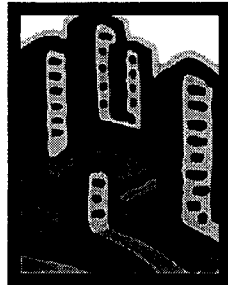


**Urban Agriculture: Definition,
Presence, Potentials and Risks,
and Policy Challenges**

by
Luc J.A. Mougeot, Ph.D.

**International Development Research
Centre (IDRC)
November 2000**



**Cities Feeding People Series
Report 31**

ARCHIV
MOUGEO
117785

**URBAN AGRICULTURE: DEFINITION, PRESENCE,
POTENTIALS AND RISKS, AND POLICY CHALLENGES**

Luc J.A. Mougeot, Ph.D.
Senior Programme Specialist
International Development Research Centre (IDRC)*
Ottawa, Canada

phone: 613-236-6163 ext 2310

fax: 613-567-7749

email: LMougeot@idrc.ca

Cities Feeding People Program Initiative website: <http://www.idrc.ca/cfp>

Submitted by invitation for presentation at
International Workshop on
Growing Cities Growing Food: Urban Agriculture on the Policy Agenda
La Habana, Cuba
October 11-15, 1999

Draft November 1999

The author wishes to extend his appreciation to the Workshop organizers and to the German Foundation for International Development (DSE) for its generous financial assistance

*Views expressed in this paper do not correspond necessarily to those of IDRC

“The upshot of these considerations is that scarcely any well-considered case can be made for putting government or donor funds into service for urban agriculture.”

Frank Ellis and James Sumberg, University of East Anglia (1998) “Food Production, Urban Areas and Policy Responses.” *World Development* 26/2: 221.

“... with the increased quantum and importance of urban agriculture and the changed scenario in the developing world, the prevalent policies restricting agriculture development efforts to rural areas to the almost complete exclusion of the urban areas need to be reviewed.”

Sartaj Aziz, Minister for Finance, Government of Pakistan and Pervaiz Amir, Asianics Agro-Dev, Islamabad (1997) “How is Rapid Urbanization Affecting Food Production and Agriculture Research?” ISNAR Symposium, The Hague, February 1997.

“More practically, we would need to encourage developments on two fronts: one, to favour a broader product base reverting to more traditional cereals and root crops,..., and two, to develop non land-using production in peri-urban and urban areas.”

Uwe Werblow, Head of the Department of Agriculture and Rural Development in the areas of Eastern and Southern Africa, European Commission-General Directorate (1997) “A radically changing world: globalisation and food security up to the year 2020.” *Agriculture and rural development* 4/2: 7-9.

“The Committee welcomed the timely selection of urban and peri-urban agriculture (UPA) for its consideration... The Committee acknowledged FAO’s established expertise and capacity in providing technical support and policy advice to countries with needs in these areas. It recommended that FAO develop an interdisciplinary and inter-departmental programme on UPA.”

Committee on Agriculture, Food and Agriculture Organization (1999) “Urban and Peri-Urban Agriculture”, p. 12. Fifteenth Session of the Committee on Agriculture. Rome, FAO. January.

TABLE OF CONTENTS

| | |
|--|------------|
| ABSTRACT | ..1 |
| 1. INTRODUCTION | ..3 |
| 2. DEFINITIONS: WHAT IS INTRA- AND PERI-URBAN AGRICULTURE? | ..4 |
| 2.1 Concept Development | ..4 |
| 2.2 Building Blocks of Current Definitions | ..6 |
| 2.3 The Urban Eco-System Connection: A Neglected Trait of the Concept | ..9 |
| 3. PRESENCE: | .16 |
| 3.1 Who Is Involved In UA? | .16 |
| 3.1.i Producers, Women Producers, Classifications | .17 |
| 3.1.ii How Producers Gain Access to and Use Urban Land? | .19 |
| 3.1.iii Promoters - Managers | .21 |
| 3.2 Why Is UA Important? | .24 |
| 3.2.i Nutritional Benefits | .28 |
| 3.2.ii Impact on Community Welfare | .30 |
| 3.2.iii Interdependence with Rural Agriculture | .31 |
| 4. MAIN DOUBTS & RISKS RAISED BY UA | .32 |
| 4.1 UA Hampers Urban Development? | .33 |
| 4.2 UA Threatens Public Health? | .33 |
| 4.3 UA Has Negative Environmental Impacts? | .36 |
| 4.4 UA Is Not Very Profitable? | .38 |
| 4.5 City Governments in Developing Countries Do Not Have Capacities and Means to Manage UA Adequately? | .40 |
| 5. WHAT FUTURE FOR UA? | .41 |
| 5.1 Development Trends | .41 |
| 5.2 Policy Challenges: Issues | .42 |
| 5.3 Policy Challenges: Delivery | .42 |
| ACKNOWLEDGMENTS | .45 |
| REFERENCES | .46 |
| FIGURE 1: Urban Agriculture: Common Dimensions | ..7 |
| FIGURE 2: Urban Agriculture and other “Kids on the Block” | .10 |
| FIGURE 3: “Urbanizing” Agriculture in (Mexico) City Using More from, and Supplying More to, (Mexico) City | .11 |
| FIGURE 4: Agriculture in the City: How Urban Is It? | .12 |
| FIGURE 5: Classifying Urban Producers Criteria | .19 |
| FIGURE 6: Urban Agriculture: policy Initiatives Implemented | .22 |
| FIGURE 7: Urban Agriculture: Factors of Growth / Diversity | .26 |

ABSTRACT

We must work harder to bring Urban Agriculture (UA) to its conceptual maturity; only with greater internal coherence and external functionality will it turn into a distinctive and useful tool for us to understand and intervene. Key features of current definitions of UA generally have downplayed a critical trait that makes UA to be urban, different and complementary of rural agriculture in local food systems: its integration into the local urban economic and ecological system. Unless this dimension is enhanced and made operational, the concept will remain little useful on the scientific, technology and policy fronts.

On the ground, UA is growing out of its ability to assist with resolving or coping with diverse development challenges. It is spurred by a complex web of factors still little understood, not the least of which are urban poverty and food insecurity. Little attention in particular has been paid to the women who tend to predominate in UA, an activity which connects well not only with their care-taking and house-holding roles, but also increasingly with their need for income. UA practitioners can be categorized variously, based on a combination of tenure modality, time allocation and product destination. Differences are further observed across regions of the world, in terms of prevailing UA production systems and associated problems.

Official support to UA is age-old, has been diverse and can be organised into several types of interventions, often combined in a single city. Access to resources, land in particular, is central; access is more often an issue than availability per se. But UA production systems have diversified and producers have adapted to cope with these and other urban constraints and opportunities.

We must better understand how urban food systems work if we want to comprehensively assess and promote UA's role and impact on the welfare of particular rural and urban communities. UA tends to develop to complement rural and foreign sources of food supply to cities. It has been promoted to effectively do so and is important to strengthening poor urban households' food security in particular.

Despite limited support and heavy losses, UA is generating products valued in the tens of millions of USD, year in and year out, in major LDC urban centers. UA is comparatively affordable, a noteworthy source of income and savings and is more profitable than rural-based production. The up and downstream effects of UA in the local economy are largely unknown and could be considerable. Low-income UA effectively contributes in several ways to reduce food insecurity by improving food intake of households and by raising children's nutritional status; this relationship could be gender-mediated.

There is little literature overtly condemning UA under any form; opposition has tended to come more from urban planning, public health and environmental circles than from agencies covering employment, community services and agriculture. Governmental checks and balances exist and have been applied to a limited extent. Regulations have remained largely ineffective and must be

revised, prioritised and implemented in an appropriate and participatory way; they need to be enabling. Concern over agrochemical use in UA tends to be exaggerated; actual use and related problems are limited by various factors, particularly in the case of intra-urban, home-based, women-practiced, food self-provisioning. More information seems to exist on evidence and on measures to curb public health risks posed to UA by ambient factors, as opposed to risks introduced by UA into the urban environment. Still, the latter is a source of rising governmental concern. In both cases problems are technically manageable; however, this depends on cities making better use of prevention and mitigating measures, including trans-sectoral coordination (waste management) and the use of UA to enhance environmental quality.

Several trends underway will buttress the growth of UA worldwide and in LDCs in particular. Risks and benefits must be addressed through active policy-making and doing. So far, UA development has been assisted largely by actors in urban politics and agricultural policy circles, for poverty alleviation and food security. This measure of support now is insufficient to deal with the growing risks and benefits posed by the expansion of UA in LDCs. A fuller integration of UA into the urban eco-system requires that urban planners, public health and environmental management actors join in with others committed so far. Areas of intervention at the community, city, national and international levels are identified, where more efforts should concentrate relative to recent progress. More needs to be done by actors on the national and internal planes that will help communities and cities to capitalize on their collective experience and to integrate UA into the city organism in a fairer, more viable and sustainable way.

