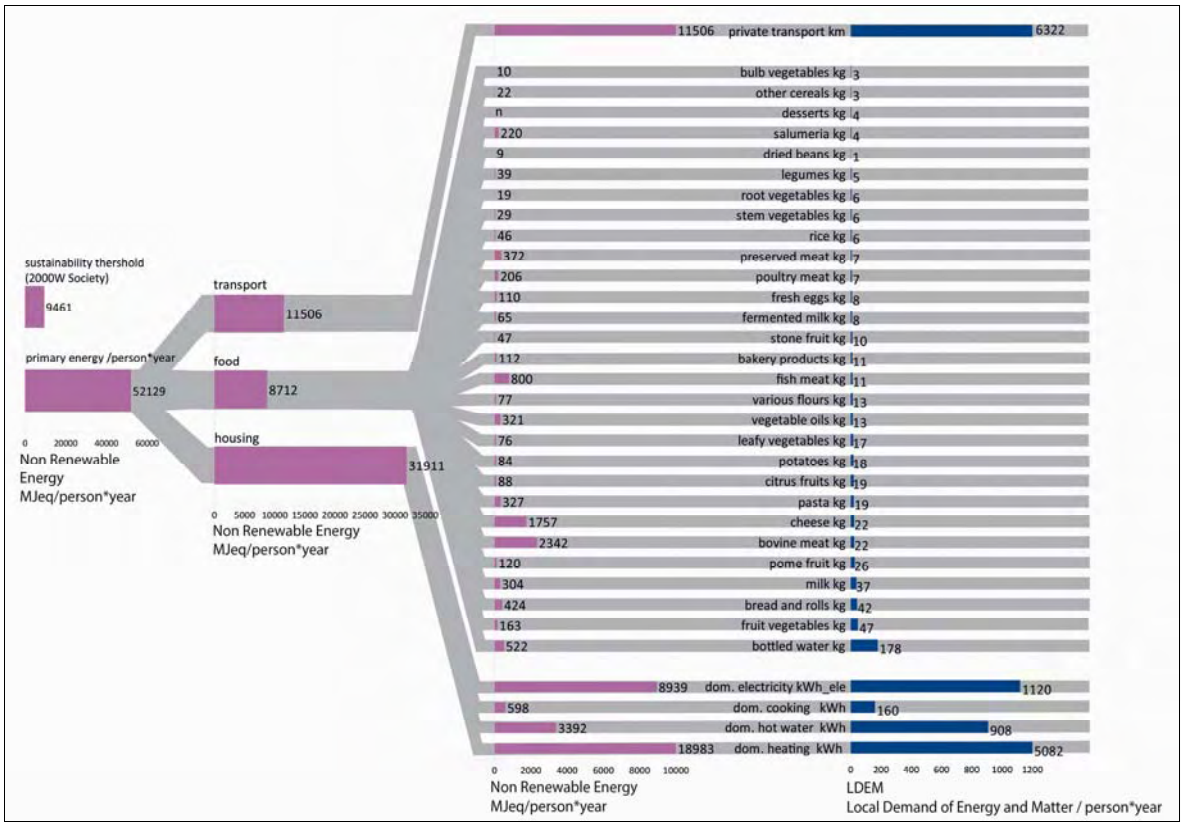

Figure 7. Non-renewable primary energy used in items of the Scenario1 user histogram (on the left values are aggregated by category of consumption: transport, food, housing).

3.2 Scenario 2- Current demand of energy and materials, exclusive use of local resources.

This scenario assumes that the energy and food resources currently consumed by the inhabitants of Albairate are available in the local area. In this case the quantities consumed are the same as the current state (Scenario 1) . Efficiency strategies in matter and energy use have not been adopted.
From top to bottom, the principal items which characterize the categories of transport, food and housing are listed (fig.8).
The transport report a single figure, kilometres travelled by private car per person per year. They amount to about 6322 km, the renewable strategy adopted as example is the use of bio-diesel from sunflower oil. In this case the amount of productive land for the cultivation of sunflowers amount to 3027 square meters.
Regarding food supply the amount of productive land was assessed using characteristics yield of the Milano county reported in the ISTAT database (ISTAT 2012). Non-renewable energy sources are used for in field activities, transport and processing.
Regarding the housing category it is assumed that all the activities which involved the direct consumption of fossil fuels could be replaced by local vegetal biomass, while the electrical consumption could be covered by the production of photovoltaic systems integrated in the existing buildings. Sizing photovoltaic systems has been done bearing in mind that this is not the case of an isolated system but a system connected to the national grid, aiming at achieving an annual neutral balance between input and output.

In this case the total extent of productive land would amount to 8852m_2, of which 3624 m_2 relative to housing (41%), 3027m_2 to transport (34%) and 2200 m_2 to food supply (25%). In the standpoint of a possible Food and Energy Integrated Plan the productive land locally available, (3047 m_2/per person) would be able to cover the total food requirements and a part of the energy needs of dwellings.
The amount of the productive land required exceed about 2.5 times the extension of the available land.
Taking as bioregional area of reference the Lombardy region, the extension of productive land per capita would amount to 1243 m_2 of productive land / person. In this case the amount of needed productive land in Scenario 2 would exceed 7.12 times the size of the available land per person.
In Italy the amount of productive land per person amounts to 2810 m_2 (ISTAT, 2012).

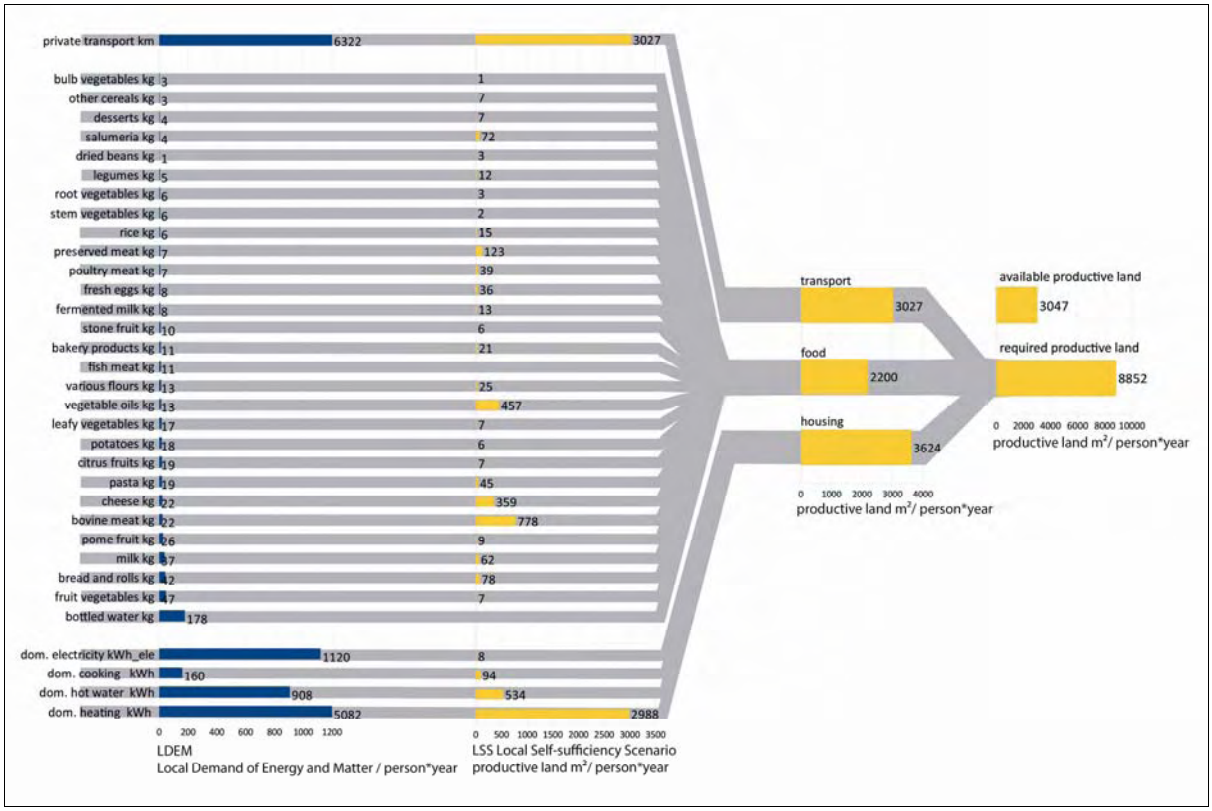

Figure 8. Extension of productive land per person (in orange) associated with the various items in the user histogram of Scenario2 (on the right values are aggregated by consumption category : transport, food and housing).

3.3 Scenarios 3 - Strategies for energy and material efficiency and exclusive use of locally available resources.

This paragraph on efficiency strategies lists strategies for each groups. It shows the impact on the extension of the productive land needed for each set of solutions (house, feeding and transport).

Housing

The solutions concerning the heating item include strategies related to the energy upgrading of the existing buildings get an average consumption for heating around 30kwh /m². Whereas the per

capita housing area amounts to 37,66m², consumption per square meter would amount to 5082KWh / 37,66 = 135kWh / m², the reduction scenario to 30 kWh per m² would involve a consumption per capita of 30 * 37, 66 = 1130kWh, less than four times the actual consumption.
The use of water flow reducers would lead to a reduction of 10% of the amount of energy for hot water. The amount of energy for cooking is left unchanged.
Concerning electricity a consumption reduction by about 40% is assumed, due to the use of more efficient appliances and artificial LED Lighting. The electricity consumption per capita would decrease from 1,120 kWh to 672kWh / person.
The amount of productive needed land would be reduced in total by 29.3% (6258mq) and considering the housing category by 71.57% (1030mq). The extension of the land needed would exceed 2,05 times the productive land actually available.

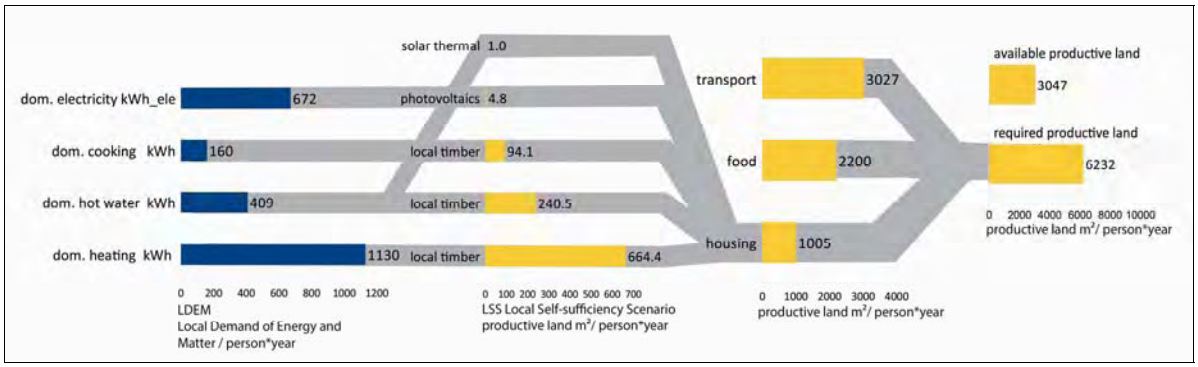

Figure 9. Annual energy consumption per person and the relative amount of productive land associated with the housing category in Scenario 3 – housing.

Private Transportation

The second most impacting category is the private mobility. Incentives for carpooling have been chosen to reduce fuel consumption, a reduction by about 30% of equivalent kilometres per person has been assumed. A value of 6322km / person*year has decreased to 4425km. In the case of productive land accounting, using the same technology assumed in scenario 2 (biodiesel from sunflower oil), the total value relative to productive land needed exceeds 1.75 times the amount of land available.

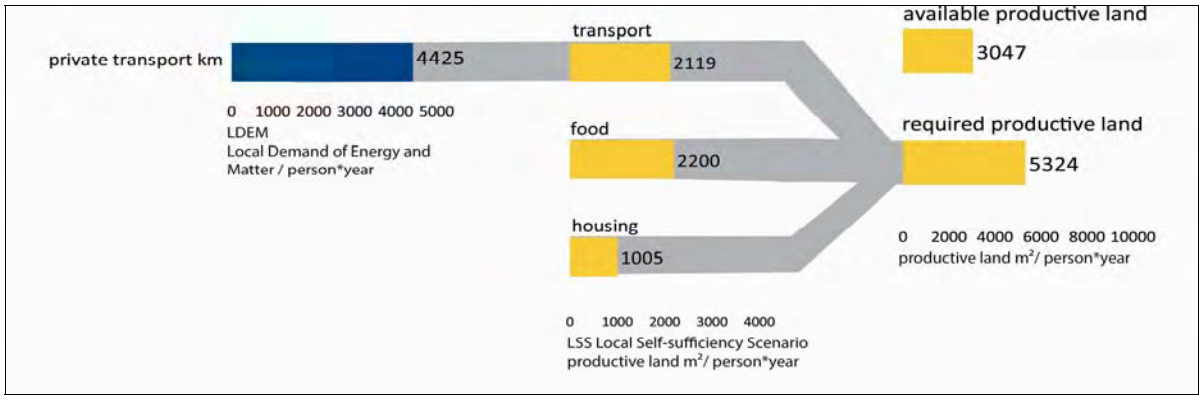

Figure 10. Kilometers traveled annually per person and relative amount of productive land associated with the category of private transport in Scenario 3.

Feeding 1

This strategy assumes a change in meat diet with exclusive use of poultry meat.
Elimination of bottled water consumption (recording a reduction of 5.99% of the primary non-renewable energy related to feeding), this strategy does not affect on the amount of productive land.
Changing the amount of red meat (beef and pork) with a similar amount of legumes in terms of protein content. This contribution, combined with the previous strategy, leads to a reduction of productive land of 17.42% on the total extent and 42.38% on the extension related to food; the amount of productive land is reduced from 2200 m^2 per person to 1268 m^2.
Halving protein intake by dairy products, and compensating with legumes , leads to a reduction of primary energy use of feeding equal to 49.63%. As it regards the productive land, the total extent is reduced by 21.09%, equal to 4221 m^2 / person. The productive land useful to produce the food consumed in a year amounts to 1,072 square meters against the previous 2200, leading to a partial reduction of 51.27%. In this case, the distance from the reference edge or 3047 m^2 is reduced , the value exceeds 1.39 times the amount of available productive land.

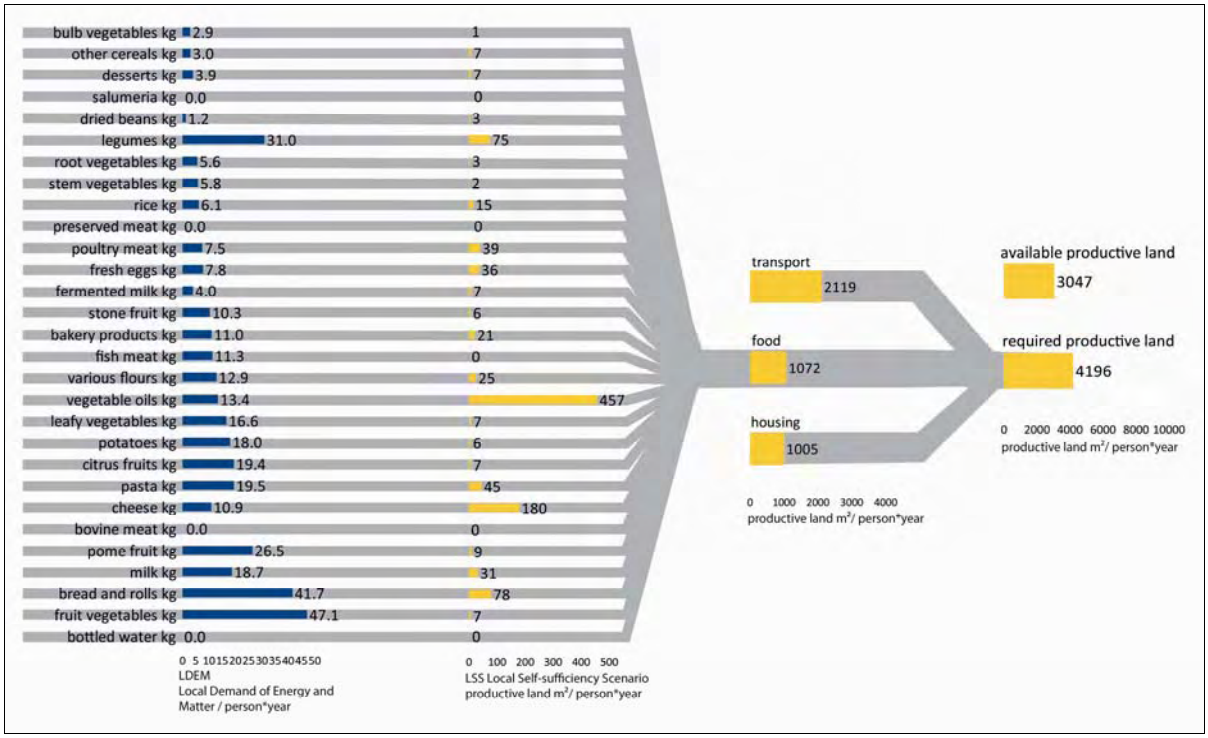

Figure 11. Annual food consumption per person and the relative amount of productive land associated with the category of feeding in Scenario 3 – Feeding 1.

Feeding 2. Nearly Vegan diet

In case of nearly vegan diet, the replacement of all protein intake from animal-derived foods with vegetable derived foods (legumes) is assumed, while maintaining the same protein intake. To compensate the caloric intake the amount of cereal products was increased (the consumption of fish has remained unchanged, it involves 3.4% of primary energy consumption).
Compared to the previous scenario, the partial reduction of primary non-renewable energy on the single category of Food amounts to 24.72% (from 4388 to 3303MJ_{eq} / person). The area of productive land is further reduced by 4.94% from 4221 m^2 to 4013 m^2, (the productive land related to food category decreases from 1072 m^2 to 864 m^2, 19.45% reduction of productive land). In this

last case, the distance from the reference limit value is reduced to 131.7%. The amount of land associated with each category is 1031 m^2 for housing, 864 for food and 2119 for transport.

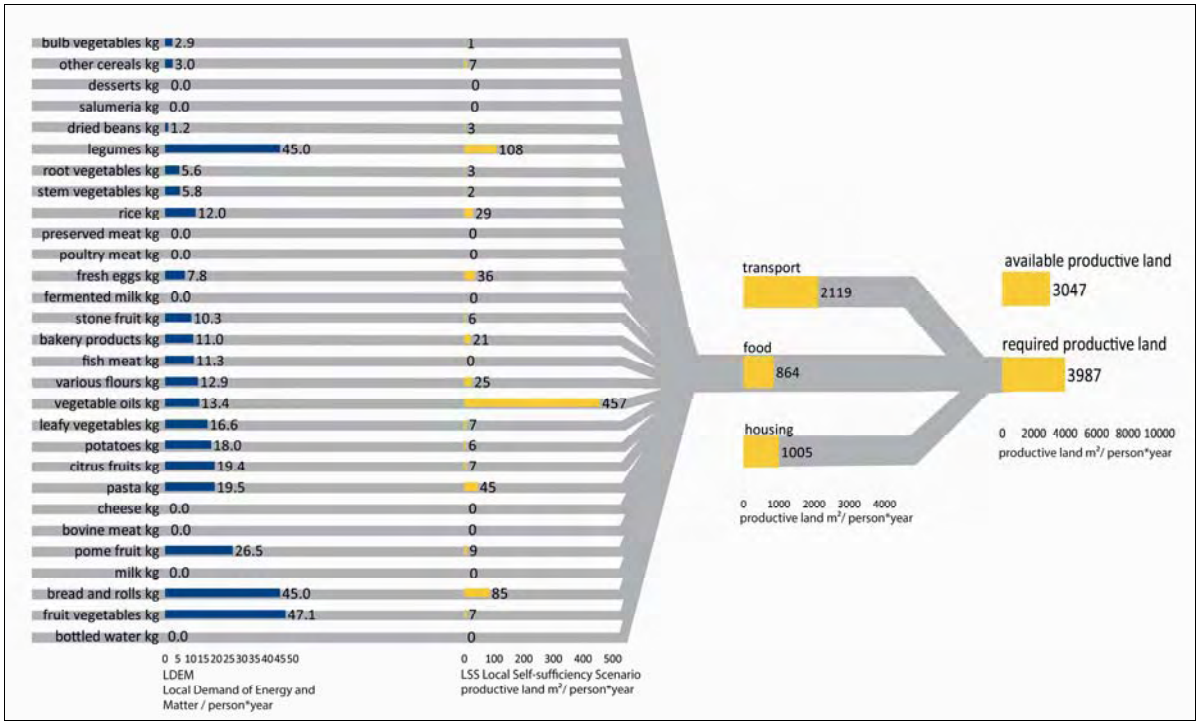

Figure 12. Annual food consumption per person and the relative amount of productive land associated with the category of feeding in Scenario 3 - Feeding 2.

