

# The Role of Urban Agriculture in Waste Management in Mexico City

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**Agriculture in what is now Mexico City can be traced back to the great city of Tenochtitlán, one of the most important urban centres in Mesoamerica (Palerm, 1990). New forms of agriculture have recently emerged in and around Mexico City, which, like those in prehispanic times, can be categorised as urban ecosystems because the majority of the inputs are obtained from the bioregion.**

Mexico City has an average altitude of 2,200 metres, a mild climate with temperatures from 18°C to 24°C and annual rainfall that ranges from 700 to 1,400 mm. The Mexico City Metropolitan Zone (MCMZ) covers an area of 7,860 km<sup>2</sup>. This area includes the Federal District and 54 municipalities, which together have a population of 22 million (INEGI, 1990).

The area's principal production systems can be categorised as urban (family gardens and backyard milk and pork meat production), suburban (vegetables, flowers, backyard and kitchen gardens, greenhouses and dairy production), and periurban (on terraces - *nopal* production, kitchen gardens, corn, silvopasture, milk and dairy production, bees and sheep; and in the valleys - livestock systems, with extensive greenhouses, amaranth and *tuna*-prickly pear production).

*Nopal is an important production system*  
Photo: H. Losada



The inputs for these different urban production systems are either household wastes or by-products from the city.

## Organic waste

In general, low levels of external inputs are used. Solid organic waste is an important source of food for animals and comes from markets, restaurants or homes. The amount of solid organic waste obtained from local markets and from the city's metropolitan food supply depot (CEDA) is considerable. Occupying 300 ha, the CEDA receives 60 per cent of the national harvest and distributes fruit and vegetables to the markets in and outside Mexico City. Losada *et al.* (1996) estimated the daily organic waste production (in 1996) to be 725 tonnes. At least 90 tonnes of this waste was used to feed approximately 2,500 dairy cows in the vicinity (east of the city), which produced about 37,500 litres of milk per day. The tomato waste was especially used to feed (about 50,000) pigs, while other waste was used to feed chickens and rabbits.

Organic solid waste from the food processing industry (tortilla factories, *nixtamal* corn processing, mills, bakeries, cookie/cracker factories and others) is used in stables as a food source with a high starch concentration, as well as for backyard livestock (for the production of milk and meat) and pig farming. The latter two systems also receive organic solid waste products from homes. Grass from the sidewalks and traffic islands, constitutes a secondary source of fodder for the dairy stables in urban spaces.

In the suburban and periurban zones, fresh or dry dairy cattle manure serves as an excellent input for agricultural activities. It is a good source of organic material, macronutrients (N, P, K) and water, and it protects crops against low temperatures. The latter two benefits are of particular importance in *nopal* cultivation on terraces. In the suburban *Chinampa* system and in the periurban valleys, excreta in dried form (20 per cent water) is used as compost (*Chinampa*) or added directly to the crops (corn). Unpublished data from Losada *et al.* (2000) show that the amounts of excreta used are equivalent to 730 tonnes per/ha/year in the *Chinampa* zone, 540 tonnes/ha/per year in the *nopal* zone and 50 tonnes/ha/year in the *tuna* (prickly pear) zone. Plant residues from *nopal* production (14 tonnes/ha/year) serve as an important input in the terraced area during the pruning season (March, April and May). In all cases the waste is obtained for free; only transport needs to be paid for.



Low levels of external inputs are used

Photo: H. Losada

### Mass and energy flows

Other external inputs need to be considered in the city's energy balance (see also the next article). In the more advanced dairy systems these include externally acquired pregnant cows, medicines, semen (for artificial insemination), high-protein foodstuffs, mineral salts, vitamins and other supplements. In more commercial agriculture these are seeds, inorganic fertilisers, herbicides and insecticides, and material for the greenhouses.

Labour input is generally more intense in the production of vegetables, legumes, flowers and *nopal* (both in the *Chinampa* and terrace systems; Canabal and Torres, 1992) than in the livestock systems (with some exceptions, such as in stables). Water and energy use, however, is higher in livestock systems. The higher use of gasoline and transport for agricultural products results from transporting manure from the stables to the field and the harvested products to the market.

The waste consumed by the animals in urban dairy farms is predominantly local and the waste excreta coming from stables and pig farms forms an important input for agriculture in the suburban and periurban zones. Energy balances in these urban systems are not optimal. Research on *nopal* production (Losada *et al.* 1996) shows different degrees of efficiency in the capture of energy as well as in the use of macronutrients.

In contrast to conventional production systems that are highly dependent on non-renewable sources and fossil fuels, the energy and macronutrient flows in these urban and periurban systems depend on inputs of biological origin, which constitute a renewable resource. These systems also have a positive medium to long term positive effect on soil formation.

### Urban agriculture

New urban production systems in Mexico City, such as the *Chinampa* system (which is considered more diverse - see the next article-) and the terraced (*nopal* vegetable) and *tuna* (Teotihuacan) production systems are well adapted to the urban environment. They make optimal use of local inputs, use local wastes as a source of nutrients and are interlinked. Like any production system, these systems need proper management (especially in the dairy systems the odour produced and the presence of flies need to be controlled), but they pose relatively little danger to the urban environment.

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