1. INTRODUCTION

The German Foundation for International Development (DSE) must be commended for convening this international workshop on such an intriguing phenomenon. This brings us to a country which epitomizes our peoples' struggle, as an urban age dawns on a world of growing instability and inequality.

Ever since the first French geographical accounts of (intra- and peri-) urban agriculture (UA) were published on Central Africa in the 1960s, scattered and isolated UA surveys by individual social scientists (e.g.: Egziabher et al., 1994) have gradually been giving way to institutional projects led by multi-disciplinary teams¹. As a result, more and better information now is available on a larger number of regions, countries and cities around the world. Over the same period, public initiatives pioneered by few local and national governments² have been followed by more widespread awareness on part of local authorities, in their regional and global fora, for the growth and potential of agriculture in and around cities.³ More urban governments are now seeking to exchange policy and technical experiences for better dealing with a spreading phenomenon in their own city.

Initial pilot projects by a handful of donors (Mougeot, 1999a) have paved the way to greater collaboration and coordination among international support and executing institutions, for information, assistance, training and policy in UA (IDRC/TUAN, 1996; SINA, 1998: 11-12).⁴

¹ For example: the University of Dar es Salaam research part of the Sustainable Dar es Salaam City Project (IDRC- UNCHS) and the MA&C-GTZ Urban Vegetable Promotion Project, Tanzania; the University Cheik Anta Diop and ENDA-Tiers Monde Community-Managed Domestic Wastewater Treatment and Recovery project (CIDA-IDRC) in Dakar, Sénégal; the Natural Resources International project (ODI-BC) in Kumasi, Ghana; the CIRAD-Agricongo FILMAR Project (MAE) in Brazzaville; the Accra Urban Food Security and Nutrition Study by the Noguchi Memorial Institute for Medical Research and the International Food Policy Research Institute (WHO, Rockefeller, IDRC, CIDA).

² See, for instance, the series of country and city reports produced by the University of United Nations' Food-Energy Nexus Programme in the late 1980s.

³ For instance: IULA congress in 1993, Global Forum in 1994; International Colloquia of Mayors on Social Development in 1994 and on Governance for Sustainable Growth and Equity in 1997.

⁴ For instance, the International Development Research Center and the French Ministry of Cooperation are supporting a program of graduate research training, in collaboration with northern and southern scientific institutions. Netherlands' Development Agency is supporting with several other agencies, including GTZ and SIDA, the establishment of an international information system, led by ETC International in association with other organizations in the South. UNDP's Urban Management Programme has approved a UA component for its Latin America and the Caribbean chapter as of 1998. UMP-LAC is now conducting a good-practice survey, to be followed by a pilot multi-stakeholder consultation on municipal policy for UA (Cabannes and Mougeot, 1999). CIDA, USAID and IDRC are supporting CARE International's establishment of a UPA program in Haiti. FAO's COAG recently recommended to the Organization to improve markedly its delivery of UA support to its country members, in partnership with other international actors in the field. More actors, including all the aforementioned in

This Habana workshop follows several recent fora, on specific UA production systems, or links between UA and other urban development challenges.⁵ It is the second brainstorming sponsored by DSE on UA in five years and it testifies to a gathering communion of efforts worldwide for us to take stock of more recent advances. With the expertise, wisdom and vision of this plenary, the Habana workshop hopefully will legate a pivotal agenda for better urban and agricultural strategies well into the next century.

2. DEFINITIONS: WHAT IS INTRA- AND PERI-URBAN AGRICULTURE?

2.1 Concept Development

Whether we agree or not with the phenomenon, the expression “urban agriculture” (UA), or “intra- and peri-UA”, originally used only by scholars and the media, has now been adopted by U.N. agencies such as the UNDP (Smit et al., 1996) and FAO (1996; COAG/FAO, 1999)⁶. This makes our need to define it self-evident, at least for our short and mid-term governance.

Our effort to define UA should bear purpose. The concept of UA should possess a distinctive architecture of its own, both on contents and form, and evolve through its interaction with the development of related concepts. Concepts are mental tools that we forge - and eventually rework- to better understand, interact with and modify our real-world experience. They are historically and culturally bound, relevant in some places and less so in others, fitting today

this paragraph and DSE, today are members of a Support Group on Urban Agriculture (SGUA).

⁵ For example: FAO on animal husbandry, 1995; DSE on peri-urban vegetable production, 1994, UNDP on urban governance in 1994, IIED on sustainability in 1994, WB on waste management in 1996, Ryerson Polytechnic University on sustainable urban food supply systems in 1997, and South Africa's Department of Environmental Affairs and Technikon Pretoria on productive open space management in early 1998 (DEAT - PT, 1998), and the Palestinian Agricultural Relief Committees' late-1998 regional workshop on the future of UA in Gaza (Abdelwahed, 1999).

⁶ The Program of Work and Budget of FAO for 1999 and/or 2000-2001 includes sixteen workplans led by 12 different services housed in five departments, and focusing on specific aspects of UA: peri-urban and intensive production systems (animal health), urban and peri-urban agriculture (crop and grassland), strengthening urban-rural linkages and need for value-added food production in cities (agro-industries, post-harvest management), marketing and urban environment (marketing and rural finance), food supplies to urban areas (farm management & production economics), integrated pest management (IPM) approaches in sustainable crops (plant protection, global IPM facility), FAO focal point and economic impacts (comparative agricultural development), household food security (nutrition programs), technical guidance for food quality (food quality standards), Africa outlook - urban forestry (forestry planning statistics branch), UA forestry case studies, guidelines and nurseries (forestry conservation, research and education), poverty alleviation and households, participatory approaches for food security (rural institutions and participation).

but perhaps less so tomorrow. The UA concept needs to evolve out of our need to codify and refine our perceptual experience with a rather new world phenomenon, so as to ensure that it remains or becomes more useful to us where we will need it. Its identity depends on this external functionality as much as on its internal coherence.

Internal coherence: Is UA really what we call, or want to call, what we perceive to be out there? Stevenson et al. (1996:9) rightly insist on our need to distinguish, for instance, between agriculture “in the peri-urban zone” and “peri-urban” agriculture. The over-arching definition should lead us into a full conceptual system or edifice, a structure of inter-connecting compartments anchored into real-world experience. Another way of looking at this system is to see a pyramid, with lower levels containing larger numbers of more operational and interdependent terms. Within and subordinated to the over-arching concept, situational variations should be allowed for the sake of local and regional relevance.⁷ To build a useful and viable UA edifice requires probably more materials and engineering than assembled so far.

External functionality: How does UA position itself relatively to other “kids on the block” (e.g.: rural agriculture, sustainable urban development; urban food supply systems, etc.)? The over-arching concept should be clear enough so that users can easily perceive its potential for complementarity and synergy with related concepts. How distinctive and value-adding is this edifice in the neighborhood where it is being built?

We should expect interaction between the UA concept’s internal and external planes to drive its evolution and renew its usefulness. Only in this way can the UA concept provide a yardstick, against which to identify empirical manifestations and gauge how these may reflect the concept, at any given time or location (e.g.: the operational translation of the UA concept should enable us to grade specific agricultural activities observed in particular urban areas). Many distant representations of the concept may never materialize themselves as close ones, while others may so over time and space. A conceptual yardstick is fundamental, as policy and technology interventions need first and foremost to identify meaningful differences and gradations, if they are to better assess and intervene with appropriate means for promotion and/or management of UA.

If we accept that the afore elements should apply to the UA concept and its framework, my reading of the UA literature suggests that we are still clarifying the generic concept and elaborating a first edition of its conceptual framework. This is an exciting time but it can’t last

⁷ Different regions of the world seem to present differences in terms of prevailing UA categories, depending on production systems considered. For instance, in the case of peri-urban vegetable production, shifting open-space systems seem more important in Africa than in Latin America, where home plots and peri-urban farms are more established, and the latter even more so in Asia (Richter et al, eds. 1995: 6-7). On the other hand, intensive space-confined systems of high-value products, such as silkworms, mushrooms and fish micro-hatcheries, are more developed in Asian cities than in most of Africa.

forever. Of course, UA's incipient conceptualization has not deterred a growing number of CBOs, NGOs, national and international research institutes, local and national governments and international agencies to intervene on the ground. Such interventions are needed to feed concept development; however, an enduring lack of clarity would probably undermine the effectiveness of such actions and discourage others from being taken. We therefore must tap on this record more swiftly and systematically in the future than we have done so until now. Only in this way will we impress on the concept an evolution in line with the rising awareness and expectations sparked by its project; only in this way will we affirm it as a useful development tool. I believe this is a challenge which this conference cannot evade.

