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LOGISTICS DRIVERS AND BARRIERS IN URBAN AGRICULTURE

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Abstract: Although urban agriculture as a way to come to sustainable urban food systems can be questioned and we have to be aware not falling into a 'local trap' regarding its benefits (Born & Purcell, 2006), initiatives for urban agriculture emerge all over the world. Some of these primarily focus on achieving social and educational goals while others try to become an (high tech) alternative to existing food supply chains.

Whichever the goals of urban agriculture, in practice many of these initiatives have difficulties in their (logistics) operations. Research on urban agriculture and local-for-local food supply chains mainly focuses on environmental and economic benefits, alternative production techniques, short food supply chains (logistics infrastructure) or socio-economic benefits of urban agriculture. So far, the alignment of urban agriculture goals with the chosen logistics concept – which includes more aspects than only infrastructure – has not gained much attention.

This paper tries to fill this gap through an exploration of urban agriculture projects – both low and high tech – from around the world by using the integrated logistics concept (Van Goor et al., 2003). The main question to be answered in this paper is: to what extend can the integrated logistics concept contribute to understanding logistics drivers and barriers of urban agriculture projects? To answer this question, different urban agriculture projects were studied through information on their websites and an internet based questionnaire with key players in these projects. Our exploration shows that the ILC is a useful tool for determining logistics drivers and barriers and that there is much potential in using this concept when planning for successful urban agriculture projects.

1. Introduction

Urban food systems have evolved over time. Historically food was produced at the edge of town, as infrastructure to transport food over long distances was lacking. With the advances in industrialism infrastructure improved and food production moved further away from cities. Production methods became highly efficient and by sourcing globally consumers could have a complete set of products all year round. Nowadays, a new food movement is erupting, where consumers are regaining interest in the origin and production methods of food. This is one of the causes for food production to return to cities (Steel, 2009).

In the book 'Farming the City' (Miazzo & Minkjan, 2013) several experts give their view on urban agriculture. Morgan states that "feeding the city in a sustainable fashion – in ways that are economically efficient, socially just and ecologically sound – is one of the quintessential challenges of the 21st century", while Bohn & Viljoen argue that "commercial-scale production will be necessary if urban agriculture is to have a quantifiable impact on food production, whilst personalised production is very significant from a social and behaviour change perspective." Both statements have an indirect link to logistics. Economically efficient (less costs, higher revenues), ecologically sound (less food miles, sustainable production methods, circularity) and commercial-scale production all suggest that financial viability, and thus reducing inter alia *logistics* costs and *logistics* impact, is important for the success of urban agriculture projects. However, looking at urban farming literature and practice,

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logistics does not seem to get much attention beyond the issue of the design of logistics infrastructure i.e. the location of sourcing, processing and delivery and the transportation of goods. However, to really improve the logistics of urban agriculture and to make it a driver for the achievement of the company mission and strategy, we argue in this paper, one has to look beyond logistics design and also take issues like the logistics control system, information system and personnel into consideration. To do this, we introduce the Integrated Logistics Concept (Van Goor et al., 2003) and show how it can help to design logistics in such a way that it is aligned with the broader goals and strategies urban agriculture businesses have.

2. Urban Agriculture

Although extensive research has been done, an unambiguous definition of urban agriculture is hard to find. The RUAF Foundation (2015) shortly defines urban agriculture as "the growing of plants and the raising of animals within and around cities". Ruaf uses the terms inner-urban and peri-urban and stresses that the main difference between urban agriculture and rural agriculture is the impact on the urban economic and ecological system. Veenhuizen (2006) refers to urban agriculture as being 'located within or on the fringe of a city and comprises of a variety of production systems, ranging from subsistence production and processing at household level to fully commercialised agriculture'. Smit et al. (2001) divide urban agriculture in four constituent parts: core, corridor, wedge and periphery. The core refers to the inner city, while the periphery signifies the urban-rural fringe or the land surrounding the city. Van der Schans (2013) uses a similar division, adding 'building' as an extra inner city dimension. Mougeot (2000) argues that urban agriculture consists of several conceptual building blocks. One of these building blocks is location, which covers intra-urban and peri-urban areas. From all these definitions it becomes clear that urban agriculture reaches from inner city to city fringe. However, boundaries of the city fringe are either not defined explicitly or differ per study. Moustier (1998, cited in Mougeot 2000) for example uses the maximum distance from where the city centre can be supplied with perishables within one day, while others set a certain radius around one central point, like 30 or 50 kilometres from the city centre. For the case of The Netherlands, being a small country with cities having far less than 1 million inhabitants, these distance definitions would result in most of the country being defined as urban agriculture, while in reality most commercial farms are located in rural areas. To make up for the different characteristics and sizes of cities around the world we decided to refer to the definition of Veenhuizen (2006) and define the city fringe as being inside the official city boundaries.

