Alternative Food Networks in Urban Contexts
a System Dynamics Approach

Stefano Menegat

McGill University – Montreal (Canada)

stefano.menegat@mail.mcgill.ca

Alternative Food Networks in Urban Contexts, a System Dynamics Approach – Abstract

In recent years many studies have investigated the field of Alternative Food Networks (AFNs) in order to understand the potential of such experiences in providing urban food needs through the implementation of ecological production techniques and short supply chains.

This study aims to provide an estimation of farmers' markets diffusion potentiality through the implementation of a system dynamics model. Farmers' markets are one of the most consolidated experience of AFNs in industrialized countries, and the model implemented has been oriented to represent the complexity of the systems involved in the diffusion of these particular kind of short supply chains. The model has considered the interactions between four sub-systems: a demand model, a supply model, an interaction module and a segmentation scheme. Then two case studies are investigated on a 15 years simulation. The analysis of both case studies has outlined the limited potential of farmers' markets in providing urban food needs, because of several barriers hinder the diffusion dynamics of such form of direct marketing: first point, the supply doesn't match the demand requirement, because of a general rigidity among producers to undertake the production conversion. Second point is the length of the growing season, which can be a constraint to the farmers' markets growth in terms of market share. Some conclusions are then proposed with a focus on the political agendas voted to promote sustainable local food systems.

1. Introduction

Population growth and growing material conditions for millions of people living in developing countries will require a 60 percent growth in the output of agrifood systems by 2050 (FAO, 2013). Many studies suggest that it will be impossible to reach this goal without adding pressure on ecosystems, worsening the climate change-related problems and increasing water sources degradation (FAO, 2011; Worldwatch Institute, 2013; MA, 2005). Furthermore, recent analysis have shown that in western countries it will be difficult to achieve increases in crop yields, because of a technological plateau in modern industrialized agriculture which hinders additional productivity gains (Grassini *et al.*, 2013).

2. Motivation and objectives

In recent years many studies have investigated the field of Alternative Food Networks (AFNs) in order to understand the potential of such experiences in providing urban food needs through the implementation of ecological production techniques and short supply chains. Defined as a form of social innovation which is developed between producers and consumers, they include direct marketing, Community Supported Agriculture programs (CSA), farmers' markets, community self-organized schemes, transition networks (Goodman *et al*,. 2012). Several analysis have provided evidences that AFNs generate environmental benefits, through the reduction of production and distribution impacts; economic benefits, in terms of wealth and jobs created for the local community; and social benefits, in terms of reduction of public diseases like obesity and in terms of social relationships construction (Pretty, 2001; Otto & Varner, 2005; Brown & Miller, 2008; DeWeerdt, 2009; Martinez, 2010; Bimbo *et al.,* 2012; Franco & Marino, 2012; Marino & Cicatiello, 2012; Santini & Gomez y Paloma, 2013).

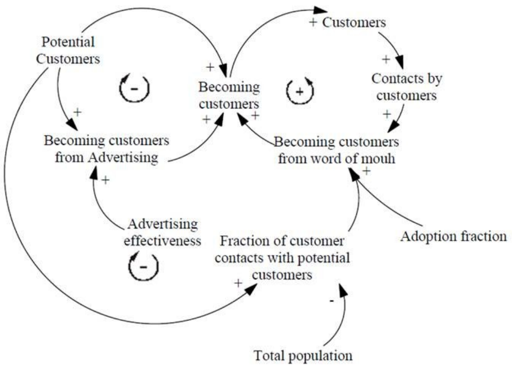
This paper aims to provide an instrument to evaluate the AFNs possibilities to become a relevant component of urban food systems in industrialized countries. The analysis is oriented to explore the diffusion dynamics of farmers' markets, one of the most consolidated examples of AFNs in industrialized countries. Short supply chains, direct marketing and farmers' markets are subjects well known among customers in Europe and North America. Local and organic food is generally assumed to be healthier, more environmentally friendly and tastier than conventional standard products (Marsden, 2004; Hardesty, 2008; Onozaka *et al*., 2010). However there is still uncertainty in these fields, especially about some claimed environmental benefits, like in the case of greenhouse gases emissions (Coley *et al.*, 2009). Despite this, farmers' markets are attracting more and more attention by public opinion, policy makers and scholars. The number of markets is growing exponentially in many contexts (USDA, 2013), but there are no evidences supporting the hypothesis that this trend will keep growing up in the future.

Many factors can hinder this dynamics, first of all the market saturation which could be closer than supposed; second, the incomplete information held by suppliers which could inhibit the production volumes to correctly meet the demand requirements; third, the affordability of local organic food which could be compromised by high prices or other variables. In order to investigate these issues it is useful to adopt a modelling approach designed to catch the complexity of the systems involved in the analysis. Through the use of quantitative inputs a system dynamics model returns different scenarios about the evolution of the initial conditions provided. While several researches have investigated the supply side and the ecological production choices among farmers from a systemic point of view (Shi & Gill, 2005; Rozman *et al.*, 2009; Li *et al.*, 2012), this analysis has not been implemented yet for the dynamics involving distribution schemes.