This paper is intended as a small contribution to this task. The review relies largely on the literature of this decade, published or not, in either English, French, Spanish or Portuguese, and primarily by geographers, economists, sociologists, agricultural scientists and urban planning specialists, or combination thereof. It disregards information known to be available from other disciplines and in other languages, particularly from engineers and in Europe and Asia, including technical reports by practitioners. That one out of every four references selected for this paper was published in 1999 both testifies to the rapid growth of the field and defeats any claim to an exhaustive coverage of what we probably know about UA at this time.

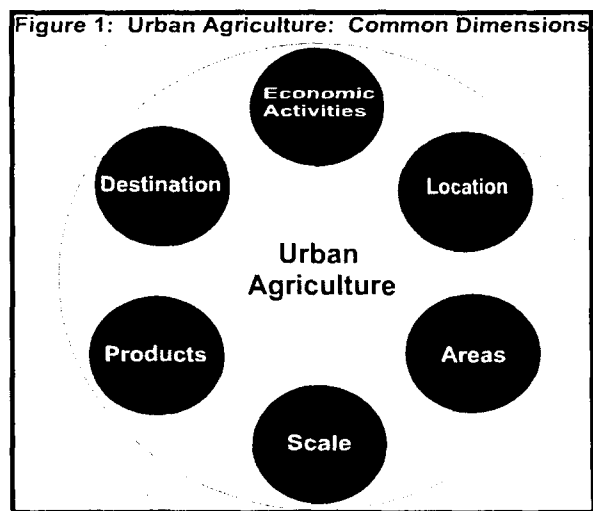
2.2 Building Blocks of Current Definitions

Recent reviews have collated definitions of UA (Quon, 1999) and identified shifting emphases in definitions throughout the history of research on UA (Mougeot, 1999b: 137-138). This section instead highlights common building blocks of the concept, reviews them and submits a critical direction for enhancing its conceptual distinctiveness.

The more common conceptual building blocks of UA identified are: types of economic activities, food/non-food categories of products and sub-categories, intra-urban and peri-urban character of location, types of areas where it is practiced, types of production systems, product destination and production scale (see Figure 1: Urban Agriculture: Common Dimensions)

Types of economic activities: Most definitions refer to the production phase of agriculture; recent definitions add processing and trade to production and stress interactions between these. Besides being sound, commodity analysis affords an integrated approach which is particularly relevant to UA where, differently from most rural agriculture (RA), production and marketing (and also processing) tend to be more inter-related in time and space, thanks to greater geographic proximity and quicker resource flow. This is achieved by small and dispersed units which make up an extensive and decentralized supply system within immediate reach of a massive consumption market. Economies of agglomeration seem to prevail over those of scale, the latter being more important in RA production. In UA, economies of scale through cooperative efforts may further enhance the benefits of unit-based vertical integration.

Food/non-food categories and sub-categories: the definitions embrace very diverse agricultural productions, though more highlight food productions fit for consumption by either people or livestock; then, mostly cultivated or raised food products (grain, root, vegetable, aromatic and medicinal herbs and fruit crops, and livestock of all shapes and sizes). A smaller number deal with other plants, such as ornamentals and agro-industrial (e.g.: silk worms, tobacco, etc.). Within food crops, definitions clearly stress the more perishable and relatively high-valued vegetable and animal products and byproducts. Several studies consider food productions exclusively, while others encompass both food and non-food productions. As such systems are often mutually complementary, often gendered, they reinforce not only food security but also economic and environmental benefits at various levels (from individual to city). To exclude the non-food category from the general UA concept would truncate our understanding of the UA system at large, of exchanges taking place across production systems and within particular production units, as well as the many ways in which UA can interact with other urban functions to use and provide resources, outputs and services to the city.



Intra-urban/peri-urban character of location: By far the element most common to reviewed definitions is location “in (within) and around” cities or urban areas (e.g. Ganapathi, 1983; Sawio, 1993; Smit et al., 1996b; COAG/FAO, 1999). This element is probably the biggest source of contention, which is why it will be discussed more at length than other elements. Most UA field studies have been carried out in large urban centers, national capitals or secondary cities; thus, few can be assumed to have largely dealt with agriculture located in rural areas “typical” of the respective countries. However, few actually differentiate between intra and peri-urban locations. Those which do so have used as criteria, for intra-urban agriculture, population sizes, density thresholds, official city limits (Gumbo and Ndiripo, 1996; Murray, 1997), municipal boundaries of the city (Maxwell and Armar-Klemesu, 1998b: 7), agricultural use of land zoned for other use (Mbiba, 1994), agriculture within the legal and regulatory purview of urban authorities (Aldington, 1997: 43). In a rare comparison between RA and UA, Moustier (1998) defines UA as one carried out within or on the outskirts of a city where a non-agricultural use of local resources is a real option; RA is one found in areas where this option is not an issue. In the CIRAD-Agricongo study of (open-space) market vegetable farming in Brazzaville for instance, gardens within the city limit are labelled “intra-urban” whereas those off-limit (though within a certain travel-time band - see below) are called “peri-urban” (Moustier, 1999: 53).

For **peri-urban agriculture** the locational definition is more problematic. By contrast to intra-urban locations well within the older and more settled urban fabric, peri-urban locations are in

closer contact with rural areas and tend to undergo, over a given period of time, more dramatic agricultural changes than do locations in more central and built-up parts of the city. Many authors recognise the need to differentiate peri-UA from intra-UA but criteria used vary widely. For instance, the peri-urban area as one where “the advantages of combining farm and non-farm work can be maximized” (Swindell quoted by Binns and Lynch, 1998: 778). Sumberg (1997) applied the OCDE definition to a study of the urban milk system in Dar; the Natural Resource Institute supplemented this definition, stressing land shortage and pollution pressures from urban expansion (NRI, 1995). In the Greater Accra study, Maxwell et al. (1998) emphasized land market pressures and changes in agricultural production. In South Africa, a sequence of production systems has been proposed which straddle an urban-rural range of population density thresholds.

Authors have been trying to delineate the outer boundary of the peri-urban area. Stevenson et al. (1996:3) say that this outer boundary varies, depending on the reach of those urban influences with the greatest impact on the production system considered. Murray (1997) and Losada et al. (1998) have identified urban and peri-urban zones within metropolitan boundaries of Quito and Mexico City, for urban forestry and animal husbandry studies. The latter further identified a suburban zone, and characterised all three (urban, suburban and peri-urban) based on varying ratios of buildings and roads and increasing ratios of open space per km² (Losada et al. 1998: 44). Others understand the outer-boundary of the peri-urban zone as some isochrone. This travel-time band is more star-shaped than circular in most cases, stretching out along main road corridors and on flat land, while contracting in wedges and rugged sectors; it can be defined by the travel time of non-resident farmers to their farm or the travel time of specific products to reach the urban market. Lourenço-Lindell (1995: 2) uses the area within which people living within the city’s administrative boundaries can travel to engage in agricultural activities. Moustier (1998) uses the maximum distance away from city center within which farms can supply perishables to the city on a daily basis; Mwamfupe (1994) used the maximum distance which urban residents could travel to their farms in the peri-urban area on a daily basis (quoted by Stevenson et al., 1996: 39). Stevenson et al. (1996:34) themselves proposed the maximum distance within which a given percentage of producers can sell their crop at farm-gate. How far from the city will this outer limit be drawn will depend on the level of development of the local road infrastructure AND transportation costs: 10 km wide in Bissau, Guinea-Bissau, but 20 km in Brazzaville, Dar es Salaam or Kumasi (NRI, 1995: 17). According to these criteria strictly, this limit falls at least 90 km away from Metro Manila (Ali and Porciuncula, 1999:23).

Types of areas where UA is practiced: criteria according to which such areas are typified vary from author to author: location respective to residence (on-plot or off-plot), development status of site (built-up vs open-space), modality of tenure/usufruct of site (cession, lease, sharing, authorized or unauthorized - through personal agreement, customary law or commercial transaction); the official land-use category of the sector where UA is practiced (residential, industrial, institutional, etc.). While some authors have focused on home-plot areas (Lee-Smith et al., 1987; Régis, 1999), others have aimed their study at off-plot and open-space locations (Freeman, 1991; Mbiba, 1994; Kiango and Likoko, 1996; Dennery, 1999; del Rosario 1999). Misleading comparisons are often drawn across separate studies without due regard to the

locational focus of original surveys. Some surveys have encompassed both on- and off-plot locations, under different tenure/usufruct modalities, revealing creative interactions between such locational categories (Maxwell, 1995; Sawio, 1993; Drescher, 1999).