Terms often related to urban agriculture are local-for-local and short food supply chains. As with the definition of urban agriculture, the definitions of 'local' and 'short' differ per study. Bosona & Gebresenbet (2011) define local food as "food produced, retailed and consumed mainly in the specific area". Kremer & DeLiberty (2011) conclude that "local food system are not merely a delineated geography or a flow of consumer goods from production to consumption, they are natural and social networks formed through common knowledge and understanding of particular places embedded in their localities". Aubry & Kebir (2013) developed a typology defining short supply chains based on organized proximity and geographical proximity. According to this study short supply chains include amongst others selling to local markets and professionals, farmer's markets, on-farm selling and box schemes. Since no standard definition could be found we choose for our study to follow the definition the selected urban agriculture initiatives use themselves for 'local' or 'short'.

3. Urban agriculture location and market orientation typology

When looking at farming projects in general two dimensions can be defined: its location and its market orientation. The location of farmers can be inner city, the city fringe or rural, while the market orientation can either be 'feeding the city' or 'feeding the world'. By confronting these two dimensions a matrix as shown in figure 1 evolves.

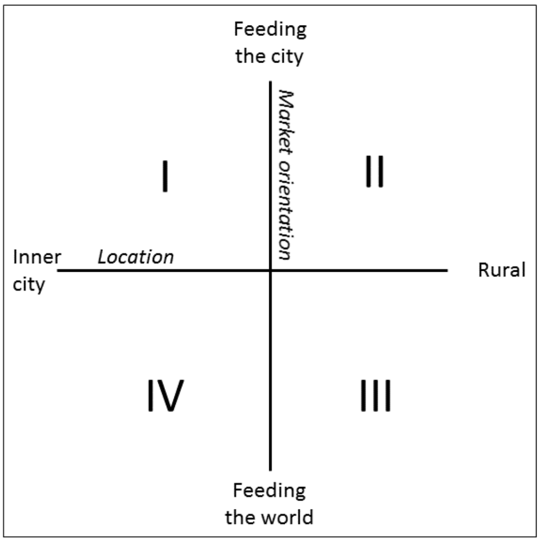

Figure 1: Urban agriculture location and market orientation typology

Quadrant I can be regarded as being urban agriculture. Farmers produce within city limits and sell to local consumers. Local-for-local initiatives belong to the upper part of the matrix, but could be covering quadrant I and II, as rural farms selling within a state or (small) country could be defined as being local.

The market orientation of farming projects may differ. The rapid industrialization and globalization of the last decades drove farms out of the city into rural areas, where they became large scale highly efficient enterprises, producing a high output. High percentages of this output were exported and were directed to 'feeding the world' (quadrant III). Nowadays some rural farmers move towards quadrant II as they diversify their market strategy by making the national market or even the local market (farmer's shop or local farmer's market) more important. Also, some farmers operating at the city fringe or close to the inner city, who primarily focused on the world market, now try to reach the local market through local-for-local concepts. This means they move from quadrant IV to I. These two shifts are part of an increase in farmers participating in short food supply chains. The move towards the top of figure 1 is driven by trends like the dissatisfaction with the conventional food system (van der Schans, 2010) and the de-alienation of city dwellers from their food (McClintock, 2010). These trends have also resulted in newly established urban agriculture projects that are focused on the local market (quadrant I), be it low-tech community driven vegetable gardens or high-tech vertical farming solutions producing niche products which are highly perishable.

