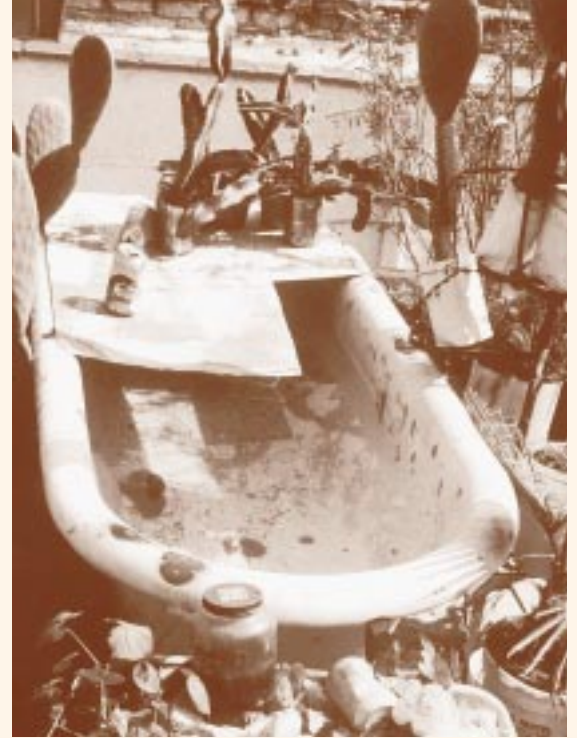


Several studies have found that modern cities, but also ancient ones, have a negative ecological footprint that is 50 to 125 times the area of the metropolis itself. Rees defines this ecological footprint as “the land area functionally required to support any given population. The resultant aggregate area can be called the relevant community’s total ‘ecological footprint’ on the Earth.” In addition, Girardet invented the term ‘biocidal cities’ – with which he labels “human settlements that take natural resources and give nothing back to mother earth”. Folke et al., find that the pollution from cities on the Baltic sea diminishes the biosphere over 200 times the area of their collective built-up area. Future studies will tell us whether [a] the harvesting of resources to feed the city or [b] the poisoning of the ecology by the cities’ waste streams are the more damaging.



Urban Agriculture and Biodiversity

Urbanisation and Diminishing Biodiversity

In earlier geographic times, one spoke of the hinterland, the peri-urban and the sub-urban area as systems for the city. Today, New Yorkers eat Bengali shrimp daily, while Japan engorges Canadian and Malaysian forests. In a way, this is not so different in process than Athens mining the forests of Calabria (Magna Graecia), or Rome the wheat and soil of the North African coastal hills and plains. What is different is that today, with over six billion humans living on Earth and with half the population now urban (and increasingly more), it is on an entirely unprecedented scale that the global environment (and its biological diversity) is being diminished by urbanisation.

The urban footprint is an indicator more of the nature of the economy and of our lifestyle than of the number of urban residents. Estimates at the time of the Earth Summit (Rio) in 1992 found that 75 percent of the natural resources that we harvest and mine from the Earth are shipped, trucked, railroaded and flown to 2.5 percent of the Earth’s surface, which is metropolitan. At that destination, 80 percent of those resources are converted into ‘waste’. This linear process of resource to pollution reduces biodiversity.

Jac Smit, *The Urban Agriculture Network (TUAN)*, USA

There is an earth-wide commitment by national governments to reverse this linear process and mitigate its damaging consequences. Clearly no single solution can address this infinitely complex problem. One could argue that a key component to transforming this vicious process is to bring back agriculture, forestry, and livestock rearing to the human settlement, as was done in earlier civilisations. In the real world, such a trend may already be taking place, as the growing literature on urban agriculture and the rapid increase in its share of the food market, from Russia to Tanzania to Indonesia to the USA, is making clear.

The importance of urban agriculture as a response to crises is illustrated in numerous situations. But the hypothesis that urban agriculture has a role to play in sustainable development of modern cities is more difficult to address. This question has several subsets. As urban land, water, energy, money, and research systems are well established, how can urban agriculture as “community or civic agriculture” be integrated? If modern capital-intensive commodity agriculture is efficient, is there a role in the agri-food system for community-based, labour-intensive agricul-

ture? Modern engineering, architecture and city planning have created cities that exclude agriculture: could urban agriculture be compatible with the modern city?

CITY FARMING’S DIRECT AND INDIRECT IMPACT ON BIODIVERSITY

A great variety in the types of ecological impacts are given in reports of agriculture in towns and cities. At the metropolitan scale, urban agriculture cleans the air and returns carbon to the soil. It restores microclimates, conserves urban water resources in some cases, but degrades them in others, and maintains a penetrable surface between air and land. And although livestock and poultry can contribute to disease and pollution, they are also powerful waste converters and soil enhancers. At the community scale, urban agriculture can either improve the “landscape for living” but it may also cause pollution and diminish human health.

Urban farmers are not inherently more environmentally conscious; they use the waste because they are farming on the 2.5 percent of the earth where the waste is. A TUAN (The Urban Agriculture Network) study for CARE International found that much of

what didn't get to the dump produced both food and green.

