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The role of ICTs in supporting collaborative networks in the agro-food sector: two case studies from south west England

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Abstract. Over recent years, in a wide range of countries, grassroots initiatives have emerged aimed at overcoming the limits of the mainstream agro-business system. These initiatives aim at improving farmers' access to local and regional markets and consumers' access to fresh local produce. Among these initiatives, Food Hubs have emerged as a promising way to improve local food supply systems. They represent collaborative networks of producers and consumers that aggregate, distribute, and market local food products. ICTs enable these collaborative networks by allowing information exchange among their actors and by providing collaborative tools that allow quick co-ordination between members of the network. The paper aims to analyse, through a multi-case study analysis, how the adoption of ICTs have fostered the development of new, "alternative" initiatives oriented at establishing local food networks and to reconnect producers and consumers. The study will present results from the analysis of two food-hub initiatives based in South West England, which are adopting informative systems to support their activities and to implement novel business models: Stroudco Food Hub and Dean Forest Food Hub.

Keywords: Food Hubs, Alternative Food Networks, Local Food System,

1 Introduction

Over the last three decades, in the academic and policy discourses observe a common concern has arisen about the sustainability of the agro-food system. The mainstream procurement system is vertically and horizontally integrated, global in scale, and aimed at maximizing efficiency and profit [1]. This model, based on economic efficiency and profit maximization, has resulted in negative environmental and social externalities [2] [3]. The increasing concentration of large corporations operating in the processing and retail sectors has led both to the crisis of trust in placeless and uniform products among consumers, and to power asymmetries along the food supply chain [2] [4]. The loss of bargaining power and constant cost-price pressure on commodity production has resulted in a decline in farm numbers, with consequences for rural areas [3]. In this context, driven by consumers' renewed interest in locally and sustainably produced foods, grassroots initiatives based on new forms of collaboration between producers and consumers have emerged [5] [6] [7] [8]. These initiatives include direct-to-consumer sales, pick your own, farmers' markets, box schemes, community-supported agriculture, collective buying groups, and community gardens. Typically grouped under the umbrella of 'alternative food networks' (AFNs) [9], they represent collaborative networks allowing for the development of new forms of relationship and governance, enabling a re-distribution of value to primary producers [3] [4].

Even if there is a common agreement that AFNs could offer the opportunity to revitalize local rural communities, they face many difficulties attempting to minimize the number of intermediaries in the food supply chain. The direct marketing activities in the AFNs are highly labour-intensive, profitable levels are low, due to a low volume of sales, high logistic and marketing costs [8]. Food Hubs (FHs) have been emerging as a way to face these challenges of coordination of marketing functions and efficient management distribution of local foods [1], [3], [8].

In this paper, we aim to explore the role of ICTs in fostering the development of FHs in the establishment of local food networks. In particular, the paper will address the following research questions (RQs):

- RQ1: Does the adoption of ICTs support the rise of new collaborative networks within the "alternative" food supply chains?
- RQ2: How do the adopted ICTs tools enable collaboration and coordination among all the networked actors in the identified case studies?

The paper is organized as follows: the section 2 introduces the theoretical background about Food Hubs initiatives, while in the section 3 the two case studies are presented and discussed. In the final section, we propose our conclusions.

2 Food Hubs (FHs): theoretical background

The concept of a Food Hub is a recent addition in the literature on AFNs. Scholars and public institutions have worked to elaborate a comprehensive definition of FH: Morely et al. [11], Horrel et al. [12], Horst et al. [13] and USDA [14] focused their attention on the functional aspects of co-ordination, looking at FHs as an intermediary between many local producers and suppliers and customers, including institutions, food service