The shift towards the upper part of our figure can count on elaborate research interest. Extensive research has and is currently being done on the logistics implications of this shift. An objective many urban agriculture projects have is to reduce environmental impact. Sourcing locally is seen as one of the major contributors to this reduction. Shortening of supply chains (Aubry & Kebir, 2013, Bosona &

Gebresenbet, 2011; Visser et al., 2013, Ilbery and Maye, 2006; Coley et al., 2009) and the reduction in number of food miles and the potential advantages to sustainability (Smith, 2008) are well researched areas. In researches like these, different logistics infrastructures for including local food in existing food supply chains are analysed. Research on newly established inner city and city-fringe urban agriculture mainly focuses on environmental and economic impact of urban agriculture (Sanyé-Mengual et al., 2012; Nationale Federatie Stadsgerichte landbouw, 2013; Miazzo & Minkjan, 2013), alternative production techniques (Mulder & den Besten, 2015) or socio-economic benefits of local food systems (e.g. Kneafsey et al., 2013; Abma et al., 2013). It is hard to find literature on the logistics challenges of starting a farming initiative, focusing on the local market in an inner city to city fringe setting. What we do know is that for the case of small holder producers in Thailand (Boselie (2002), referred to in Trienekens et al. (2003)) it "has proven to be difficult […] to become a supplier within the retail market segment" because of "small production volumes, the inability to supply year-round, and the non-transparent farming practices" (Trienekens 2003, p. 7). These urban agriculture characteristics lead to logistics challenges, as "in most cases of food distribution systems for local food shops and localised farmers markets, where individual companies run their own vans or small trucks, logistics is relatively inefficient and fragmented" (Bosona & Gebresenbet 2011, p. 294).

Thus, although research has been in different contexts, it suggests that given the characteristics of urban agriculture (limited scale and limited (year-round) assortment) optimising urban agriculture logistics is challenging. Research that has been done has mainly been on the logistics infrastructures and their impact on sustainability issues.
However, for the design of logistics in line with company goals, these researches have the shortcoming that the focus on logistics infrastructure disregards other important logistics aspects that do have an effect on efficiency and sustainability of the logistics of the company. This paper introduces the use of the Integrated Logistics Concept (ILC) as a way to see how logistics can be designed beyond logistics infrastructure to align it with the overall missions, goals and strategies of urban agriculture businesses. This approach also helps to identify logistics drivers and barriers. In the rest of this paper we first introduce the ILC. Then five examples of urban agriculture are described and analyzed by applying the concept. This study should be seen as a first testing ground, based on student research, for the feasibility of using this concept for urban agriculture businesses to improve their logistics.

4. Research methodology

In this research five urban agriculture projects were evaluated by third year bachelor students. The urban agriculture cases were selected based on the following criteria:

- The farm should fit quadrant I of the typology: located inner-city or in the city fringe and have enough scale to have a significant contribution to 'feeding the city'. The intention was to include projects from different countries and different continents;
- The farm should produce its own crops;
- The farm should sell its crops to the local market.

Additionally, both low-tech and high-tech farms were chosen.
It was found that not many of the existing urban agriculture projects meet all these criteria. Although The Netherlands have a lot of inner-city urban agriculture projects, only few have a local-for-local market orientation. The Dutch projects are mainly community driven, have a socio-economic character and cater for the need to reconnect to where our food comes from. Additionally, The

Netherlands do have several examples of box schemes, where boxes filled with local produce are delivered to consumers (HelloFresh, BeeBox and Willem & Drees). However, these businesses do not produce crops themselves, but operate as logistics service providers. As such they are not the focus of our research. Furthermore, we only selected cases in developed countries, although we realize that in developing countries interesting cases exist too.

An internet search resulted in the selection of the following five urban agriculture projects:
- Lufa Farms in Montreal - Canada
- Sky Greens Vertical Farming in Singapore
- Greensgrow Farms in Philedelphia - USA
- Ceres Fair Food in Melbourne - Australia
- Fresh City Farms in Toronto - Canada

Next, all aspects of the ILC were described, based on information found on the internet. It turned out that the publicly available information was not enough to provide a detailed (logistics) description of the projects, so an additional questionnaire was sent out by the authors to key persons within the projects. The questionnaire was based on the checklist for the ILC, as developed by Ploos van Amstel (2008). Three of the farms filled out the questionnaire.

5. Integrated Logistics Concept

Logistics plays an important role in the competitive advantages of companies. This also applies to food producers, since *"efficient logistics management has a positive impact on the success of food producers, because logistics activities greatly affect the profit of producers, the price of food products and the satisfaction of consumers"* (Brimer, 1995). To gain competitive logistics advantages companies need to have a well-defined relationship between their strategies, their logistics mission and their logistics concepts. In practice however, incorporation of logistics concepts in strategies and operational plans seems to be quite difficult. The ILC (Van Goor et al., 2003) is a way to structure the logistics organization and operation of a firm. It bridges the gap between the general competitive strategy of a firm and the logistics operation. Figure 2 shows the framework for integrated competitive logistics.