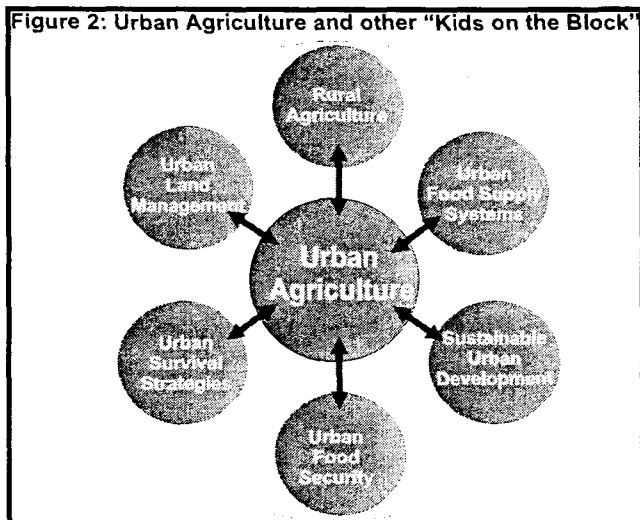
Product destinations: most definitions embrace agricultural production for both self-consumption and some trade (sale, barter, gifts, etc.). Both destinations are usually found to be targeted to varying degrees by the producers or households studied. Economic research recently has been aimed at specific (export) market-oriented productions and has helped us to better understand the economic performance of UA, its comparative advantages over other supply sources, both at the producer and consumer level. On the self-consumption plane, relatively more attention must be given to the economics of animal assets and the fungibility of supplemental food self-consumption afforded by UA to households. Whereas in Accra little attention was paid to the asset value of small livestock, a study in Cairo, a city thrice as densely populated as Accra and with only 3% of its precipitation, revealed that nearly 30% of low-income households in informal housing had livestock worth on average nearly a full month of income (GTZ, 1999).

Production systems (scale of): Few definitions clearly include or exclude specific types of production systems a priori. Surveys collect data on the different types of systems found in the area under study (see other section for details). Generally, the research effort has focused on individual, family micro, small and medium enterprises, as opposed to large, national or transnational undertakings. However, recent studies show that the bigger interact in more than one way with smaller market-oriented units, often even to the expense of units primarily geared to self-consumption (peri-urban areas). Corporate out-sourcing has been practiced for some time in UA, particularly in Asian cities, but trade liberalization is also making it attractive in a growing number of productions and cities in Africa and Latin America.

2.3 The Urban Eco-System Connection: A Neglected Trait of the Concept

Most authors only define UA in general terms; this is then often developed into some typologies to organise data analysis on the afore-reviewed dimensions of the concept. Studies rarely use their findings to refine the UA concept of the day (Mbiba, 1998) and to clarify UA's distinctiveness, or how UA relates to the body of related development concepts (see Figure 2: Urban Agriculture and other "Kids on the Block"). Smit et al. (1996b) briefly discuss the connection of UA with the urban nutrient cycle and with the urban food system. Several authors have further incorporated UA in their analysis of related concepts (e.g.: Moustier 1998 on rural agriculture; Lindell-Lourenço 1995 on food entitlements; Koc et al., 1999 on food security; Rakodi 1995 on urban households' survival strategies; Smith 1998 on urban food supply systems; Lee-Smith 1998 on urban land management; Girardet 1992 and Mitlin and Satterthwaite 1996 on sustainable urban development). This has generally been done so more on a theoretical plan than in operational terms, due to the UA concept's lack of clarity (Lee-Smith, 1998; Binns and Lynch, 1998: 790; Sumberg, 1999).

In his review article on trade globalisation, LDC urbanisation, and food security over the past two decades, Smith (1998: 207) for instance observes that this "...for the most part has neglected the important dimension of urban food systems and how these link production and consumption networks at local, regional and global levels." Smith argues that sustainable urbanization critically depends on equitable and effective urban food systems, of which urban food production is a growing component in LDCs. Greater attention must be given to



the external architecture of UA and Smith's argument offers an interesting starting point for doing so. More information is needed on how urban food supply systems work to understand the complementary roles of rural and urban sources of food. There are few data focusing on UA's significance in urban food supply systems at any point in time, and even fewer data on UA's evolution over a given period of time. Several cities for which historical data are available suggest that the significance of specific UA productions in the food supply system and related official policy are not necessarily linear (Mougéot, 1998; Sumberg, 1997, and Moustier, 1998).

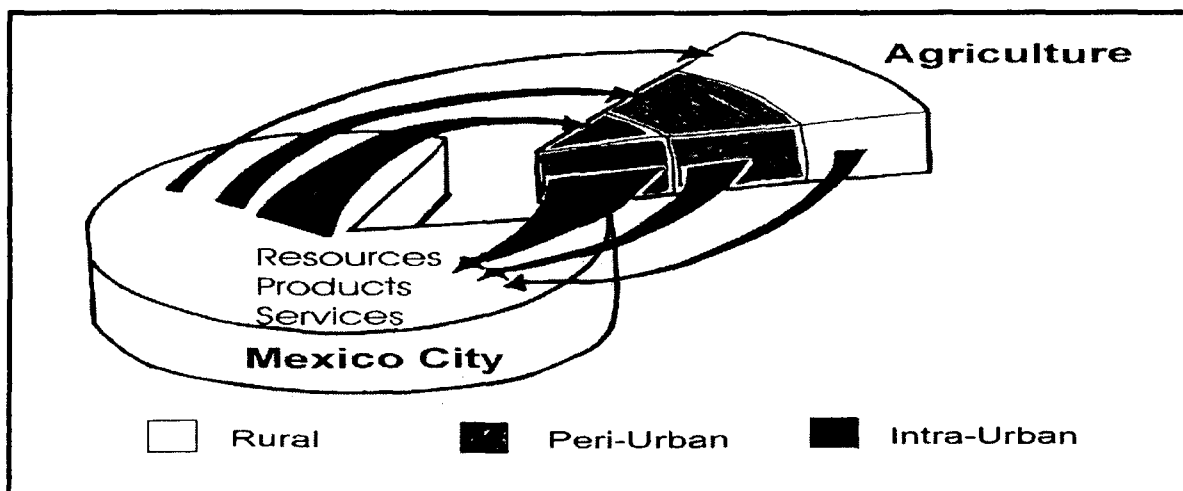
One striking feature of definitions so far is that few contrast UA and RA, even less so the implications of one for the other (Binns and Lynch, 1998: 790). Indeed, all building blocks reviewed earlier, excepted location, can apply to RA as well; they do not suffice to trademark UA and justify the need for UA-specific knowledge, know-how and policy. The following paragraphs identify some aspects on which efforts should concentrate and provide some evidence to clarify UA's distinctiveness.

The lead feature of UA which distinguishes it from RA is its integration into the urban economic and ecological system (from hereon referred to as "eco-system"). It is not its urban location which distinguishes UA from RA but the fact that it is embedded in AND interacting with the urban eco-system (Richter et al., 1995: 6). Integration into the urban system has been crucial to the persistence of UA, more so to its technological and economic influence over RA throughout history. Probably as old as our cities (Jacobs, 1969) UA has not been an exceptional nor a temporary pursuit. Ancient civilizations, which invested into massive earth and water-works within and fringing their cities, also used these to grow trees, shrubs, vegetables, fruits, and other plants, for food, feed, forage, wood and fuel, shade, fencing, and to raise livestock for food, materials, transport, trade, sacrifice, assets and status. UA was not sited haphazardly in the urban fabric or disconnected from the urban economy; food production took a variety of forms, using efficiently space, site amenities and economies of agglomeration (Mougéot, 1999b: 139-140). Throughout most of our history and in quite different cultures and climates, urbanites have engaged to varying extent in producing some of the food which they require, within or fringing

city limits. Food production has not been carried out only by the well-off; authorities often commissioned, built or managed significant food-producing systems, even incorporating these into the design of modest living quarters. From the evidence, many cities probably became and continue to be testing grounds for, and diffusors of, innovative farming systems. Technological breakthroughs include: sun reflectors, water collection, storage and conveyance, frost protection, greenhouses, space-confined systems, wetland drainage and slope terracing, aqua-culture, perma-culture, hydroponics. Large canal networks clearly seem to have followed the advent of fully established cities (Adams. 1994: 15). Though the nature of cities and of urban food supply systems has changed, the need for UA to interact well with the rest of city one hand, and with rural production and imports remains as true today as it was, thousands of years ago.