Agriculture in urban areas can mitigate negative impacts on surrounding and more distant biodiversity (the urban footprint). It is argued that urban agriculture is inherently more biodiversity-prone than modern rural agriculture, by being more sustainable, less chemically dependent and more biologically friendly. Urban agriculture occurs on smaller sites and typically has a more diverse/integrated crop mix. Urban agriculture closes open nutrient and energy loops. Perhaps the most effective example is modifying urban wetlands to food, fuel and recreation instead of filling them with waste and converting to built-up uses. Further research might be worthwhile on differences in biodiversity in different climate zones, associated with urban versus rural farming.

As urban agriculture grew in the Washington USA metropolis from 1978 to 1998, the variety of tomatoes available in the market increased from eight to seventy-four. Urban agriculture is the conservator and generator of biodiversity in agricultural crops from poultry to lettuce. One acre of urban agriculture, using urban waste as an input, can save five acres, or more, of rural marginal agricultural land or rain forest. Food production in our own back yards and city parks does not require genetically modified crops to be economically viable.

Urban agriculture produces food and energy crops close to the market demand, some within the neighbourhood. This proximity of production to consumption reduces traffic, storage, and packaging as sources of the pollution that erodes biodiversity. The average distance travelled for a food item

Urban agriculture is an effective tool to slow down the loss of biodiversity

on a supermarket shelf in New York was determined in 1995 to be 2,000 kilometres. In contrast, Rikers Island prison within New York City produces fresh food for the occupants, and for a catering service, within one kilometre of its consumption.

However, it is also possible to have a negative impact on the biodiversity of a city, by using poor urban agricultural practices. The *negative health* impacts of agricul-

ture in cities played a major role in their substantial disappearance in 20th century Europe and North and South America. Today, as in earlier times, agriculture in the city poses a range of possible negative impacts. Irrigation with polluted water, animal waste in the streets, or spraying chemical insecticides next door to a school or church can be injurious to man and the community biosphere. Converting park-like open space to mono-cropping can diminish biodiversity of the site (a vineyard is not a wilderness).

The management of an ecologically sustainable or 'biogenic' city, which conserves biodiversity, will require a much higher level of environmentally sophisticated management than current practices.

IMPACTS OF URBAN AGRICULTURE

Agriculture at *community* level is a good tool to self-management of resources, and the strive towards maximum or optimum biodiversity. With the rise of metropolis, a great deal of community responsibility has been handed over to the city and to large profit-making corporations.

The appropriate level of biodiversity management may well be the *bio-region* (watershed, island, coastal plain, or range of hills). Here rural and urban jurisdictions and interest groups will need to meet and negotiate to discover and assign the best role of urban agriculture. This may be done on a crop-by-crop basis, or at the farming system level, taking account of implications of the interaction between crops for biodiversity.

Taking the discussion a level higher, the appropriate role of urban agriculture in sub-Saharan Africa, may be quite different than for the Caribbean archipelago of small islands, where shipping costs and waste management are more critical. It may be desirable for a "low-income, food-deficit" country to concentrate on food production within urban areas in order to concentrate on foreign earnings from rural agriculture, and to conserve national natural resources for future generations.

POLICY CHANGES

The 1990s have witnessed a worldwide commitment to biodiversity. Beginning with the Environment Conference in Rio de Janeiro in 1992 and advancing through the work of the environmental NGOs, the green political parties, and some national

governments, awareness of the threat of losing local and global biodiversity is becoming well established.

The 1996 USA Census of Agriculture reports that the number of farms, farmers and value of crop is increasing in both cities and the so-called sub-urban belts or metropolitan fringes. This is said to be a response to convenient markets and improved access to land and inputs, but is without national policy support. Similar data is emerging half a world away, in South Africa where national policy supports urban agriculture.

The alternative to the WTO scenario of liberalisation and international trade, may mean street trees on the main shopping street; vegetable production combined with chicken production in a small watershed; or a home garden containing 179 plant species (as an FAO study found in one sub-district in Java).

The essence of community ecological management is the principle of "closed nutrient loops". Urban waste management policy could benefit biodiversity by concentrating on closing open nutrient loops. This requires public and private organisations to maximise the re-use of waste within urban regions to ecological benefit. On the negative (control) side, there could be policies to reduce burning, use of chemicals, and long-distance hauling.

The Climate Change Convention urges member countries to "enhance carbon sequestration in forests and agricultural land". The International Centre for Local Environmental Initiatives (ICLEI) is currently recommending "carbon trading" by towns and cities.

There is some degree of consensus amongst international development organisations and national governments in favour of "sustainable agriculture", "sustainable urbanisation" and conserving a bio-diverse Earth. Urban agriculture is an effective tool to slow down the loss of biodiversity. Sustainable urban agriculture may be a smart policy option. To be sustainable throughout the 21st century, agriculture, our burgeoning urban human settlements and mother earth need city farmers.