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5.3 Practices of urban agriculture on the metabolic frontier: cases from Geneva and Rotterdam

Colin Sage, Michiel Dehaene and Chiara Tornaghi

In the preceding chapters we made the claim that urban agriculture may help to mend the metabolic rift, re-building missing links and moving us from predominantly linear input-output relations towards more circular arrangements. What this means may be best understood by thinking through a series of examples. These examples not only illustrate the extent to which urban agriculture is implicated within urban metabolism, they first and foremost exemplify the various ways in which urban agriculture may contribute to metabolic change and strategically amend the current status quo. The discussion moves from a description of the different material and energy flows to question the political underpinnings and implications of specific choices within urban agriculture. Who benefits from improved metabolic cycles? Who gains control over resources in general and nutrients in particular? What is the direct effect on the health and well-being of individuals? The selection of examples included here encompasses professional farmers as well as community groups, microfarmers, and enviornmental activists in different European countries, and aims to exemplify how nutrient recovery (via urban agriculture) is not only crucial for mending the metabolic rift, but reveals how it happens, with which constraints and why it needs to be regulated.

Managing waste, energy and nutrient flows: the farm of Michel Bidaux

The commercially run farm of Michel Bidaux is located south of Lake Geneva on almost flat land near the French border. In 1985 Michel Bidaux joined his uncle`s farm and today he runs a business with the help of his family (wife and three children) and eight employees. The products he provides are as diverse as his customers. Beside the direct sales to consumers of his self-produced wine and chicken, he runs a company which processes chicken manure, household waste, and biomass, producing compost for his own farm as well as biogas.

Over one year about 4.000 chickens are bred within a three-month cycle. The chicks are bought from other farmers. Chickens are sold directly to consumers living in the surrounding area who order them in advance and come once every three months to pick up their share. The manure produced by the chickens goes to a biogas plant that is run by a nearby farmer.

After fermentation within plant the digested residue that comes out of the biogas plant goes back to the Bidaux farm where it is added to his local compost programme. Through the biogas fermentation the manure has lost its ugly smell. Additionally it has been sterilized and it can no longer inflame during the process of composting. The biogas obtained in the plant is used to generate electricity and the heat derived from the process is used to warm a nearby school.

The compost is used for the fertilization of 60 ha in which field crops such as wheat, barley, canola, peas and soybeans are grown. No chemical fertilizers are used for these crops the largest proportion of which is used to feed the chickens. On 3.5 ha of land grapes are cultivated for which some fertilizer is purchased. The wine is sold to nearby urban customers. All crops receive sufficient moisture through rainfall: additional irrigation is unnecessary. Moreover as a service to the local public authority the Bidaux farm offers wood cutting and roadside maintenance. Around 1700 tons of material is processed as woodchips and sold to a nearby public school for heating purposes. Some waste material is also added to the on-farm composting process which, besides the fermented chicken manure, also includes organic household waste from urban households and for which Mr Bidaux receives financial support from the city of Geneva.

It is clear that the farm is playing a role in “tightening” the energy and waste cycles in the peri urban area of Geneva. The farm reduces its dependency on external energy sources and is itself a source of renewable energy as it provides renewable biomass for the heating of the school and a local biogass plant. The farm also contributes to nutrient cycling through the co-composting of green waste and digested chicken manure. Chicken manure is a highly nitrogeneous waste, which tends to limit its use as a fertilizer (nitrogen fertilizers can be readily transported to water bodies and cause major damage, therefore their application is strictly controlled). Combining the ‘digested’ chicken manure with food waste results in a more balanced fertilizer which can be used on the farm. The balanced nature of the compost will maximize the likelihood that these nutrients will remain within the agricultural system.

Finally the farm is playing a significant role in the conversion of waste to useful products within the greater urban area of Geneva. Again the conversion of chicken waste to energy and compost is important. Due to its highly pathogenic nature, its imbalanced nutrient content and its strong odour, chicken manure can be a difficult waste to manage sustainably. This case appears to be an effective management system. Furthermore, there is the composting of green household waste and green waste from hedge cuttings. The wood fraction of the hedge cuttings is turned into biomass for energy production.