4. Conclusions

The results presented in this paper as an example, demonstrates the suitability of the methodology for the integrated assessment of the main consumption categories (housing, feeding and transport) in a limited area, a small sample of territory. Future developments of the work will include the application of Elar in wider areas, and the integration of new categories such as public services. It will be necessary to expand the set of best practices, enriching it with various case studies related to different climatic conditions and to refine the procedure of the mobility assessment. Further investigation will concern the integration of economic indicators such as local workforce to compare the amount of productive land and use of non-renewable energy sources with the amount of man-hours locally activated.

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EATING AS A PLANNED ACTIVITY: AN ONGOING STUDY OF FOOD CHOICE AND THE BUILT ENVIRONMENT IN SYDNEY

Fanqi Liu[1]

Keywords: food choice, food systems, healthy built environment, Sydney

Abstract: As more people move into cities, the world is embracing an 'urban-style' diet associated with multiple harms such as the spread of lifestyle diseases, including diabetes and obesity. Food choice is a multi-determined, situation-dependent phenomenon. Despite individuals' food choice is often seen as a result of different psychological and socioeconomic backgrounds, evidence suggests that the built environment influences people's lifestyle preferences including food choices. Although the number of publications regarding food issues has grown rapidly, it remains unclear how the built environment influences residents' food choice. A deeper understanding of this behaviour could reveal under-researched aspects of a healthy built environment. In this paper, the significance of new insights in the built-environment perspective in food choice research is addressed. This on-going study contributes to the understanding of the availability and accessibility of healthy food in cities. It focuses on how the urban form influences people's food choice in metropolitan Sydney. A mix of quantitative, qualitative and spatial research methods is applied to identify urban form barriers to the utilisation of healthy food in urban settings. This includes spatial statistical analysis to sample study areas, and in-depth interviews to explore participants' food choices and the influence of the built environment. This analysis has implications for urban planning and policy making for healthy cities.

1. Introduction

Public knowledge of and interest in food has never been greater. Topics related to food are being discussed in multiple disciplines such as public health, cultural studies, economics and history on different occasions. At the same time, our current food systems, most prominently in urban areas, are associated with multiple harms such as the spread of food-related chronic diseases, including type 2 diabetes (T2D) and obesity (Wallinga, 2009). In Australia, for example, around 90 percent of the total population lives in urban areas, with 63 percent of the adults and 25 percent of children overweight or obese (Australian Bureau of Statistics (ABS), 2012). If current trends continue, over two-thirds of Australians would be overweight or obese by 2025 (Walls et al., 2012). Although the public is constantly being educated to eat 'wisely' through Australian national diet campaigns like 'Go for 2 & 5', the food choice behaviour along with food preferences is still rather unhealthy for most Australian urban and suburban dwellers.

Despite that the individual's food choice is often seen as a result of different interrelating factors, evidence suggests that the built environment influences people's lifestyle preferences including their diet choices (Booth et al., 2001; Popkin et al., 2005; Walker et al., 2010; Kent and Thompson, 2014). These studies, however, tend to focus on the extreme situations whereby infrastructure and services supporting healthy lifestyle choices are largely inadequate and scarce; from a food perspective, for example, 'food deserts' (neighbourhoods with limited access to healthy food) are often reported. Previous studies have missed out on a variety of other ways in which the built environment shapes

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food choices. That being so, there is currently very little known about food choice in the built environment where multiple food options are available.

In recent years, the growing interest in food systems in planning profession highlights the need for understanding food behaviour in the built environment. The concept of food systems in communities and metropolitan areas, being absent for many years in the planning field, has notably emerged since 2000 (Pothukuchi and Kaufman, 2000). Along with the goal of promoting sustainable urban development, the re-localisation of production-consumption chain in food systems was 'led by disparate groups… into a broad-based multidisciplinary movement' (Pothukuchi, 2009, p.349). As individual food choices determine the food consumption patterns, it is clear that a deeper understanding of food choice can reveal a significant aspect of a healthy built environment and planning strategies for food systems.

The current limitations in understanding how the built environment influences people's food choice is the fault line I address in this paper. This on-going study focuses on how the urban and suburban built environment affects residents' food choices in metropolitan Sydney, where a fifth of the Australian population lives. Understanding the link between the built environment and our choices begins with building the framework about our food choice behaviours.

2. Conventional answers of the food choice determinants

What we know about food choice behaviours is based on different separate research domains such as food chemistry, nutrition science, sociology, psychology and public health studies during the last century. The issue has grown in importance in light of the priority for the population dietary change in the recent years with multiple physical and social harms, and the understanding of the determinants that affect our choices has been identified for interventions considering health issues. Since the food choices are multi-determined, situation-dependent phenomenon (Rozin, 2005) influenced by a broad range of interrelating factors, both socially and physically, none of the determinants we know currently is intended to explain what we choose to feed ourselves.

An initial study by Lewin (1943), a pioneer of social psychology, suggests that taste, health, social status and cost may be involved in food choice. Each factor along with its related values was examined in later studies in different research domains, and since then, the drivers for what we choose to eat are developed in various disciplines.

Biologists and physiologists investigate food choice determinants by tracking physiological processes (e.g. energy balance, gastrointestinal and brain mechanisms) and specific signals or needs (e.g. hunger, thirst) (Köster, 2009). Even though these factors respond the question 'why do we eat', the answer is in itself not exhaustive, as food is not only a basic need for people (Mela, 1999).

Researchers in psychology develop more sensible and detailed models and theories to describe food choice, yet 'some often encountered fallacies' (Köster, 2003, p.359). Theory in regards to motivation- and decision-making for food, for example, recognises the search for stimulation as a central driver of food choice. Although positive findings were found when testing the theory, not all stimuli show such results (Pliner, 1982). To fix the model or theory, attempts for more comprehensive portraits of food choice process have been made by adding influences from other factors into frameworks, however, without empirical investigation or practical application, food choice remains not well

understood (Shepherd, 1999). Besides that, as Köster (2003) indicates that since sensory food consumer science is a young research domain of less than fifty years, the psychological analysis of food choice may often be trapped in some fallacies.

Like any other complex behaviour with both individual and social factors, public health and food science researchers tend to focus on factors related to health and nutrition status. As studies show the inequalities among the population with food-related chronic diseases among different socioeconomic position backgrounds (Paeratakul et al., 2002), most of these studies focus on the socioeconomic gradient to poor health. In the Australian context, for example, the low-income groups and aboriginal Australians are highly targeted. Turrell et al. (2002) interviewed residents in Brisbane, Australia, of various socioeconomic levels, and found that people from socioeconomic disadvantage groups tend not to purchase foods high in fibre and low in fat, salt and sugar, while higher status groups were more likely to shop according to nutrition recommendations. Brimblecombe et al. (2014) explored the social context of food choice (e.g. knowledge, health and resources) and the factors perceived to shape it with Aboriginal adults in Northern Australia. A study with middle-income Caucasian Americans, however, shows more complicated process other than cost and nutrition knowledge (Furst et al., 1996). Likewise, using grocery receipts to avoid self-report errors, Cullen et al. (2007) reports differences in food purchasing based on socioeconomic status. Although quantitative and qualitative methods have been adopted for investigating the factors for food choice related to poor health, it remains unclear.

Researchers in other domains and disciplines, such as sociology and economics, also try to solve the puzzle by providing evidence from their aspects such as culture, tradition and marketing stratagies. However, as these factors belong to different research traditions and disciplines, 'each of these disciplines claims to have at least a partial answer' (Köster, 2009, p.70). As a result of the mono-disciplinary nature, 'although admittedly it is slightly modulated by influences from the other factors' (Köster, 2009, p.70), most of these studies have failed to demonstrate the interactions between different determinants. Additionally, because different individuals develop different strategies to resolve the frequently shown conflict among these factors (Connors et al., 2001), the determinants may also vary in different life stages and the weight of each may differ from one individual or group to the next.

3. The need for the built environment research

Prior literature has emphasised that food choice is a multi-faceted process. The central question of food choice research, as discussed in almost all related studies in different degrees, concerns 'why does who eat what, when, and where' (Köster, 2009, p.70), yet the answer to the 'where' question is not well developed. This is perhaps due to the lack of interdisciplinary research; researchers outside of the geographical research society, being trained in general scientific research techniques, usually have little knowledge in spatial reasoning (Goodchild and Janelle, 2010). This led to a methodological deficiency in previous studies: some did not consider the spatial factors, and some failed to demonstrate the environment-individual bond.

In recent years, further recognition of the importance of the environment in shaping lifestyles has been reported, whereby academics have just begun to understand how the environment influences individuals (Booth et al., 2001). Given the fact that the majority of the population are living in urban settings, the influence of the built environment is often discussed. On one hand, the built

environment characteristics are commonly defined as 'situational context within which behaviour takes place' in their frameworks, independently of other factors including sociodemographic, cultural and social characteristics (see e.g. Furst et al., 1996; Booth et al., 2001; Brimblecombe et al., 2014). Although, geography and planning texts after World War II have provided comprehensive portraits of the links, visible and invisible, between environmental characteristics and others such as socio-demography, cultural factors and social status (see e.g. Taylor, 1998; Hall, 2002; Thompson and Maginn, 2012; Tuan, 2012). Thus, the current food choice studies may undervalue the influence of the built environment. For example, research of socioeconomic disadvantage and the poor health suggests that the 'epidemic' of diet-related chronic diseases may be partly caused by environment-related characteristics in socioeconomic disadvantage neighbourhoods (see e.g. Inagami et al., 2006; Jetter and Cassady, 2006; Daniel et al., 2009). On the other hand, as our connections with the built environment are mostly invisible and implicit, it is difficult to admit and trace in food choice studies.

The lack of discussion on food choice from the built environment's point of view has significant implications not only for the food choice research but also for the planning research and practice. Although urban food system is becoming one of the central topics to be considered on the planning agenda in the last fifty years (Pothukuchi, 2009), the food choice in the urban area remains unclear. Studies of food systems starts with the metaphor of 'food deserts', where access to fresh food is limited; the experience of food deserts can be driven by the limited availability to fresh food and limited access to transport (Shaw, 2006; Walker et al., 2010). For example, about two million American households were reported living over a mile from a supermarket and having limited access to automobiles (United States Department of Agriculture, 2009), and similar outcomes were also found in other anglophone countries including the United Kingdom, Canada and Australia (Whelan et al., 2002; Smith et al., 2004; Lu and Qiu, 2015). Although not all research has found a link between healthy food access, diet and obesity (Jeffery et al., 2006; Li et al., 2009), living in food deserts often comes with unhealthy diet (Morland et al., 2002; Rose and Richards, 2004) and may lead to an increase in obesity risks (Morland et al., 2006; Powell et al., 2007).

In recent years, attempts to target advocacy efforts for food deserts predominantly include the provision of a range of alternative healthy food options such as wholesale groceries, community gardens, farmers' markets and urban farms, along with the goal of promoting sustainable urban development, and the re-localisation of production-consumption chain. These attempts have optimised our food system by providing the potential for food production, increasing the accessibility and availability for healthy food in urban area and improving the economic and energetic efficiency (see e.g. American Planning Association, 2007; Ericksen, 2008; Ackerman et al., 2014). As these studies were mostly focusing on extreme cases with limited choices where healthy food was neither sufficient nor accessable, the understanding of food choice in the majority of urban built environments, where plentiful food options are available, is still unclear.

A similar situation may also be found in healthy built environment studies. As the key built environment characteristic supporting human health in regards to food is distinguished as providing healthy food options, the main discussion on this topic is to make environments welcoming healthy eating options, which focuses on achieving the accessibility to healthy food on a community scale (Kent and Thompson, 2014). While food consumption is one of the key activities in food systems and a healthy built environment, the research needs to go a step further, looking not only at the availability of food options, but other built environment factors that shape food choice.

Given these points, my attempt is to theorise the relationship between the built environment and food choice. The proposed aim of this on-going study is to present a theory 'about' food choice in the built environment rather than a theory 'of'.

4. A roadmap for food choice study in the planning field

As proposed above, my endeavour is to address a theory about food choice in the built environment by recognising that food choice is a multi-determined, situation-dependent phenomenon, influenced by a range of interrelating factors. While the planning research and practice is normally public-interest driven and aims at creating liveability, it can play a larger role in modifying everyday routines and regular behaviour by understanding how we behave in the built environment and developing a spatial consciousness in the context of day-to-day matters for both professionals and the people without built-environment academic training (by which I mean all of us).

We live in a city-centric culture where a lot of the time we assume that food is everywhere to be found in variety and convenience: from markets, cafés, restaurants, and even cinemas. On one hand, we take food for granted and the planning professionals tend to ignore the food system. As the nature of the planning practice, starting with perceived market failure (e.g. affordable housing, effective transport) (Pothukuchi and Kaufman, 2000), if the problem is not clearly stated, it is hard to integrate food-related issues into planning practice. On the other hand, no other public issue is as essential to every individual as food systems. In the event where food systems were broken, communities regardless of gender, age, cultural background, or cultural level would be significantly affected; this makes food systems fit for understanding how the urban surroundings involve and implicate in our everyday activities. As noted by Casey (2001, p.684), 'In effect, there is no place without self and no self without place' (Casey, 2001, p.684).

Planning studies have a traditional focus on observing behaviour, which is assumed to reflect the environment; and analysing the environment, which work by enabling or limiting choices. By applying the system thinking into planning, cities are being evaluated as systems consisted of different elements including individuals and infrastructures that work together to make cities 'cities'. The concepts of the systems theory can help find the explanation: the explanation of a certain problem or elements is from the understanding of the parts in relation to the whole (Chadwick, 1978). In this case, due to the complex and conflicting nature of all food choice determinants, the food choice behaviour is the problem in the system (i.e. the built environment) that could be best understood in the context of diversity in urban settings rather than in isolation (i.e. a linear cause-effect explanation). In addition, to solve the tensions in current literature, I employ grounded theory methodology to address my attempt to generate new theoretical frameworks, reason being it operates in exposing existing theoretical tensions and thus aims to build theoretical suggestions grounded in the context of new data and based on the observation (Strauss, 1998; Bryant and Charmaz, 2007; Aldiabat and Le Navenec, 2011).

Under the guide of systems theory and grounded theory, it is clear that food choice, the behaviour itself, is the centre of the study rather than the individuals who make the food choice, or the built environment where choices occur. Therefore, neither the individual itself, along with the individual characteristics such as cultural background and socioeconomic position nor the difference in urban settings is intended to explain the central question 'why does who eat what, when, and where'. As

the strong critiques are drawn from practice theory, individual attitudes in decision-making cannot solely explain the behaviour as it is not a simple linear process (Urry, 2012).

In brief, I propose that food choice is a product of practices that is shaped by the individual, the built environment and multiple other factors. Instead of investigating isolated single factor, I propose a framework that helps understand the complex food choice in the real world. As previously discussed, four main problems ought to be resolved:

- There are insufficient cases outside of food deserts, where food options are plentiful;
- There is not enough interdisciplinary research;
- There is a lack of spatial thinking and spatial reasoning techniques;
- There is an inadequacy in methods to collect data on perceptions influenced by the built environment.

Based on the problems above, the proposed framework in this study should be interactive in the way that the influences of the built environment can be perceived, described and documented for analysis. The framework and the research plan should be made in accordance with the complexity of the food choice that no such thing can solely explain or determine the behaviour. Furthermore, two main features should be recognised in the framework:

- the dynamic nature of the choice behaviour;
- the implicit nature of the built environment influences.

Collectively, four major aspects help to shape my framework in this study. First concerns the availability, types and perceptions of food outlets in an area. The built environment contexts (e.g. zoning, building types, infrastructure and urban facilities) provide various opportunities and constraints to food activities such as providing physical spaces for food supply, distributing and purchasing (American Planning Association, 2007). One type of food outlet may be fixed as one setting while another may not, such as a fast food outlet without table service would normally be considered more flexible than restaurants (Stewart et al., 2004); likewise convenience stores are small as compared to fresh food grocers which consume a larger capacity for chillers/freezers. Apart from that, the perception related to the availability issue is also important as the error and bias often occurs in spatial behaviour (Golledge, 1997).

Secondly this paper will explore the accessibility to food and how it works in shaping choice. As largely discussed in food desert and food insecurity research, the limitation to fresh food is often associated with limited access to transport (Walker et al., 2010). In an area with multiple food options, however, the question of accessibility is largely ignored in current research. While there is currently no direct evidence to support the relationship, studies on automobility demonstrate that built environment factors such as topography, traffic situations, parking systems and pedestrian conditions have impacts on the method people choose to travel (Kent, 2013), which may also have impacts on food choice behaviour.

Another aspect is how built environment factors (other than above) attract or repel consumers. As we attach meaning to particular places and spaces, certain urban settings and moments may generate specific knowledge and experiences which affect the behaviour (Lynch, 1960). Lastly, this study also aims to investigate how food activities are integrated into other daily routines. Since daily routines are often shaped by built environment factors such as job/housing balance and street

layout, it is worth exploring the food choice as part of daily routines in urban settings. In this study, the four aspects will be tested.

5. Research design

5.1 Study Area

The Sydney metropolitan area is considered as the study area to explore the relationship. Sydney is the capital city of New South Wales, and the most populous city in both Australia and Oceania. It is home to 4,627,345 people or about 20 percent of the Australian population. Sydney is rather a low-density city in comparison to other major cities worldwide, with approximately 40 local government areas consisted into six subregions that 'tend to share similar characteristics (economic, transport, infrastructure linkages etc.)' (Department of Planning and Environment, 2014, p.139).

The Greater Sydney boundaries, along with the Satistic Area Level 1 as the cadastre, in ABS' geographical framework was selected for analysis. Since the Greater Sydney region also includes large tracts of the rural hinterland and do not define the built up edge of cities (ABS, 2011), I arbitrarily apply the threshold of 150 inhabitants per square kilometre adopt from Organisation for Economic Co-operation and Development method (Organisation for Economic Co-operation and Development, 1994) to define urban areas using the latest 2011 cuenes. Figure 1. shows the population density of selected study area using *ArcGIS for Desktop Advanced* Version 10.3.

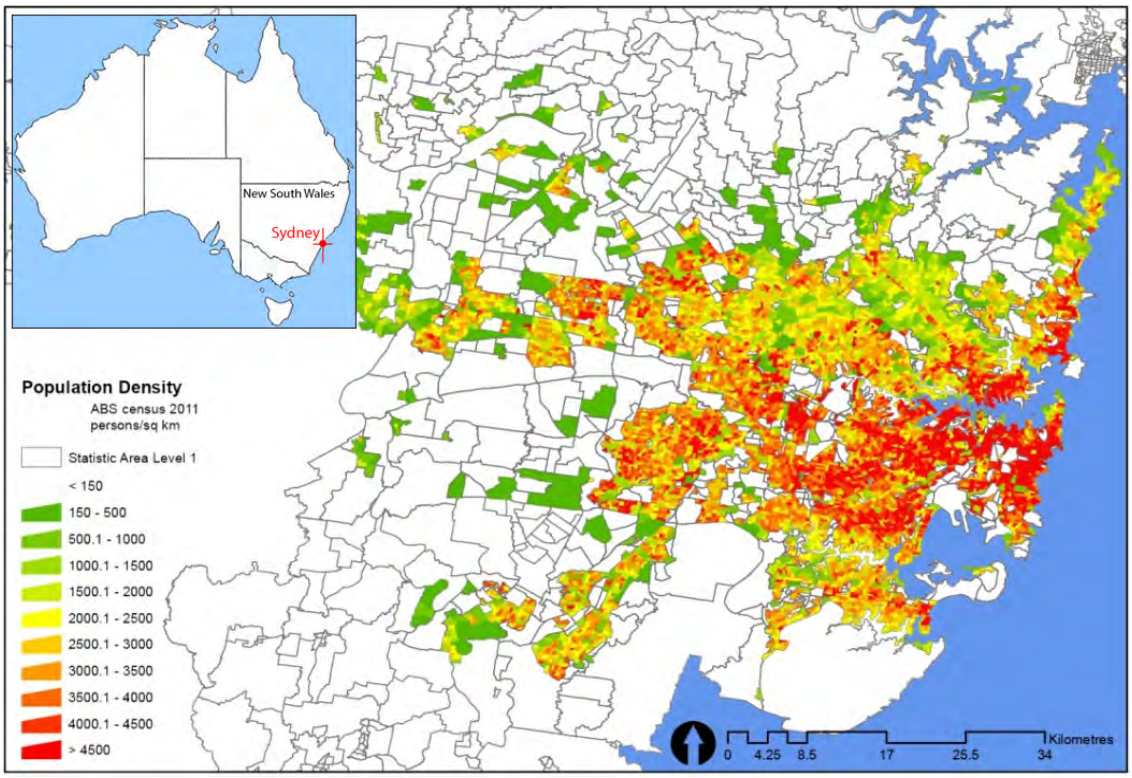

Figure 1. Population density in study area. Source: ABS, 2011

5.2 Research process

The study will conduct in two phases:

- The first phase of testing the hypothesis that the food choices can be explained by the characteristics of the built environment, using spatial statistical analysis technique;
- A second phase of purpose sampling and collecting data using in-depth interviews.

