For Hunger-proof Cities
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Measuring the Sustainability of Urban Agriculture

Rachel A. Nugent

Introduction

What can agriculture add to a city’s sustainability? Beyond the immediate benefits of fresh food, dietary variety, and landscape diversity, do cities gain in the long term from growing food within and nearby? Research suggests that it is worthwhile to look beyond traditional views of urban dwellers as consumers and rural dwellers as producers of food, especially in developing countries. Urban planners and policymakers seek practical, feasible solutions to infrastructure problems and environmental degradation while trying to address the social and economic ills of the inner city. Urban agriculture may have something to offer these policymakers. (See FAO [1996] and Smit et al. [1996] for detailed descriptions of urban agriculture.)

Food production in cities and that in the surrounding densely populated areas are called urban and peri-urban agriculture, respectively. Definitions of city vary by settlement characteristics and the laws of different countries. Regardless of the legal definition, every city contains some urban agriculture, in backyards, rooftop containers, public open spaces, community gardens, greenhouses, and bona fide commercial farms on the periphery. Common to these diverse agricultural activities are limited space, products that are of high value or perishable (or both), and products often consumed by the growers themselves or by nearby populations. This study presents a framework for measuring the economic, social, and environmental benefits and costs of urban agricultural production.

Because urban agriculture has only recently become the object of policy and academic interest, no standard method of quantitative analysis has yet been established to evaluate its effects. The most detailed discussion of urban agriculture to date is “Urban Agriculture: Food, Jobs, and Sustainable Cities” by Smit et al. (1996).

The present study, however, rather than being descriptive, offers a method to systematically quantify the costs and benefits of urban agriculture across a spectrum of cities.

Framework for analysis

Economists and policymakers have used cost-benefit analysis for years to assess the overall and distributional impacts of projects and policies. It has only recently been extended to environmental impacts (Hanley and Spash 1993; Schulze 1994). The present study presents an extended cost-benefit approach to identifying and quantifying the economic, social, and ecological impacts of growing and distributing food to local...
consumers in an urban environment. It is important to extend traditional cost-benefit-analysis techniques to recognize the nonmonetizable and nonquantifiable values and impacts (Hanley and Spash 1993) of urban agriculture.

Although methods have been devised to measure nonmarket values (see Pearce and Turner 1994), applications to urban agriculture are virtually nonexistent, and many of the impacts are still being defined. One promising way to measure ecosystem and other complex effects is to develop indicators — proxies that suggest impacts on underlying features of concern. The proxies are more observable and measurable than the features of concern and provide indirect indices of changes in these features. For instance, quantities of total particulate matter in the air or poverty rates among populations can indicate the state of otherwise unrecordable ecological and social conditions (see Urban Quality Indicators [Yoakam n.d.1] and related Internet-based publications).

The results obtained using this approach are less precise than those of a standard cost-benefit project study, but they are more representative of the full range of impacts of urban agriculture. As research progresses and data improve on both urban agriculture and ecosystem impacts, this framework can be used to develop a more precise understanding of costs and benefits.

The purpose of a cost-benefit analysis is to provide a clear accounting framework for any increase or decrease in society's welfare (with society defined as the affected population). Impacts that improve society's welfare are assumed to be those that increase consumption levels of market and nonmarket goods or services (including decreases in price) or those that increase the quality of goods or services already being consumed. These impacts are called benefits. The impacts that lower society's welfare are assumed to be those that decrease the quantity or quality of consumed goods or services, increase the price of consumed goods or services, or use resources that cannot then be used for other purposes. These impacts are called costs.

A cost-benefit analysis offers policymakers and participants important information about urban agriculture. The primary purpose of such an analysis is to ascertain whether an activity is beneficial. The careful accounting required by a cost-benefit analysis also provides insights into the nature of the impacts, their distribution throughout the population, and their timing. For example, a cost-benefit analysis of urban agriculture in one location may show large short-term economic benefits. But it may also show long-term environmental costs from, for example, the deterioration of water quality from the use of chemical fertilizers. Costs and benefits of agriculture have been more extensively defined and quantified in the rural than in the urban context. Further, the same activity will often have different impacts and consequences in the urban environment. Thus, it is useful to identify differences between urban and rural agriculture to clarify the scope of the impacts.