The farm of Mr Bidaux provides a good example of the multiple possibilities in building new links within the urban metabolism. Managing wastes in a sustainable manner as shown in this case study benefits the urban metabolism in several dimensions: lower energy inputs, greater nutrient cycling, reduced outputs (in terms of waste, air pollution, water pollution), and improved farm profitability. The case is representative of many examples we find throughout Europe of small enterprises that succeed turning the difficulties of working within an urban context into a potential advantage, managing the complex logistics needed to manage these different material streams. A relatively small organization, like that of Mr Bidaux, turns out to be well placed to manage the complex logistics needed to manage the different material streams, from picking up household waste, moving woodchips, moving animal feed and compost: all are optimized within the organization of the enterprise.

From closing cycles to urban metabolism: nutrient sovereignty and the right to waste

The discussion on urban agriculture has helped to bring to our attention opportunities where the agricultural sector has identified new entrepreneurial frontiers outside the traditional scope of the sector, turning what used to be considered as waste into a potential resource.

Thinking metabolically about urban agriculture opens new perspectives that are not limited to the multifunctional, and cyclical reframing of food production. Rather, it enables a growing awareness of the various ways in which food production is embedded within urban metabolism, revealing some of the processes that turn natural resources into edible goods. The question of how water, waste, material and energy cycles are handled is more than a matter of efficiency and reduction of environmental externalities, but has serious implications on the control that people living in the city can exercise over resources that play a role in food production. If the urban environment generally tends to place people in a position of dependence as far as food provisioning is concerned, urban agriculture may play a role in regaining control over the urban food system. Whether or not it does, is not simply a question of efficiency.

Various initiatives within the Rotterdam context have chosen to reframe discussions in those terms. The 2014 edition of the international Architecture Biennale 'Urban by Nature' mounted a broad discussion framing questions of urban development in metabolic terms (IABR 2014). In the run up to the show the office of James Corner (Field Operations) and the Dutch design firm Fabric were asked to conduct a large reflection on Rotterdam in metabolic terms, identifying various opportunities within a combined analysis of water, energy, material and waste flows. These resulted in various proposals including reflections on neighbourhood

urban farming (IABR 2014), and on households' kitchen waste stream recycling, but it also addressed the potential of 'mining' phosphate from the sewage system (which deals with an estimated 582 tons of phosphates per year) and from the Maas, making use of Rotterdam's downstream position within the Rhine-Meuse River system.

Perhaps even more interesting than these design exercises are the various bottom up initiatives that have emerged in the Rotterdam context. The recognition that much urban waste is actually an asset in the urban production of food is certainly very much pioneered by a number of grassroots initiatives in Rotterdam interested in alternatives to the current food system. Driven by attempts to close energy loops, sensitise the city to unsustainable farming practices (i.e. industrial meat production), establish economically sustainable urban farming (make a living out of urban agriculture), and increase food self-reliance (by creating productive landscapes), a number of projects linked to the Edible Rotterdam platform have all faced the issue of ensuring access to the nutrients needed for their farming practices.

While the Bidaux farm in Geneva reveals a successful and thriving business around a particular configuration of agreements and rights that guarantees it access to key resources (such as local waste), the Dutch context within which the grassroots projects were dealing was – to some extent - much less favourable given the appropriation of waste aimed at food production.

For example, a community garden set up in Willemstuin in Rotterdam city centre on a site due to be redeveloped, had to deal with very poor soil. How was it to improve soil fertility when financial resources to buy compost were limited? The question quickly arose: shouldn't open community gardens, which provide a number of collective benefits such as improving the appearance of the built environment, opportunities for socialising and food provisioning have the right to access free compost produced by the city council from its grass and tree cuttings in public parks? If local taxes are used to pay for the removal of grass and the production of compost surely it would logically follow that the final product should be the common property of taxpayers as use-value, and not a new commodity for the market. Within this reasoning, and jointly with other community gardens active in the umbrella organisation "Edible Rotterdam", a number of local growers have won 'the battle' for their right to a bag of compost per person, though this is hardly sufficient for the needs of a productive community garden, even if small. Willemstuin community garden is run by a trained 'compost ambassador', who aimed to set up on site a community composting area. This sounded like a perfect solution: the garden needs good soil to thrive, and every gardener, as any human