In this study, the built environment characteristics are hypothesised to influence residents' food choice. The first phase is to verify if the two variables, the built environment and food choice, are related or not. It aims to find out how 'likely' our food choices are related to the built environment. Many geographers have utilised spatial autocorrelation to measure the degree to which one characteristic is similar to others nearby, in order to understand the likelihood that if it is a result of a random process. This method, however, needs analysable values. Thus, an indicator to measure food choice is required. The indicator selection is based on the criteria that it should provide evidence to assess the outcomes of food choice and it should be numeric and access for public; the spatial incidence of T2D is selected as the indicator for food choice. This data is sourced from the National Diabetes Services Scheme (NDSS) (NDSS, nd). The technique in this study to testing the hypothesis is to generate Moran's I score using *ArcGIS for Desktop Advanced* Version 10.3. figure 2. demostrates the difference in the spatial incidence of T2D.

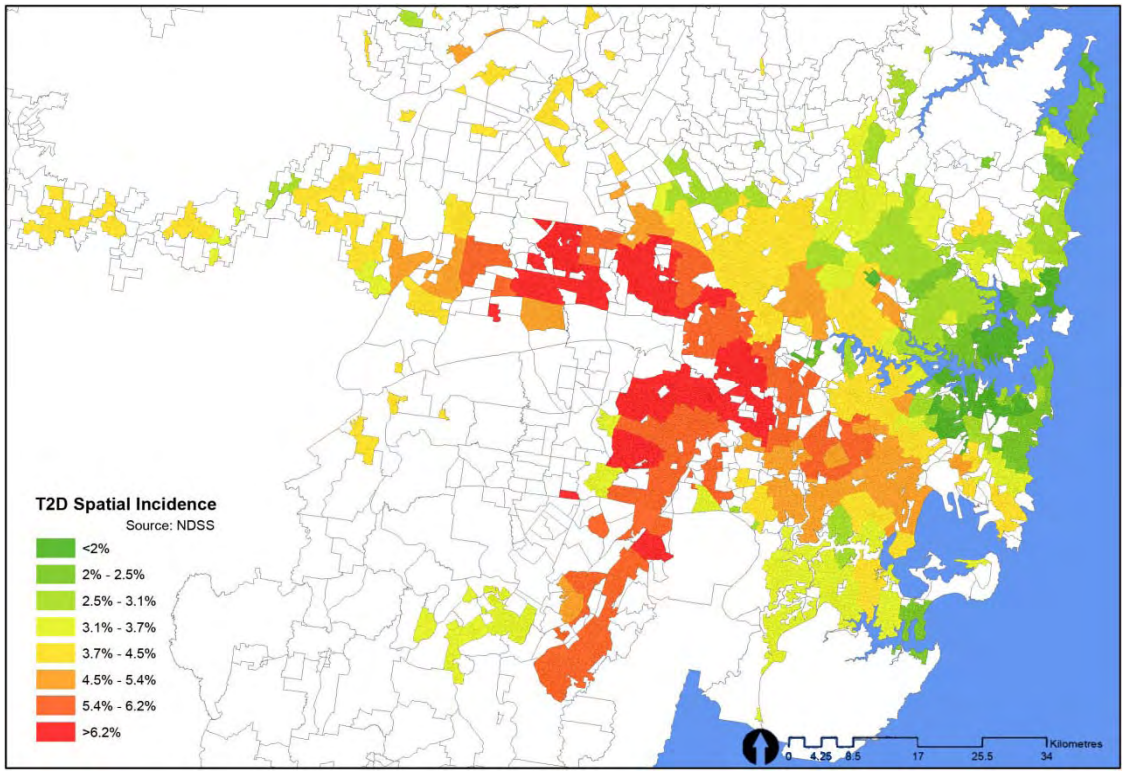

Figure 2. spatial incidence of T2D. Source: NDSS

The reliability and rationality of using T2D incidence as the food choice indicator are drawn from the literature to date in diabetes research. The linkage between food choice and T2D is proved and accepted. Low fibre and high fat sugar/protein food choices, such as high in red and processed meat; fried foods, beverages in high sugar, and fibre depleted wheat flour, all generate a delay in satiation

promoting excessive intakes of energy, saturated fats, sodium and simple carbohydrates or sugars (Gulliford and Ukoumunne, 2001; Psaltopoulou et al., 2010). These unhealthy food choices are linked to poor insulin sensitivity and glucose homeostasis, intra-abdominal fat deposition and high body mass index (BMI), which are all risk factors for T2D (Wolfram and Ismail-Beigi, 2011). In contrast, food consumption of non-starchy vegetables and whole grains on a regular basis decreases fasting blood glucose and improves glucose metabolism, which significantly reduces the risk of T2D (Carter et al., 2010; Psaltopoulou et al., 2010; Wolfram and Ismail-Beigi, 2011). Despite the fact that T2D has genetic and family-related risk factors, lifestyle modification and healthy diet behaviour can overwhelm biologic risk by preventing or delaying its incidence (Chaturvedi, 2007). Hence, the T2D incidence can indicate the utilisation of healthy food and the food choices.

The second phase is to select locations of purposive sampling to recruit participants for qualitative research. The criteria for purposive sampling are based on the difference in the measure for food choice (spatial incidence of T2D) and the similarity in socio-demographic characteristics. The selection here is pure to provide a source of participants to the following interview, not to make statistical inferences; starting from here I turn to use the qualitative research methods. A flyer about this study will deliver to mailboxes in selected locations for recruiting participants.

The primary method followed by for data collection is semi-structured in-depth interviews. I aim to focus on understanding the food choice in the context of built environment settings. With this in mind, a neighbourhood auditing will perform in order to discuss in details in interviews. I can describe, for example, the topography of streets, the condition of traffic and the location of food outlets. An interview guide is developed after pilot interviews which aim to identify key concepts for the main data collection. Interviews will be recorded with a digital voice recorder, and then transcribed. Once finished, I will use the computer-aided qualitative data analysis software program QSE NVivo 10 for data analysis.

6. Conclusions

Addressing food choice issues needs the insight of the built environment. With the goal of promoting liveable cities, researchers in planning society should contribute to food choice studies. This study will attempt to give a real world understanding of how the food choice is being influenced by the built environment. It will also identify urban form barriers to the utilisation of healthy food in urban settings in Sydney.

The mixed methods proposed in this study could be applied to a range of behaviours to understand how the built environment works on them. In this study, the methods give a new way of thinking about food choice, as the decision is made in the built environment, and factors affecting the choice may also imply in and affect by it.

On the other hand, the principal limitation of this study is that the linkage and associations may be insufficient to establish causality due to the nature of built environment research. Another limitation is that using the spatial incidence of type 2 diabetes as the indicator for food choice may conceal other food choice characteristics. Moreover, since the research is conducting in Sydney, the incoming results may not be applicable to the wider population and all urban settings.

Nevertheless, this study will highlight the relationship between the built environment and food choice to help built environment professionals to unravel the complexity and to encourage a healthy lifestyle in the future policy-making process.

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ALTERNATIVE FOOD NETWORKS AS SPACES FOR THE RE-TERRITORIALISATION OF FOOD. THE CASE OF TURIN

Egidio Dansero[1], Giacomo Pettenati[2]

Abstract: Alternative Food Networks (AFN) can be variously defined and can assume very different forms, according to the degree and the focus of their "alternativeness", which can be identified in issues like the relationships between actors, the connections between places, the processes of production, and so on.
However, what characterizes most of the practices which can be defined as AFN is the definition of a new relationship between places of consumption (mostly cities) and places of production (mostly productive rural areas), based on the relocalization of a part of the food system, which can be explicitly stated as aim of the AFN, or just observed as the product of practices of short food supply chain.
The aim of this contribution is to explore the role of AFNs in reconnecting cities and rural areas - as well as producers and consumers – starting from the results of an empirical study developed in two rural areas (Collina Torinese and Roero) surrounding the city of Turin.
This specific study is part of a wider interdisciplinary research (AFNIA – Alternative Food Networks an Interdisciplinary Research) aiming at the analysis and the interpretation of the role and the characteristics of Alternative Food Networks in Piedmont, integrating geographical, economic, sociological and environmental perspectives.
The starting point of this part of the research is the analysis of the localization of more than 600 producers involved in different typologies of AFNs in Turin (farmers' market, solidarity purchasing groups, other forms of direct sale).
Crossing the data about the localization of these producers with the rate of direct sale among local producers, it was possible to identify some areas which seems to be particularly involved in "feeding the city" through AFNs.
The two analyzed in the research are the Collina Torinese and the Roero, two hilly rural regions, the first contiguous to the urban area of Turin and the second about 40 km south-east from the city.
The research presented in this contribution investigates in depth, with an eminently qualitative methodology based on interviews, how AFNs develop in these territories, mostly from the producers side, analyzing local projects and policies aiming at supporting short food supply chains; the motivations of producers in participating at AFNs; the territorial effects of the involvement of a considerable number of farmers in this networks.
The objective is to understand whether the reconnections between the city – as space of consumption – and this rural areas – as spaces of production – can be considered as more or less explicitly pursued step toward the partial ri-territorialization of the food system.

1. Alternative Food Networks: a territorial perspective

The current dominant globalized food system can be represented as characterized at any scale by a widespread productivistic approach, market oriented, ruled by few large-scale powerful economic actors, usually transnational corporations (Morgan et al. 2006).

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This scenario brought to what Morgan et al. (ibid.) define as de-territorialisation of food, which can be declined into the disconnection between production and consumption of food, the disembedding of food from its places of production, the disentwining between the phases of the food chain and the dimensions of food (Wiskerke, 2009).
The notion of deterritorialization harks back to the rich debate on territoriality, coming from Deleuze and Guattari (1991) and used in the geography and spatial planning debate to describe the cycles of productions and reproduction of territory through the action of the networks of actors operating in it (Raffestin, 1980).
Magnaghi (2010) considers the deterritorialization as a structural factor of the present economic system, based on efficiency, driving to a sprawled urbanization and the weakening of the relations between societies and places, territories, landscapes, environment (and food).
The relations of power that sustain this system are considerably unbalanced, as most of the decisions affecting the system are taken by few very powerful political and economic actors, while there is a significant loss of power both of producers and consumers.
Despite the still important role that rural areas play as spaces of production, they have been affected by a devaluation, both cultural and economic, as they are mostly considered not as places, but as neutral supports for industrial agriculture.
This system produces "placeless foodscapes" (Ilbery and Kneafsey, 2000), where the relationships between food and the place where it is produced are broken and what most of people eat are homogeneous and standardized products, which come from a globalized non place-based value chain.
Such a system optimizes the efficiency of the food chain and production costs, but it has several negative externalities, such as: downward pressure on farm incomes and consequent loss of jobs , skills, expertise and knowledge in the agricultural sector; increase in environmental pollution, in the form of waste, dependence on fossil fuels and greenhouse gas emissions, consumption of water resources for production; loss of agricultural biodiversity and natural ; decline of the organoleptic quality and the diversity of products; increased competition for land, land grabbing and new forms of food colonialism; increase of diseases related to obesity and wrong eating habits, especially in the population groups with the lowest incomes (Wiskerke, 2009).
In this context, the heterogeneous landscape of alternative agro-food networks (or Alternative Food Networks - AFN), is one of the main dimensions (the other two are public procurement and urban food planning) of what is commonly called "alternative food geography" (ibid).
With the definition of AFN we mean those networks of production, distribution and consumption of food which propose and practice models that can be considered as alternative to the ones of the conventional food system, based on agro-food industry and large-scale retail trade. The *alternativeness* of these networks can be based on a very different range of factors, such as the relationships between the actors of the network, the relations that are produced between the places of the network, the distribution of power, the environmental sustainability of the production and distribution processes, the social justice of the network, and so on. (Goodman et al, 2004, Goodman et al, 2012).
Notwithstanding the vagueness of the definition, according to Jarosz (2008), we can identify AFNs in four major ways: (1) shorter distances between producers and consumers; (2) small farm size and scale or environmentally sustainable farming methods; (3) the existence of "alternative" food purchasing models and venues, usually based on human relationships and proximity between consumers, producers and/or retailers; (4) a commitment to the social, economic and environmental dimensions of sustainable food production, distribution and consumption.

Within this variety, we can identify several different examples of AFNs (such as farmers' markets, Solidarity Purchasing Groups, Community Supported Agriculture, urban collective gardens, local food cooperatives, etc.), which assume different meanings, according to the geographical context and social milieu in which they emerge.
The focus of the *alternativeness* of these heterogeneous practices could be on the *food* which is produced, distributed and consumed within or through them (e.g. organic productions, traditional recipes, ancient cultivars, quality food specialties, etc.), or on the relational model of the *networks* which bring food from farm to fork (e.g. community supported agriculture, direct sale, fair trade, consumers-producers pacts, etc.) (Watts et al, 2005; Wiskerke, 2009).
Another well-known and useful classification of AFNs, both on the food and the network side, is proposed by Marsden et al. (2000), which distinguish between *face to face* AFNs (based on the direct relationships between the actors of the food chain), *spatial proximity* based (basing their alternativeness on the relocalization of the food chain) and *spatially extended* (where the alternativeness is embodied by food, even if travelling worldwide).
Obviously, it would be a mistake the attempt to strictly classify these various and changing practices and to define a neat division between AFNs and the so-called conventional food system. Frequently, in fact, we assist to blurring relationships between alternative and conventional practices, which coexist in the same places, and sometimes mix in the same networks and practices (Sonnino e Marsden, 2006).

A critical perspective is also demanded for what concerns the relationships between AFNs and the relocalization of the food system. Falling in the so-called "local trap" (Born and Purcell, 2006) or "unreflexive localism" (DuPuis and Goodman, 2005), often the debate evokes a coincidence between local food and alternative food. Actually, at the local scale – however understood – the inequalities and distortions of the conventional food system are often reproduced, even if with a minor spatial extension.
Supporters of the relationship between an increase in proximity and fairer and more sustainable food systems, either locally or globally, are aware that even localized systems can reproduce the dynamics of spatial and social injustice unsustainability (ibid.) and that it is necessary to define precisely which negative aspects of the conventional system can be at least partially solved by small scale alternative models (Allen, 2010).
The risk of uncritically assigning positive value at the local scale is also to deny the political dimension of the local, denying the multidimensionality of the scale and sub estimating both the role of powerful supra-local actors in addressing local dynamics and practices (Dupuis and Goodman, 2005) and the presence of localist reactionary and defensive attitudes of some local actors (Hinrichs, 2003). Most scholars working on this themes agree that it is not enough (and in some cases not even necessary) to increase the physical proximity between producers and consumers and between stages of the supply chain, instead we must seek to build a new relationship between food and places, weakened by agribusiness (Casey, 2001; Feagan, 2007).

AFNs often – explicitly or implicitly – aim to a spatial reorganization of the food systems, moving from a dominant globalized food geography, uninterested to the specificities of places, to the construction of a new relationship between food and places. Trying to summarize the rich debate on these issues, we can identify four different aims, declared or practiced by AFNs.
The first is the *relocalization* of the food system (Hendrickson and Heffernan, 2002), often considered as a reduction of the *food miles* and a growth of the market share of local food. The relocalization of food can be imagined starting from an idea of "local" based on extension, with the identification of an

optimal circular area within which food can be considered as "local", or with a more complex understanding of "local", as a variable scale, produced by relationships between people, places and resources (Sonnino et Marsden, 2006; De Kremer et De Liberty, 2011).
A second spatial shift of the food system, often mentioned in the debate is the re-regionalization (Kneafsey, 2010). One of the key dimensions of the spatial perspective in studying food systems is the analysis of the *foodshed* of a city or an area (Kremer and De Liberty, 2011), that is the set of (usually not contiguous) areas where the food consume in a place comes from. If the analysis of the foodshed can be seen as the assessment of existing dynamics, the idea of regionalization (or re-regionalization) is usually used with a regulatory meaning, trying to define which should be the areas from where (not only local) food should mostly come from, in order to achieve more sustainable or just food systems.
As the difference between re-localization and regionalization is decidedly nuanced, regionalization can be considered an upper scale process that connects different "locals" in a complex and open food territorial system (Clancy and Ruhf, 2010).
Another concept often mentioned in the debate , which supports and enriches ones of relocalization and re- regionalization is the one of the *re-embeddedness* of food in places (Sonnino and Marsden, 2006), local ecologies (Murdoch et al, 2000) and social networks (Sage , 2003). This is a potentially very useful analytical category because it includes the spheres of the cultural, social and political environment (horizontal dimension) and the institutional sphere (vertical dimension) of food systems (Sonnino and Marsden , 2006).
According to the territorial point of view guiding this contribution, however, a concept that better than others can synthesize the characteristics of alternative geographies of food and AFNs is reterritorialization, understood as opposed to the deterritorialization which characterizes practices attributable to the conventional system (Morgan et al , 2006).
As suggested by Dansero and Puttilli (2013), this territorial approach – related to a wider field of research[3] - is particularly valuable for studying the AFNs for two reasons. First, because these practices can be seen as a redefinition of the relationship between food and territory, the reaffirmation of social relationships, a new economic and cultural relation between places, producers and consumers. In addition, the concepts of territory and territoriality (for a recent overview, see Raffestin, 2012) – mostly used in the Italian and French contexts (Saquet, 2012) - may offer a new analytical perspective for what concerns, food networks, with particular reference to their spatial configurations.
This approach it can be considered fruitful to investigate the already mentioned riterritorialisation of food through AFNs, which can follow the deterritorialization deriving from the weakening of the relationships between food networks and places characterizing the conventional industrialized and globalized food system.
According to this approach, the territory is not only considered as a delimited area, but also as the result of the action of multiple networks of actors operating in a particular place, compared to other places and with existing resources (Raffestin 1980; Dematteis 1985, Turco 1988).
From a territorial approach, Dansero and Puttilli (2013) propose to consider AFNs starting from three complementary dimensions:

- spaces: the organization of AFNs in space, specifically the physical and functional distance between the actors participating in the network. The focus is on both the spaces of production - from where a new urban-rural linkage can be developed - and the spaces of sell and consumption, which often become new spaces of socialization.

[3] See, among the many references, the conference organized by FAO in 2013, named "A Territorial Approach to Food Security and Nutrition and Rural Poverty Reduction".

- resources: the type of resources used in AFNs. These resources can be very varied: at one extreme, they can be highly locally specific, unavailable or unreproducible elsewhere, while at the other extreme, they can be standardized resources, reproducible anywhere. Is the food sold in the AFN the expression of a specific place or a specific network of actors? At which extent the relational, cultural and material resources mobilized through the network come from the milieu of specific places?
- relationships: the type of social relations between the actors who belong to the AFN. At one side, we can find experiences with an explicit community dimension, based on face-to-face relations and trust, on the other side more structured, market oriented, organizational models. Which is the main aim of the AFN? A new space of market for economic activities? A new space of social relationships? The support to the development of a weak area? How do these different aims mix together in each practice?

In the next paragraph, we will analyze the role of alternative food networks in the food system of Turin, trying to underline their territorial configuration, referring to the conceptual framework described above, even if a more detailed analysis will be developed in the next months of researching.

2. Turin: a case study

2.1. The local context

In the Northwest of the country, between Milan and the French borders, with a population of 900.000 (almost 2.3 million if we consider the *città metropolitana*), Turin is the fourth biggest Italian city for population. After centuries as capital of the Duchy and then of the Kingdom of Savoy and few years as first Italian capital (1861-1865), in the XX century the city grew as a company-town, around the huge automobiles plants of FIAT, in the Southern neighborhoods of Lingotto and Mirafiori and the flourishing satellite activities.
In the last decades, the city has been the location of one of a dramatic transformation both physical and symbolical. Many factories closed and has been substituted by brand new portions of city. This material change went with a remarkable process of re-invention of the city's image, which had its turning point in the 2006 Winter Olympic Games (Dansero and Puttilli 2009). In about fifteen years, the city shifted in the collective imagination of Italians from a grey industrial city to a vibrant city and a tourist destination, based on creativity, cultural heritage, cinema, museums, innovation and food (Vanolo 2008).
Turin belongs to a territorial system where food is a mature economic, social and cultural asset, which contributes to a regional development increasingly based on high-quality food production (wine, chocolate, nuts, cheese, etc.) and food and wine tourism, which – as mentioned above - are gradually taking the place of heavy industries in the economic system and in the discursive representations of the area.
The acknowledgment of this assets, stimulated by some strong and very active stakeholders (e.g. Slow Food, Eataly), brought to the organization of several initiatives and events aiming at promoting and protecting typical food products (e.g. Salone del Gusto, Terra Madre, Cioccolatò, etc), which made of Turin one of the recognized national "capitals of food" (Torino Strategica, 2013).