firms, retail outlets, and consumers. All these authors specified that the main functions characterizing FHs are information management, aggregation, distribution, and marketing of source-identified food products. Blay-Palmer et al. [15], in their definition of FHs, highlighted the sustainability aspect of FHs, while other authors try to balance the functional aspects with the civic and sustainable ones. In their study Fisher et al. [16] stated: "Food hubs are, or intend to be, financially viable businesses that demonstrate a significant commitment to place through aggregation and marketing of regional food." In the same vein, Franklin et al. [17] and Franklin and Morgan [18] pointed out that community food hubs provide to local producers and consumers the coordination of activities such as sourcing, supply, and/or marketing and distribution of products. According to these authors, the primary goals sustainability-oriented community FHs are environmental protection goals, and the economic viability of local farmers. With social motivations such as community cohesion, social gain, healthy eating, and local food access, as secondary goals. With a similar perspective, Berti and Mulligan [3], in their definition of FHs, highlighted both their role as intermediary organization, and capacity to operate as "activator" and "animator" of a strategic network involving all the actors in the short food supply chain. In such a network, producers preserve their identity, their organizational independence and their strategies, but, at the same time, all the actors collaborate to achieve mutual convenience. Together they co-produce shared economic and socio-environmental values to be distributed within the network and positively affect the entire local community.

Scholars proposed different perspective in FHs' definition, as well as noting the variety of organizational structures, target customers, ownership and control, function and operation [10], [11], [13], [14]. Despite this diversity it is possible to observe a common agreement about the potential of FHs to overcome the distributional limitations of small-scale AFNs and to help initiatives to 'scale-up' and deliver benefits for local communities [19], [8], [1], [3], [2], [16], [14].

The main services provided by the FH organization to coordinate the activities of its networked partners, manage the goods and information flows in this particular form of short supply chain are related to:

- Logistics. Aggregation (on-farm pick up and on-FH drop off), product storage, re-packaging for distribution (customer location delivery and/or delivery management at the FH's drop off points) and relative information management with order consolidation for each producer and customer order management;
- Marketing. Recruitment of producers and consumers, internal communication management, product identity and branding activities, as well as sales management;
- Community engagement. Communication with farmers and consumers to identify needs for the following season, collaboratively planning cropping. Organising social events to allow meetings and engender trust between farmers and consumers. Creating and promoting educational programmes and training events.

One of the main role played by Food Hubs is building an effective information flow and transparency among the actors adhering to this form of AFN [14].

The advancement of the ICTs and the rapid growth of e-business have offered the space for new business models that, in line with FHs' objectives, allow for novel ways to create, co-produce and distribute value. The adoption of ICTs and its support to the

supply chain management represent a great opportunity to assist the operations of Food Hubs [6]. FHs can take advantage of services and functionalities that allow them to manage inventory and online catalogues, allowing consumers to place online orders and carry out payments, supported by order processing and logistic activities. ICTs enable FHs to establish connections between buyers and sellers and to share data among all the parties in the network. As Barham et al. stated, “it is not coincidental that the emergence of the regional food hub concept is occurring at a time when technology is increasingly accessible and portable” [14].

The overall online FHs’ value proposition relies in reducing search, transaction and coordination costs for buyers and sellers adopting an online food hub model that has been defined by Horst et al. [13] as an “internet-based online directory and marketplace that fosters efficient connections between local and regional food producers and consumers”

3 Two case studies from the South West England

The case studies were two FHs initiatives both located in Gloucestershire, a predominantly rural County in the South West England. The two FHs are respectively Stroudco CIC and Dean Forest Food Hub Ltd. On February 2017 by the means of semi-structured interviews to FHs key members; we collected data on the FHs’ structure, their processes, the volume of their trading activities and on how the adoption of the ICTs affected the operations and coordination management activities in both the case studies. The interviews were oriented to investigate the main actors, and processes, as well as the impact of the ICTs in terms of enabling a better information flow management both for decision-making and for operational processes.

3.1 Stroudco

The Stroudco Food Hub is a member-owned Community Interest Company (CIC) jointly controlled by all its producers and consumers members. It started its trading activities in 2009 in Stroud by launching its internet-based food hub system. The town of Stroud has a population of 13,260 inhabitants (2011 census) and displays socio-economic characteristics typical of English semi-rural communities. The area is well known for its long established local food movement which includes one of the most popular farmers’ market in the UK, as well as a community-supported agriculture (CSA) project and a co-operative allotment project of national importance [17]. In this context, in 2008, two local food activists set up a community-led FH. The Stroudco’s value proposition was to provide, locally produced food to low-income households living in a specific area of Stroud who were not able to afford the products sold in the Stroud’s farmers market. At the same time, the business model was oriented to give to local producers (located within 15 miles of Stroud), who could not be engaged in the other AFNs in Stroud, to access a local market at higher than wholesale prices. The aims were to build connection between local consumers and producers, to develop a more sustainable local food culture and resilient community. Central to the Stroudco

were the adoption of a web-based ordering system, to manage supply and demand of local food, on fixed order cycle, combined with the use of a school hall, located in a deprived area, as the drop off point for producers and pick up point for consumers.