3. Methodology and model description

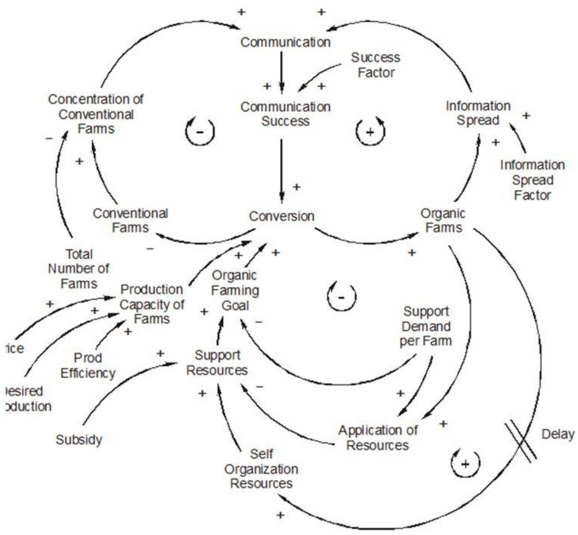
System dynamics is a methodology existing since the mid-1950s (Forrester, 1958) and it has been widely used in the analysis of business cycles (Forrester. 1976), environmental modelling and socio-economic ecological simulations (Meadows *et al.*, 1972; Ford 1999; Sterman 2000). For the purpose of this study two main references have been used: an innovation-diffusion model (Bass, 1969; Sterman, 2000) and an organic farming development model (Rozman et al., 2009).

Fig. 1a.Bass model CLD.



Source: Sterman, 2000.

Fig. 1b. Organic farming development model.



Source: Rozman et al., 2009

Figure 1a and 1b show the Causal Loop Diagrams of the models considered in this study. Figure 1a represents the Bass diffusion model, which has widely used in System Dynamics with reference to the diffusion of sustainable products (Ford, 1999; Santa Eulalia et al., 2011; Massiani, 2011) and consumption behaviours (Winkler et al., 2012). Assuming that Alternative Food Networks are a form of social innovation (Seyfang, 2006) which shapes consumers' attitude towards farmers' markets, a modified Bass model has been included in this study in order to simulate the diffusion dynamics of adopters of such form of direct marketing.

Figure 1b shows the Causal Loop Diagram of the model proposed by Rozman et al. (2009) oriented to analyse effective policies scenarios of ecological agriculture development among farmers. The model, which has not been modified in this study, is framed on several key-variables featuring a regional context, which include: the number of conventional farms; the number of organic farms; the conversion dynamics; the implementation of subsidies schemes; the promotion of organic farming in terms of market development, marketing or education; the organization of general organic farming support environment; a system of self awareness; the delay constants of process changes. The relationships between the demand side (Bass model) and the production side (Organic Farming model) are managed by several links and feedback loops which will be presented in next paragraph.

3.1 Model implementation

As above mentioned, the production system and the innovation diffusion system are integrated in the model implemented. While the production module has not been modified (because of the fact that it is well suited for the aims of the analysis), the diffusion module is integrated with several components. The whole model is based on four modules: the modified Bass model (demand), the organic farming development model (production), the interaction module (supply) and the market segmentation scheme. According to the general macroeconomic framework the consumption scheme influences the production choices, through the specific composition of consumers' preferences (utiliy). Local organic farms are also subject to an utility function, which can improve or hinder their attitude in selling their produces at farmers' markets.

Under normal conditions, demand expressed by customers matches the supply provided by producers, giving the total amount of farmers' markets sales for each step of the simulation. Comparing these values with the total sales amount in the food market allow to calculate the market share reached by farmers' market in the local market.

The stock-flow diagram (Figure 2) uses the notation provided by the Powersim simulation software. Each variable is in relationship with the others through differential equations. The main behaviours and interactions of the model are described as follows:

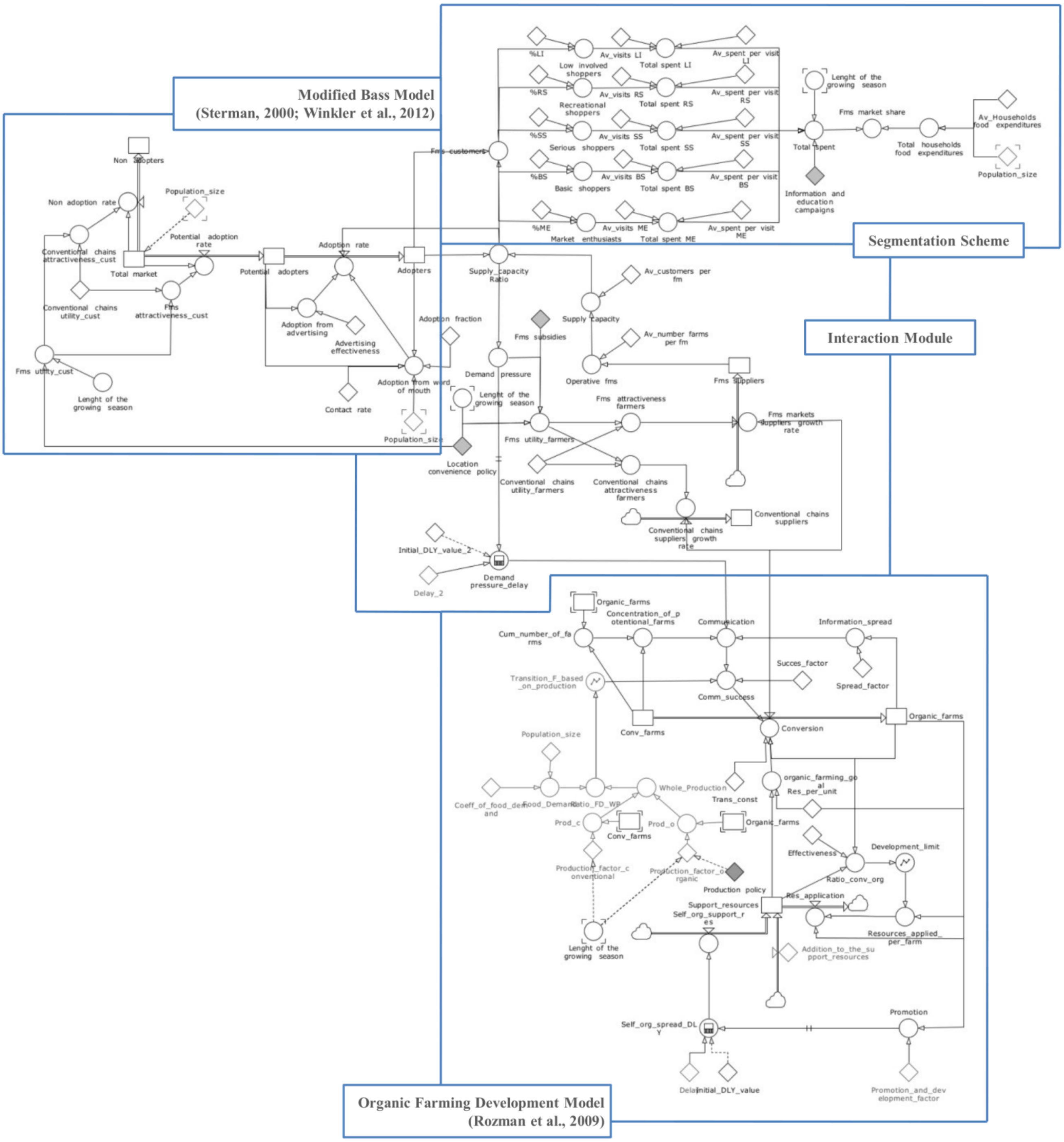


Figure 2. Farmers markets diffusion model - Stock Flow Diagram

The innovation diffusion dynamics is subject to a preliminary estimation of the potential adopters, based on two utility functions giving the attractiveness of conventional retailing systems versus farmers' markets. As shown in Winkler et al. (2012), a discrete choice mechanism can be included in this first assessment, but in the analysis here proposed utility functions are simplified because of the unavailability of specific data. The only factor influencing dynamically the utility of both retailing systems is the length of the growing season, which is positively associated with the development of farmers' markets. The first outcome of the diffusion model is the number of potential adopters, who are subject to the innovation diffusion dynamics as described in Sterman (2000). New adopters are derived from the total number of adoption from advertising, which are expected to be very low as discussed in Baker et al. (2009), and the total amount of adoptions from word of mouth.

The resulting number of adopters is directly compared with supply capacity provided by operative farmers' markets, and indirectly (through the demand pressure factor) with the farmers' markets attractiveness for organic farms and organic farming attractiveness for conventional farms. Farmers' markets utility for farmers is also positively influenced by the length of the growing season, which is correlated with the organic production factor in the production model. This one, the production model, gives the growing rate of organic farms, which are allocated in the conventional retailing systems or in the farmers' markets system through another simplified discrete choice scheme. As discussed in Rozman et al. (2009), the conversion of conventional farms to organic ones takes into account the market absorption model, which is based on the support resources available and the organic farming goal. The interaction between demand and the supply of organic locally grown food is not regulated through the support resources variable, because, it is assumed, local market is only a small percentage of total organic market. Then, demand pressure for local produces directly increases, or hinders, the communication process which is responsible for the conversion success.

Organic farms growing rate and farmers' markets attractiveness give the total amount of FMs suppliers. Through the average number of farms per market and the average number of customers per market it is than calculated the supply capacity. Adopters and supply capacity allow to calculate the total amount of customers. According with Elepu & Mazzocco (2010), farmers' markets customers can be segmented in five different behavioural profiles: "Low Involved", "Recreational Shoppers", "Serious Shoppers", "Basic Shoppers" and "Market Enthusiasts". Each segment is characterized by an average number of visits per season ("Av. Visits") and an average quantity of money spent for each visit ("Av. Spent per Visit"). The output of the module is the "Total spent" by all the customers for each period of simulation. Comparing these outcomes with the total amount of households' spending in food produces, is possible to calculate the size of farmers' markets market share.

3.2 Model calibration, data sources

The general structure of the model has been calibrated with second-hand data, derived from different sources. The demand module includes inputs related to the consumers' attitude towards patronizing farmers' markets, the effects of communication and advertising campaigns (Baker *et al.*, 2009; Council of Atlantic Premiers, 2008) and the role played by the word of mouth system in attracting more customers (Govindasamy *et al.*, 1998; Kuches *et al,*. 1999; Nayga *et al.,* 1995; Sterman, 2000; Hunt, 2007). The attractiveness of farmers' markets among households has been quantified using data from Bond *et al.* (2006), Zepeda *et al.* (2006) and Zepeda (2009). Latvala (2010) has estimated the willingness to pay a premium price for locally grown organic products with reference to trust issues in food chains, and these values have been included in the model. The segmentation scheme uses the customers' classification proposed by Elepu & Mazzocco (2010), while constants related to supply capacity are derived from Marino & Ciccatiello (2012). Other variables, like the population size, the length of the growing season, the number of conventional and organic farms, and the production factors, have been directly collected for the case studies.

4. Scenario Analysis

4.1 Study Areas

The Turin metropolitan area is located in North West of Italy, covering approximately 6800 square kilometres. The urban context collects the 77 percent of the 1.058 million households living in that area. The average household's food expenditure is US$ 151 per week. In the region there are 335 operative organic farms and 14797 conventional farms. The growing season is 200 days long.