2.2. Alternative Food Networks in Turin

In a city where food plays such an important role in economic, cultural and political life, there are many examples of practices that can be defined as alternative food networks, according to the very inclusive definitions proposed above.
Before enumerating the main AFNs identified in the urban area and interpret some of them at the light of the territorial approach proposed, it is necessary, to make an briefly introduce some specificities of AFNs in the Italian food system. As already highlighted, one of the most debated issues in this field is the presumed (declared and practiced) alternativeness of the different forms of food networks (Jones et al, 2010; Watts et al, 2005).
In the Italian context, though, the deterritorialization of food practices is still only partial, albeit threatened by different cultural and economic models (Helstosky , 2004) . People still use to cook fresh food at home daily (only 20% of the Italians use to buy pre-cooked food[4]), to buy it at food markets (80% of the Italians buys part of their food at local markets[5]), sometimes directly from producers.
Obviously, this does not mean that Italy and Italians are not a node of the globalized agroindustrial driven food system, for what concerns flows of goods, flows of workers and the concentration of power.
In a food system of this kind, common in many countries of southern Europe, it is still more difficult to define the boundary between traditional habits, "conventional" food practices and alternative food networks (Dansero and Puttilli, 2013).
In this paper, the focus will be on two typologies of AFNs, well represented in Turin: farmers' markets and Solidarity Purchasing Groups (GAS – Gruppi d'Acquisto Solidale).

2.1.1 Farmers' markets

The growth of farmers market in the more economically developed countries is one of the main evidences of the renewed interest of consumers for fresh and local food, with clear information about its provenance (Govindasamy et al., 2002)
In Italy, there are about 1000 FMs, mostly concentrated in the Centre and North of the country, mostly organized and managed by professional agricultural organizations, notably Coldiretti[6] (Marino and Cicatiello, 2012).
In some cities, including Turin, however, there are two types of markets where farmers can sell directly .
The first are the municipal markets that take generally every day in different parts of the city. There, a specific sector of the market is reserved to producers. Among the about 45 daily food markets of Turin, 38 are those that host agricultural producers, mainly selling seasonal fresh fruit and vegetables (but also cheese, meat, honey, eggs, and so on).
In most of them, however, it is very difficult to distinguish the stands of local producers from those of vendors who sell products coming from conventional channels (such as the wholesale market). Here, the identification of local producers comes from the direct relations between producers/sellers and

[4] Coldiretti, 2012.
[5] Nielsen, 2015.
[6] Coldiretti is the main agricultural organization in Italy. Founded in 1944, has now 1.9 million members all around Italy (70 % of all Italian farmers) (www.coldiretti.it).

consumers[7]. Only in a few cases, the area reserved for producers is clearly identifiable (through descriptive panels), usually where it has been the object of specific development projects. The most striking example in this sense is the Porta Palazzo market , where every day a variable number of farmers (over 90 stalls on Saturdays), sell their products under a metal roof in Art Nouveau style , which is a historical place of socialization for the people of this popular neighborhood of Turin (Black, 2012).
The second type of farmers markets in Turin are the periodic markets organized by various organizations. The main role, in this sense, is played by the farmers' organizations, notably Coldiretti, which through the program Campagna Amica organizes more than 600 markets throughout Italy. In Turin, there are around 15 farmers markets, most of which (8) organized by Coldiretti under the initiative Campagna Amica. Other organizers are Slow Food (with two "Mercati della Terra"), the CIA – Confederazione Italiana dell'Agricoltura and other associations and networks like ASCI - Associazione Solidarietà Campagna Italiana or Genuino Clandestino .
If municipal markets are spread throughout the city, with at least one market in each of the 23 historical neighborhoods of Turin, the farmers markets belonging to this second typology are mainly concentrated in the historic center of the city, with a particular concentration on the square in front of the City Hall (Piazza Palazzo di Città), where almost every weekend there is a farmers' markets, organized by one of the actors mentioned above.
The degree of declared opposition of these practices to the conventional system is much variable. It is low in the case of the markets organized by organizations of farmers such as Coldiretti or CIA; while on the other extreme it is much more explicit for what concerns markets like the ones organized by the network Genuino Clandestino (that uses the spaces of the Autonomous Social center Askatasuna) .

Figure 1. Distribution of farmers' markets in Turin

[7] Each producer, actually, have to show visibly on his/her stand a certificate, attesting the main characteristics and the localization of its farm.

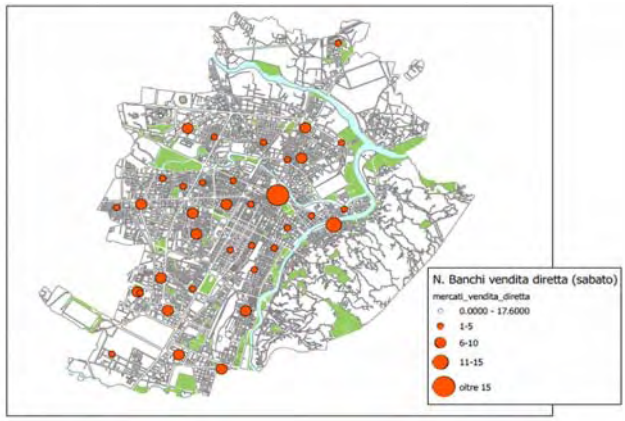

Figure 2. The distribution of producers in municipal markets in Turin

At the provincial scale (Città Metropolitana) the number of farmers' markets grows to around 70, mostly concentrated in the periurban area of Turin. The density of this kind of AFNs decreases in rural areas and around smaller towns. Their total number in Piedmont is of about 150[8], mostly concentrated around the main urban areas of the region.

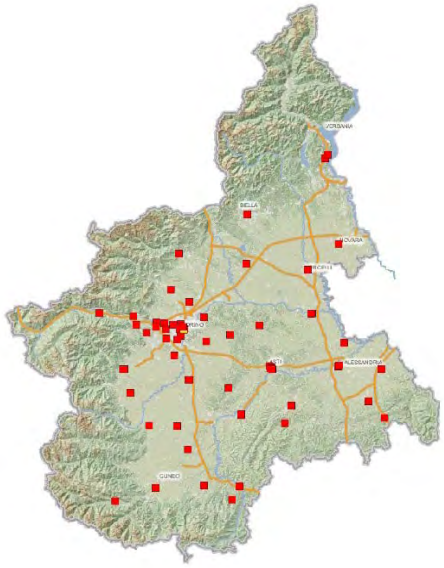

Figure 3. The distribution of GASs in Piedmont

The panorama of the farmers' markets of Turin is characterized by a big variety of organizers, aims and political engagement of the farmers' market in Turin and in Piedmont, which would make useless an analysis of these practices as a whole.

A common trait is the local provenance of producers, mostly concentrated from few areas of Piedmont, notably the hilly regions of Roero and Collina Torinese and the foothills areas between Turin and the Alps.

[8] The exact number of farmers' market is variable, because some of them are organized only seasonally or not on a regular base.

A big variety concerns the characteristics of the products sold in the markets, strictly related to the mission of each market. Most of them are populated by conventionally produced local products, while some exceptions can be found in the few organic food markets or in more explicitly political markets, such as the ones organized by Slow Food, selling mostly products coming from the Slow Food Presidia, or the ones organized by Genuino Clandestino, where most of the products are not-certificated organic and come from small size alternative family farming.

2.1.2 The GASs (Solidarity Purchasing Groups)

The *Gruppi d'Acquisto Solidale* (GAS) or Solidarity Purchasing Groups are a form of organized critical consumption, which emerged in Italy since the 90's, structured around the collective purchase of products (not just food), whose suppliers (often producers) are usually selected according to criteria of environmental sustainability and social and economic justice. If in the case of farmers' markets, consumer choices are only partly guided by explicitly political reasons related to the support of an alternative food system (Marin and Cicatiello , 2012) , for the member of GASs, the support and the definition of alternative models of consumption and production are almost always the core of the activity of the organizations (Graziano et Forno, 2012; Grasseni, 2013).
The extreme organizational variety of the GASs and their different levels of formalization (from totally informal group to formal associations) makes it very difficult to make an exhaustive census. The national network Rete GAS has about 1.000 self-reported groups throughout Italy, even if they represent only a part of the total number of these groups of consumers.
In the municipality of Turin there are about 70 self-reported purchasing groups and their number increases to 120 across the whole Città Metropolitana, with a strong concentration in the urban area of Turin.
The number of the members of each GAS can considerably vary, from few families, to more than 100 families for the biggest ones.
The choice of the products bought by the members of the GASs depends on the mission of the GAS itself. Some of them are focused on local food, some others buy only organic food, with no care of its geographical origin, while others are more focused on social justice and fair trade. It is very difficult though an exhaustive analysis of the characteristics of these AFNs, due to their mainly informal nature.
For what concerns relationships, a relevant topic is the networking of many GAS at the metropolitan scale, in order to make big orders of specific products, usually not locally produced: in particular, oranges (as well as lemons and tangerines) coming from Southern Italy. The choice of big collective purchases for some specific products is related to one of the most problematic issues related to GASs, that is logistic. The informal and voluntary based nature of these groups makes them often inefficient, for what concerns deliveries and purchases. For this reason the network GAS Torino, with other networks of Northern Italy, launched small-scale projects of Small Organized Distribution (PDO) in opposition to the Great Organized Distribution of large scale retail (AA.VV. , 2013). These projects are expression of the network of actors working together through and for a more aware and environmentally and socially sustainable consumption of food (social cooperatives, local produce stores, etc.).
Moving from the relationships between GASs to the relationships between each of them, it should be noticed how most of them emerge from already existing networks, with different degrees of formal organizational structure, such as cultural, religious, political or sport associations, groups of workers, neighbors, and so on.

2.1.3 The provenance of producers

Some key issues to be investigated in order to understand the "territoriality" of AFNs are the provenance and the characteristics of producers participating to them, in terms of farm size and structure, production processes, multi-functionality, promotion of alternative visions of the rural.
At the current progress of the research here presented, it is possible to propose some reflections about the geographical localization of producers participating to AFNs in Turin.
The map of Figure 5 shows the localization of more than 600 producers involved in farmers' markets, GASs or other typologies of AFNs not presented in this paper.
Most of them comes from an area within 50 km from Turin, witnessing the importance given to the local provenance of products sold through the AFNs, beyond their processes of production. A specific concentration of producers can be noticed in three areas:

- The hills surrounding Turin on the eastern and southeastern side of the metropolitan area.
- The Roero hilly region, about 40-50 km south of Turin
- The foothills areas between the urban area of Turin and the Alpine valleys of Susa, Chisone and Pellice.

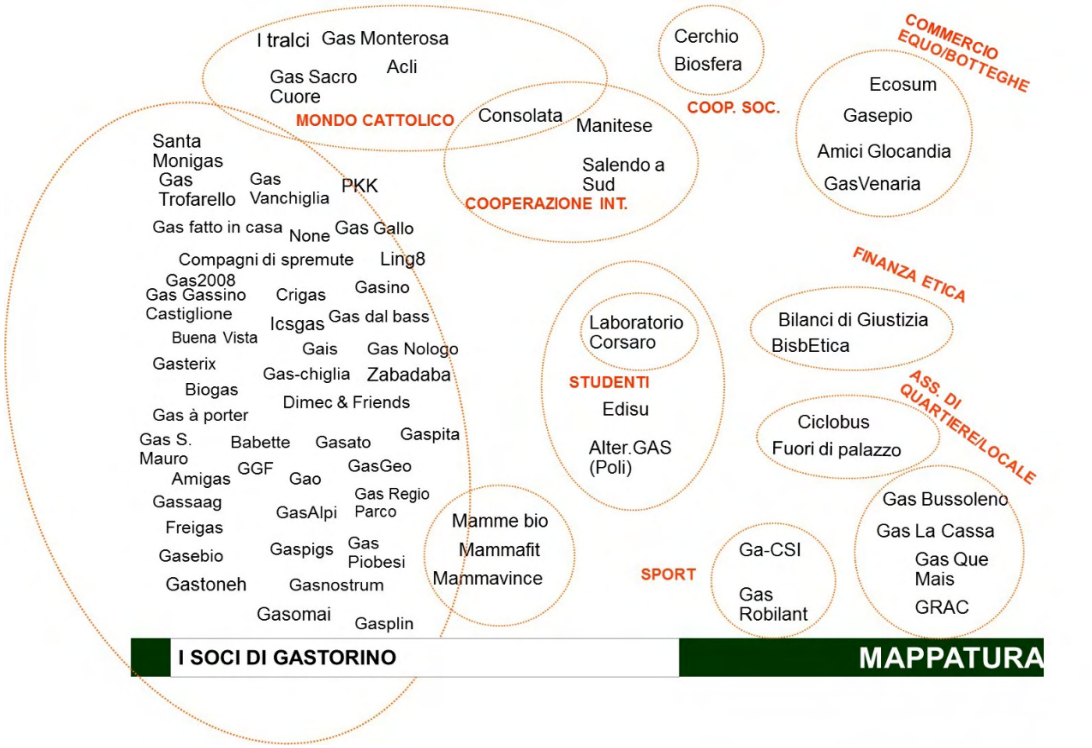

Figure 4. The social networks of GASs in Turin

These three sub-regions are very different for what concerns their agricultural and economic structure and their relationships with Turin. It would be then very useful to analyze more in depth the reasons of the concentration of producers participating to alternative food networks in this areas, in order to understand if it can be related to the development of a new relationships between urban and rural, possibly through the reterritorialization of food practices and networks.
The foodshed of GASs is broader than the one of farmers' market, as it is most common to find in the "basket" of the consumers participating to collective purchases products coming from other regions and other countries. The main motivation of the purchase of some products is not in this case their

local provenance, but their being representative of an alternative model of food production and distribution. Figure 6 shows the main clusters of producers providing food to the GASs of Turin from outside Piedmont, usually with the intermediation of Rete GAS. With the exception of olive oil, mostly coming from Liguria, the closest region to Piedmont where it is produced, the choice of the other products and producers is mostly related to ethical or environmental issues, such as: sustainable fishing practices (fish coming from Mar Tirreno), support to populations of Emilia-Romagna after the 2012 earthquake (purchasing the Parmigiano Reggiano produced in the areas devastated by the event), support to organizations (namely Libera) fighting mafia in Southern Italy, by cultivating lands confiscated to mafia.

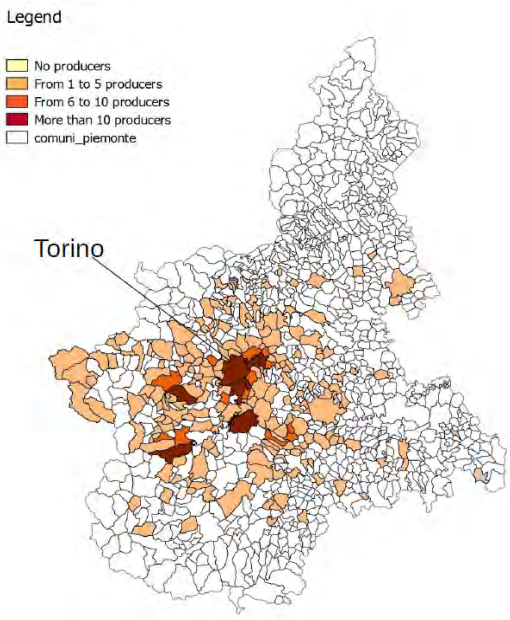

Figure 5. The provenance of local producers participating to AFNs in Turin

Figure 6. Some clusters of Italian producers involved in Solidarity Purchasing Groups in Turin

3. Conclusions

Figure 7 tries to relate different kinds of AFNs existing in Turin to different dimensions of the spatial reconfiguration of food systems described above. Even if such systematization could be useful, it does not represent the heterogeneous complexity of the many different kinds of AFNs existing in a city like Turin.

From a methodological point of view, it will be necessary, for the continuation of this research, to analyze each AFNs separately, using general conclusions on for a final summary.

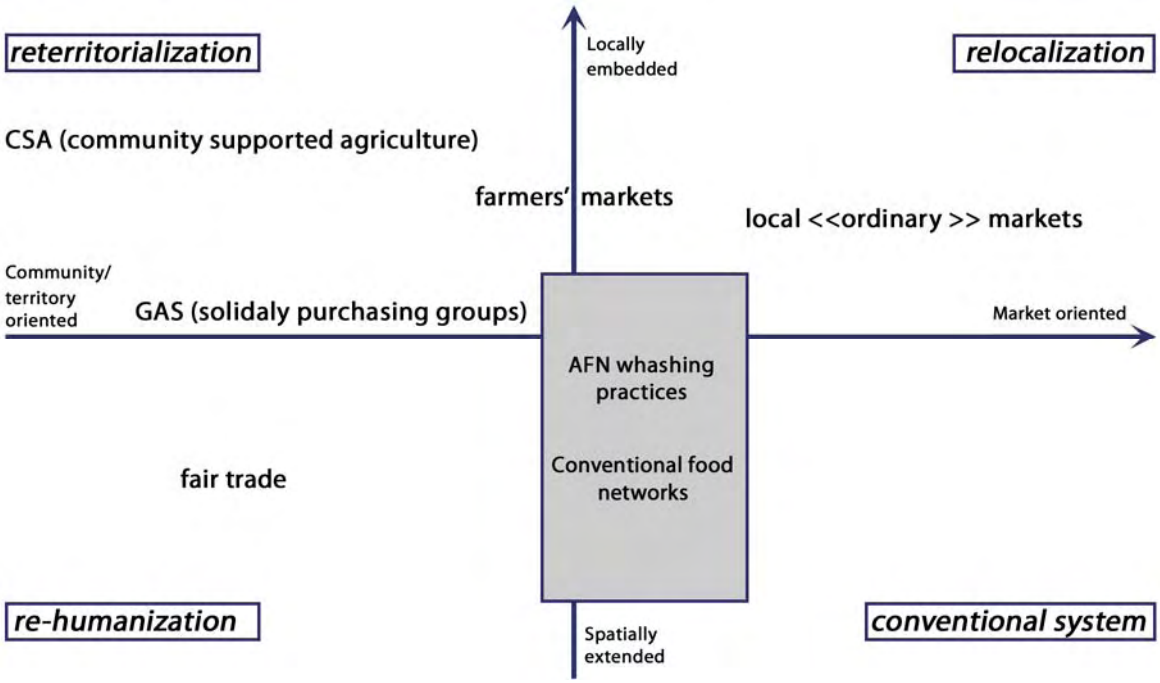

Figure 7. Spatial reconfigurations of the food system according to the different typologies of AFNs

Some of the already mentioned main topics common in the debate about AFN clearly emerge even from this still general overview on these practices in Turin such as:

- The need of a critical gaze, trying to understand how the "alternativeness" of these practices relates to the conventional system to whom they are anyway strictly related too
- The need of avoiding an unreflexive understanding of the local scale, as panacea of the negative aspects of the food system.
- The idea of the niche. Are AFNs niche practices? How do they relate with other practices which are common in Italy (e.g. buying fresh food at the market), which are not explicitly alternative, but which cannot be considered only as a part of the conventional system?
- At which scale AFNs maintain their "alternativeness"? Which can be the balance between small scale, place based practices and wider practices, able to effectively affect the food system at a regional, national or even broader scale?

For what concerns the territorial approach proposed in this paper, it is possible to summarize here some main topics.

Spaces

AFNs emerge from and produce specific relationships between the places of production and the places of consumption. A main point is that they are generally considered, by most of the consumers participating to these networks, as places in their complexity, wherever they are, and not simply as economic spaces of production. It has already been discussed how the localization of producers involved in AFNs can be used as an evidence of their strategies and aims. Another relevant issue is the role of the places where producers (or their products) and consumers get in contact, which sometimes become places where the often hidden food system (Pothukuchi and Kaufman, 1999) emerge and become evident. It is the case of markets, here notably the market of Porta Palazzo, which is one of the main places of sociality in the city.

Relationships

The reflections about the relationships which characterizes AFNs can be consumers-consumers; consumers-producers; producers-producers.

This overview on AFNs in Turin shows a big variety of relations, which extend from mostly market-oriented corporatist relationships, like those of markets organized by farmers associations, to purely community-oriented ones, represented for example by the more "alternative" markets.

Many AFNs, emerge from and reproduce existing relationships, both in a positive and negative sense. It would be useful to better understand which new relationships emerge through AFNs, both from the consumers and the producers side, as they can be the starting point of new, more equal relations between places.

Resources

Exploring the resources that AFNs mobilize means more than considering the type of food produced, sold and consumed through them. Considering food, however, could be a useful starting point, as it allows to observe how some of them considers it merely as an economic good, even if high quality, fair, sustainable, and so on. In other cases, though, food is the vehicle for the development of new social, environmental and economic models at any scale, starting from the valorization of the local unreproducible material and symbolic resources, with new cultural and economic framework coming from outside. In this sense, one of the aims of the further steps of the research is to understand if and how in those areas where producers participating to AFNs in Turin are localized, their participation is part of a project (not only institutional) of local development through the reterritorialization of food.