The framework starts with the company's **competitive strategy**. The most well-known strategies are cost-leadership and differentiation (Porter, 1985). In a cost-leadership strategy a company strives to reduce the total costs of the company, while a differentiation strategy focuses on enhancing the product or service of the company by adopting a unique sales approach. Van der Schans (2015) applied the competitive strategy concept to urban agriculture projects and added three other urban agriculture strategies, being diversification (offering additional functions to cover the costs), reclaiming the commons (involving city dwellers in the project e.g. by community supported agriculture, co-financing, working at the farm) and experience (experience has more added value than the products alone). Having a clear competitive strategy helps companies to gain competitive advantages and be more profitable. Normally, it is advised to pursue one strategy. However, urban agriculture projects often use a combination of different strategies. Urban agriculture projects generally have much broader goals than gaining competitive advantage. Of course, reducing cost and having a unique selling point is important, but socio-economic factors also play an important role in their strategies.

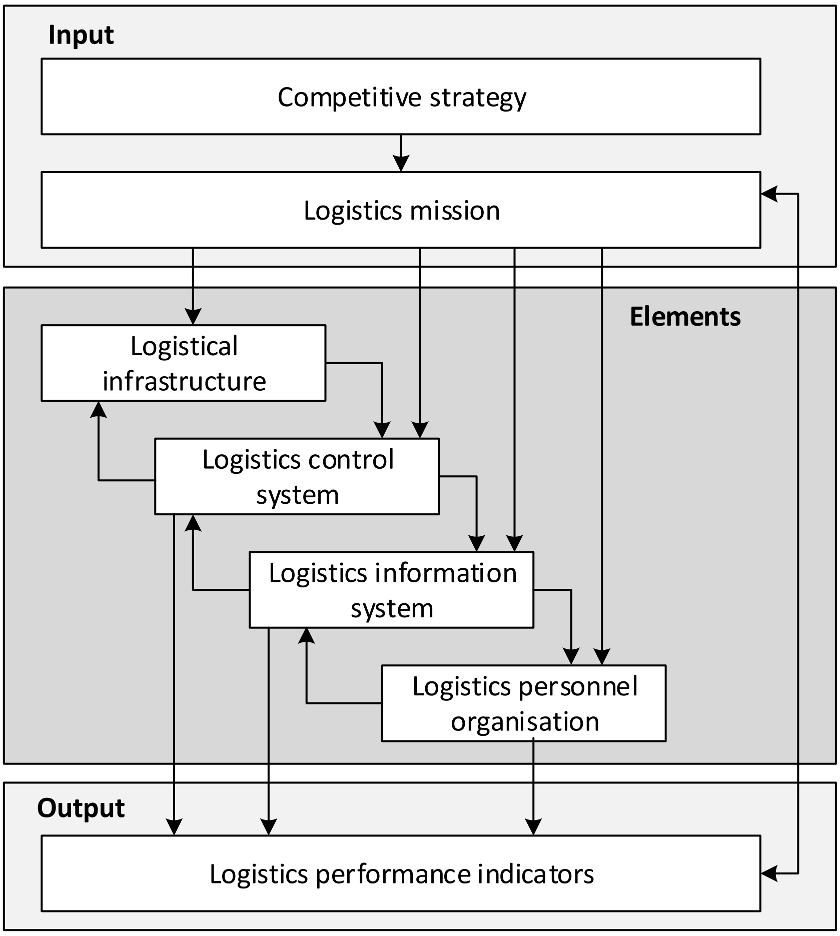

Figure 2: Integrated competitive logistics framework (Van Goor et al., 2003)

Once the strategy is chosen, following the logistics concept, it is translated to a **logistics mission or logistics objectives**. If, for example, the competitive strategy of a company is cost-leadership, the logistics objectives are related to a reduction of the overall costs associated with the logistics operation, like reduction of inventory costs, reduction of transportation costs and/or reduction in production costs.