The metropolitan area of Montreal in Canada includes about 1.473 million households, mainly concentrated in the urban perimeter. The average household's food expenditure is US$ 151 per week. In the region there are 46 operative organic farms and 1796. The length of the growing season is 160 days per year.

There are two major differences between the two case studies: the number of conventional farms, which is drastically lower in Montreal case because of the slightly smaller dimension of the administrative area and the larger size of the average farm, and the length of the growing season, which is shortened, in the case of Montreal, by the long winter season.

4.2 Standard Run Scenario

After applying the above mentioned conditions at the model, two scenarios are explored, both on a period of 15 years. The Turin and the Montreal case studies show several similarities.

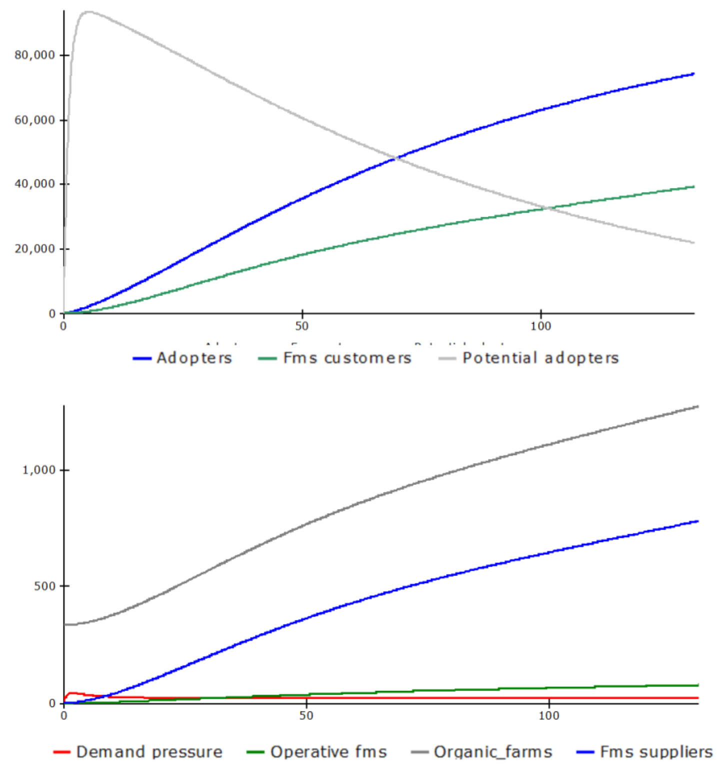
As shown in Graph 1 and 2 the demand dynamics appears growing in both cases. After 3 years in the case of Montreal the "Customers" growth rate is slowed down by the progressive saturation of the supply capacity. In fact, as reported in graph 1a, while "adopters" are growing with a relatively linear trend, "Fms customers" are stagnating.. This behaviour is related to the "Operative fms" growing trend, which is hindered by the insufficient growing in "Organic farms". Organic farms, and, consequentially, "Fms suppliers", follow an S-shaped curve which reaches a plateau in the early stages of the simulation. Demand pressure is not sufficient to boost the conversion dynamics, and, in the meantime, it is not efficient to improve Fms' suppliers growth, which are constantly about a half of the total amount of organic farms.

In this case the barriers affecting farmers' markets diffusion are strictly related to the dynamics of reinforcing loops, which are weakened by the small amount of conventional farms and the relatively short growth season, which carries effects both on the productivity of organic farms and attractiveness of farmers markets both for customers and suppliers.

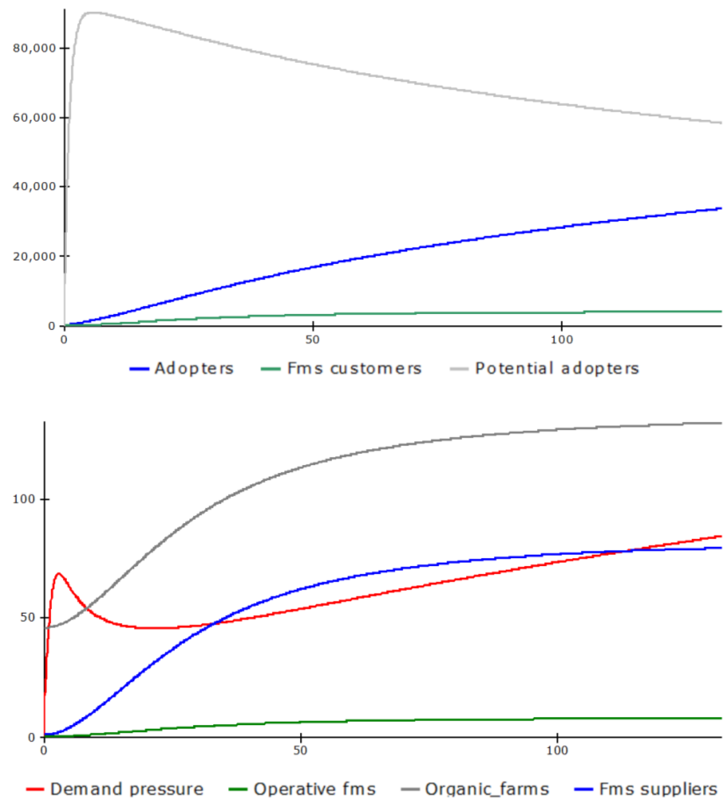
At the end of the simulation only few thousands of adopters are satisfied by supply, while about 30,000 adopters have no access to an adequate offer of farmers' markets. During the period the number of organic farms has increased about 100 units, and the new operative farmers' markets are about 8. In this context farmers' markets market share is not significant.