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Franco Fassio, "Cultural events as "complex system" in their territorial relationships: the case study of the Salone Internazionale del Gusto and Terra Madre", In: *Localizing urban food strategies. Farming cities and performing rurality.* 7th International Aesop Sustainable Food Planning Conference Proceedings, Torino, 7-9 October 2015, edited by Giuseppe Cinà and Egidio Dansero, Torino, Politecnico di Torino, 2015, pp 566-573. ISBN 978-88-8202-060-6

CULTURAL EVENTS AS "COMPLEX SYSTEMS": THE CASE STUDY OF THE SALONE INTERNAZIONALE DEL GUSTO AND TERRA MADRE

Franco Fassio[1]

Keywords: flows and networks, cultural and food events, systemic design, environmental impact, "good clean and fair"

Abstract: Gastronomic and cultural events or festivals, though of great scope and complexity despite being limited in time, have a significant effect on the level of 'stress' of human activities and on the delicate balance between the territory and the community.
Starting from the analysis of the case study of the Salone Internazionale del Gusto and Terra Madre, an international event, based in Turin, for the exhibition and sale of high quality food and wine, the purpose of the paper is to offer some insights about the dynamics triggered by a "system event" in its material and immaterial flows and how the design of concrete actions to make it more sustainable can generate a new system of shared and enduring values among the involved stakeholders.
The methodology used belong to the theoretical framework of the systemic design, which has been integrated with the requirements of a sustainable fair manifestation according to the Slow Food philosophy of the "Good, Clean and Fair". Stand construction, waste production, energy, packaging, materials for onsite food consumption, the logistics for transporting goods, CO2 emissions, the mobility of persons and goods, water resources are some of the design areas considered for the improvement of the event environmental side. The result for the 2014 edition, was the creation of a system made of more than one hundred of concrete actions, which have significantly reduced the environmental impact of the event, and have increased its social, cultural and economic value, thanks to a active participation of more than 60 stakeholders too. This new system beyond reducing the environmental impact of the event, favoured the creation of a territorial network of relationships that become a sounding of its contents and keep them live once it ends.

1. Research question and aim of the paper

The boundaries of an event, such those one of a city, change over time and according to the problems that we aim to face, new structures of open relationships are able to change the territorial linkages that have been previously created (Bagnasco, 1986). This assumption, takes on a particular meaning when we face the issue of food-town and we are dealing with gastronomic events that have a strong educational value and aim to make us reflect on what are our practices and daily food choices. The following paper aims to analyze how the rethinking of some design aspects of an event in order to make it more sustainable from the environmental perspective through the adoption of the Systemic Design method, can change its boundaries, its matter and energy flows creating as a consequence a new system of relationships. The case study analyzed is the Salone del Gusto and Terra Madre, promoted by the International Slow Food Association.

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2. The case study

Slow Food is a global, grassroots organization, founded in 1989 to prevent the disappearance of local food cultures and traditions, counteract the rise of fast life and combat people's dwindling interest in the food they eat, where it comes from and how our food choices affect the world around us. It coordinates projects that defend local food traditions, protects food communities, preserves food biodiversity and promotes quality artisanal products. Since its beginnings, Slow Food has grown into a global movement involving millions of people, in over one hundred fifty countries, working to ensure everyone has access to good, clean and fair food.
Slow Food believes food is tied to many other aspects of life, including culture, politics, agriculture and the environment. Through food choices people can collectively influence how food is cultivated, produced and distributed, and as a result bring about great change. Salone Internazionale del Gusto and Terra Madre are two of the several events organised by the organisation. They represent, in the food fair field the answer to the homologation determined by a globalized market that penalize the small production of quality. It represents the idea that the safeguard of all cultural and environmental heritages linked to the gastronomy can revitalize the micro-economical level. Terra Madre is the international meeting of the Slow Food Communities, born to defend the fundamental right to share daily happiness offered by food and as a consequence to promote the collective duty of protecting the heritage of alimentary cultures that allows these pleasures. For five days every two years, the fair pole, puts up about 220,000, visitors in 75,800 squared metre, 125 institutional stands, 1,000 exhibitors, 300 stalls, 4,500 people belonging to the food communities from all the world and also spaces of restoration, sample, rooms for didactic, laboratories of taste and more else.
In 2005, Carlo Petrini, the International President of the Slow Food[2] Association states a new definition of food quality with the manifesto of "Good, Clean and Fair" (Petrini, 2005) where he outlines the criteria for a new quality that the food products should fulfil across the whole life cycle: a new holistic vision of the gastronomy that it has been further investigated by the University of Gastronomic Sciences[3].

From the combination of the Slow Food manifesto, Good, Clean and Fair, with the principles of Systemic Design, was born the idea of developing a systemic event, with the purpose of associating quality content to a more sustainable "container" and with the ambition to educated the consumer to recognize a new concept of Systemic Quality about food production, distribution and communication.

3. Methodology: the systemic design approach

Food events can be considered as complex systems for several reasons:
- the dynamics of their continuous evolution position them at the cross-roads of the latest phenomena in the internationalization of the cities-countries system;
- they create a localized network oriented to territorial development;
- they provide an opportunity for dialogue with and education of visitors.

[3] Gastronomy is defined as an in-depth understanding of the entire web of food production, from agriculture to processing to distribution, the knowledge about the material and immaterial relationship between man and food.

Acknowledging these reasons and with the intention of designing an event that will be less wasteful by harmonizing the content and making it conform to its container, the research was moved to adopt the systemic design methodology of investigation.
Systemic Design is a network of interdisciplinary knowledge that takes into account different design areas. It seeks to promote new, sustainable consumption and management of output (i.e. waste), making it usable for other processes and giving it a new economic value. The starting point of systemic design is, therefore, the knowledge of the principles of organization and efficiency that ecosystems have developed to survive for millions of years (Benyus, 1997). Each organism, animal, plant, microorganism or human being is a complex system made up of parts that are themselves smaller living systems, but not the less important for being so. In the living world we have systems within systems. They are related not only as a static configuration of elements, they share common properties and organizational principles created by the interactions between the different parts (Capra; 2002, Capra and Luisi, 2014). The whole is more than the sum of the individual elements (Forrester, 1974; Emery, 1989; Bistagnino, 2011). For this reason, nature does not know the meaning of the word 'waste' because each surplus is metabolized by the system, through the dynamics of the five natural kingdoms. By considering the event itself as a complex and living organism the research adopted the principles of systemic design to rethink and to shape the event according the mechanisms of a functioning ecosystem.

4. The applied research

From 2006 Slow Food, the Piedmont Region and the City of Turin, under the coordination of the University of Gastronomic Sciences and the Polytechnic of Turin, took up a road toward the progressive abatement of the environmental impact of the event in question (at first) with the aim of creating an exportable design model, through the application of the methodology of Systemic Design.

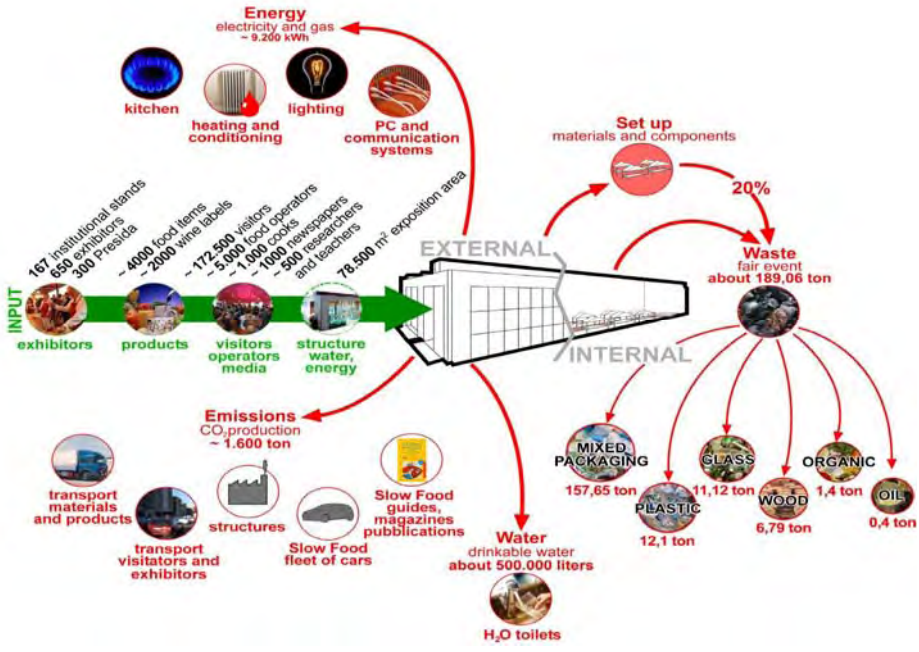

Figure 1. In this image, a part of the Holistic Survey developed for the Salone del Gusto and Terra Madre 2006.

The first steps moved from the analysis of the life cycle of the event “Salone Internazionale del Gusto and Terra Madre 2006” considering the status quo relative to the incoming and outgoing flows of the trade fair system (Figure 1): stand construction, waste production, energy, packaging, materials for onsite food consumption, logistics for transporting the goods, CO_2 emissions, the mobility of persons and goods, water resources were considered as the main design scenarios that determine the environmental sustainability of an event.

By the "holistic relief" of the initial state (2006), the project outlined the first scenarios and the first concrete actions. The organizers of the event collect the data to promote a new model of “Systemic Exhibition” which considers all the incoming and outgoing flows of the trade fair system.
Several design experiments considered as intermediate stages of research were developed during the exhibitions of Slow Fish 2007 (Genoa) and Cheese 2007 (Bra), to identify innovative strategies with a direct involvement of the companies/expositors.
For each scenario a technical partner has been identified. Starting from the first edition of the project, we have begun to build a network of collaboration between companies of the territory and others at the national and international level for some specific products or services (Figure 2).

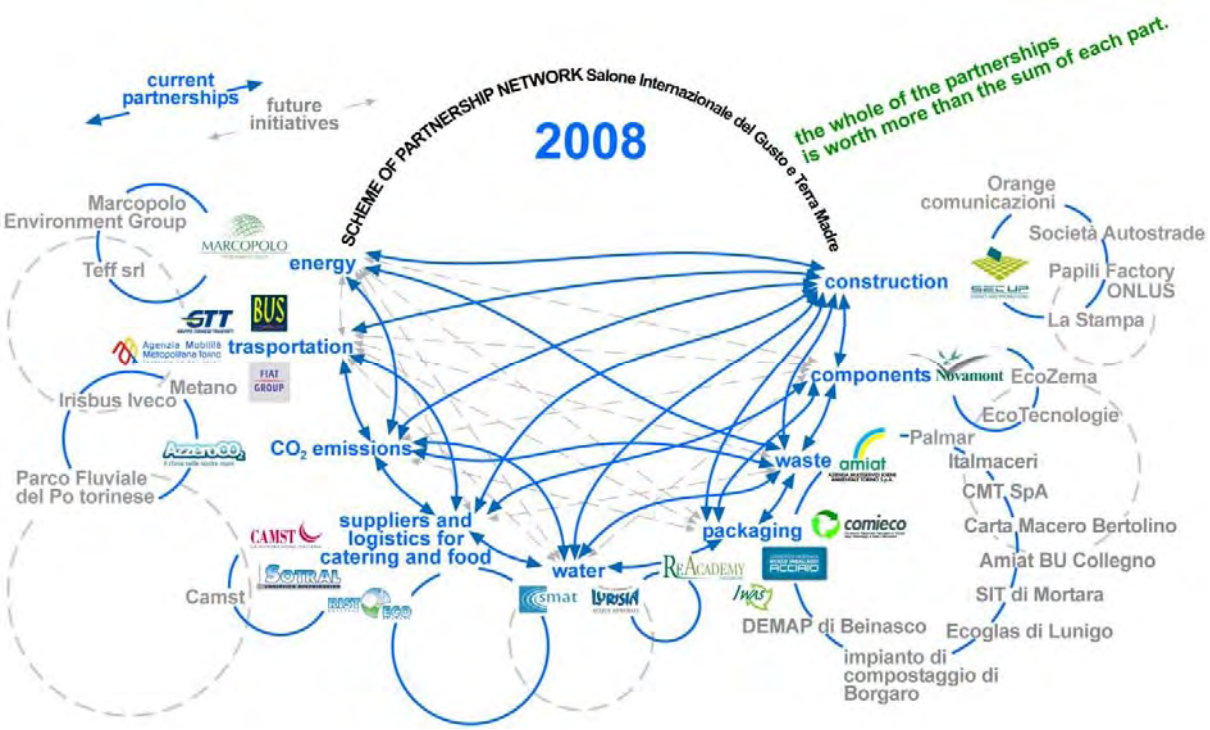

Figure 2. Highlighted in blue, the relationships built among the partner companies of the project in 2008, whereas in grey, the possible increase of the system. In the edition of 2014, the companies involved have become 60.

The choice of partners was based on their actual involvement in the status quo of the system or according to the contribution they could generate for the system. A memorandum of understanding has been signed with each partner to share the path of research to be implemented. Through the development of these partnerships the event was born and has grown as a system characterized by relationships built among the partner companies of the project. Today, we can say that the value of

these partnerships is more than the sum of each individual one (Fassio 2008b; Fassio and Balbo 2008).

5. Results

From 2006 to 2012, the environmental sustainability of the Salone del Gusto and Terra Madre has grown by over 65% compared to the starting data. In 2012 the project areas considered were:

- equipment: selection of eco-materials/ or systemic solution for valorisation;
- real and virtual communication;
- waste and by-product collection and valorisation;
- eco-packaging;
- logistics of goods and people;
- energy supply and reduction;
- water management;
- emission reduction and compensation.

From 2006 we state that an event can be defined an event of quality, only if takes action into the direction of the environmental sustainability.
In the edition of 2014, the project enlarged a wider and more holistic definition of the event sustainability, considering beyond the environmental dimension also the social, sensorial and economical ones, according these definitions.

- Social Sustainability: the development and implementation of new ideas (products, services and models) to meet social needs, creating new relationships and partnerships. Social innovation brings new answers to pressing needs that involve processes of social interaction. Social actions add value to society by increasing the capacity of individual action and community (according to the definition of Social Sustainability in the “Guide to Social Innovation”, European Commission, February 2013).
- Sensorial Sustainability: it is determined by all those actions, design choices, which guarantee the functionality of the event and its perception through the five senses. What is being investigated is the attractiveness of the event or the "pleasure" caused by the use and perception of space, determined by factors such as aesthetic as functional, the arrangement of the areas, the choice of materials used, the functionality of the spaces and the 'ergonomics of the instruments, the clarity of communications and their educational potential (reproducibility of the messages in daily life), the presence or absence of "anthropological places" as opposed to increasing development in our cities of "non-places".
- Economical sustainability: is the economic impact generated on the territory by the event and its degree of accessibility for people and companies. It allow to consider the permanent income and work for the livelihood of the people belonging to the territory in which the event takes place and for companies that are involved. Definitely it is a key-factor in the spread of a new culture of production and consumption that transforms all the actors of the event in "co-organizers" (through their choices can determine the sustainability of the event), and in everyday life in "co-producers" (through their choices may be subject influencing the market both locally and globally).

The quantitative and qualitative factors identified in 2014, beyond determining a new concept of holistic sustainability of a cultural event, will contribute to develop new design strategies for the future editions.

102 concrete actions have been put in place for the year 2014, thanks to the involvement of more than 60 companies and finally, the project was funded by the Italian Ministry of Environment, since recognized as innovative and bearer of benefits in the territory. New activities and services dedicated to the family, baby pit-stop for mothers and their children during the age of breastfeeding, special itinerary for deaf people, laboratory based on all senses in order to overpass the linguistic barriers, are some exemplifying actions toward the social sustainability of the event. For example, to increase the sensorial sustainability of the cultural experience, all directional panels of the event are written with the font EasyReading which is a compensatory instrument for readers with the dyslexia; the conferences are translated in 7 languages; we use soundproof and sound insulating materials to improve the general acoustics of the event by preferring those which are of natural origins.
For what concern the economical sustainability, discounts of 20% on the entry price, for those who came with sustainable means of transport or the creation of a series of free events in the City of Turin because everyone has the right to live the event. The whole project was finally explained in a stand of over 200 square meters, where with daily animations we have increased the awareness about the project action and their educational values.
After five editions of the project, the applied research has profoundly changed the event. Considering matter, energy and emissions, people and territory, we have totally changed our concept of the quality of an event. The projectual content becomes a best practice, a replicable model for the design of other national and international events.

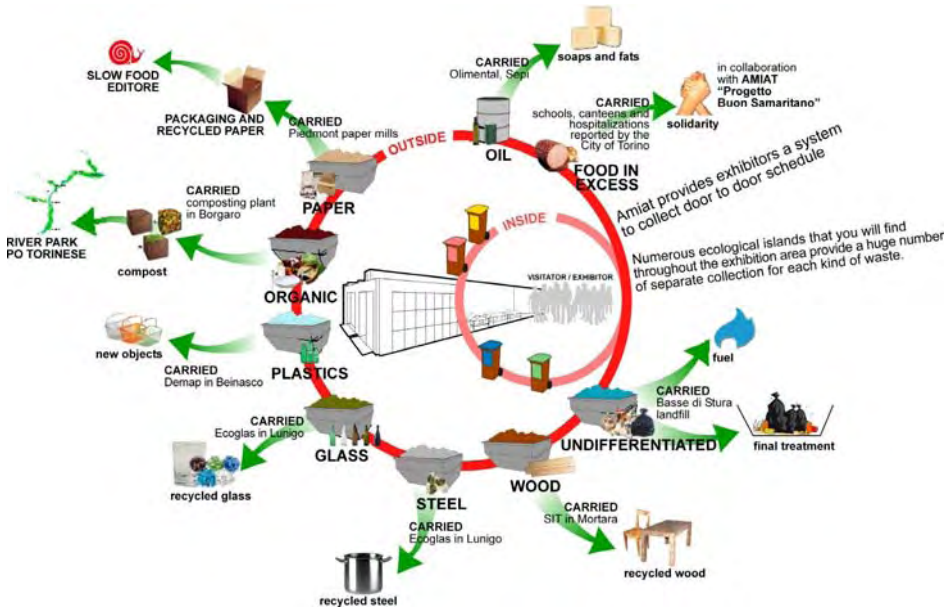

Figure 3. Iconographic schema of the system of the waste collection where are localized the place of collection respecting the logistic of the event, are identify the final destination of each waste and its final valorisation through the generation of a new product.

6. A focus on the waste scenario

One of the best design and cooperation practices among stakeholders is that one, relative to the waste management project scenario. In 2006 in an equal number of days the event has influenced the waste production of Turin and its suburbs of about 3%. It's important to consider that the inhabitants of the area are about two millions and the visitor of the event are only one hundred and

eighty thousand in 2006. This meant that if a due attention to the production of waste and then to their final use is not paid, the system of waste disposal of Turin with a pair of similar events within a restricted period, would risk to collapse.
A meticulous, constant and ever-more detailed waste collection, starting in 2006 with about 16,2% of separate waste collection, reaching a decrease of about 59,11% in 2012 with 92% of purity of separated waste. In this activity the role of participant has been crucial. The participants involved in the waste collect, transformed themselves in a co-organizer because they directly contributes to reach the goal of a good differentiated collect of waste. The amount of waste per capita has decreased from 1.1 kg in 2006 to 0.75 kg in 2012 as well as the associated CO2 moved from 0.47 kg to 0.15 kg. The waste reduction and the increase of their value at the end of life, it is one of the factors that allow the decrease of CO2 emission of a percentage of 60% compared to 2006.

7. Awards

The combined efforts for reducing the environmental impact of the event, led the Salone del Gusto and Terra Madre in 2008 to be mentioned by the Jury of the Prize Biennale Italy for the innovation brought to the "Design of Events" among other 50 events for *"the capacity of the event to plan cultural activities for a site or a territory able to realize a direct, cognitive and emotional experience for the visitor".*
In 2009, international experts that were working to the update and second edition of the standard BS 8901 selected the systemic design approach applied to the Slow Food events as a best practice and a case study. From the lesson learned thanks to the experiences and practices adopted during the first two editions, the standard has been integrated with elements regarding the sustainable management of the events according the perspective of the Life Cycle Assessment (LCA).
In 2015 the project has been inserted in the ADI Design Index, the publication of the Italian Association for Industrial Design (ADI), as one of the best Italian design product[4].

