PERSPECTIVE

City farming needs monitoring

Pollution poses a significant challenge to food production in urban environments, says **Andrew A. Meharg**.

People are moving from the countryside to cities in ever increasing numbers. As towns and cities grow, farmland is being concreted over. Urban agriculture is often considered to be the future, at least for some components of a city dweller's diet. But cities are far from prime agricultural land, and it cannot be assumed that food produced in urban areas is safe to eat.

Growing food in urban environments seems like an attractive proposition, partly because of the inherent sustainability: waste heat that all cities generate can be harnessed, and grey water (waste water from baths, showers and kitchen appliances) or surface runoff and nutrient-rich sewage effluent can be recycled. As well as a sustainable use of brownfield sites, it can reduce the carbon footprint of food transport and can make cities greener. For poorer families, urban farming produces an income and can diversify diet. Community-based projects can promote social interaction and outdoor activity for a double dose of health benefits. Areas designed with urban farming in mind — such as vertical farms (growing plants up the sides of buildings, for example) and patchworks of fields between, on top of or within blocks of buildings — could shape our future cities. Rooftop and indoor farming would further increase the land area available for agriculture.

But before urban farming can be expanded on a large scale, a key issue that differentiates cities from the countryside must be considered: pollution. Current and past industrial activity, dense and dirty transport infrastructure, domestic burning of fossil fuels and the plethora of chemicals released into domestic waste streams all pollute the soil of cities. Urban sewage and grey water carry detergents and excreted drugs — concerning because many of these are hormonally active — as well as a large suite of industry-derived contaminants. In addition to contaminants from suspended soil dust, city air already has elevated levels of nitrogen oxides, sulfur oxides, hydrocarbons and particulates from car exhausts. Air pollution is known to reduce urban crop yields¹, but the consequences of ingesting foodstuffs covered in these pollutants are not well understood.

Urban soil pollution is not uniform across a city — some areas are severely contaminated, whereas others are cleaner and more suitable for farming. But, in general, fruit and vegetables produced in city environments contain more undesirable substances than rural produce. Whether this increased pollutant burden constitutes a health risk is a matter of debate². However, to ensure that commercially produced food from urban farming is safe, systematic monitoring must be in place. Each potential location should be screened for contaminants and each variety of produce grown must be analysed, because of the differences in the accumulation of contaminants. For example, an extensive survey of fruit and vegetables in a historic mining region of southwest England showed that soil-dust-contaminated

leafy vegetables and tuber crops contaminated by direct soil contact were important sources of toxic metals in commercial horticultural produce³. Monitoring of this kind is intensive, but the consequences of unsafe produce entering the food chain impel us to implement these measures for crops grown in cities.

Pollution in urban farming flows in both directions. Just as the city can contaminate agricultural produce, farming itself can introduce unwanted chemicals into the environment. Water supplies can be polluted by inorganic fertilizers and manures, which lead to excessive build-up of algae and aquatic plants in nutrient-rich waters, as well as by pesticides. Noxious smells, excessive noise and the stirring up of soil dust into the atmosphere while working the land are all by-products. And having farmland in close proximity to the public is problematic, particularly for infants who may ingest the soil.

One way to allow intensive agricultural activity in urban centres, but to avoid potentially contaminated soil, is hydroponics —

growing plants without soil, in water. However, as many cities struggle to supply water for domestic and industrial use, large-scale hydroponic farms would be a further burden on a precious resource. Although in principle hydroponic water could be recycled, this is not always feasible, owing to the water's high nutrient and, if used, pesticide content. In hot climates, bringing water for agriculture into the centre of cities can lead to increases in pests such as malaria-carrying mosquitoes⁴.

It may be possible to build new cities that avoid the current contamination issues. But in existing cities, where urban farming is an afterthought, some lateral thinking is required to give urban agriculture a future. Growing non-food crops such as textile fibre plants, biomass crops and timber would make use of urban and suburban

waste land, green the city, recycle waste water and biosolids, and produce crops that currently take up rural land that is ideal for food production. Whether farming in cities is cost-effective or not, the non-economic returns such as better living spaces that facilitate social interaction through community-based activity must be considered. If urban waste resources can be recycled into energy, building materials and clothes through farming, everyone will benefit, ultimately making our cities healthier environments. ■

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