Turin case offers a different perspective (graph 2): the growth in the number of organic farms and farmers' markets suppliers is more incisive than in the Montreal case, allowing more than an half of the total amount of "Adopters" becoming "Customers". In contrast with the Montreal scenario, the Turin example shows the effectiveness of reinforcing loops in improving the growing rate of organic farming and farmers' markets attractiveness, both for customers and producers. With about 40,000 customers and 79 operative markets, Turin scenario reaches the 5% of total food market share. The above mentioned factors, boost in the case of Turin the conversion of the multitude of conventional farms to organic production and increase dramatically the farmers' markets utility both for customers and suppliers. However, also in the Turin scenario, the unsatisfied demand at the end of the 15 years period results about an half of the total demand.

Graph 1. Turin scenario Standard Run



Graph 2. Montreal scenario Standard Run



The simulation “standard run” has shown several challenges in developing a market for farmers' markets and AFNs. Two main barriers affect the diffusion dynamics of such experiences . In any case, as mentioned in the introduction, the fact that positive externalities could emerge by improving the role of farmers' markets in local food market should justify a policy intervention oriented to remove the barriers affecting the farmers' market diffusion and stimulating the weak links of the local supply chain.

4.3 Policy intervention scenario

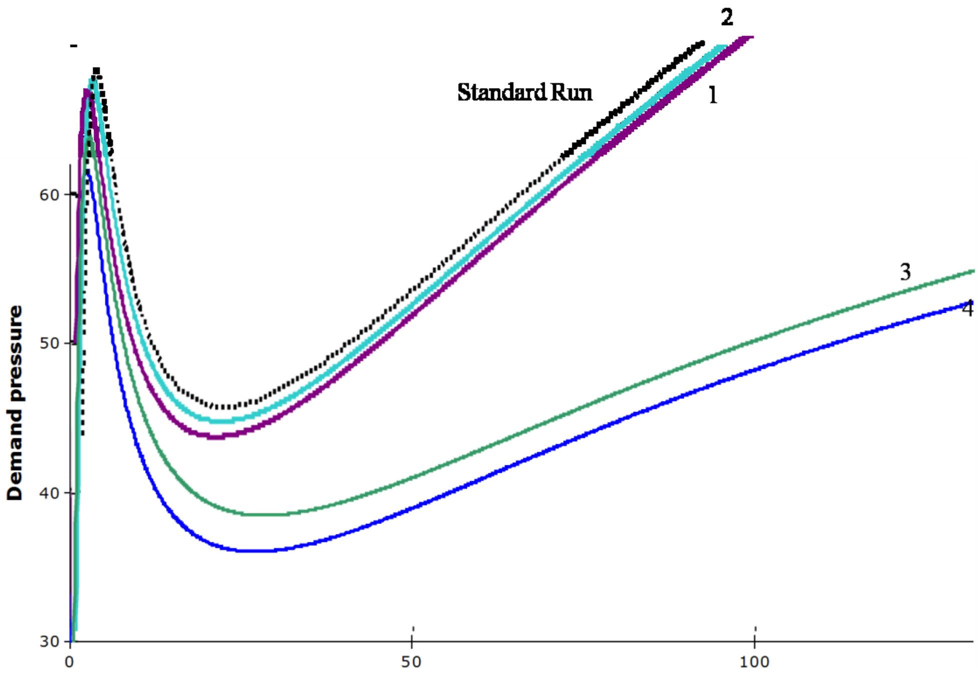
Because of the difficulty in facing some of the above described barriers, like the length of the growing season, it can be useful to consider at first other fields of interventions like economic instruments in order to improve farmers’ utility towards selling their produces at farmers’ markets, production policies, oriented to boost organic farms productivity, and location convenience policies, intended to boost farmers’ markets utility both for customers and producers (tab. 1).

Table 1. Hypoteses of policy intervention

Policy instrument –activated variable	Related scenario
Location Convenience Policy	1
Incentives	2
Production policies	3
Complete policy 1) + 2) + 3)	4

The goal of the policy intervention scenario is to simulate alternative tools in order to maximize the efficiency of local food system. In these sense the variable “Demand Pressure” requires to be minimized over the simulation period. In fact, if the unsatisfied demand is declining, demand pressure will decline too. Three scenarios are simulated for the three policy intervention while a fourth scenario represents the simultaneous activation of all the policy instruments at the same time.

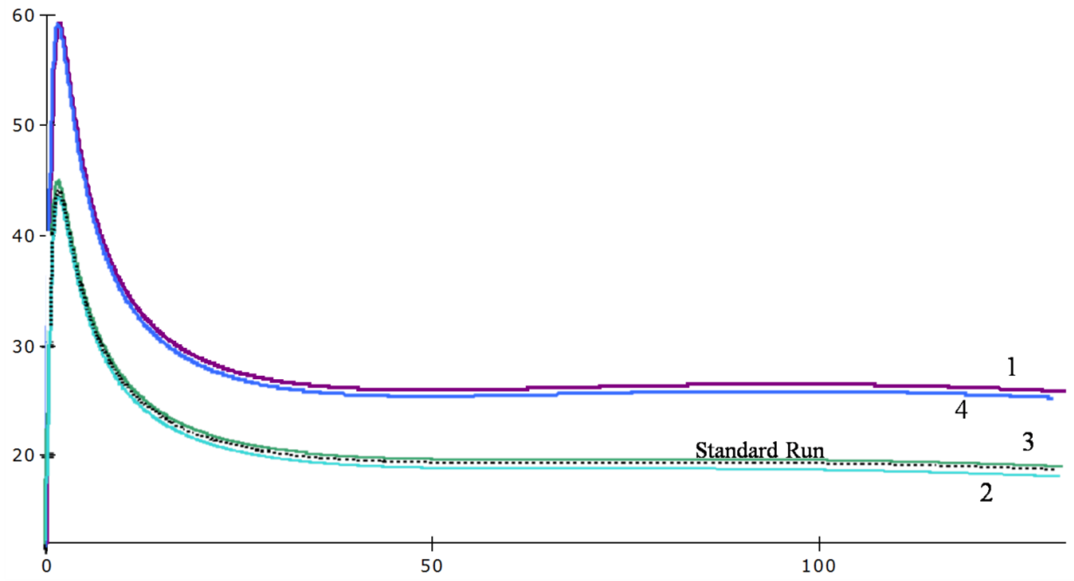
Graph 1. Efficieny scenario – Montreal case