The initiative received a grant of approximately £70,000 for the development of FH's web-based platform and for the set-up costs.

To guarantee the economic sustainability of the initiative, the FH has adopted a revenue model based on two sources of income: consumer households pay a membership fee of either £2 per month or £1 per order, plus £2 if they choose for the home delivery service, and producers pay 8% of gross sales made through Stroudco.

In their first year of trading 8 producers and 20 consumers were engaged in the FH as members to run monthly trading activities. After few years, the marketing activities were oriented to recruit new members from across Stroud to reach a critical mass of orders. Moreover, the range of available products was broadened with the inclusion of non-local foods provided by a wholefood wholesaler, with a mark-up at 28% above wholesale. Stroudco also employed a manager to carry on the day-to-day running of the hub with the support of some volunteer. Currently, the number of Stroudco member has reached almost 500 consumers and 60 producers, with the number of collected orders ranging from 20 to 50 per week.

Central to Stroudco is an internet-based administration system. Stroudco started its activities adopting a self-designed system, developed as an open source project, free and easy to copy. On May 2016, the FH switched to a new platform named Open Food Network (OFN) UK, a software platform supporting food hubs management and operations, provided by the global not-for-profit foundation Open Food Foundation and customized by some of the FH's members. The new platform is enabling the food hub to manage in a more user friendly and efficient way their main processes and operations. The OFN UK platform offers functionalities to the FH's suppliers, who are trained by the members directly involved in the customization of the new platform in managing their own description and contacts, as well as their catalogue by controlling products descriptions, prices, and their stocks. Consumers can join Stroudco and, through an online shop front, get information about producer, products, the full price breakdown, as well as order and paying. The platform offers to the FH's management staff tools to set the order cycles, to add mark-ups and shipping fees, orders consolidation and procurement as well as order fulfilment. The platform also provides tools for Customer Relationships Management (CRM) and for reporting. The Stroudco allows the direct communication between consumers and producers through a blog. Furthermore, through the web portal and the newsletter, Stroudco advertises the social events organized to foster the relationships and connections among its members.

3.2 Dean Forest Food Hub

The Dean Forest Food Hub is a workers' co-operative and a social enterprise. It started its operations on July 2013 thanks to the initiative of two of the eight key members who currently manage and control the FH. The project started without any founding grant, but with the support of Stroudco that helped by providing advice on the FH model and

the Stroudco software. The software was then set up and customized by one of the founders who has a background in software engineering.

The area of Forest of Dean surrounds the second largest Crown Forest in England with 110 Km² of mixed woodland. It has not traditionally been an agricultural area and, in contrast to Stroud it is not characterized by the presence of many AFNs schemes and people in the area found difficult to access to fresh local produce. Spreads around the forest are a large number of un-connected market gardens, orchards, cheese makers, and meat producers. The objective of the Dean Forest Food Hub is to provide everyone in the Forest of Dean to access affordable, quality local food that is fair for the producer. The FH's value proposition is to provide a web-based platform representing a single place to source food from over 20 local producers, whose sustainability is checked by the FH's staff, in an easy and convenient way. The FH provides a network of 11 accessible pick-up points located around the forest. At the same time, the FH provide to producers a platform to access the local market in an efficient way aggregating orders coming from several consumers on a weekly order cycle and providing a single drop-off point. The model adopted by the FH is a low margin model in which producers set the sale price. The FH works to link farmers with each other, with farm tours for exchanging ideas on best practice, as well as to connect consumers and producers with social events like the "Forest Food Hunt". The FH also uses a forum and social medias to foster interaction among people engaged in the initiative.

The revenue model is based on the income provided by the margin of 10% on the sale price for the local produce and a mark-up of 40% for non-local products. In addition, the home delivery service entails a £2.50 charge.

In July 2013, the Dean Forest Food Hub started its trading activities with just one producer and a few consumers ordering 3-4 boxes per week, with volunteers running it. Now the number of producers has grown to 20, with 600 registered consumers and 3 people have been employed. The FH is collecting an average of 50 orders per week for an average value of £4,400 per week and these numbers are growing every years especially after the Dean Forest Food Festival held every autumn.