The competitive strategy and the logistics mission are the inputs for the design of the **four elements of the logistics concept**: the logistics infrastructure, the logistics control system, the logistics information system and the logistics personnel organisation. These decisions are related to each other and are hierarchical. The quality of the company’s logistics concept can be measured by the logistics performance indicators.
First, the **logistics infrastructure** has to be determined. As Van Goor et al. (2003) state “the logistics infrastructure is a model of the physical flow of goods, services and information of an organisation in its most rudimentary form”. The logistics infrastructure models the complete supply chain, showing all actors (like production facilities, warehouses and stores).
Second, once the logistics infrastructure is in place the **logistics control system** has to be designed. This is the system that controls the physical flow of goods. This is about sourcing, production and distribution planning and decisions on whether and how these plans are shared with other actors in

the logistics chain. Also forecasts are considered here. For the part of the logistics chain where customer orders are not known forecast techniques have to be selected and implemented.

Third, directly related to the design of planning and control is the **logistics information system**. It has to be determined which ICT tools will be used to support the logistics operation. Also, it has to be determined *which* data is gathered and *how* this data is used and shared.

The **fourth** and last element in the concept is the **logistics personnel organisation**. The tasks and responsibilities of the logistics managers have to be determined. The choices made in the logistics planning and control and the logistics information system determine the type of personnel organisation a company needs.

Once all elements of the logistics concept are in place the performance of the logistics system will have to be assessed. By measuring the logistics performance indicators and linking them to the logistics objectives the quality of the system can be determined. The deviation of the measured indicators from the objectives requires evaluation and, if needed, adjustment of the design of the elements. Thus, design, implementation and use of the (integrated) logistics concepts can help firms to align their logistics goals and operations with their overall company goals. In our research we have made an inventory of the elements of the integrated logistics concept in five urban farming cases and looked to what extent these elements seemed to be aligned in these cases and where room for improvements seemed to exist.

6. Results

Publically available information on the internet was used to apply the ILC to the selected projects. It is noted that the following is our interpretation of the information found on internet.

Mission and competitive strategy

The competitive strategies mentioned on the web sites of the farms refer to the overall mission the farms have. As part of a mission to be sustainable, care for future generations or to enable to feed tomorrows citizens, differentiation is a strategy all farms have. The urban agriculture project tries to differentiate itself from the regular food systems by emphasizing the freshness, localness and sustainability of the produce. Lufa Farms, for example states “We grow food where people live and grow it more sustainably” (Lufa, 2015). The site of Sky Greens reads: “Ensuring food supply resilience is important to land-scarce countries such as Singapore.” (Sky Greens, 2015). Fresh City Farms has the mission to connect food makers and eaters. They do this by farming in the city “and work with like-minded makers to deliver a food experience that respects our bodies, our planet and our shared tomorrow. By bringing makers and eaters closer together, we hope to rekindle the intimacy between people, land and food” (Fresh City Farms, 2015). Greensgrow’s mission is “revitalizing livable communities through the practice of sustainable entrepreneurial urban agriculture” (Greensgrow, 2015), while Ceres Fair Food wants to “do good at every part in the food chain” (Ceres Fair Food, 2015).

Quite often the differentiation strategy is combined with diversification by adding functions like education and community building. Regaining commons and experience are also part of the overall strategy. Although ‘affordable food supply’ is mentioned quite often, a clear low cost strategy was not found in the analysed urban agriculture projects.

Logistics mission

The answers to our questionnaire reveal that translation of a general strategy into a logistics strategy did not take place. Also web sites do not explicitly state logistics mission of companies. However, for all five projects logistics aspects are mentioned. Most initiatives do have logistics strategies that fit into their general strategy, especially to the strategy of being:

- More sustainable
- More local
- More fresh

These aspects can be seen as the main drivers for the logistics design for urban agriculture projects. Logistics missions related to these drivers are:

- Proximity to end-user and reduce food miles
  - Grow food in the city (all farms)
  - Source as nearby as possible (Ceres Fair Food, Fresh City Farms)
  - If sourced abroad, bring produce as sustainable as possible to the distribution centre (Ceres Fair Food)
- Source from partners with same values (Lufa Farms)
- Minimize packaging (Ceres Fair Food, Greensgrow, Fresh City Farms)
- Deliver at the same day products are harvested (Lufa Farms)

The general missions in the field of sustainability are also translated into operational strategies for the production of food.

