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# Supplying School Canteens with Organic and Local Products: Comparative Analysis

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**Abstract.** Governments are facing the challenge of feeding students in schools in a city environment in a process that revolves around the coordination of multiple producers, distributors, logistics operators and traders of perishable foods. This paper aims to analyse food collection and distribution to assess the potential of urban food systems regarding school feeding. To do so, we compared school feeding distribution systems in Brazil and France to identify the main issues and investigate the role of local food systems. Our results showed that all cities are concerned about the involvement of short food supply chains to provide vegetables and fruits for schools to promote small local farming but there are cultural characteristics that require the use of different approaches.

**Keywords:** School Canteens · Local Production · Organic Food Production · Short Food Supply Chains

## 1 Introduction

Nowadays, the governments are facing the challenge of feeding cities, involving the coordination of multiple producers, distributors, logistics operators and traders of perishable foods. Because the increasing of population, more food and better freight transport systems are required [1–3]. In the last 10 years, the demand for locally grown food has dramatically increased in countries [4] and due to the concentration of the population in the cities and urban areas, the task of feeding has taken great attention since the growing population needs to be fed.

Food supply brings several implications such as sustainability, social equity and economic development, and they are key in different policy discussions

and must be considered in the food transportation strategy. In fact, aiming to decrease the transport nuisances and to improve the quality and sustainability of the food supply systems, several cities have started to think on how to outperform their local supply systems by combining proximity producers' supply with advanced city logistics systems.

To deal with the food supply requirements, several control entities and supply chain stakeholders have promoted local food production and consumption [5]. Compared to conventional channels, they propose to reduce the distance that food travels to reach the consumer [6], becoming easier to access to freshest and better quality foods [1]. In fact, local authorities have introduced a requirement for short circuits and local products in institutional catering [7].

A well planned food supply system is key to ensure the distribution of food in an efficient way both time and quality wise [6]. However, according to Barham et al. [8], one of the challenges faced by food producers is the lack of a distribution infrastructure that can allow them to respond against the increasing demand of local products in large markets. This added to the fact that food distribution system seeks to capture the growing demand at lower prices, but they do not always share the localization and distribution infrastructure strategies [9].

Despite the concept of food supply chain deal with the idea of 'farm to fork', in which raw material is transformed as it goes through multiple stages and agents [10] some researchers point to the shortening of these food supply chains [11].

Short food supply chains involve direct purchases of local food from familiar farmers with smaller distances between the production and consumption [12]. It contains the idea of local food, which means distinguishing product features, natural raw materials and methods, and direct incomes for families [13].

In this sense, some initiatives are gaining core around the world. French cities, for instance, are nowadays organizing collective restauration under unified structures that allow initiatives like consolidation and food hub (FHs) deployment. The local authorities has been promoted two main sustainable food policies: (i) to deploy organic and local supply strategies (fruits and vegetables); (ii) to make opportunities such as grouping local producers into urban food hubs. And this is not only a case for developed countries, Brazil, for example, include in law the obligation of municipalities spends at least 30% of resources destined for school feeding to purchase products coming from family farms.

With these ideas in mind, the aim of this paper is to analyse food collection and distribution to assess the potential of urban food systems for collective uses revolving around school feeding. To do so, we compare schools feeding distribution systems, one in Brazil and one in France to identify the main issues and investigate the role of local farm systems.

## 2 Methodology

The methodology proposed here is that of case study research [14] but will include both a quantitative assessment and a qualitative analysis. The construc-

tion of the case study and its consequent analyses is organized in the following phases:

1. Data collection: mainly based on a documentary analysis (with both scientific and technical/legislation documents) [15, 16], this phase consists on collecting the main information to describe the case and the context that explain how the meals distribution works.
2. Data analysis for food distribution system comparison: after having described the case qualification, a comparison between two distribution systems for school canteens is performed.
  - Data is analysed with two objectives: the first is to define the current context by addressing the main issues of the distribution services; and
  - The second is to examine data to propose practical implications and proposals of actions for the municipality.

### 3 Results and Discussion

#### 3.1 French case

The case study is that of two French cities. The geographical scope of the study focuses in two urban area that has about 160 school canteens, that represents 28,000 meals per day and works 140 days per year. The main families of products distributed are groceries, fresh and frozen products (for this study it will be only considered the fruits and vegetables supply). In France, the percentage of students eating at the school canteen was set to 40% - 60% of the students registered.

Aiming to allow all children to have equal access to food, the meal prices vary between French municipalities. The meal cost is defined by the city, the department, or the region according to the school level. The parents pay part of this cost considers the income and family size. The average price per meal paid by parents is between 3 and 3.50 euros, but wealthiest families pay 7 euros, and the lowest-income families pay 20 cents per meal.

The school canteens is used to be supplied mainly on semi-manufactured and frozen products coming from platforms at different locations of the urban area. The aim of the municipality is to substitute some of those industrial distribution chains by short circuits of small local and organic producers.

The menu for school canteen is planned for the year and adjusted monthly. This means that the producer knows in advance the approximately amount of food that will be requested by the central kitchen (where the food is cooked) via the Food Hub (FH), nevertheless, the central kitchen confirms two days before the right amount of food that will request. Also, institutional catering is not the only customer of the FH, they also served other establishments from HORECA sector. The FHs are in charge of collecting, storing and distributing the products from the producers to the customers.

By using FHs enable short supply chains and allow an increase in the share of local and organic products available for institutional catering [17]. Nevertheless, the main issues of the distribution system founded are:

1. The producers allocation related to an administrative subdivision or a geographical proximity allocation; and
2. The impacts on the transportation collaboration policy related to food delivery directly by the producers or food collected from the FHs.