8. Conclusions

Cultural events can be sees as the mirror of the continuous stream of changes that characterize the human reality and as a complex system, it is results of the interaction from many variables, that can hardly be inserted in a check list.
At the international level the mainstream approach regard the design of sustainable events is mainly oriented toward the creation of a scientific model, characterized by a monitoring period and then a series of verification experiments, which are designed, as they would be free from internal contradictions. When it is possible it is functional to formulate our model according a codified language. However in many cases, especially when it has to do with the dynamics of human society, this kind of approach is likely to be incomplete.
As Fritjof Capra and Pier Luigi Luisi state in "Life and Nature, a systemic vision" (2014), *"to understand contemporary science is crucial to realize that all scientific theories and models are limited and approximate. The twentieth-century science has shown repeatedly that ultimately all natural phenomena are interconnected and their basic properties, in fact, derived from relations with other things. So to be able to explain each of them, you need to understand all the others and this, of course, is impossible".*

[4] http://www.adidesignindex.com/en/ricerca-per-l-impresa/systemic-event-design

In our case the design of a sustainable event is therefore always been characterized by a series of design choices, valid case by case, with the aspiration of approaching an infinite network of interconnected phenomena. As said by the biochemist Louis Pasteur *"Science advances through tentative answers that go down deeper and deeper in the essence of phenomena".* This kind of approach even it is not totally complete in its results, has led all the actors involved in the “"system event" to reflect about its sustainability in its lifecycle.
This passage has been able to trigger a process of social innovation, to give people "new eyes" that observing the problem and not sacrificing the characterizing components, are able to optimize the event material and immaterial flows related to the promotion, organization, exhibition and dismantling, adapting them to the local quality of the territory.
The most striking result was to educate, protect and promote a new culture of environmental, social, sensory and economic, applied to the design of cultural events. A culture of project based in brief on the analysis and re-design of the relationships activated and that can be further activate by the event and on the ability to simplify this message to make it understandable and achievable for the most.
The event will therefore be well designed if the designer will be able to deepen the activated relationships until to imagine a replicable actions and gestures in the daily life of each of us, as to assume also an educational function.
By the attempt of creating more awareness and responsibility, it is thus possible to design actions for an event involving the co-evolution of a sustainable network of actors who cooperate for a common and shared welfare.

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MAPPING AND ANALYZING THE NETWORKS AND SUPPLY CHAINS FEEDING A FOOD DISTRICT IN LONDON, CANADA

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Keywords: Foodshed, Food Supply Chain, Local Food, Network Analysis, Small Food Businesses

Abstract: In a world where the food we eat is often grown half way around the world, what does it mean when a vendor at the neighbourhood farmers' market says that they use local food? Small businesses are important actors in the food industry, since they are small enough to quickly respond to changing consumer demands and market trends. However, often in order to meet customer demands, they need to challenge and work around the conventional system of food provision. Primary data was gathered using semi-structured interviews with small food business owners. Foodshed analysis was used to describe and analyse the alternative and conventional food supply chains and networks of a food district in a midsized Canadian city. The small businesses interviewed source food from a large number of local farmers; however, the foodshed is largely dominated by the Ontario Food Terminal in Toronto, Canada's largest city. A limited number of regional distributors provide small businesses with access to locally grown food and an alternative to the produce terminal. This research reveals the distances and suppliers to which the supply chain extends, as well as complex ways in which supply chains of different businesses overlap. The diverse, interconnected and relational nature of the food system has important implications for food and local economic development policies for both urban and rural regions.

1. Introduction

Local food has experienced a resurgence in recent years with the proliferation of farmers' markets and artisanal food producers who are competing in an industry dominated by large multinational agri-businesses and retailers. Small businesses are important actors, since they are small enough to quickly respond to changing consumer demands and market trends (Donald 2008). In order to meet these customer demands, however, small businesses often need to challenge and work around the conventional food system. The purpose of this paper is to describe and analyse the food supply chains of a local food district in London, Ontario, a midsized Canadian city. The paper begins with a review of the literature on conventional and alternative food networks, and the analysis of foodsheds, food networks and supply chains, which provides the basis for our study objectives. Following an outline of the study area and methods, results of our analyses are presented and a discussion of the findings. The diverse interconnected and relational nature of the food system has important implications for the development of food and local economic development policy for both urban and rural regions.

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2. Review of Literature

2.1.1 Globalization of Food Systems

The 'conventional' food system today is characterised by large scale, industrial farming and agricultural practices, complex global supply chains dominated by a few multinational agri-business companies and retailers (Hendrickson & Heffernan 2002; Winter 2003). As seed and chemical companies and food retailers have gained oligopolistic power in the food supply chain, they have used this power to force shrinking margins on agricultural producers (Hendrickson & Heffernan 2002). This pressure has led producers to increase production in order to compensate for shrinking margins as farmers were encouraged to 'get big or get out'. Consolidation has occurred at all stages of the supply chain as the number of small and midsized farms continue to decline (Statistics Canada 2012), and local abattoirs and other small scale producers are going out of business or being bought up (Carter-Whitney 2008). Large agri-businesses and retailers are based on complex, globalised distribution systems which are inaccessible for small and medium sized farmers and producers.

2.1.2 Local / Alternative Food Systems

The term alternative food networks is problematic since it is defined by what they are not and "tend[s] to be employed as a universal term, to denote food systems that are somehow different from the mainstream" (Tregear 2011, p.423). This is problematic since it creates an ambiguous term which is then applied to a wide range of food systems, with a wide range of objectives, including: reducing the number of intermediaries by encouraging direct farmer-consumer relationships, organic or ecologically grown food, food grown and consumed locally, food grown in socially just ways, or food grown in specific localities using traditional farming techniques. Each of these food systems have different values, priorities and motivations that underpin them, and as a result have very different impacts and outcomes. Often these food systems are positioned along three dimensions of alternativeness: the qualities of the food (Goodman 2004), the characteristics of the networks through which the food moves (Renting et al. 2003; Watts et al. 2005) and the locality where the food was produced.

Food systems based on providing high quality food, such as the organic industry, have been criticised for being susceptible to being co-opted by the industrial food system (Watts et al. 2005). In response a greater focus developing stronger networks through which food is transported has been proposed as a 'stronger' alternative which can resist being co-opted. These networks are typically exemplified by bringing farmers and consumers closer together with fewer intermediaries (Feenstra 1997). These direct relationships are argued to allow, among other things, for beneficial social relationships and trust to develop between consumers and farmers, and improved economic viability of farming and small food businesses (Holloway & Kneafsey 2000; Jarosz 2008; Sadler et al. 2013). Value based supply chains and short food supply chains are two more concepts which have been proposed to differ from conventional supply chains based on a number of dimensions, including degree of cooperation, trust, transparency, and a commitment to the welfare of all participants in the supply chain (Marsden et al. 2000; Renting et al. 2003; Sevenson & Pirog 2008; Bloom & Hinrichs 2010). It is suggested that if relationships and networks are based upon these values they will be harder to co-opt and will be able to drive significant change and retain their alternativeness.

The 'local' has long been a scale that was considered to challenge the conventional food system by bringing farmers and consumers together and providing social, economic and environmental benefits

(Feenstra 1997). However, the tendency to romanticize the local or use it in an exclusionary and discriminatory way has been criticized since it is false to assume that any scale is by default more socially, environmentally or economically just (Hinrichs 2003; DuPuis & Goodman 2005; Born & Purcell 2006). The push towards localization may even exacerbate local and regional inequalities between localities (DuPuis & Goodman 2005; Feagan 2007; Tregear 2011).

The universal criticism of these attempts to define the 'alternative' is that there is a tendency to dichotomize the food system into two opposing options, an alternative and a conventional system. Instead, there is a need to better understand the complexities of the food system and the ways in which the alternative and conventional overlap and intertwine (Sonnino & Marsden 2006; Bloom & Hinrichs 2010; Tregear 2011).

2.1.3 Analysing Foodsheds, Networks and Supply Chains

The concept of a foodshed was first proposed by Walter Hedden in his book *How Great Cities are Fed* (1929). Hedden first conceived of the term foodshed while considering where all the food eaten in New York City came from. A key component was the network of terminal markets which aggregated and moved food around the continent. It was not until Author Gertz (1991) reintroduced the concept to describe regional food systems that the term became commonly used. Since then, foodshed analysis has tended to: (1) determine the *potential* for supplying an urban area from the local foodshed by measuring net consumption and production (Peters et al. 2008; Kremer & DeLiberty 2011); (2) study large scale international trade (Billen et al. 2011); or (3) focus exclusively on the local food system (Kremer & DeLiberty 2011). It is argued here that foodshed analysis techniques which incorporate spatial analysis and network analysis can offer valuable insights into how the current alternative and conventional food systems interact, as well as showing the potential for growing the alternative.

While foodshed analysis inherently implies a spatial component there are parallels with studies of food supply chains and food networks. Ilbery and Maye (2005) note the interaction between local and global supply chains in their investigation of specialist livestock products. Ter Wal and Boschma (2008) argue for the potential of social network analysis to contribute to economic geography and gain a better understanding of clusters, regions and formal networks. Consequently, social network analysis has recently been applied to studies of food systems where there is an easily defined and contained population of actors (Chiffoleau & Touzard 2013; Christensen & O'Sullivan 2015). These types of networks, however, are limited in their applicability, since most food systems are not closed and are always influenced by outside actors. Network analysis and supply chain analysis have been criticised for solely focussing on either horizontal or vertical connections respectively, while ignoring the other (Lazzarini et al. 2008). This paper will use foodshed analysis combining spatial and network analysis of alternative and conventional supply chains used by small businesses.

2.2 Relevance and Objectives

2.2.1 Objectives

The objective of this study is to demonstrate the use of foodshed analysis techniques to investigate the supply chains and networks used by small businesses in a food district. This aims to incorporate

the experiences of small food business owners, typically a difficult to access group of actors, into a fuller understanding of the open and diverse food systems used by businesses.
Analysis will focus on a case study of a food district in the city of London, Canada to determine where the food comes from that is used by small businesses and how networks vary between businesses within the food district. Businesses in the food district exhibit varying degrees of 'alternativeness', however they are all independently owned, small businesses which differentiate themselves by offering 'quality food'.

2.2.2 Impact and Relevance

It is argued that the foodshed analysis techniques described below are valuable for academics, planners, and policy makers to gain a better understanding of the opportunities and challenges in growing local food networks. This has important implications for local economic development initiatives in both urban and rural contexts. In particular, these techniques can provide new methods of evaluating policy changes and local economic development initiatives in the food system. Additionally, the case study provides further evidence of the misconception of distinct 'local' or 'alternative' food systems, as well as the need to think regionally, across local and regional political boundaries when considering the implications of food system policies and initiatives.

3. Study Area & Background

3.1.1 City of London, Canada in South Western Ontario (SWO)

This study was conducted in London, Ontario, a mid-sized Canadian city (population 366,151 in 2011), located approximately halfway between the major urban centres of Toronto and Detroit. London is also the largest municipality in the agriculturally fertile SWO region. The region's farms produce $6.1 billion of farm outputs, which accounts for over half of Ontario's farm outputs, and including related industries, represents 11.4% of Ontario's GDP (Econometric Research Limited et al. 2015). The food and beverage manufacturing sector in the is comprised of large multi-national firms such as Cargill Canada, McCormick Canada, Labatt Breweries of Canada, Maple Leaf Foods, among others (Ontario Food Cluster 2015). Prominence of the food sector has increased recently with the decline of the North American auto manufacturing sector.

Agriculture in the SWO region is heavily focused on the global commodity crops of Corn, Soybeans and Wheat. Table 1 shows the breakdown of major crops in the region. Corn, soybeans and wheat account for 80% of total agricultural land. In contrast, field vegetables account for 2% of SWO's agricultural land, while fruits, berries and nuts account for just 0.4% (Econometric Research Limited & Harry Cummings & Associates 2014). Despite all this food production, Ontario is a net food importer. The only crops that Ontario is a net exporter of are Grain Products and Oilseeds, while Ontario net imports $1.0B worth of vegetables (Econometric Research Limited et al. 2015).

A discussion of the SWO food system is not complete without mentioning the Ontario Food Terminal in Toronto. The food terminal brings together farmers, brokers, importers, exporters, restaurants, institutions and other buyers to exchange food. Collectively, the buyers at the food terminal are the largest buyer of Ontario produce in the province, and ranked in the top four terminal markets in North America with 2 billion pounds of produce distributed annually (Ontario Food Terminal Board 2015). The food terminal fulfils an essential role for the produce industry, making it easy and

convenient for sellers and purchasers to meet in the largest urban centre in the country. Many products grown in SWO are shipped to the terminal, sold there, and then shipped back to the region to be consumed. In this context the local food movement in the region has largely focussed on cutting out that step of distribution system by either sourcing directly from farmers or through local distributors.

Table 1. Selected crops produced in SWO. Source: (Econometric Research Limited & Harry Cummings & Associates 2014)

Crop	Hectares	% of SWO Agricultural Land	% of Ontario's Production
Soybeans	608,793	32.9%	61.0%
Total Corn	544,023	29.4%	58.3%
Total Wheat	327,807	17.7%	66.5%
Total field vegetables	36,254	2.0%	69.1%
Total area of fruits, berries and nuts	6,570	0.4%	30.8%

3.1.2 The Old East Village Food District

Figure 1: Food businesses in The Old East Village Food District, by business type

The Old East Village is an inner city neighbourhood located immediately to the east of downtown London (see Figure 1). Like many North American inner city neighbourhoods it underwent a period of decline in the 1980s and 1990s, due in part to the growth of the suburbs and the decline of the North American manufacturing sector. This left the neighbourhood suffering from neglect with a lack of investment in properties and a struggling businesses district. The Old East Village and Downtown London were both identified as food deserts due to their low socio-economic status and lack of access to healthy and affordable food (Larsen & Gilliland 2008). The food desert began its rebirth as a food district in 2006 with the opening of the Farmers' and Artisans' Market at the Western Fair (Larsen & Gilliland 2009). The market itself brought approximately 47 new food vendors into the neighbourhood. The market not only provided access to healthy and affordable food to the neighbourhood, but also created opportunities for food businesses to grow and develop and is now a regional attraction which stimulates the local economy (Sadler et al. 2013). Since the market opened, 5 food businesses from the market have expanded to open stores and restaurants in the neighbourhood. In addition, 6 other new food businesses have opened or relocated to the Old East Village (see Table 2 for a summary of the food businesses located in the Old East Village Food District).

Table 2. Summary of businesses located in the Old East Village Food District by type of business, and by location inside or outside the farmers' market

Number of…	Inside Farmers' Market	Outside Farmers' Market	Total
Produce Retailers	10	3	13
Meat / Dairy Retailers	11	3	14
Prepared Food Retailers	18	5	23
Restaurants and Cafes	8	17	25
Total	47	28	75

As a result of this growth, the Old East Village Business Improvement Area (OEVBIA) has identified food as an economic driver for the local economy. Initiatives are under way to encourage the continued growth of food businesses. This research project aims to assist these initiatives by helping to understand the regional food system which the food district is linked to, as well as the opportunities and challenges facing small businesses in the food industry.

4. Methods

This study used semi-structured interviews with small business owners located in the Old East Village food district to develop a fuller understanding of the food district's foodshed.

4.1 Recruitment strategy

Interview participants were recruited using emails, phone calls and in-person visits to local food businesses. As part of a larger research project, businesses and farmers across SWO were sent emails which asked if they would fill out a survey and if they would be willing to participate in interviews for the research project. Businesses located in the food district who indicated a willingness to participate were approached in person or contacted via phone to schedule an interview. In addition, businesses

located in the food district who had not replied via email were contacted and asked if they would participate in an interview. The relationships identified by each interviewee helped identify additional key businesses in the food district. These businesses were then contacted to participate in an interview and further expand the map of the network. Interviews continued until there was a strong representation of different types of food businesses in the food district including: raw food retailers (produce, meat and dairy), prepared food retailers (bakeries), and restaurants and cafes.

In total, 24 food district businesses were approached to be interviewed. Interviews were held with 21 businesses and three declined to be interviewed due to time constraints. Table 3 below provides some basic descriptive features of the interviewee businesses.

Table 3. Description of businesses interviewed by business type, business age and primary business location in the food district

By Primary Business Type	Raw Food Retailer	Prepared Food Retailer	Restaurant / Café
# Interviewed	8	7	6
By Business Age	0-5 Years	5-10 Years	11+ Years
# Interviewed	7	9	5
By Primary Location	Inside Farmers' Market	Outside Farmers' Market	
# Interviewed	12	9	
By Market Niche	Artisanal / Higher Quality	Local	Healthy
# Interviewed	21	10	5

4.2 Semi-structured interviews

Semi-structured interviews were conducted with owners of small food businesses based on a series of open-ended questions. The interviews were comprised of two main sections, the first discussed the history, market niche and experience of the business in the food industry, and the second section involved describing the supply chains and partnerships used by the business. This paper focuses on the second section of the interview.

The aim of the interviews was to discover all supply relationships used by businesses, including local and non-local, and alternative and conventional. To ensure this, the terms 'local' and 'alternative' were avoided during interviews. Instead, the research project was described to interviewees as an investigation of supply chains used by small businesses. Interviewees were asked to identify all food supply, partnership and other relationships used by their business. Prompting questions were used to ask how relationships were developed, or why a particular supplier was chosen. When a distributor was identified, interviewees were asked if they knew where distributors sourced the food they supplied to the interviewee. If part of a network was unclear then follow up interviews were conducted with interviewees to clarify the names, locations, or the type of relationship with a supplier. In addition, interviewees were asked to identify businesses that they supplied food products to, and other businesses with whom they had partnered or turned to for advice.

4.3 Methods of Data Analysis

4.3.1 Foodshed Analysis and Visualization

Using the transcripts of each interview a list of suppliers (including where possible the suppliers of the suppliers), partners and customers were created for each business. These relationships were inputted into the social network analysis software NodeXL (Smith et al. 2010). Additional descriptive information for each relationship (“edge”) was recorded, including: the type of relationship (partnership or supply) and, in the case of a supply relationship, the types of food products supplied and the importance and status of the relationship to the interviewee. In this way the network recorded both the horizontal ties between like-firms and vertical ties between producers and businesses at different stages of the supply chain (Lazzarini et al. 2008). Additional information for each business (“node”) was also added, including: type of business, business age, address and coordinates of their primary location.

Descriptive statistics for businesses in the network were calculated including the numbers and types of suppliers and customers (“out-degree”) as well as the number of farmers and distributors supplying a business. Visualizations are used to depict the network and allow for visual analysis of the organisations of the relationships. Visualizations of the network were also used to identify additional businesses that could be interviewed, as well as identify clusters or groups of businesses within the network.

4.3.2 Spatial Analysis and Mapping

The nodes and edges from the network were also imported into a Geographic Information System (ArcGIS 10.3, ESRI) and mapped to provide a clearer understanding of geographic clusters, groups and gaps in the network. In addition, the length of the edges was calculated to provide a proximate measure of the “food miles” that food travelled through the supply chain to reach a business or consumer.

5. Analysis and Results

5.1 Supply Chain and Network Analysis

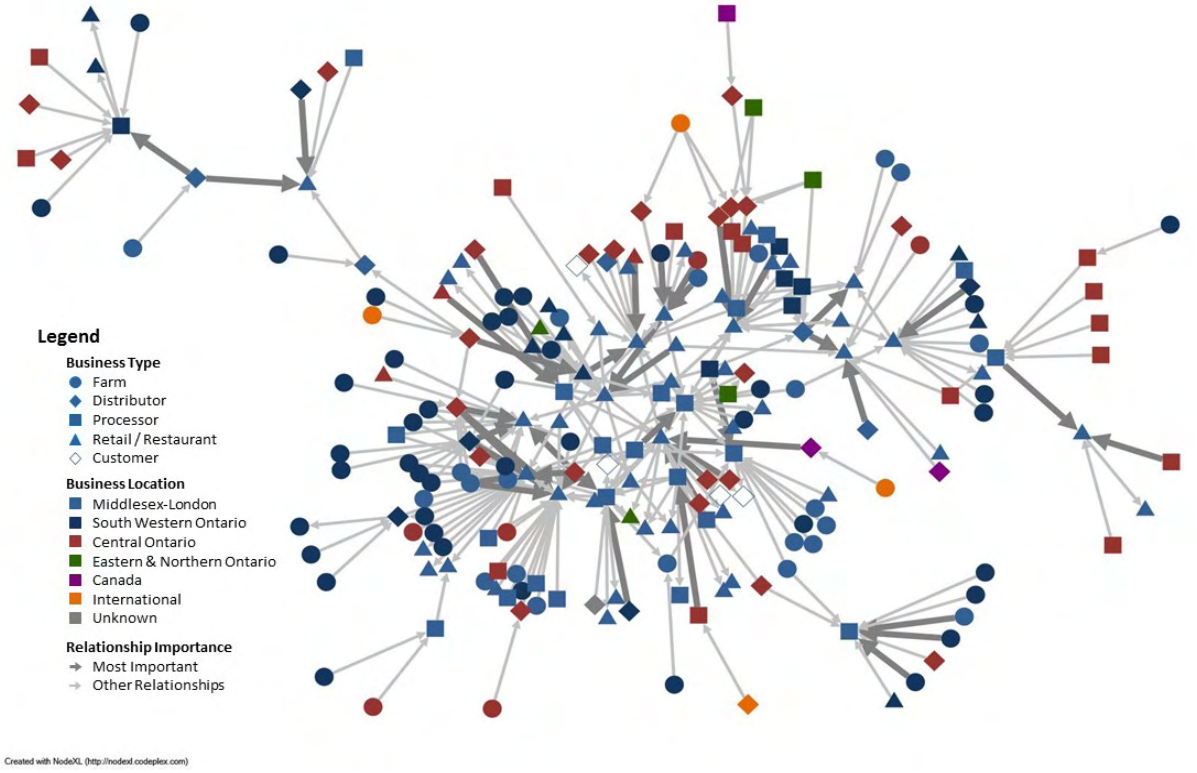

Figure 2. Food supply chain connections to the Old East Village Food District

The 21 businesses interviewed collectively identified 303 supply chain relationships with 221 businesses, farmers, businesses and locations (see Figure 2). The food network visualization was created in NodeXL (Smith et al. 2010) and groups connected points together, and pushes unrelated ones apart. Colours of the points relate to the region in which the business is located. The symbols refer to the different primary food system activities that a business was engaged in, and the darkness and thickness of the lines indicate the importance of the relationship. Based on the interviewees description of their supply relationships, the most important or critical relationship(s) were coded.