This integration with the urban eco-system is not captured in most definitions of the UA concept, and less so developed in operational terms. This is an area in need of much greater attention beyond initial steps taken by a few. For instance, Smit et al. (1996b: 3)'s definition of UA stresses the recycling of urban waste and the catering to the daily urban demand; this adds to the locational feature of earlier definitions an urban input-urban output loop. A revised definition is submitted as follows: **UA is an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-)using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area** (see Figure 3: "Urbanizing" Agriculture in (Mexico) City Using More from, and Supplying More to, (Mexico) City).

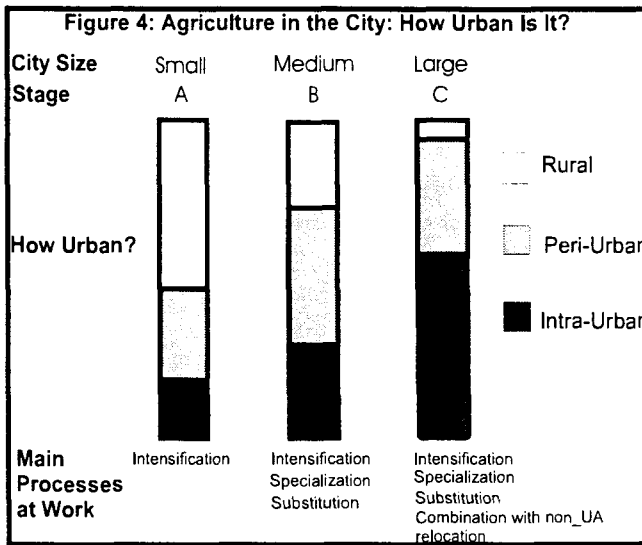
Figure 3: "Urbanizing" Agriculture in (Mexico) City Using More from, and Supplying More to, (Mexico) City



The principle of agriculture's integration into the urban eco-system enables us to recognise three types of situations with regards to the degree to which agriculture found in the city is actually integrated into the city organism (Figure 4: Agriculture in the City: How Urban Is It?):

(A) in any given city at any given time, agriculture will be found that is rural, peri-urban and intra-urban in nature, the three interacting and complementing each other to varying extent, with the latter being more integrated to the urban eco-system:

In order for agriculture found in cities to become more urban in character, this must innovate to cope effectively with city constraints and tap no less effectively on urban assets and flows found and generated by the city, and in turn benefit this (and others) with its products and services on a daily basis. Put differently, agriculture will be more or less urban, according to the extent to which it will use the urban eco-system and in turn be used by this same urban eco-system.



Clearly, the following would be a case of greater integration: a small enterprise run by city-born and trained individuals uses vacant ground area on a central-city school property, relies on city-based technical extension, product inspection and market price information, applies inputs and seeds purchased from urban outlets and disposed of by urban industries, plus treated domestic wastewater, and grows organically short-cycle, high value vegetables which it sells to city supermarkets and other urban consumers on a daily basis; it then applies incomes to re-investment into rare ornamentals for export, and the purchase of goods and services produced/sold by city outlets.

By contrast, a case of lesser integration would be: a recent arrival to the city, settled on its peri-urban outskirts, grows on a part-time basis on an adjacent lot slated for future development, a low-value, rain-fed grain crop, relying essentially on seeds, know-how, tools and other inputs brought from the rural area; the system taps very little on urban-based services, the crop goes essentially to self-provisioning the household, at most bartering for other food brought in by visiting rural relatives; some savings on food purchases but little extra income available to purchase city-based services or goods, and none to re-invest.

Most UA lies between these two extremes, with the urban system constantly impressing on any agricultural activity to become more urban. The concept enables us to assess conditions and policy interventions needed, if any, to move from lesser to greater integration. Are daily leafy produce imports by air from an overseas production zone part of Frankfurt's peri-urban agriculture? Possibly in the future, probably not now, that is, if we consider how much of all resources, products and services used by the overseas production zone are drawn from the city of Frankfurt itself and, conversely, how much of all resources, products and services provided by

the overseas production zone effectively reach the city of Frankfurt. Several studies exemplify the principle of integration through comparisons between intra-urban, peri-urban and rural activities. UA is found to complement RA in terms of self-provisioning, marketing flows and market supply flows. As shown for instance by CIRAD studies on vegetable and livestock productions, in West and Central Africa: **Self-provisioning:** Specific UA productions are important sources of self-provision for all households, anywhere and anytime. Self-provision from some productions affords a measure of self-reliance to urban markets at certain seasons and/or periods of time; self provision is found to benefit households regardless of their income, but is particularly critical to poor households. **Market supply:** Although in most cities surveyed, UA has been growing in absolute terms, its contribution to urban food supplies relative to RA and imports varies, depending on product and season: this is particularly true of animal products and by-products (in Addis Ababa: raw milk, broilers, eggs by UA; butter and beef by RA; cheap low-grade by imports, in Addis) and market produce (perishable leafy vegetables of wide consumption by UA, other bulkier vegetables - tomatoes, onions, potatoes - by RA). UA critically flattens price/variety seasonality by lessening dependence on off-season imports, or making up for reduced supplies from RA during the dry-season. Urban market gardening is run by professionals with low capitalization; it represents a main source of regular incomes (particularly short-cycle leafy), some spent on buying lower-priced staples; on a yearly basis cultivation moves around in the city, following the shifting availability of water. Temperate vegetables, poultry and fruits are often supplied by UA entrepreneurs who may hold other occupations as well. RA is better suited than UA to supply rain-fed bulky vegetables (consorted with basic food staples), and more recently of dry-season irrigated specialized crops, such as temperate vegetables - tomatoes, onions. **Marketing systems:** fewer levels of trade and a higher percentage of producers are involved in the trade of UA than in RA or imports. This dispersal of trade corresponds to a dispersal and small scale of UA (demand-supply variability risks, lack of storage and of access to credit by traders). By comparison, the wholesaler-collector function in the marketing system of RA is much more significant. Volumes traded and transportation costs are larger in RA, while marginal sale profits and bargaining power of producers against traders are higher in UA (Moustier, 1998).

Panigrahi (1995:43) and Seré and Reinhardt (1995) implicitly use the urban eco-systemic link principle, when identifying distinctive traits of peri-urban livestock productions (PULPs) relative to rural counterparts: types of livestock, size and nature of systems are conditioned by urban demand and feed availability; feed resources are generated by urban-based activities (agri-industry by-products, natural fodder on roadsides and in parks, abundant urban domestic wastes); form, quality and cost of product constrained by increasingly sophisticated urban consumers. According to Stevenson et al. (1996)'s systematic comparisons of rural, peri-urban and urban fruit/vegetable productions, in Dar es Salaam, the dependence of productions on urban-origin inputs and on urban-destination outputs clearly increases, from the rural (village) to the urban end of the spectrum. At the same time, this growing dependence impresses on productions: greater intensification, specialization, crop value and profit margin. Variables used to document this relationship include: percentage of non-resident farmers living in city, part-time farmers (with jobs in city), area in short-cycle and perishable vegetable crops, migrants from urban area, urban expansion factors, traditional/introduced ratio of crops, commercial value of crop as growth factor, fruit-vegetable/staple food crop ratio, farmland ownership/rental-borrowing ratio, diversification/specialization ratio, use of multiple plots to maximize access to natural streams,

local availability of agricultural inputs, crop size and marketing options, urban/rural destination of sales, mode of crop transportation to market.

On the resource level, the urban eco-systemic link of UA has been explored primarily through its reuse of wastes generated by urban agricultural and non-agricultural activities. UA's usage of premium manure and other city-generated organic waste is more widespread among intra-urban producers than among peri-urban farmers (Stevenson et al., 1996: 27); however, the latter may absorb larger volumes of lower-grade organic wastes, often through direct agreements between farmers and municipal waste collectors (Kano, see Lewcock, 1995). In Mexico City, waste produced by intra-urban cattle and pig units are used by suburban and peri-urban farming units (Losada et al., 1998: 45). The importance of the urban eco-system link for UA to be considered as truly urban is evident in NRI's understanding of UA research with a "distinctively urban-related character": for instance, the utilization of urban waste in composting to control soil-borne parasitic and pathogenic organisms and create high-value organic fertilizer for the urban market (NRI, 1995: 12). Also, growing interest in the link between UA and urban solid and liquid waste treatment and recovery is certainly indicative of the economic attractiveness of the urban eco-systemic dimension of UA.

(B) across cities of different size or complexity at any given time, more of the agriculture found in the city will be of urban nature in larger as opposed to smaller centres: systematic evidence for this relationship remains more limited than for (A). A six-city Kenyan study further shows that intensity and productivity increase with city size, that similarly the use of organic inputs and of networks of exchange or trade does increase with city size (Lee-Smith, 1998).

(C) in any given city and over a period of time, during urbanization, agriculture of an urban nature will grow as a percentage of all the agriculture found in that city: in this case, no systematic case study was found on the evolution of UA in a same city over a reasonable period of time.