As shown in graph 2, the most effective policy intervention is the third, the introduction of "production policies" oriented to improve the organic farming productivity. While the hypothesis 1 and 2 have a marginal effect on the standard run scenario, the three instruments applied together show an important result in terms of efficiency. Simulation figures about 1.4% of total food market share related to farmers' markets, with 161 suppliers and 16 operative markets. However, also in this case Montreal shows several limits in providing urban food needs. A strategy to radically improve the success of farmers' markets and organic locally grown food is than to widen the boundaries of local food system, designing, for example, local food districts (administrative regions) which should include rural areas and with which urban centres should coordinate politic initiatives for the development of sustainable local food systems.

The Turin efficiency scenario, on the opposite side, shows a complex situation (graph 3). Policies oriented to improve organic farms productivity (3) and incentives to farmers to sell their produce at farmers' markets (2) have a little effect on local food system efficiency, while interventions on the location facilities (structures, services, etc..) worsen the ratio between satisfied and unsatisfied demand.

Graph3. Efficieny scenario – Turin case



This results can be related to a context in which is operative a multitude of conventional farmers, and the signals coming from demand are not well received by potential suppliers. In such case, improving demand attitude towards organic locally grown food is not necessary, while delays and the insufficient organic farming attractiveness hinder supply responsiveness.

In order to implement a more efficient local food system in the Turin case, one way could be a policy intervention on the conversion rate of conventional farms to organic production. For example, estimating the whole amount of negative externalities avoided thanks to organic farming and direct marketing, could provide policy makers with a quantifiable stock of resources to be allocated as incentive to drive conventional farms towards the organic production and farmers' markets patronizing.

5. Conclusions

The model has considered the interactions between four sub-systems: a demand model, a supply model, an interaction module and a segmentation scheme. Then two case studies are investigated on a 15 years simulation. The analysis of both case studies has outlined the limited potential of farmers' markets in providing urban food needs, because of several barriers hinder the diffusion dynamics of such form of direct marketing: first point, the supply doesn't match the demand requirement, because of a general rigidity among producers to undertake the production conversion. Second point is the length of the growing season, which can be a constraint to the farmers' markets growth in terms of market share. These considerations allow us to purpose some conclusions:

1. Urban contexts without large portion of rural areas in the neighbourhood and with a scarce number of farmers will require the implementation of an administrative agenda oriented to include in urban food policies other administrative regions. The policy instruments tested within this study have shown a certain grade of efficiency, but the outcomes of the simulations in terms of supply capacity and demand satisfaction are insufficient.

2. Urban contexts with favourable climate and with a significant number of farms and arable land in the neighbourhood are advantaged, but also in this case urban food needs are not completely satisfied by supply. Because of several barriers and delays in communication between demand and supply, the

proportion of unsatisfied customers is near the 50%. The policy agenda discussed within the Turin case study, has no positive effects on the diffusion dynamics of farmers' markets. In this case an effective instrument would be the introduction of subsidies for the transition from conventional farming to organic farming.

However, the discussion about the possible ways to satisfy urban food needs in next decades should include the potential role that farmers' markets can play. The instrument developed within this study could be used to implement ex-ante policy assessment and long term strategy analysis which could found application also to the other AFNs systems, including CSA schemes. Despite this, other fields of investigations should be taken into account by policymakers and scholars in order to face the complexity of local agrifood systems. This study has suggested that farmers' markets and direct marketing initiatives would not be sufficient to ensure the satisfaction of demand of organic locally grown produces, therefore further investigations should evaluate the potentiality of traditional retail systems in satisfying such needs. The model proposed in this paper could be adapted to analyse the development strategies of traditional retailing systems which have to solve several issues before to be operative on the local organic markets. For instance, some major questions are related to the supply structure and the capability of producers to provide produce volumes and quality standards at the price required by the market, or the management of short supply chains instead of less expensive long industrialized supply chains (King *et al.*, 2010).

References

Agriculture and Agri-Food Canada. 2013. *Canada Certified Organic Farms 92-2009* (available at www.agr.gc.ca).

AnAU. 2011. *Data Warehouse*. Anagrafe Agricola Unica del Piemonte (available at: www.sistemapiemonte.it/fedwanau/elenco.jsp).

Baroni, L., Cenci, L., Tettamanti, M., & Berati, M. 2006. Evaluating the environmental impact of various dietary patterns combined with different food production systems. *European Journal of Clinical Nutrition*, 61(2): 279-286.

Bass, F. 1969. A new product growth for model consumer durables. *Management Science* 15 (5): p215–227.