Urban food systems

Typically, urban economies import labour and export goods and services; urban ecological systems import natural resources and export waste and pollution (import-export model). Cities cannot be self-sufficient in meeting many of the needs of their

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populations, and it would be unwise to create policies to divert resources with such a
goal in mind. However, urban agriculture suggests some ways to reorganize urban food
systems to make them more of a closed loop, reducing both the importation of natural
resources and goods and the exportation of waste and pollution. In the process, cities
may derive other economic and social benefits from diverting resources to meet a broad
set of citizens' needs.

A careful cost–benefit analysis can help urban planners, consumer advocates,
poverty groups, and others understand how to integrate urban agriculture with local
needs and conditions. For instance, an urban area in a developing country may be faced
with growing numbers of poor residents who cannot purchase adequate quantities of
food but are eager to engage in part-time agriculture to provide for themselves. A
cost–benefit analysis can reveal that specific factors impede their engaging effectively
in agricultural production, such as lack of proximity to available vacant land or scarcity
of seeds. In this case, a cost–benefit analysis makes the solutions readily apparent and
helps to realize the full potential of urban agriculture.

A city facing decisions about solid-waste disposal may have an incentive to
develop more urban agricultural production, as it can productively use compost pro-
duced from solid waste. In Hartford, Connecticut, urban gardeners used both yard and
animal wastes from horse stables for fertilizer. Although a city would not develop urban
agriculture simply to dispose of compost, cost–benefit analysis of the activity can reveal
that it is worthwhile to use resources in a certain manner from an economic, social, or
environmental perspective.

Economically relevant impacts
of urban agriculture

Under the traditional import–export model, food production and urban food consump-
tion are separate activities or systems. They have some overlapping functions but in
general are specialized and isolated from each other. Production occurs in one locale,
consumption occurs in another, and each system has very little knowledge of the other.
However, it is possible, by changing the location of some agricultural production to the
consumers' locale, to reduce the consumers' dependence on outside sources of inputs
and to reduce the disposal of waste into outside sinks (certain parts of an ecosystem,
for example, wetlands, that have a biological capacity to receive and neutralize toxins
or other pollutants).

The framework presented in this paper takes into account how agricultural
production in cities alters the urban food system. Table 1 lists the benefits of urban agri-
culture, and Table 2 lists the costs. Empirical measures of these benefits and costs are
presented elsewhere (Nugent 1999).

The benefits and costs of urban agriculture are put into three major categories:
economic, social, and ecological. This categorization stems from the common illustra-
tion of sustainability as a “three-legged stool”. A cost–benefit accounting of all the
impacts in the tables would reveal the level of sustainability of urban agriculture in a
selected city. A process of assigning weights to different factors could be used to
account for local conditions or needs. For instance, a city with a large number of food-
insecure residents may assign a heavier weight to the benefit of food production. Such
weights would have to be derived from a process of stakeholder involvement to elicit overall community values.

Like rural agriculture, the urban production process requires inputs (land, labour, natural resources, know-how) and produces waste. In an urban environment, however, some of those inputs are provided by recycling resources that have already been used in the urban environment, thus avoiding or delaying disposal. Examples of these recycled and unused resources are vacant land; unemployed and volunteer labour; household “gray” water (water that has been used for washing dishes, etc.); and composted yard waste, wood chips, and manure. Other inputs within the urban environment may go unused for other purposes (zero opportunity cost) but be productive as part of agricultural production.

As in rural agriculture, major components of urban agriculture are packaging, transporting, and marketing of food products. However, the products of urban agriculture are frequently transported only short distances (to a farmers’ market or local
grocery store) or not at all (sold on site at farmstands or through pick-your-own schemes). This locational advantage obviates the need for heavy packaging and reduces the amount of energy consumed by these processes. Locally grown food products are marketed more directly to the consumer, or they are not marketed at all but given to family, friends, and neighbours.

As in rural agriculture, modern urban food production carries some health and environmental risks. This is especially true if potentially toxic chemicals are used in proximity to people or if other human activity exposes food to contamination. However, growing food in urban environments also creates documented social and health benefits, such as greater food security, nutritional diversity, community cohesion, and psychological well-being.

Future research should strive to create a better understanding of the impacts of urban agriculture and its potential for ameliorating some of the problems faced by growing urban populations. A necessary first step would be to employ a common framework for assessing the nature and distribution of costs and benefits. Using this framework, policymakers can discuss the sustainability of urban agriculture and develop appropriate policies.

References