Figure 2 illustrates the differences in information availability and transparency of different food supply chains. In a perfectly transparent food system all supply chains would originate on a farm (indicated by arrows pointing out from a circle). However, it is the nature of our food system that businesses need year round consistent supply and rely on distributors who can import food from all over the world. In these supply chains, typically the only information about the food that is passed on to the consumer is the country or state of origin of the food. Supply chains that originate in a diamond or square, or any other shape indicate an instance where the interviewee only knew the distributor, processor or other type of business which directly supplied them with the food.

Table 4. Descriptive statistics of supply chain relationships for interviewees

All Direct Suppliers	All (n=21)	Raw Food Retailer (n=8)	Prepared Food Retailer (n=7)	Restaurant / Café (n=6)
Mean # of Direct Suppliers	10	14	7	8
Median # of Direct Suppliers	8	12	7	8
Minimum # of Direct Suppliers	2	3	2	5
Maximum # of Direct Suppliers	27	27	11	12
Direct Farm Suppliers				
Mean # of Direct Farmer Suppliers	4	7	3	2
Farmers as % of Suppliers	33%	46%	30%	20%
Businesses with No Farm Suppliers	5	1	3	1
Direct Distributor Suppliers				
Mean # of Direct Distributors	3	4	2	4
Distributors as % of Suppliers	39%	34%	39%	45%
Businesses with No Distributors	1	0	1	0

On average, businesses had 10 direct suppliers, 4 of which were farmers and 3 were distributors (see Table 4). In addition, 5 businesses interviewed did not source directly from any farms. Raw food retailers had the highest average number of suppliers (14), and one raw food retailer had the maximum number of suppliers (27) of any interviewee. These raw food retailers also had the highest average number of direct farm supplier relationships (7), and on average, farmers represented the largest percentage of their suppliers (46%). Raw food retailers also tied for the highest average number of distributors with restaurants and cafes (4). On average, businesses in the categories of restaurants and cafes and prepared food retailers had fewer suppliers, and also proportionally worked with more distributors and fewer farmers. Only 20% of the suppliers listed by interviewees from restaurants and cafes' were farmers, and 45% were distributors.

Table 5. Numbers of 'important' supplier relationships for interviewees with different types of suppliers

Number of 'important'…	All (n=21)	Raw Food Retailer (n=8)	Prepared Food Retailer (n=7)	Restaurant / Café (n=6)
Farm Suppliers	8	5	3	0
Distributors	25	11	4	9
Others (processors, retailers, etc.)	11	3	4	4
Total Important Suppliers	44	19	11	13

Interviewees tended to identify their most important relationships by either their largest food expense, most frequent delivery, or oldest relationship. Typically these relationships are the first ones that were mentioned, and only after prompting questions about other products were other relationships revealed. Distributors were much more frequently identified as important suppliers than farmers, and this was true across all business types (see Table 5). Food retailers identified 5 important farmers that they work closely with, however they also work with a large number of

distributors (11). Restaurants and cafes did not identify any farmers that were important suppliers and instead relied on 9 distributors.

5.2 Spatial Analysis

The businesses and relationships identified in the interviews were mapped and analysed using ArcGIS. If a business had multiple locations, then the primary location typically where production occurs, was used for the map. This spatial analysis deals only with the inter-firm relationships between two businesses, whereas the intra-firm supply chains between a business' multiple locations are not considered.

Figure 3 depicts the supply chains that bring food to the Old East Village Food District in London, Ontario. As is expected, many of the businesses are located nearby in London and surrounding Middlesex County. A large number of farms suppling businesses are located in the counties immediately adjacent to Middlesex, including Elgin (South), Oxford (East), Huron and Perth (North). There is relatively little food from counties southwest of London (Lambton, Chatham-Kent, and Essex). A large number of distributors from the west end of Toronto (Central Ontario) were identified near the Ontario Food Terminal, with others further north near the airport and the #401 highway. About halfway between London and Toronto, distributors and food processors and other businesses from the cities of Kitchener-Waterloo, Cambridge and Guelph (Central Ontario) had numerous connections to businesses in the food district. Businesses in the Old East Village Food District source food from as far away as California, South America and Europe.

Table 6 indicates where suppliers of the businesses interviewed were located. Among all interviewees, 22% of suppliers were other businesses located in the Food District, ranging from a high of 37% for restaurants/cafés to a low of 14% for raw food retailers. Further, 46% of direct suppliers were located within London-Middlesex, another 28% were from the rest of SWO, and 22% from the Central Ontario region around Toronto. This indicates where the businesses providing the food are located, not necessarily where the food itself was grown or raised, since many suppliers are distributors and processors.

Table 7 indicates the differences in the businesses in the three major regions which were represented in the network, highlighting the role that each region plays in the food network. A total of 74.5% of the businesses identified in the interviewee's supply network from surrounding London-Middlesex (LM) were 'other' food businesses such as small food processors, retailers and restaurants. Nevertheless, a considerable proportion of suppliers from LM were farmers (21.4%). Businesses identified in the rest of SWO (outside LM) were primarily farmers (67.7%), with a quarter being other food businesses. In contrast, 50% of businesses identified in the Central Ontario region (home to the Ontario Food Terminal) were distributors, and another third were processors.

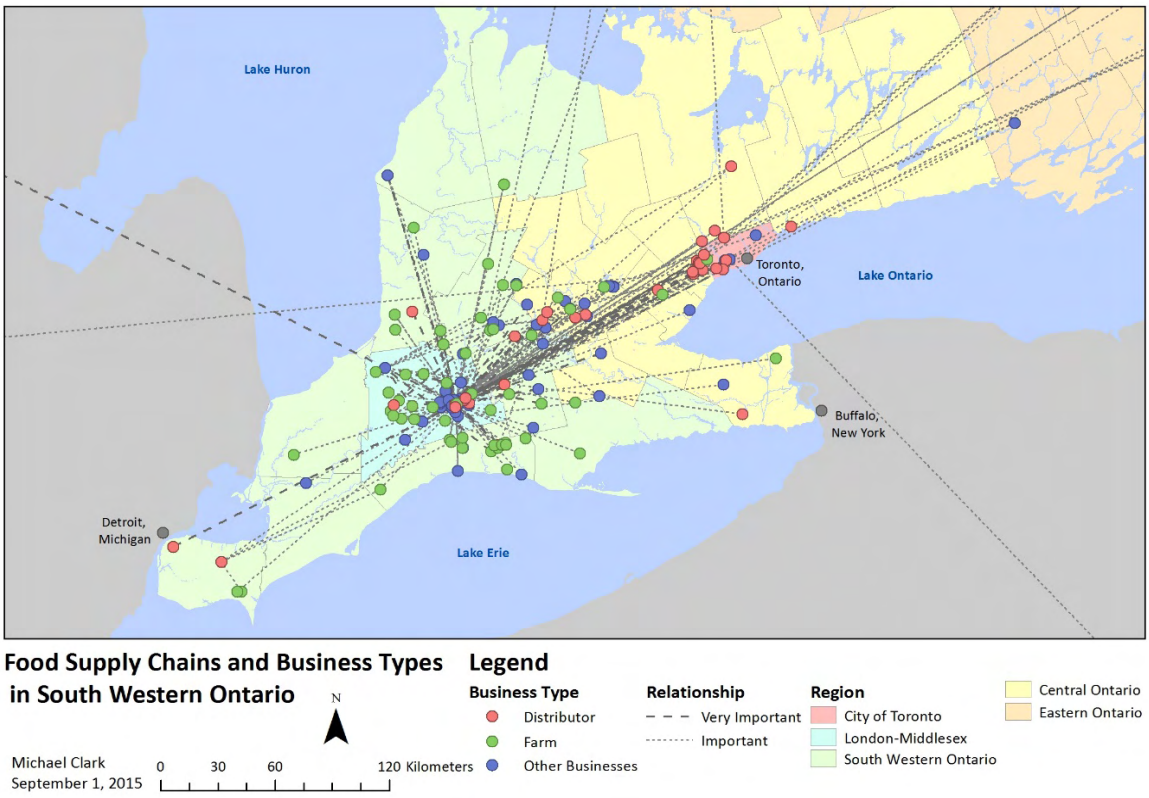

Figure 3. Food supply chains in South Western Ontario of businesses in the Old East Village Food District

Table 6. Locations of direct suppliers, by interviewee business type

	All Interviewees		Raw Food Retailer		Prepared Food Retailer		Restaurant / Café	
	#	%	#	%	#	%	#	%
Old East Village Food District	46	22%	15	14%	13	27%	18	37%
London-Middlesex	95	46%	43	40%	21	43%	31	63%
South Western Ontario	58	28%	39	36%	14	29%	5	10%
Central Ontario	47	23%	24	22%	12	24%	11	22%
Eastern Ontario	1	0%	0	0%	1	2%	0	0%
Canada	2	1%	0	0%	0	0%	2	4%

Table 7. Types of businesses in the supply network, by selected regions

	Farm		Distributor		Other Business		Total Businesses	
	#	%	#	%	#	%	#	%
London-Middlesex	21	21.4%	4	4.1%	73	74.5%	98	100
South Western Ontario	42	67.7%	5	8.1%	15	24.2%	62	100
Central Ontario	6	12.5%	24	50.0%	18	37.5%	48	100

Table 8. Average distance (KMs) between an interviewee and direct farms suppliers

	All Interviewees	Food Retailer	Prepared Food Retailer	Restaurant / Café
Mean	48	47	45	66
Median	35	33	44	41
Min	3	3	10	28
Max	170	170	102	153

Most of the farms identified as suppliers were located in or immediately around the City of London. On average, direct farm suppliers were located only 48km away from the businesses interviewed, while the median distance was 35km (Table 8). The furthest direct farm supplier was 170km from the interviewees; however, 65% of direct farm suppliers were within 50km of the interviewee.

6. Discussion

The discussion section will first outline some of the key characteristics of the food district, and then follow with a discussion of the advantages and disadvantages of the methodology.

6.1 Breaking Assumptions of Food Systems

6.1.1 Availability of Local Food

London is located in South Western Ontario, a region which specializes in the production of the global cash crops of corn, soybeans and wheat; however, there is also produce, fruit and meat that is grown/raised in the region. The 21 interviewees in this study identified 63 farms from Middlesex County and South Western Ontario which supplied food to their businesses in the Old East Village Food District, either directly or through a distributor. This demonstrates that small food businesses can be leaders in establishing direct or short food supply chains between local farmers and businesses. Nearly half (10) of the interviewees mentioned that they offer local food as a selling feature of their business. Businesses had different definitions of local; however, the longest direct farm relationship was only 170km, which is consistent with boundary of the '100 mile diet', while 65% of direct farm relationships were within 50km of the business.

6.1.2 Role of Distributors

Interviewees identified a surprisingly large number of food distributors. Aside from the Ontario Food Terminal in Toronto, the most commonly used distributors only supplied a maximum of 3 of the businesses interviewed (14%). The food industry is highly competitive and a total of 24 different distributors were identified. These ranged in business size and coverage area from London-based businesses that only served the city to Canada-wide distributors. Some distributors specialize in specific products such as grains and spices, while others offer a wide range of products.

Large distributors were typically located in the Greater Toronto Area, possibly with a regional office in London or nearby. These distributors were not feasible for many businesses since the minimum order size was too high for the size of the businesses interviewed. In addition, very little information about the food provenance, such as where and how it was produced was provided. In contrast, a

number of the smaller local distributors located in or around London specialised in offering local or organic food sourced directly from farmers. The counties South West of London account for 30% of Ontario's field vegetable agricultural land, however only a few farms were identified as suppliers. This may be partially explained by a lack of established distributors in the region. The only two distributors in the region are a food retailer who has recently expanded to undertake some small scale distribution and a specialty food distributor. The term 'distributor' is often given a negative connotation as a middleman that increases the price consumers pay for food, however they also provide a very valuable service. This is seen in the recent trend calling for regional food hubs to help aggregate and distribute local food (Blay-Palmer et al. 2013).

6.1.3 Horizontal Linkages

Many of the businesses interviewed worked with neighbouring businesses in the Food District, often selling each other's products, or purchasing together. However, many others worked more closely with businesses in other non-geographic 'clusters' such as industry specific networks, or political / social / environmental networks and ethnic communities. The informal nature of the cluster enabled new businesses to enter the food district and establish their own support networks, rather than having to comply with existing hierarchies.

6.2 Value of Methodology

6.2.1 Foodshed Analysis

This research used interviews with business owners to map the foodshed, including the supply chains and partnerships, of businesses in a food district. This approach provides a number of benefits to studying food districts and developing public policy to support local food systems. It allows for the identification of existing successful supply chains as well as gaps in the distribution system that limit businesses from sourcing local food.

The food system offers challenges for social network analysis, since it is not a closed system, and it is therefore not possible for researchers to interview every business in a food network. This study included interviews with a sample of businesses in a food district; however, even if all businesses within the food district were interviewed, the district boundary is irrelevant to the businesses when they are determining who to work with. This limitation in the use of social network analysis illustrates the fact that food systems cannot be assumed to be constrained or limited by municipal, regional or provincial political boundaries. In today's globalised world, food from all over the world is consumed all over the world. Despite all of the local supply connections identified, the majority of food consumed in the food district, especially in the winter, is likely produced in California and South America and brought to Canada via distributors through the Ontario Food Terminal.

6.2.2 Semi-Structured Interviews

Using interviews to build the networks allows for a rich understanding of the importance and strength of each relationship. The perspectives of small business owners are often neglected in food system research since they have limited time to participate in research studies. Interviews were used instead of surveys since it was found that surveys were often ignored or only partially completed. Interviews require active face-to-face recruitment and the building of mutual trust between the

interviewer and the interviewee that proprietary supplier information will remain confidential. Using interviews was useful for prompting interviewees to list all of their suppliers for all the food products they use, rather than just the largest ones. Due to the complexity of our global food system, many businesses only knew their direct suppliers and did not know where exactly the food was grown. Interviews allow not only for the identification of suppliers, but also for understanding when and why other suppliers are not mentioned.

7. Conclusions and Areas of Further Study

It is recommended that the foodshed analysis techniques used in this study are incorporated into more food system research. This can be of great benefit to policy makers and planners when considering policy changes and investments in infrastructure. Small businesses need to be recognised as important actors in 'alternative' and 'local' food systems since they are well positioned to take advantage of new and niche opportunities which large agri-food businesses cannot respond to. The research shows that the regional implication of local food policy needs to be considered, since the food system crosses local, regional and even international boundaries.

Further research using foodshed, network and supply chain analysis is needed to study the evolution of a food system over a period of time, to provide valuable insight into how food systems grow, develop and adapt to policy and other changes. Foodshed analysis could also be used to compare different communities within a food system. This study focussed on small food retailer and processors; however, a similar study with farmers would improve the understanding of the other side of the food system and the opportunities and challenges for supplying food to the food district.

8. Acknowledgments

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AGRICULTURAL LANDSCAPE PROTECTION AND ORGANIC FARMING ETHICS: THE ROLE OF ALTERNATIVE FOOD NETWORKS IN SPATIAL PLANNING. A CASE STUDY FROM SPAIN

Salvatore Pinna[1]

Keywords: AFNs, landscape preservation, spatial planning, quality of food, Spain

Abstract: Alternative Food Networks (AFNs) represent a change in food production and consumption practices. Their importance has increased among consumers wishing healthier nutrition, farmers' support, and sustainable agriculture. Drawing upon the concept of landscape as expressed in the European Landscape Convention, the paper aims to study if, and to what extent, ethics of organic farmers being part of AFNs could be used as theoretical framework to boost spatial planning for agricultural landscape conservation. The paper analyses the case study of the Soto del Grillo Agro-ecological Park in Spain. In-depth interviews have been used in order to get spontaneous and complete information by farmers. In order to schematise the information, the theoretical categories described by Morris & Kirwan (2011) were considered: i) understanding relationships between production methods and ecological benefits, ii) realising methods, and iii) utilising the information provided by the previous dimensions to communicate with customers. Texts and images of farms websites have also been analysed, in order to see how traditional landscapes questions and ecological values such as biodiversity are associated with food quality. Results are discussed in the light of the park regulation and future development projects, especially focusing on the connection between food, territory and traditional landscape, in order to see whether the driving forces highlighted by farmers are taken into account in the practice. This relationship could open a new season in spatial planning processes, taking into account cultural and social aspects of food production and consumption, encouraging sustainable tourism and reinforcing the relationship between rural and urban spaces.

1. Introduction

This paper aims to discuss the role of Alternative Food Networks (AFNs) as example of traditional agricultural landscapes preservation through multifunctional agriculture. In fact, since the establishment of the European Landscape Convention (ELC), cultural and historical values have been included in the notion of landscape, along with the scope of its sustainable exploitation instead of a mere conservation. Europe has a big tradition in agricultural production, and today almost the half of European land is dedicated to food production (Eurostat, 2010). For this reason, the Common Agricultural Policy (CAP) has always been one of the most supported policies, and now it absorbs the 45% of the total European budget (European Union, 2012). The CAP has been changing since its establishment in the Sixties, passing from being a simple support to production to concern environmental issues with the Fischler reform in 2003. The new CAP 2014-2020 includes new environmental measures and food chains themes (European Union, 2015).
In the paper of Lefebvre et al. (2014), some reflections on the landscape management scales and the role of the CAP are presented. The authors identify three landscape governance scales: i) the farm level, where farmers' decisions shape the single parcels; ii) the landscape level, where landscapes recognisable for their homogeneous characteristics results from the aggregation of parcels; and iii)

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the global level, i.e. the whole EU landscape. Lefebvre and colleagues argue that the CAP until now has been targeted to the first level. Drawing on these reflections, the paper aims to show how spatial planning for multifunctional agriculture -in particular through rural parks- can coordinate farms actions in order to get results at the landscape level. Socio-economic concepts of ecological, spatial, and social embeddedness (Penker, 2006) are useful instruments and fundamental behaviours in farms activities in order to create effective synergies between land use management and economic activity of food chains.
After a brief literature review, the paper presents the case study description and the methodology used for the analysis of in-depth interviews and websites. Then, results are presented and discussed. Finally, some conclusions and for future research aims, are exposed.

2. Literature review

Scientific research about Alternative Food Networks (AFNs) has started in the late Nineties, with the scope of understanding the development of "newly emerging networks of producers, consumers, and other actors that embody alternatives to the more standardised industrial mode of food supply" (Renting, et al., 2003, p. 394). Until now, a unique and broadly accepted definition does not exists, and 'AFNs' is used as an umbrella term (Forssell & Lankoski, 2015) comprising different types of production, distribution, selling, and even consumption methods (Sánchez Hernández, 2009). Notwithstanding, some common characteristics have been well described (Forssell & Lankoski, 2015).
AFNs have been studied according to different schools of thought (Tregear, 2011): i) political economy. These studies are based on Marxism theories in order to see how AFNs develop and change under economy and politics influence. This approach has highlighted many problematics regarding social injustice and inequality within AFNs; ii) rural sociology, which describe AFNs contribution to the establishment of social values in food networks, contrasting the capitalist market de-humanisation. Micro-level focus and sociological approach are typical of this field; iii) modes of governance and Actor-Network Theory. Here, the focus is on vast geographical areas (regions or even countries), with the scope of describing AFNs relationships with regulations and institutions.
However, it has been only in recent times that AFNs role in biodiversity conservation has been recognised (Brunori & Di Iacovo, 2014), focusing for example on the interest in conserving traditional and local varieties that have been abandoned by conventional agriculture (Simoncini, 2015). Thus, their potential influence on landscape preservation remains today an underexplored field.