However some evidence is available on multiple-year trends for specific systems and areas of Dar es Salaam, Dakar, Hong Kong, Cagayan de Oro, where UA land-based systems have shrunk, systems have intensified or specialised, have been substituted by more profitable ones, increasingly combined with non-agricultural land uses, when not relocated. Shanghai (13 m) exemplifies several of these processes at work, with land-extensive systems (vegetables and livestock) moving to the outskirts while production within city limits is becoming more efficient to deliver higher yields and labor productivity and value-adding (Yi-zzhang, 1999: 18-19).

It is reasonable to think that reliance of UA on city-provided resources, inputs and services can only grow during urban development, as does the UA's supply of resources, inputs and services to that city; this is because city-agriculture links unjustified when the city was smaller become more feasible and functional as the city grows, in view of the particular constraints and opportunities which arise from that growth.

We can expect up and downstream multiplier effects of UA to grow in larger centers, where UA generates a bigger demand for agricultural inputs and services and where in turn UA generates a bigger supply for specialty food processing.

There is evidence that ecological enhancement and psycho-social rehabilitation are UA services to the city which, in larger urban centres, are added to its basic food security and income generation functions already found in smaller urban centres.

In all three relationships (A, B and C), agriculture will become more urban, or will integrate itself more into the urban eco-system, through a series of processes which accumulate over time and are more numerous in the larger urban centres.. There is good empirical basis to believe that UA exhibits varying degrees of “urbanity”, within a given city, among cities and over time, as a result of processes ranging from intensification, to specialization (perishables/high value) , to substitution with other agricultural uses, combination with non-agricultural uses, and selective relocation. UA is able to overcome constraints and tap on opportunities because it tends to be smaller-sized, more dispersed, more adaptive to external pressures, higher-valued and higher-yielding, more intensive and integrated, more profitable or fungible, more innovative and synergetic with non-agricultural land uses, activities and services considered as urban in nature (the urbanization of the countryside brings along an urbanization of agriculture). UA does this through adjusting to economies and dis-economies of agglomeration (demographic, social, economic, political and ecological) found in the city and unprecedented in corresponding rural areas.

From the Mexico City study and others, it seems that an important area for urban policy is a greater collaboration between researchers and local authorities to strengthen and improve close working relationships which are developing between different UA systems, in terms of sharing resources, inputs, services, products and by-products, and between these and other urban land uses (Losada et al., 1998: 54). In the same way that political decentralization facilitate the promotion of agriculture in cities, decentralized urban policies (resource, input and infra-structural management) will no doubt be critical to the greater integration of agriculture with the urban eco-system. The sustainability and viability of UA will depend on its integration in the urban eco-system and Nugent (1999) has proposed a series of cost-benefit indicators which in fact could be applied to measure and correct the success of such integration.

In conclusion: UA’s urban eco-systemic link throughout its entire conceptual framework remains to be fully developed. Its conceptualization currently offers a generic definition and some indications of its distinctive traits. A de-codification of this definition is needed to help us identify its distinctiveness, both theoretical and operational. This must be done if we are to properly use UA to understand and intervene in our experience of an urbanizing (developing) world. Efforts in that direction have already begun and these are not trivial. They already are forcing us to distinguish between UA and non-UA in urban areas (the latter will continue to exist with or without a UA concept), between intra-UA and peri-UA, and to examine the place of UA within larger conceptual frameworks. The concept of RA, if not agriculture itself, is being read in new light. Because UA is claimed or reported to interact with so many facets of urban development, UA also holds the potential to help us diversify and strengthen our urban management strategies. This is not a small opportunity, as city-based electorates struggling for access to food, income and sanitation, are increasingly calling the shots in local and national policy arenas.

3. PRESENCE OF UA: WHO IS INVOLVED AND WHY IS IT IMPORTANT?

3.1 Who is Involved in UA?

The actors involved in UA are many; they are the suppliers of resources, inputs and services and the producers, the transporters and the processors, the retailers and the consumers, the promoters and the managers. These actors pertain to the public and the private sector, the formal and the informal economy.⁸ The political relationships which these actors thread among and between themselves as well as with resources are diverse; they can be complementary and synergetic, competitive and antagonistic, collaborative or adversarial, equitable or exploitative. The following paragraphs try to account for the little we seem to know on the actors and their inter-relationships. This section focuses on the relationships among producers, between these and retailers, and between these and authorities, particularly with respect to selected issues (e.g.: access to land, rural and urban agriculture, communities' welfare).⁹ It is essential that more

⁸ Dixon (1999) argues that a cultural economic perspective could reinforce the political economy of food systems. According to her, the latter focuses on the relationships between economy, social **class** and politics (commodification, trans-national agri-food production, aggregate consumers, and retail restructuring). Cultural economics focus on economy, social **identity** and politics; it emphasizes the social reality of the commodity, the valuation process beyond pricing, productive units like families, households and communities; it broadens the meaning of output, embraces exchange beyond market exchanges (time, pride, information, guilt, inter-personal power), and expands the sphere of distribution beyond movement of products between producers and consumers; it also underscores women's roles across the food system. A cultural economy of UA may be in order, given the incidence of self-consumption, its role in household welfare, non-market exchanges and symbolic values attached to self-produced food.

⁹ Knowledge is sparse and largely limited to those cities where issue-driven multi-stakeholder research and policy-making processes have been conducted. **Affluent urban dwellers** are privileged urban farmers. A recent three-city study in Tanzania revealed that the percentage of households growing food for self-provisioning varied but were generally higher in the mid and high-income groups (Yachkaschi: 1997: 108). In low-density districts of Dar both animal husbandry and vegetable gardening are widespread, often integrated (Mlozi, 1998): large fenced home plots, more dependable and cheap water supply, abundance of manure, family relatives and worker dependants, subsidized transportation, afford self-provisioning and market-oriented farming, sometimes violating legal norms. Rarely reported to overtly oppose UA, these urban producers are often perceived by the larger lot of poor farmers, rightly or not, to be needed allies for greater official support to low-income UA. When **non-farming neighbors** are queried in surveys, percentages who say they would farm if they had enough land are often substantial; some consume produce from their farming neighbors. Still, neighbors who do not farm sometimes complain about livestock noise, manure smells, rodents, tall crops sheltering delinquents; this is rarely reported as a major issue. On the other, little could be found on **rural farmers'** views on UA. Zimbabwe's national association of farmers stands always ready to admit legalized urban producers. **Urban real estate developers** often complain that peg removal by interim farmers adds to land development costs. **City councils** often authorize UA as a fixed-term or seasonal use of unbuilt grounds in public housing projects; **small and large estate owners** welcome UA by authorized individuals at their residential construction sites, in return for protection against theft of materials, damage to facilities, garbage dumping or squatting.

attention be paid to the political economy of UA if future promotion and management interventions are to be fair, viable and sustainable.

3.1.i Producers, Women Producers, Classifications

Everybody does some urban farming, but some do it in bigger ways than others. A California-based winemaker imports Chilean grapes from the Santiago region. A Brazilian electricity utility leases out right-of-way parcels to vegetable growers in metro Rio. A Dominican rehabilitation institution in downtown Santo Domingo has inmates grow and sell hydroponic lettuce to nearby supermarkets and ornamentals to high-income neighbors. Zimbabwe's Harare City Council irrigates cattle pastures with treated municipal wastewater; informal women cooperatives farm local vacant fields for food and cash. A group of men garden small plots on a Church's unbuilt estate in Tanzania's capital, Dar es Salaam. Almost everywhere where fresh dairy products are in demand, senior bureaucrats stall-feed dairy cows on their private estates. In Cuba, public housing residents in La Habana and elsewhere grow home vegetables and rain-fed root and grain crops in nearby public open spaces; in Peru, women home-raise guinea pigs for sale in Lima and in secondary cities such as Cajamarca.

However, **most urban farmers are low-income men and women who grow food largely for self-consumption, on small plots which they do not own, with little if any support or protection.** They tend to come from smaller towns; a majority are not recent arrivals. For instance, a 1994 survey of three different sectors of Nairobi revealed that over 60 percent of 177 producers had moved to the city before 1985 (Mboganie-Mwangi, 1995). At prized sites such as the Pikine wastewater treatment plant in Dakar, Senegal, or along a major artery in central Fortaleza, Brazil, I met market gardeners born in the city who have been practicing UA all their life.