### 3.2 Brazilian case

The Brazilian city is located in the metropolitan area of Sao Paulo, in Sao Paulo state, southeast region in Brazil. The municipality has 28.7% of urban areas and 71.3% of rural areas. There are 203 schools that provide meals 200 days per year for more than 55 thousand students (2017 number). In this study, we considered only vegetables supply by 58 local family farmers. Each school has a kitchen and cooker to prepare meals. Before being dispatched to the schools, products are stored in cooperative deposits or sometimes collected directly from the field and delivered to the logistics operator.

Vegetables are acquired for three local cooperatives of farms that gather the items in a central deposit and the vegetables are distributed twice a week per school using a third party logistics provider. The aim of the municipality is to guarantee at least 30% of financial resources obtained from the Federal Government are used to purchase products from small family farm producers (Brazilian law 11,947/2009).

The local government based on the immense rural area of the municipality and agriculture cluster area seeks to promote short supply chains assuring that federal government investments in school feeding add-value to the municipality. The main issues in the distribution system are:

- Food menu – (a) schools can choose items in a list of secretary of education – there is no obligation of purchase all items, (b) farmers offer vegetables according to the seasonality and their production;
- Transportation – (a) there are many schools in rural areas that difficult the access and distribution, (b) there is no pattern of vegetables, it difficulties the logistics operation;
- Budget restrains – the value per student is less than 0.20 US\$ per student/day;
- Storage: the area in schools for is storage items are insufficient and there are deficiencies in refrigeration systems.

### 3.3 Case comparison

Figure 1 presents the comparison of both cases.

All cities are concerned about the involvement of short food supply chains to provide vegetables and fruits for schools to promote small local farming, however, there is a difference in the production of these items. In France, there is a concern to use organic items, and in Brazil, the challenge is one step behind, the idea is offered to students more vegetables in the menus but the use of agricultural pesticides is permitted.



		
Logistic decisions	<ul style="list-style-type: none"> <li>Strategic network design: To increase the share of organic and local producers for institutional catering</li> </ul>	<ul style="list-style-type: none"> <li>Strategic network design: To increase the share of small local family farms and healthy food in the menus</li> </ul>
Kind of meal offered	<ul style="list-style-type: none"> <li>Including organic and local fruits and vegetables.</li> </ul>	<ul style="list-style-type: none"> <li>Generally is offered a complete meal including: rice, beans, vegetables, meat and juice to drink. Some schools implement variations in specific days according nutritional aspects.</li> </ul>
Network description	<ul style="list-style-type: none"> <li>5 Food Hubs</li> <li>1 Central Kitchen</li> <li>160 School Canteens</li> <li>1 Flow: Hot + cold between each echelon</li> </ul>	<ul style="list-style-type: none"> <li>1 Food hub</li> <li>203 School Canteens with Kitchen and Cooker</li> </ul>
Routes construction	<ul style="list-style-type: none"> <li>VRP Spread Sheet Solver by echelon                             <ul style="list-style-type: none"> <li>Producer-Food Hub (FHs);</li> <li>FHs-Central kitchen (CK)</li> <li>CK – School Canteen (CS)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>3rd party logistics provider</li> <li>Delivered twice a week</li> <li>No software for create routes, only logistics provider expertise</li> </ul>
Main issues	<ul style="list-style-type: none"> <li>Producer allocations: administrative subdivision or a geographical proximity allocation.</li> <li>Transportation collaboration policy : food delivery directly by the producers or food collected from the FHs.</li> </ul>	<ul style="list-style-type: none"> <li>Food menu – schools can choose items in alist of secretary of education</li> <li>Transportation – there are many schools in rural areas that difficult the access and distribution.</li> <li>Budget restrains – the value per student is less than 0.20 US\$ per student/day</li> <li>Storage area in schools is insufficient</li> </ul>

Fig. 1. Case Comparison

Regarding the approach of distribution while in France the meals are prepared in a central kitchen in Brazil the operation is decentralized and each school has a kitchen and cooker.

For logistics distribution in Brazil, a 3rd party logistics has a contract with the city hall and is responsible to distribute the items from a central deposit managed by cooperatives of farmers to the schools while in France the food is delivery directly by the producers to FHs or it is food collected from the FHs. Then, the food is distributed to a central kitchen where the food is cooked. The last mile distribution is performed by a 3rd party logistics who has a contract with the city hall, who supplies the school canteens.

Finally, in order to identify a policy, practical implications and proposals of actions for the municipality, the proposed systems imply a consequent modification of supply chain and transport practices. Indeed, those changes impact different stakeholders in the distribution chain, who have different objectives, issues, and perspectives. A particular focus will be made on the comparison between two different context and how those food supply systems impact current practices considering the risks related to their development.

## 4 Conclusions

This paper analysis local food distribution to school canteens in two cities in France and one in Brazil and compare challenges and logistics distribution.

Our results showed that in both countries there is the use of short food supply chains to provide vegetables and fruits for schools to promote small local farming. However, we observed the existence of different approaches. In France, is adopted organic items and ready-to-eat meals using a central kitchen delivered by producers. While in Brazil the canteens are centralized in schools

and vegetables and fruits are conventional - the use of pesticides is allowed - delivered by a 3PL partner contracted by the city government.

The limitation of this study is the sample size, and the results need to be viewed in an exploratory manner. However, this fact does not invalidate the importance of this comparison using two different countries - developed and underdeveloped - but with the same objectives to ensure that students of school age could receive assistance to focus on their studies development.

As further research is an analysis using more delivered systems in the same and other countries to identify similar and different approaches that can be used in a future model of distribution of food for school canteens, considering short food supply chains.

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