being, is an organic waste producer. Given the limited nutrient content provided by the 'civic' bag of compost per capita, the obvious next choice to improve soil quality was to bring their own home waste to the garden, to be composted, rather than disposing of the food waste through the municipal household collection system. After all, they paid for that waste in the first place: they paid for the banana skin, for the potato peels, for the tea bags, the eggs shells, and all the inedible parts of their food when they bought it. They also pay household waste collection tax, whether they produce waste or not. While this seems a rather rational choice, it is, however, legally impractical. For the city council is bound by an agreement with the incineration company to deliver an amount of cubic metres of waste per week. Consequently, if every citizen began to divert his or her waste for whatever reason, the incinerator and all the complex economy around it would have to be changed. There is also a wide range of health and hygiene regulations related to the urban travel of waste. As a consequence, Willemstuin's gardeners do not have the right to move freely with their bag of kitchen waste to bring it to the garden. Their community compost, and with it the aim of closing nutrient loops for their food growing project, is consequently facing some difficulties.

Willemstuin is not the only project struggling to retain or to access community waste. The Pig House had gone through similar troubles: funded with an arts grant a group of environmentalist-artists set up a pig sty in a city square, with the aim of raising awareness about the meat industry. The local community had planned to feed the pigs with their own kitchen waste for two years, and would then have been involved in slaughtering the animals, and sharing the meat. While pig rearing is an efficient way to dispose of kitchen waste, and the 'emotional bundle' related to rearing-slaughtering-eating was a brilliant tool to bring attention to animal rights, industrial farming and ethical/sustainable consumption, the project encountered a whole range of obstacles that impeded its full development and required lengthy negotiations with the council around permission to keep and move urban waste across the neighbourhood.

As we can see, when waste becomes more widely recognised as an asset, a number of competing groups advance demands for its use. Now, let us imagine for a moment that Bidaux's farm was located in Rotterdam, a city where the promises of the circular economy are very much known by a wide number of actors: the grass cutting and tree pruning that he is paid to take away in Geneva, as a service, would likely be seen as a matter of contention in Rotterdam, requiring a range of new policy arrangements.

Another, perhaps even more controversial example related to the circulation of nutrients in urban environment is constituted by what is called 'human manure', also known as 'night soil', which has been historically used as agricultural fertilisers for 40 centuries (King 1911), both before and partially after the metabolic rift. Human excrement is not a very popular topic among urban gardeners and farmers in western cities, despite a growing number of publications and handbooks for DIY gardeners that highlights its benefits and practicalities (see for example Jenkins 2006 and Steinfeld 2004) and well known experiences of closed energy, water and waste loops that included compost toilets and agriculture (for example the Centre for Alternative Technology, in Wales). However it is interesting to note that in a dynamic and forward looking context such as Rotterdam - one of the few European cities with an Urban Agriculture Strategy, in a country that has now a well established "National day of urban farming" – both local authorities (Rotterdam city council and the Dutch Water company), and a few community gardens have admitted exploring and/or testing the benefits of recycling human waste.

To conclude, we want to remark that when waste ceases to be something to get rid of and, instead, becomes an asset for urban food production (or other activities), a whole range of new regulatory questions come to the fore. The question here is not only how urban cultivation can improve metabolic processes and improve urban sustainability, but more poignantly raises the question who has rights to waste? When waste is an essential element for food production – rainwater, organic food waste, animal and human excrement, tree-and lawn cuttings – the question of waste recycling becomes the opposite, a matter of nutrient sovereignty. How can urban metabolism enable urban agriculture? Without virtuous recycling paths, urban cultivation will remain dependent upon external inputs (chemical fertilisers, industrially produced compost and mulch, etc) reproducing, rather than mending, the metabolic rift.

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