Baker, D., Hamshaw, K., & Kolodinsky, J. 2009. Who shops at the market? Using consumer surveys to grow farmers markets: findings from a regional market in north western Vermont. *Journal of Extension*, 47(6): 1-9.

Bimbo, F., Viscecchia, R., & Nardone, G., 2012. *Does the alternative food supply network affect the human health?*. In: 126th Seminar, June 27-29, 2012, Capri, Italy (No. 126060). European Association of Agricultural Economists.

Bond, J. K., Thilmany, D., & Bond, C. A. 2006. Direct marketing of fresh produce: understanding consumer purchasing decisions. *Choices*, 21(4): 229-236.

Brown, C., & Miller, S. 2008. The impacts of local markets: a review of research on farmers markets and community supported agriculture (CSA). *American Journal of Agricultural Economics*, 90(5): 1298-1302.

Coley, D., Howard, M., & Winter, M. 2009. Local food, food miles and carbon emissions: A comparison of farm shop and mass distribution approaches. *Food Policy*, 34(2): 150-155.

DeWeerdt, S. 2009. Is local food better?. World Watch Magazine Vol. 22, No. 3. Washington DC (available at www.world-watch.org/node/6064).

Elepu, G., Mazzocco, M. 2010. Consumer segments in urban and suburban farmers markets. *International Food and Agribusiness Management Review*, 13(2): 1-18.

FAO. 2006. *The double burden of malnutrition: Case studies from six developing countries.* FAO. Rome.
FAO. 2013, *Statistical Yearbook 2013*: *World Food and Agriculture*. FAO. Rome (available at www.fao.org)
FAO. 2011. *World Livestock 2011: Livestock in food security*. FAO. Rome (available at www.fao.org).
Forrester, J.W. 1958. Industrial dynamics: a major breakthrough for decision makers. *Harvard Business Review,* 36 (4): 37–66.
Forrester, J. W. 1976. Business structure, economic cycles, and national policy. *Futures,* 8(3), 195-214.
Ford, F. A. 1999. *Modelling the environment: an introduction to system dynamics models of environmental systems*. Washington, DC, Island Press.
Franco, S., & Marino, D. 2012. *Il mercato della Filiera corta. I farmers' market come luogo di incontro di produttori e consumatori*. Gruppo 2013 Working Paper Series, No. 19 (also available at www.gruppo2013.it).
Gallardo, R. K., Olanie, A., Ordonez, R., & Ostrom, M. 2012. *The Use of Wireless Capability at Farmers Markets: Results from a Choice Experiment Study*. In: 2012 Annual Meeting, August 12-14, 2012, Seattle, Washington (No. 124891). Agricultural and Applied Economics Association.
Goodman, D., DuPuis, E. M., & Goodman, M. K. 2012. *Alternative Food Networks: Knowledge, Practice, and Politics*. Routledge, London.
Govindasamy, R., Zurbriggen, M., Italia, J., Adelaja, A., Nitzsche, P., & Van Vranken, R. 1998. Farmers markets: Consumer trends, preferences, and cha-racteristics. *Parking Journal of Extension*, 52(28.3): 16-0.
Grassini, P., Eskridge, K. M., & Cassman, K. G. 2013. Distinguishing between yield advances and yield plateaus in historical crop production trends. *Nature communications*, 4.
Hardesty, S. D. 2008. The growing role of local food markets. *American Journal of Agricultural Economics*, 90(5): 1289-1295.
Hinrichs, C. C. 2003. The practice and politics of food system localization. *Journal of Rural Studies*, 19(1): 33-45.
Hughes, D. W., Brown, C., Miller, S., & McConnell, T. 2008. Evaluating the economic impact of farmers' markets using an opportunity cost framework. *Journal of Agricultural and Applied Economics*, 40(1): 253.
Hunt, A. R. 2007. Consumer interactions and influences on farmers' market vendors. *Renewable Agriculture and Food Systems,* 22(01): 54-66.
King, R. P., Miguel I. G., & DiGiacomo, G. Can local food go mainstream. *Choices,* 25.1 (2010): 4.
Kirwan, J. 2004. Alternative strategies in the UK agro-food system: interrogating the alterity of Farmers' Markets. *Sociologia ruralis,* 44.4 (2004): 395-415.
Rozman, C., Pažek, K., Kljajic, M., Bavec, M., Turk, J., Bavec, F., Škraba, A. 2013. The dynamic simulation of organic farming development scenarios‐A case study in Slovenia. *Computers and electronics in agriculture*, 96, 163-172.
Santini, F. & Gomez y Paloma, S. (Eds). 2013. *Short Food Supply Chains and Local Food Systems in the EU. A State of Play of their Socio-Economic Characteristics*. Sevilla, Spain, Institute for Prospective and Technological Studies, Joint Research Centre (available at ipts.jrc.ec.europa.eu).
Santa-Eulalia, L. A., Neumann, D., & Klasen, J., 2011, *A Simulation-Based Innovation Forecasting Approach Combining the Bass Diffusion Model, the Discrete Choice Model and System Dynamics: An Application in the German Market for Electric Cars* In SIMUL 2011, The Third International Conference on Advances in System Simulation, (pp. 81-87), October 2011.
Seyfang, G. 2006. Ecological Citizenshal Organic Food Networks, *Journal of Rural Studies*, 22(4): 383-395.
Kuches, K., Toensmeyer, U. C., German, C. L., & Bacon, J. R. 1999. An analysis of consumers' views and preferences regarding farmer to consumer direct markets in Delaware. *Journal of Food Distribution Research*, 30: 124-133.
ISTAT. 2011. *XV Censimento Generale della Popolazione e delle Abitazioni*. Istituto Nazionale di Statistica. Rome (available at www.istat.it).
ISTAT. 2014. *Banca dati I.Stat*. Istituto Nazionale di Statistica. Rome (available at dati.istat.it).
Latvala, T. 2010. Risk, information and trust in the food chain: factors explaining consumer willingness to pay. *International Journal of Food System Dynamics*, 4:691-705.
Li, F. J., Dong, S.C., & Li, F.. 2012. A system dynamics model for analyzing the eco-agriculture system with policy recommendations. *Ecological Modelling* 227: 34-45.
Marino, D., & Cicatiello, C. (Eds.). 2012. *I farmers' market: la mano visibile del mercato. Aspetti economici, sociali e ambientali delle filiere corte (Vol. 3).*Milano, Italia, FrancoAngeli.