Also the nature of urban agriculture (limited scale and assortment) drives the logistics design. Because of the limited variety in crops in urban agriculture additional produce has to be sourced from other farmers / suppliers for being able to offer the customer a complete shopping basket. This aspect adds to the logistics complexity and might result in barriers for achieving optimal logistics performance.

Logistics infrastructure

As for the logistics infrastructure Lufa Farms, Greensgrow, Ceres Fair Food and Fresh City Farms source extra products to offer customers a broad assortment of goods. They use pick-up points for delivery to customers. Ceres Fair Food and Fresh City Farms offer additional home delivery services. Greensgrow also uses a farm stand and a mobile market to sell their produce. Sky Greens has its produce incorporated in the retail distribution structure of Fairprice supermarkets in Singapore. As for the delivery of the products from the farmers to the urban agriculture projects no information was found. It is not clear whether this flow of goods is being optimized.

For the logistics infrastructure the questionnaire added more detail to the publicly available information. In all three cases the farmers deliver their products to the warehouse or picking location either by themselves, by using logistics service providers or, in two cases, the initiative picks up the produce from the farmers themselves. In only one case the farmers combined their deliveries to increase logistics efficiency. Delivery frequency varies from 3 to 5 times a week. Two initiatives do not keep any stock, while one initiative keeps a small stock in their warehouse.

Delivery to the pick-up points are either done by using a logistics service provider (one) or by using own transport (two). Only one initiatives uses electrical bikes and/or cars. All initiatives combine deliveries to pick-up points in optimal delivery routes. In the choices for locations of pick-up points the logistics drivers that were mentioned earlier are translated by basing the location of the pick-up points mainly on concentration of end-users (more local, more fresh), availability of location and optimization opportunities (more sustainable). Research done by Coley et al (2009) also suggests that an optimal location of pick-up points could be a driver to reduce carbon emission.

Farms seem to be aware of the logistics infrastructure and try to minimize transport kilometers for *their own part* of the supply chain. Optimization at supplying farms takes place less, which can be considered as a barrier for efficient supply chain logistics. Comparable results were found by Bosona and Gebresenbet (2011) in their Sweden study. They also signal improvement potential in the deliveries from farmers, resulting in positive effects on sustainability goals. Also optimization of transport mode or volume (amount that can be transported at one time and number of deliveries a week) seem to get less attention.

Logistics control system
In the logistics control system production planning and demand forecasting play an important role. From the websites it became clear that Sky Greens uses contract farming. In that way they know how much to produce. Greensgrow uses the number of CSA members as an indicator for expected demand, while Lufa Farms, Ceres Fair Food and Fresh City Farms can manage demand by adjusting the contents of the weekly bags. It is not clear whether the local farmers who deliver to these organisation, keep stock of the products offered at the online marketplace to cater for unexpected demand variations.

In the questionnaire all three initiatives stated that they forecast customer orders. Two initiatives also include the availability of farm land. Demand is regarded as being predictable, although unstable between months. Demand volatility is managed by either marketing (informing the consumer that they buy seasonal items, which are not always available), using historical data or adding a concurrent farm stand with extra items for sale. As such, although not explicitly mentioned, logistics control in the schemes we studied seems to focus on the prevention of over-production and thus loss of unsellable produce. However, the quality of the demand forecast or the amount of loss of produce is not being measured.

Logistics information sytstem
Our review of web sites and our questionnaire provide insights on logistics information systems for three cases. All initiatives use ICT to support their business. Only one initiative shares the customer orders with their suppliers by web portal on a daily basis. Compared to the other initiatives they use more advanced ICT systems to support their operation. For the other two initiatives ICT is limited to Microsoft office, combined with a transport and/or warehouse management system. But again, how much this logistics information system is dedicated towards achieving overall company goals remains unclear.

Logistics personnel organisation
The web sites of the initiatives and our questionnaire gave information on the logistics personnel organisation for two initiatives. One initiative employs a logistics manager, but the tasks of the logistics manager are not described. Another initiative has 8 employees working in logistics, four warehouse personnel and four in transportation. From this it can be concluded that the logistics function is not always explicitly defined, which makes it hard to have someone take responsibility for the logistics performance. This could be a barrier for improving logistics performance.