The fact that women tend to predominate in most surveys may have to do with factors still not fully accounted for. Recent studies indicate that gender ratios vary greatly from city to city, depending on cultural/religious context, the economic conjuncture, the economic activity, the production system, scale and areas involved. In vegetable marketing men prevail in market gardening in Brazzaville, Lomé, Addis Ababa, and Dakar, while men prevail among producers and women in vending in Cagayan de Oro, Philippines (Schnitzler et al., 1999:46); in Tanzania, gender ratios vary markedly in retail between cities depending on religious affiliation (Yachkaschi, 1997:102). Men are more attracted to production in times of high unemployment (Harare, Mexico City). They tend to prevail in wholesale trade in Tanzania (Yachkaschi, 1997:62). Lourenço-Lindell (1995: 3) observed a clear specialization by production type and process task, according to gender and ethnic group. Small homebased animal husbandry is the business of women in Accra and in Santiago, Dominican Republic. In Lusaka, women, who prevail among producers, are disadvantaged with regards to income generation and access to

resources and markets (Drescher, 1999). In West and Central Africa, women are often engaged in vegetable marketing, and can exact substantial profits from male producers; merchant women who also double as producers are able to invest more in their production system than full-time men producers; when they do so they have been found to be as efficient as men in their use of inputs (Kouvonou et al., 1998). Immigrants and native ethnic groups often introduce or dominate specific production-market systems or areas (Cosgrove, 1994; Moustier, 1996; Moustier and David, 1997).

There is no doubt that UA connects well with women's traditional child care-taking and general household management. It allows them to strengthen food provisioning and work close to the homestead. Most women urban producers are probably engaged in self-provisioning to a larger extent than men (Hovorka, 1999). UA is particularly significant for women with larger families to feed and/or support (Dennery, 1999; Maxwell, 1995). Women can enter self-provisioning with limited skills and capital. But the need for women to share their work budget between house chores and farming, whether for self-consumption or trade, does limit their access to distant tracts of open space, inducing them to specialize in closed-quarter production systems (del Rosario, 1999; Panigrahi, 1995). Even women engaged in market gardening often have less time available and fewer resources than men, thus investing more work effort of their own per unit area than men. This implies that even in open-space settings, particularly where water-can irrigation is the only option, they tend to farm smaller areas, and choose higher-valued crops than men (peppers for export in Accra). Those women who own urban land have been found to be particularly inclined to engage in or facilitate UA (Harare, Hovorka, 1999: 10).

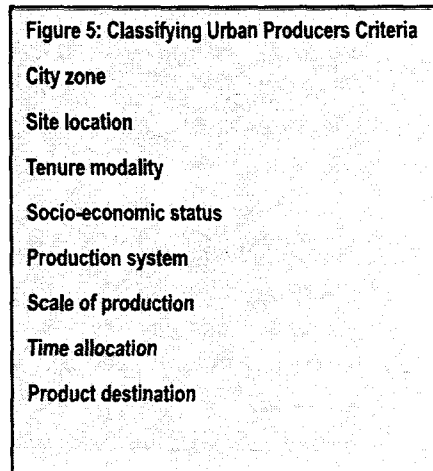
There is evidence that UA can afford women with greater control over household resources, budget, decision-making and benefits. Many re-invest their savings into their children's education, into small upstream (bulk purchase and retail trade of manure, Haiti) or downstream (food processing and street vending, Nairobi) of UA enterprises, as well as into other small businesses (Dennery, 1997; Chauca, 1999; Moustier, 1996). When denied land ownership in their traditional communities of origin, or when they cannot inherit their husband's estates, women have used UA to finance their purchase of a house in the city. Women also seem to use UA to improve their household and community sanitation (organic fertilizers and treated domestic wastewater for vegetables in Nairobi and Mexico City; selective collection of organic wastes for pig-raising in Cairo) to a larger extent than men do (Hovorka, 1999: 8).

As women focus on more intensive and integrated production systems, they may be more affected by research and extension services which disregard such systems and their knowledge of crops, combination of inputs and cultivation methods (Drescher, 1999). Women's concern with their children's health, their focus on food procurement and their use of home-based and close-quarter systems all lead them to prefer organic inputs rather than agrochemicals. In several countries, women urban farmers have developed a high degree of organization and political

activism (Zimbabwe; Mozambique and Gambia, quoted by Hovorka, 1999: 13).¹⁰ Some authors have warned that supportive policy for UA could lead to intensification/commercialisation of UA, thereby making it a men's domain and curtailing women's job openings (Drescher and Iaquina, 1999). To be sure, policies intended to support women's engagement into UA are only justifiable and viable in the long run, if they comprehensively acknowledge women's distinctive constraints and opportunities, and act upon these to effectively enhance women's citizenship, as opposed to worsening their lot relative to that of men.

Classifications of UA productions/producers are many (see Figure 5: Classifying Urban Producers Criteria). They reflect a combination of

production factors which characterize important segments of UA in any given city: city zones, site locations, tenure modalities, producers' socioeconomic status, production systems and scales. Criteria (or combination thereof) which seem to prevail are: zonal location within the city, modality of access to land, producers' dedication of time and other inputs, and product destination. Some studies have focused on specific categories, such as production systems at home-based (Lee-Smith et al., 1987; Chauca, 1999) and at open-space based locations (Freeman, 1991; ENDA-ZW, 1997; del Rosario, 1999). Others have developed classifications for specific production systems, such as market vegetables (Abutiata, 1995; Centres, 1991) or animal husbandry production (Centres, 1991, Chauca, 1999). In Kumasi and Lomé, (Abutiata, 1995: 45-6; Kouvonou et al., 1998), vegetable producers are classified according to time dedication, including three sub-classes of part-time producers (urban night security men, artisans, peri-urban absentee farmers) and full-time and all-year-round producers (hiring labor). In Bissau, Lourenço-Lindell (1995) differentiates types of UA based on product destination: subsistence (self-consumption) or market-oriented. More elaborated classifications are based on a combination of tenure modality, time allocation and product destination, for Kampala (Maxwell, 1995) and Accra (Zakariah et al., 1998); similar criteria were used by Sumberg (1999). Policy may benefit or affect the future of urban producers, depending on how they account for and intervene on those criteria according to which particular groups of producers differentiate themselves from others.



3.1.ii How Producers Gain Access to and Use Urban Land?

¹⁰ In her excellent review, Hovorka recommends further research to better understand:

- * how and why distinct UA activities are elected by or assigned to individual household members at a micro level (intra-household control and power relations);
- * how and why gender differences and inequalities are reinforced or not by organizational, legal and political macro structures (cultural traditions, economic policies);
- * how and why, in a given cultural context, women urban producers are further differentiated among themselves, by ethnic group, social class and age category, in terms of their access to resources, products and benefits.

Most studies find that developing-country cities have plenty of undeveloped land or under-utilized (indoors, walls, rooftops) areas available, often in central areas; access to prime locations is fiercely disputed. A growing number of newcomers to UA cannot gain access to enough or suitable land or area, even if this is available: some either take over long-farmed plots from relatives, take up smaller plots on more distant or lesser-quality land, or else hire themselves as labor on prized plots held by mid or upper-class urban farmers (see Drakakis-Smith et al., 1995 on Harare; del Rosario 1999, on Santiago, Dominican Republic; Mlozi, 1998 on Dar es Salaam). Producers gain access to urban land from a variety of urban actors, through diverse modalities of tenure and usufruct; arrangements are very often informal and sometimes based on customary law. In surveys available, those gaining access to tracts of land against the will of their owners are a very small minority.

Given the constraints on access to , and on the size of, land plots available for UA at any location, production systems are very diverse in order to make the most and the best use of particular locations within the urban fabric. Areas used are of all sizes, from tiny home spaces (windowsills, containers, fences, rooftops, basements, walls) to recreational grounds, utility and transportation rights-of-way (stream or roadsides), to suburban public or private estates. For ground-level areas, plots may vary from less than 50 m² in city cores to several thousands of m² along transportation corridors and particularly in suburban wedge areas. Aridity, unreliable supplies of piped water, violent rainfalls are all critical limitations in many systems, particularly where water must be paid for; the quantity and quality of water and the producer's ability to manage the resource determine the location, size (which may vary from season to season) labor requirements and crop choice of his or her undertaking. Generally speaking, space-intensive forms of UA are found at central locations, while more space-extensive forms, as with other land uses, migrate towards the moving city periphery during urban development. In central Dar a plot of 500 m² can produce enough spinach to feed 3000 people once a month (Jacobi and Amend, 1997). In central Santo Domingo, I have seen people harvesting some sixty heads of lettuce eight times a year, this from a two-meter-high plastic pipe, fed with a hydroponic solution, and standing on 0.5 m² of ground area. Elsewhere, mushrooms and silkworms give higher returns per unit area. In central Cairo where densities can reach 100 000 inhab/km², squeezed in between the Nile and a major artery, a nursery of ornamentals applies purchased manure and water from the Nile and sells to driving-by customers.