At operational level, similarly to the Stroudco FH, the Dean Forest Food Hub is analogous to an online farmers market, opening and closing at a fixed time each week. Producers register to the online platform and get a producer agreement electronic survey to fill in. Then, they decide whether they prefer to be trained to manage their own page where they can describe their production methods, list their produce for sale with stock levels and prices, or if they prefer, allow the FH's staff to do that for them. Consumers can buy from the list of produce available up to three days before the food drop, as well as directly contact producers to ask any questions. FH's staff then process consumers' orders collected and registered through the web system and each producer receives its own order. In this phase, FH's staff communicates with producers located close to one another and involved in the same order to facilitate a joint delivery to the FH's drop-off point. Producers have two days to deliver their products to the drop-off point provided by the producer who was the first to be engaged in the FH initiative. Then a team of roughly 30 volunteers and the FH's staff pack everything into the right boxes according to the picking lists generated by the software. When all the boxes are ready, the FH's staff, according to a shipment roster, distribute them to the network of pick-up points, or, if consumers opted for the service, they provide home delivery. All the sales data are stored and every season analysed by the FH's staff. The FH produces

a seasonal sales report to review results with producers, identify any gaps in supply or demand, and identify needs for following season to carry out a pre-season crop planning.

4 Discussion

This study let us to positively confirm that ICTs represent a useful tool for supporting sustainability initiatives within local food supply chains supporting the rise of new business models such as the online FHs adopted by the initiatives we investigated (RQ1). The adoption of online FH models helped FHs to reduce their operational costs. We observed that the web platforms adopted by the two case studies, with different levels of sophistication, allowed the FH initiatives to be more efficient as well as automating and standardising processes, supporting volunteers whose help in carrying out FHs activities. The adoption of ICTs enabled the two FHs to face the challenges imposed by the complexity of activities typical of FHs and including the management of seasonality and perishability of products, the inconsistency and unpredictability of supply, working with multiple suppliers and having multiple incoming and outgoing logistics (RQ2). With the timely provision of salient information, as in the case of the Dean Forest Food Hub, networked actors are enabled to optimize their logistical activities. In terms of social benefits, ICT solutions help foster better relations between consumers and producers. By improving the flows of information, good practices are shared and the isolation of small business overcome. While forums and social media foster online communities linking consumers to one another and to producers,.

5 Conclusions

From the case studies above, we make the following observations:

Firstly, this type of FH is often dependent on donations, grant funding and voluntary work, which limits the model's overall resilience. ICTs could play an important role in lowering costs and making it easier to establish a FH. Simultaneously, leveraging on their capacity to aggregate local productions, the FHs could differentiate their business model by wholesaling food to institutional buyers such as schools, in addition to retailing food to households. In this case, the adoption of an online auction tool allowing buyers to get information to attain the produce they desire could be beneficial.

Second, confirming Matson & Thayer's studies [7], FH seem to be a successful business model when it addresses the needs of local food deserts. In the Dean Forest Food Hub, consumers perceive the FH as the most convenient way to source local fresh food, in the absence of other AFNs, and the initiative has more opportunities. While the Stroudco FH showed some limits in the scaling up of the initiative that can be due to the presence of other popular AFNs in Stroud. The argument could be made that there is currently a degree of saturation in the alternative food market of the region and people prefer to be engaged in face-to-face interactions occurring in other forms of AFNs.

The study is limited by the lack of data on how consumers and producers perceive online FHs and a deeper analysis of what are the main factors limiting the scaling up of such initiatives. Confronting this question, observed by others in initiatives in UK, and in other countries, would help us to investigate if the online FH model is sustainable and if people could rely on it as the sole source of their food.

This paper is an exploratory study aimed to deepen the knowledge on FHs and the role ICTs play in fostering the rise of new forms of AFNs, we are conducting further research aimed at overcoming limits of the present work as well as to explore the potential of mobile applications in the context of local food. These technologies might offer the exchange of contextualized knowledge, which might overcome limits of the current model with sporadic direct meetings, and persuade more people in to choose the online FH, thus helping the initiatives to scale up.

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