Logistics performance indicators

Logistics performance indicators (LPIs) are not mentioned explicitly in the publically available information. However, when applying the ILC, the LPIs should be related to the logistics mission and can thus be derived from this. Based on the missions found on the websites the following logistics performance areas seem to fit sustainability goals, goals of freshness and locality of produce well:

- Sustainability and locality:
  - Minimum use of gasoline / CO_2 and offset of carbon emission
  - Minimize food miles/ vehicle movements
  - Minimal packaging material/ reuse of boxes
- Freshness:
  - Same day delivery/before 3pm

However, if and how initiatives measure and monitor these performance areas stays unclear. Only one initiative mentioned in the questionnaire that they measure costs per packed bag and costs per delivery. For the ILC to be fully implemented, companies should think what to measure and how these measurements relate to the logistics and overall goals.

7. Conclusion

This paper has introduced the Integrated Logistics Concept (ILC) as a way to gain insight in logistics drivers and barriers for urban agriculture initiatives. As stated earlier, this paper should be seen as a first attempt to use the concept for urban agriculture. Five urban agriculture initiatives were selected and analysed, based on publically available information on internet. To (partly) verify and extend the available information a questionnaire was sent out to the five selected projects. Three projects filled out and returned the questionnaire. Given the limited sample used only very tentative conclusions can be drawn.

The most important drivers for logistics design urban agriculture initiatives can be derived from their logistics missions. Drivers are: being more sustainable, sourcing and selling more local and delivering fresher produce. Moreover, the logistics design is also driven by the characteristics of urban agriculture, being limited scale and assortment. These drivers make urban agriculture logistics even more challenging.

Barriers that were found in this research are:

- No integrated logistics approach. A first general finding from our web search and questionnaire is that, just like in literature, the focus with respect to logistics of urban agriculture firms seems to be mostly on the logistics infrastructure. All other aspects included in the ILC get much less or no specific attention. From this it follows that there is a lack of alignment of overall goals and logistics goals and logistics design. This misalignment of the elements of the ILC forms a barrier for urban farming firms to optimally use logistics as a way to reach their company goals. Overall company mission and strategy should be translated in logistics goals, logistics infrastructure, logistics control, information system, and personnel organisation. Logistics infrastructure is more than network design. It also is about which modalities to use, how frequent, and about opportunities to integrate with other supply chains to make things even more efficient. But still then, no matter how efficient the logistics infrastructure is designed, with poor control losses might occur in the supply chain. Also a malfunctioning information system can lead to many inefficiencies. To manage all this someone has to be made responsible for the performance of the logistics operation. In that way coherence between all logistics elements can be created, resulting in an aligned, measurable and successful logistics operations.

- A lack of a holistic view on logistics in the supply chain. From the outcomes of the questionnaire it became clear that in two of the three cases supplying farmers deliver their produce individually to the initiative's warehouse. In these cases load factors will not be optimal. This might be a barrier in achieving the formulated logistics goals, as low load factors result in higher logistics costs and higher environmental impact. It is important that, when optimising logistics, the whole supply chain is taken into consideration. Optimisation opportunities can be found in cooperation between different actors in the supply chain instead of optimizing only one link in the chain.
- Limited or no measurement of LPIs. For example, as we have seen, urban farming businesses are not fully aware of their logistics goals and their logistics performance indicators. On the web sites coherence between the strategies, goals and logistics performance indicators was difficult to find. Moreover, according to the answers to the questionnaire the LPIs that we identified are not measured, making it a barrier for optimal logistics performance.

Thus, although logistics is important in their operation – all initiatives have schemes with delivery from different farms and delivery to pick-up points or retailers (Skygreens) – logistics does not get much explicit attention. The ILC seems to be a powerful tool for designing and/or analysing logistics coherence and to make logistics a tool to reach company goals. Using the ILC helps make deliberate choices on the total logistics design, including what to measure, why to measure and how to measure the quality of the total logistics system and thus resolving potential logistics barriers.
Given the challenges urban agriculture initiatives face (being economically efficient, ecologically sound and financially viable) an integrated logistics approach is essential. The use of the ILC shows a lot of potential when planning for successful urban agriculture projects.

The results of this research are based on a very limited sample of urban agriculture initiatives. Further research could include an extension in cases and a more detailed analysis of how logistics is designed and organized. Furthermore it would be interesting to see, together with urban agriculture initiatives, how the ILC could be applied in practice. Special attention could be paid to determining the parameters that have to be adjusted in order to resolve the identified barriers. This is especially relevant when initiatives have to grow to a commercial scale and logistics becomes even more complex.

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