Marsden, T. 2004. Theorising food quality: some key issues in understanding its competitive production and regulation. *In*: M. Harvey, M. McMeekin & A. Warde, eds. *Qualities of Food*, pp: 129-155. Manchester, UK, Manchester University Press.

Martinez, S. 2010. *Local food systems; concepts, impacts, and issues*. Darby, USA, Diane Publishing.

Massiani, J., 2010, *Modelling and Evaluation of the diffusion of electric vehicles: existing models, results and proposal for a new model for policy in European countries.* European School of Management and Technology (ESMT), Berlin, URL: http://ww2.unime.it/sefisast/SEFISAST/-Conference Paper_files/Massiani.pdf.

MEA. 2005, *Millennium Ecosystem Assessment, Ecosystems and human well-being*. Washington, DC, Island Press.

Meadows, D. H., Meadows, D.L., Randers, J., & Berhens, W.W. 1972. *The limits to growth.* London, Universe Books.

MIPAAF, & ISMEA-Sinab. 2014. *Bio in Cifre 2014, Anteprima*. Ministero delle Politiche Agricole Alimentari e Forestali & Istituto di Servizi per il Mercato Agricolo Alimentare. Rome (available at www.politicheagricole.it).

Nayga, R. M., Fabian, M. S., Thatch, D. W., & Wanzala, M. N. 1995. Farmer-to-Consumer Direct Marketing: Sales and Advertising Aspects of New Jersey Operations. *Journal of Food Distribution Research*, 26(1): 38-52.

Otto, D., & Varner, T. 2005. *Consumers, Vendors, and the Economic Importance of Iowa Farmers' markets: An Economic Impact Survey Analysis*. Ames, USA, Leopold Center for Sustainable Agriculture, Iowa State University (available at www.leopold.iastate.edu).

Panzone, L., Perino, G., Swanson, T., & Leung, D. 2011. Testing for the Best Instrument to Generate Sustainable Food Consumption. *International Journal on Food System Dynamics,* 2(3): 237-252.

Parfitt, J., Barthel M., & Macnaughton S. 2010. Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society B: Biological Sciences* 1554: 3065-3081.

Pretty, J. (2001). *Some Benefits and Drawbacks of Local Food Systems.* Briefing Note for TVU/Sustain AgriFood Network, November 2001.

Onozaka, Y., Nurse, G., & McFadden, D. T. 2010. Local food consumers: how motivations and perceptions translate to buying behaviour. *Choices*, 25(1).

Rozman, C., Škraba, A., Kljajic, M., Pažek, K., Bavec, M., & Bavec, F. 2009. The development of an organic agriculture model: a system dynamics approach to support decision-making processes. *International Journal of Decision Support System Technology*, 1(3), 46-57.

Shi, T., Gill, R. 2005**.** Developing effective policies for the sustainable development of ecological agriculture in China: the case study of Jinshan County with a systems dynamics model. *Ecological Economics* 53 (2): 223–246.

Statistic Canada. 2011a, *2011 Census*, Ottawa (available at www.statcan.gc.ca).

Statistic Canada. 2011b, *Avarage household food expenditure by province*, Ottawa (available at www.statcan.gc.ca).

Stegelin, F. 2012. Demand elasticity and supply flexibilities of fresh produce, and how they affect the buy local. University of Georgia. Athens, USA (available at www.aaec.ttu.edu).

Sterman, J. D. 2000. *Business dynamics: systems thinking and modelling for a complex world*. Boston, USA, Irwin/McGraw-Hill.

The Council of Atlantic Premiers. 2008. *Direct-marketing of agri-food in Atlantic Canada: Situation and Outlook*. Hlifax, Canada (available at www.gnb.ca).

USDA. 2013. *USDA-AMS Market Service Division*. United States Department of Agriculture, Washington, DC, (available at www.ams.-usda.gov).

Ville de Montréal. 2002. *City Master Plan*, (available at ville.montreal.qc.ca).

Weber, C. L., & Matthews, H. S. 2008. Food-miles and the relative climate impacts of food choices in the United States. *Environmental science & technology*, 42(10): 3508-3513.

WHO. 2012. *Obesity and overweight.* WHO Fact sheet, No. 311, (available www.who.int.

Winkler, T. J., Ziekow, H., & Weinberg, M. 2012. Municipal benefits of participatory urban sensing: A simulation approach and case validation. *Journal of theoretical and applied electronic commerce research*, 7(3), 101-120.

Zepeda, L., & Li, J. 2006. Who buys local food. *Journal of Food Distribution Research*, 37(3):

Zepeda, L. (2009). Which little piggy goes to market? Characteristics of US farmers' market shoppers. *International Journal of Consumer Studies*, 33(3): 250-257.