3. The Soto del Grillo agro-ecological park in Rivas-Vaciamadrid

The Soto del Grillo Agro-ecological Park (in Spanish: *Parque Agroecológico Soto del Grillo*) is located within the Community of Madrid, Spain. Its territory falls under the zone D of the South East Regional Park (a protected space established in 1994), dedicated to the regulated exploitation of natural resources (Romea Rodriguez, 2013). Established in 2013, the Park aims to promote fresh, local and seasonal food consumption, boost new jobs position, and improve short food supply chains, in accordance to sustainable development and to the conservation of typical landscape and natural resources (Ayuntamiento de Rivas Vaciamadrid, 2015). It extends for 85 ha, which have been divided into five zones: a) environmental protection; b) agricultural production; c) other agricultural uses; d) formation and community gardens, and e) equipment and services. At the park borders, some interventions for environmental protection and biodiversity improvement have been realised: reforestation, riparian forest, and delimitation of farms with live fences. The b) zone is partitioned

into 17 parcels, which are managed by farmers through a scoring based on different parameters provided that they enrol in the register of organic certification: i) project developer skills (experience and formation); ii) innovative aspects of the production process; iii) marketing strategies (distribution channels and promotion); iv) economic and financial viability; and v) other criteria (job creation and social and local initiatives).
The park is linked to the twice-monthly farmers' market, which takes place in a peripheral municipal space (Campelo & Piedrabuena, 2013). In April 2015, the project has been enriched with the creation of a quality label named "fresh product from Soto del Grillo Agroecological Park" (in Spanish: *producto fresco del Parque Agroecológico Soto del Grillo*). The label was created in order to boost the commercialisation of food produced within the park, through four objectives: i) promotion of agro-ecological practices: this includes food quality, economic viability, and water and soil protection; ii) origin and proximity, for the awareness of consumers about the origin of products and food miles; iii) quality: the cultivation practices guarantee people health, environmental protection, and assure that the product has been harvested at its best maturation point; iv) seasonality, which promotes good food consumption habits and varied nutrition.

4. Methodology

Seven of the 17 producers enrolled in the municipal project have been interviewed. Interviews have been structured in three sections: general data of the farm, questions about production methods, and selling methods. The reason of the division into two separate sections, one related to cultivation practices and the other to business aspects, is justified by the theoretical framework used for the analysis. The concept of embeddedness (Polanyi, 1944; Granovetter, 1985) has been chosen in order to see how the economy of food production is influenced by non-economic factors. Moreover, as described by Penker (2006) three dimensions where embeddedness works can be identified: ecology, space, and society. The first refers to ideas related to environmental practices, the benefits they produce, and to the quality of food. Spatial embeddedness is linked to the concept of food re-localisation (Sonnino & Marsden, 2006), meaning all the measures (above all the form of distribution, but also promotional and educational initiatives) that contribute to re-connect people to the place of origin of food. In such way, consumers are aware of the origin of the food they eat and in how its quality is related to the place of production. Finally, social embeddedness encloses those factors that, determines the 'socio-economic alternativeness' of AFNs: influence of ideas about collective benefits, generation of trust between producers and consumers, and contrast to capitalist economy in the business activity.
In order to better divide farmers' insights into these three dimensions, the study draws upon the paper of Morris & Kirwan (2011b), who describe three steps that link ecology and food: i) understanding, meaning how farmers relate their production methods to ecological benefits; ii) realising, that is how farmers apply the previous concept to realise benefits, which could not necessarily be akin with food production (as for example particular land or water managements); iii) utilising, that is the information exchange with customers about the previous two dimensions. It has been chosen to extend this division even to the social and spatial dimensions, in order to discover how embeddedness influence farmers' behaviours within each step and to report results organised according to them.
Interviews contents have been analysed through the codification method (Burnard, 1991; Marshall, 1996; MacQueen, 1998), assigning a code to every smallest piece of information within the texts. This operation helps to schematise contents and to find recurring themes, according to the three types of embeddedness described before.

For the websites analysis, textual and visual contents have been analysed in the light of three 'geographical lores' or 'tales' as firstly described by Crang (1996) and modified by Morris & Kirwan (2010): i) geo-historical knowledge, where images and stories about history and geography are used to create a strong link between the products and their origin; ii) naturalistic knowledge, which contains the description of the whole production process, highlighting the environmental-friendly methods and practices, and iii) association between products and ideas. The category iii) has been modified in order to adapt it to the case of AFNs and their social embeddedness, thus it has been renamed 'socio-economic purposes and compromises', that include every references to the social embeddedness defined by Penker.

5. Results

Table 1 shows schematically the values expressed by farmers during the interviews (labelled as "ix", where x is a progressive number) and in the websites (labelled as "wx", where x is a number). Each theme (space, ecology and society) is presented alternating interviews and websites analysis, in order to compare how they are treated for the promotion of the business.

Table 1. Comparison of expressed values within the interviews and the websites

		i1	i2	i3	i4	i5	i6	i7	w1	w2	w3	w4	w5	w6	w7
Geo-historical	**History**	x			x										
	Family								x					x	
	Heritage/Trad.			x	x			x						x	
	Territory	x	x		x		x	x							
	Tourism	x									x				
	Landscape										x				x
	Climate	x			x										
Naturalistic	**Natural methods**	x					x		x	x			x		x
	Water		x	x	x			x							
	Soil			x	x	x	x	x		x		x			x
	Energy	x								x	x			x	
	Biodiversity				x	x	x	x		x	x	x		x	x
	Landscape				x		x				x			x	
	Certification								x	x	x	x	x	x	x
Socio-economic	**Education**	x		x	x		x				x	x		x	x
	Diversity	x		x	x										
	Health		x	x	x			x		x		x	x	x	x
	Economic														
	Social Goals	x	x	x	x			x		x			x	x	x
	Cooperation	x		x	x	x		x				x			x

5.1 Space

5.1.1 Spatial Embeddedness

In this category are enclosed all the ideas and actions that try to "re-embed food systems" (Penker, 2006, p. 369) generating trust through personal relation between producers and consumers, and concepts like 'zero miles' and localness. In this study, the following codes have been established for the definition of spatial embeddedness: references to history, familiar dimension of the business, heritage and recovering of traditional methods, place characteristics that determine the peculiarity of the cultivation, landscape as distinctive trait of the region, touristic attractiveness, and climate.
Territory is the most frequent mentioned theme (including climate references), together with heritage from ancient generations. For the former, producers point strongly to the importance of eating local and to lost varieties restoration as a form to maintain the environmental conditions that make every place unique and different from others. This issue is a problem for some producers, because they perceive as a limitation the obligation to use certified seeds:

> *It has no sense to use a seed produced by the multinational Battle, […] and we cannot use it… that seed from Battle will produce more, but as we use it, someone from China can use the same… and we cannot use a typical seed from this territory. The INIA, the Institute of Agrarian Research… sells plants suitable to this region, the Jarama Valley, that is where we are right now, but again we cannot use it. So, we do not understand this obligation, and we do not agree with it. (i6)*

Seasonality is another recurring theme regarding localness; among other characteristics, organic farming is considered a way to appreciate differences among places, each of them with their seasonality:

> *My project [for the assignation of the parcel within the park] is dedicated to seasonal vegetables, because here the weather, the climatology is very specific (i1)*

> *The theme of local production [is important], I mean trying to make people accustomed to eat seasonal products, in order to avoid bringing products from far away. This happens very often, even though these products are organic, they are brought from far away. (i3)*

For the latter, it is interesting to note that diversity is both an environmental and a cultural fact. Recovering antique varieties of vegetables from the region of Madrid, in form of seeds which are suitable to the specific climate, has a big relevance for biodiversity improvement, and it also stimulates the curiosity of that consumers who remember when families use to have gardens and food tasted differently:

> *This richness you are introducing in the kitchen of people, suddenly becomes something… again, something cultural (i4)*

> *There are four kind of tomatoes and pears, which people usually eat. But there are many others that maybe are autochthonous or with different flavour and colour. Producing these new varieties, flavours that in some ways were lost, varieties that were no longer cultivated; evoking all these things, pushes people to look for lost things, tomatoes that taste as tomatoes! So, we try to recover lost things (i7).*

The other categories are only touched; a farmer spoke about people biking and riding in the paths around the cultivated field, and now he thinks to start a pick-your-own selling method for people who go into the park for field trips. He also cited Romans as the ones who started olive tree cultivation in Spain, while he was mentioning typical national cultivations. Another reference to history was done by a farmer (i4) in order to explain how organic farming is a traditional cultivation method from the prehistory, more respectful to nature. During the interviews there was no reference to Soto del Grillo landscape as historical heritage from the past, nor as a space traditionally dedicated to agriculture. This can be explained by the fact that the park is established in a zone formerly abandoned, as highlighted in the case study presentation.

5.1.2 Geo-historical Knowledge

References to space are very scarce in the websites; questions about local varieties and climate are absent. However, it is interesting to note that two websites mention the park and its surroundings, which in the interviews are not treated. One (w6) just dedicates few lines to this description, even though in a quite evocative way:

> *The farm is located in Soto del Grillo, a kitchen garden blooming within the boundaries of Rivas, to the edge of the Jarama river. It is a natural setting extending in the shade of Piul cliffs, embedded in the South-East Regional Park.*

The other website, instead, allots a large space to the description of the landscape where the farm is located, also through panoramic images (Figure 1); the beauty of landscape is used to promote field activities as riding, biking and walking tours, with the possibility to know better the flora and fauna of the South East regional Park:

> *The whole region belongs to the natural protected space "South-East Regional park", which is characteristic for being a place of shelter and reproduction for protected avifauna in its many lagoons, as for some botanical peculiarity vegetal species existing in the zone.*

The website also explains the project for the creation of a 'Madrid kitchen garden route', going over the municipalities belonging to the zone. Finally, there is a little reference about how the region has been historically suitable to agricultural uses:

> *Region of agricultural beauty and richness, shaped as a big valley with fertile irrigated plains embedded among gypsum hills and cliffs. In the past it formed the 'Madrid kitchen garden', whereas nowadays fodder and cereals (corn) cultivations predominate.*

Unlike the interviews, websites do not mention specific climate characteristics of the zone influencing cultivation; history is absent, too.

There are some references to familiar dimension, in the form of tales about how the farm was founded and the reason of the farm ideology (w6), and as a justification for the product quality due to the avoiding of external people in the whole process of production and distribution (w1).

Figure 1. A lagoon within the South-East Regional park (from: www.vegafertil.es)

5.2 Ecology

5.2.1 Ecological Embeddedness

In this category, farmers express ecological values and ideas about environmental practices that distinguish business distinct from conventional channels; according to Morris & Kirwan (2011, p. 326), is the communication of the ecological methods of production to customers that can “contribute to on-farm environmental management”, giving products an added value.
The codes included in this section are the following: explanations of how farmers replace chemical products with natural methods for illnesses prevention and fertilisation, soil and water protection, energetic issues, biodiversity improvement and shaping of agricultural landscapes.
As it can be seen in the table 1, references to ecology are more than space and history; protection of soil and water, and biodiversity improvement are the most named questions. At a first look, the reason could be the fact that all the interviewees are certified as organic; however, some of them go beyond the mandatory measures imposed by UE. For example, some farmers complain about the scarce attention to water contamination and a lack of the control bodies in analysing the soil:

> *[There is] a tremendous bureaucracy; it would be better that an inspector came here in order to… I mean, what’s the advantage in knowing what I put in the soil? I could invent! I mean… the regulation only produce problems to me. An inspector should come here in order to analyse the soil, the leafs, the water (i3)*

> *The cultivation methods could be more exhaustive, for example issues like CO2 emissions or water usage could be taken into account; it is not the same having a well to irrigate, which is a natural aquifer of alluvial waters, than a water supply from Murcia, through a diversion from Trajo Segura that dries headwaters (i4)*

Another farmer (i5) expresses the importance of some measures that are not related to production but are fundamental for biodiversity improvement, and in his opinion it is maybe for this reason that they are not included in the organic regulation. He said he wants to put live fences in his farm, because they improve biodiversity and, as a side effect, his parcel has a highest ecological value than one without them.
Biodiversity is also related to landscape:

> *As we are within the Regional park, garden diversity can also be part of the landscape diversity; I mean, having a diverse garden allows protecting the landscape (i6)*

The vision of producers as 'nature protector' (Home, et al., 2014) is clear in a statement of one farmer, where he explains his personal vision of what is environmental protection; beyond the mandatory actions, he said that being ecologic consists in paying attention to many aspects related to farm activity. For example, caring the environment for example through a rational water usage, respecting bugs as important component of the ecosystem:

> *Protecting the environment consists in being polite; don't do to the land what you wouldn't like to be done in your house. No more. If your home is dirty, your garden will be the same (i1)*

5.2.1 Naturalistic knowledge

Being a way to promote commodities, websites point quite enough to the whole process of production explanation and to what make the difference in respect to conventional farms. The treated themes are quite the same of the interviews, with the exception of water management, which is not mentioned. On the contrary, energy is a highlighted question; three websites report the advantages of cultivating seasonal, local vegetables and fruit. This choice allows spending less energy than the conventional chains, in addition to the fact that products are fresh and tasty.
Biodiversity is a recurring theme but, in opposition to interviews, is always in general terms and in association with the explanation of what is organic farming. However, some implicit references to landscape shaping through cultivations association could be find in the field images (Figure 2).
One website dedicates a quite long explanation for the utility of cultivation rotation, above all its effects on the maintenance of soil fertility.
All the websites declare their enrolment in organic certification. This observation confirms what farmers said during the interviews, that is, if certification is not useful in order to generate trust with customers in direct selling, it is an essential instrument to guarantee quality and freshness in distance sales.

Figure 2. Association of vegetable evoking agricultural landscape improvement

5.3 Society

5.2.1 Social embeddedness

In this study, all those ideas related to social benefits, alternative economy to the capitalist system, and relationships among actors of food networks are enclosed into the concept of social embeddedness. Unlike the previous two cases, there is not direct link with agro-food production. However, these aspects play a big role in the otherness of AFNs (Renting, et al., 2003; Venn, et al., 2006; Higgins, et al., 2008) and their importance in the 'new rural paradigm' (Goodman, 2004).
This is the category about which farmers expressed more ideas, as it can be seen from the table 1. References are about education in consumption, supply diversity, attention to consumers' choices and habits, health, economic advantages for farmers, changes in society structure, and cooperation with other realities.
Producers recognise that educating people to organic consumption not to only would make them aware of the natural cycles and seasonality of food, but is also a way to develop an environmental sensibility:

> *People who buy organic are very interested in health, but not in where the product has been cultivated nor if it has environmental impacts. […] They have not clear what environmental damage is (i3)*

On the contrary, according to another farmer (i4), people are very interested in questions not directly related to the product quality, for example the business structure and its social characteristics. Indeed, she works in a cooperative; after having joined it for two years, workers become members and have vote right, which is independent from the time they have spent within the business. She considers that consumers choose to buy food produced by the cooperative also for this reason.
Eventually, education and generation of trust are strictly connected, due to the way of working of AFNs:

For consumers [our selling methods] are better [then the conventional ones] because they know at first hand where the product comes from, whom is cultivated by, how is produced. They came here to visit the farm, they can see how we work. […] This generates a strong, mutual trust (i6)

Another social advantage is the diversity of the products supply within AFNs, which is strictly connected to themes like economic benefits, education in consumption, and cooperation. For example, a farmer complains about the fact that almost every producers belonging to the park sell the same products. For him, this causes an economic damage, and suggests a way to avoid the problem, and even improving the commercialisation:

In winter, all of us bring the same to the market: cabbage, cauliflower, and broccoli. Nobody has carrots, nor leek, nor any other product, because we use to cultivate the same products in the same times. Logically, the market cannot absorb this supply. This even causes aversion between us: "if you sell the cabbage for 1,90 €, I'll sell it for 1,85". This is a nonsense. The best option would be that we brought our products below a brand, for example "Soto del Grillo Producers' Cooperative", bringing twenty winter varieties (i1)

Cooperation reaches its top in one of the two cooperatives (i7), where members are not only producers, and consumers are strongly invited to join the cooperative. This, beyond giving more economic stability to the business, helps the generation of trust. The same cooperative wants to establish in Madrid a Participatory Guarantee System (PGS), where themes that are not included in the UE organic certification can help to develop a change in the society; PGSs take into account aspects like women conditions, workers' rights, food sovereignty, etc.
Social goals are mentioned by the majority of farmers, in different forms and degrees according to the structure and the philosophy of the farm. For example, one of the interviewees is part of an association, whose main scope is the working placement of people with disabilities, and the organic farm has been opened in order to offer a different type of employment for them.

5.2.1 Socio-economic purposes

This category encloses all the elements within the websites that are related to social embeddedness. As it can be seen in the table, websites do a large use of these values, in order to highlight the 'alterity' of the business respect to the capitalist market rules (Goodman, et al., 2011). Very few differences have been found between interviews and online contents; the only category not mentioned is the diversification of the supply respect to other producers, which is understandable in for the fact that each website promote its own business. The same reason could be applied to the less presence of references to cooperation among farmers.
It is interesting, on the other hand, to see how some websites mention issues related to economic advantages for organic farmers; the choice of eating organic food boosts little and familiar businesses, toward a society change that could contrast the effects of the green revolution, which gave power to big corporations:

During the green revolution, hordes of farmers all over the world emigrated to cities, depopulating fields, expelled by big combine harvesters and immense tractors that make people unnecessary.
Land consolidation, introduction of hybrid seeds and rise of supplies (fertilisers, fungicides) brought farmers to multinationals. This has created a society that is distant from the productive dimension, depending on big enterprises for food provision (w3)

Finally, websites promote visits to farms in order to re-connect people with the agrarian world, and sometimes this mixes up with tourism and business promotion (w3). One farm (w6) offers periodically workshops in school and hospitals about organic farming.

6. Discussion

The analysis division in categories referencing to space, ecology, and society helps to well understand if and to what extent synergies between park and label objectives and farmers' practices exist.
Results show that interviews and websites contents match very well the heterogeneity of the park goals; the influence of cultural and socio-economic factors in agricultural production is important for biodiversity conservation (Simoncini, 2015). Furthermore, taking into account the considerations of Primdahl (1999), the case study goes beyond the problems generated by the separation between land owner and farmer. Although farmers cultivate parcels of municipal land, they do not show strong productivist behaviours, instead expressing the willing of putting in practice measures for environmental protection and landscape improvement. In this context, it is not important to know whether the Park principles influence farmers' behaviour or, perhaps, there is evidence of an influence of the socio-economic context in farm design (Lovell, et al., 2010). What is interesting for the scope of the study is to recognise the importance of the synergy among actors, and the potential role of the park in managing recreational and touristic aspects for farms.
This, in fact, can influence tourist experiences in the dimensions that are out of single farmers' control
(Brunori & Rossi, 2000), for example by improving the knowledge about the territory the farms is located in, and promoting single businesses.
The park, in these cases, plays the same role of the so-called *collective actions*: "the capacity to create alliances beyond the locality" that "enables small entrepreneurs to mobilize social relations to improve their economic performances" (Simoncini, 2015, p.409).
Some problems have also emerged, for example the lack of cultivated vegetable variety. This could be a hindrance for biodiversity improvement, beyond the excess of concurrency among farmers who produce the same crops. A possible solution could be a stronger planning action by the park administration, for example through dedicating some parcels to specific cultivations.
On the other hand, the link between the park and the monthly farmers' market is an example of coaction; the market is an indirect promotion of the park and its label quality, helping in reaching goals of health, nutrition, and localness. It is a way to make people conscious about food provenance, and a place where relationships with farmers are established. Said that, from the analysis emerges a guarantee system in which landscape and environment protection are strongly taken into account. This system can be considered a pioneer example of what multifunctional agriculture is able to become, also considering that some aspects highlighted here are contained in the Green Direct Payment of the new CAP, aiming at making the CAP a more environmentally focused policy (Erjavec & Erjavec, 2015).

7. Conclusions

The paper shows that scientific research about embeddedness in agro-food system is far from being complete; the role of AFNs actors in landscape conservation, which until now has been scarcely analysed (Simoncini, 2015), in the case study appears essential for the achievement of the multifunctional goals of the Soto del Grillo Agro-ecological Park.

AFNs practices are not limited to cultivation methods, instead embracing different approaches within the distribution and selling phases, that influence directly or indirectly (through affecting the production phase) the environment. This, beyond being characteristic of alternative food supply, shows how valid could be the association of a farmers' market (or any communal selling method) to a structured space of production; in fact, in the case study the cycle of producing, distributing and selling is closed within the local boundaries. This association is considered fundamental in order to better promote the park and its multifunctionality, also considering the relevance of the territorial identity that the park can help developing (Simoncini, 2015). With no desire of falling into the 'local trap' (Born & Purcell, 2006), the case study highlights a big potential for the park in order to improve consumers' knowledge of the environmental impacts of their diet. Moreover, it is highlighted how a multifunctional park could forge people's imagination, knowledge, and practices of supporting traditional landscapes, responding to the need for cities of "changing attitudes of customers into reasons for changing landscape plans" (Brunori & Di Iacovo, 2014, p. 142). In this sense, the potential of the park is realised in shaping and modifying the conceived, perceived, and lived food, which need to be changed together in order to have a real effect (Brunori & Di Iacovo, 2014).

Further studies are needed for a better understanding of how food networks can interact with planning, including all the actors belonging to the network (Lamine, 2014) in order to consider as many aspect as possible of their complexity (Santhanam-Martin, et al., 2015). Moreover, as the Soto del Grillo Park works at a local (municipal) scale, studies at different scales could reveal if and to what extent the geographic dimension influences effectiveness and failures of such realities. This could respond to the question posed by Lefebvre et al. (2014) about the role of policies (and, in particular, of the CAP) in managing the different agricultural landscape scales. Such additional research should be conducted also through the theoretical framework of the Ecosystem Services, which are strictly related to agricultural landscape multifunctionality (Lovell, et al., 2010).

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