According to the latest official Mexican census data, the space defined as urban (83 % built-up, 15.5% roads) in the Metropolitan Zone of Mexico City had 2931 heads of cattle, 1541 pigs, 132 902 hens and 4 271 rabbits, plus 303 334 hectares of spring-summer crops (down to 6303 hectares in autumn-winter) and 25 922 hectares unsown; crops and livestock figures were much higher over same-size areas in suburban and peri-urban sectors (Losada et al., 1998: 46, 48).

Within a given city, particular systems interact one with another within the same area over time or across areas at any given time. This enables producers to reduce their risks and to improve their access to particular resources and markets. Plot size and location strongly condition the urban farmer's choice of production system and specific crops. In Bissau, producers using smaller spaces were more likely to grow high-demand, low-profit, short-cycle indigenous

produce rather than the longer-cycle and higher profit-making, but less demanded, exotic varieties. Those using large areas are more likely to initially plant short-cycle locals and reinvest income into long-cycle foreign produce later in the season, such as in peri-urban Brazzaville and in Accra (Moustier, 1996; Maxwell et al. 1998).

Urban farmers may use different spaces in a complementary way over a period of time. For instance, year-round home gardens often serve as nurseries for rain-fed off-plot fields, as in Lusaka (Drescher, 1999); the same stream-side field may carry vegetables in the dry season and grain crops in the rainy season. Working several fields at different locations maximizes access to critical inputs (stream water and effluents) and to niche markets (ornamentals at crossroad intersections, herbs across from catering facility, etc.), ensures stability against eviction from any particular site or against crop losses due to theft or other hazards.

Different urban farmers engaged in different productions often cooperate one with another: they may use each other's plot at different times of the year (dry ground rice growers and flood land vegetable farmers in Bissau), exchange wastes or products (dairy farmers with close-by vegetable growers in Nairobi). Urban producers tend to recycle animal wastes and vegetable wastes as much as possible.

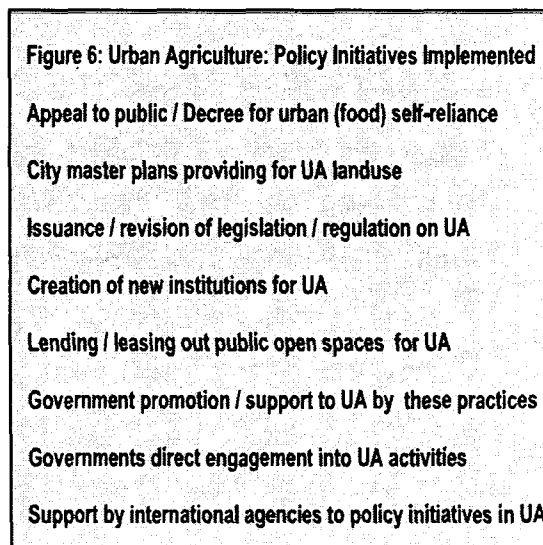
UA management involves deciding which types of products and what scales of operation should be allowed in different parts of the city. A city may want to avoid major concentrations of stall-fed dairy cattle or piggeries in central districts, where it may encourage systems integrating stacked small livestock with space-intensive high-valued crops. Even in areas where public open spaces are in short supply, tenure agreements are being sought between urban producers and owners of private or public estates with idle areas (hospital grounds in Lima, golf club in Harare, school yard in Santiago, Chile, ocean port grounds in Lomé, etc.).

3.1.iii Promoters - Managers

Various NGOs, governments and international agencies have been supporting UA activities in LDCs, since the 1970s. NGO initiatives in UA have been very diverse since the 1970s, in all major world regions, and inventoried in a number of publications (i.e. worldwide: Wade, 1987; Smit 1996; on Canada: Lifecycles, 1998). NGOs have been active particularly in Latin America and the Caribbean (Prudencio, ed. 1997), and less so in Africa and Asia, where more NGOs traditionally focusing on rural development are now extending into urban areas. In urban areas, more NGOs have been seeking the collaboration of governmental actors to upscale local UA interventions, such as ENDA-ZW in Harare, Zimbabwe, CEARAH-Periferia in metro Fortaleza in Brazil, CARE Haiti in Port-au-Prince, Haiti, FUNAT in Habana, Cuba, REDE in Lima, Peru, etc. Few evaluations of NGO initiatives in UA are however available and more are needed to orient future interventions in collaboration with other actors (Chauca, 1999; Régis, 1999; Mougeot, 1999c).

This paper focuses on official promoters/managers. Where promoted, the new low-income UA is

being so, as earlier with informal employment and housing, by national and local politicians, often despite public planners and other technocrats' views on UA, and in response to urban dwellers' initiative. This was true of Uganda and Mozambique twenty years ago, as much as it is of Cuba and Indonesia in the 1990s. A view which is receiving growing acceptance in official circles is that UA can and should be mainstreamed into more robust strategies for food security, poverty alleviation, income and employment generation, productive waste and land management (de Zeeuw, 1998). Official promoting/managing interventions carried out for UA can be organized into several categories (see Figure 6: Urban Agriculture: Policy Initiatives Implemented). Combinations of these can be found at work in any city, such as reported for Bulawayo, Zimbabwe (Ndebele, 1996):



National and local political leaders' public appeals for self-reliance: In countries as diverse as Tanzania, Zambia, Cuba, the Philippines, Guinea Bissau, Indonesia, presidents and mayors have called on urban and rural citizens to become more self-reliant in food. In newly independent countries, elected representatives have been more responsive to their constituencies' hardships and coping strategies than were colonial governors. In the early 1980s, the Nigerian President Shagari gave permission that all vacant public lands within urban areas could be used for cultivation without charge.

Provision for UA in city master plans: New capital cities, as Doala in Ivory Coast and Dodoma in Tanzania, have been designed to accommodate UA. Agriculture has been incorporated into urban expansion plans for Kinshasa, Dar es Salaam, Maputo. In Bissau this was deemed juridically insufficient to protect vegetable gardening from urban expansion (Moustier and David, 1997).

Revised urban regulations: Colonial zoning bylaws and international sanitation standards are often seen as excessive, unenforceable or inappropriate to local conditions (Kironde, 1992). Rising demand for milk and a strong cultural acceptance of cows overcame the Indian government's attempt to ban livestock from New Delhi in order to beautify the city (Panigrahi, 1995: 18). Bylaws have been revised to allow for specific production systems in specific zones and state agencies have been authorized to promote appropriate practices in such areas, as in Kampala (where roaming cattle is still prohibited) and Kumasi (Atukunda, 1998; Abutiati, 1995). Dar es Salaam as one of the most elaborate bodies of legislation on UA in Africa; multi-stakeholder surveys have been used to suggest priority improvements to both text and enforcement (Sawio, 1998). Although the letter of the law may not be revised overnight, interpretation and application have had to compromise with survival options available to large sectors of city populations, as in Kenya, Cuba and India.

New institutional mechanisms for UA: Several countries have created permanent institutional programs and agencies; these have exploited flexible zoning modalities (Cruz, 1999 and Gonzales 1999, on Cuba), purpose-specific leaseholds (Argentina), promoted UA to supply national school catering programs (Costa Rica), legally organized groups of urban farmers (Zimbabwe, Tanzania), entitling them to credit and technical assistance. The Cuban Ministry of Agriculture has created an Urban Agriculture Office for La Habana (2 m), where extensionists work in 13 of the 15 municipalities of La Habana; some 400 horticulture clubs are affiliated to the Ministry (Altieri et al., 1999). Philippino legislation, approved in 1991 for the decentralization of powers and resources, enabled the Cagayan de Oro (0.5 m) City Government to establish the City Agriculture Office, now responsible for all UA matters (Potutan et al., 1999).

Allocation of municipal open space: organised groups have been assigned undeveloped public arable land for fixed periods of time (Harare, Gweru, in Zimbabwe), UA has been tolerated as interim or permanent land use in public housing schemes (Dar). The Greater Pretoria Metropolitan Council recently recognized specific UA food productions as valid urban land use, has incorporated UA into the management of its urban open space system, set aside land for UA in designated sectors of the city and is developing proposals for implementation. Argentina's national program of community crop and animal farms uses public tracts of land ceded by municipalities specifically for UA purposes. In La Habana, Cuba, all vacant lands are potentially subject to UA use; some 19 ministerial resolutions now protect urban areas under agricultural production; whoever wants to develop an area occupied by an organoponic operation must pay the cost of re-establishing this operation elsewhere in the city. In wards plots assigned by local councils to individuals and groups for commercial food production are monitored and, if under-used, are transferred to other producers (A. Nodal, Mario Gonzales, Barbarita Hernandez, La Habana, 11-13 October 1999). Following food production decentralization and release of state-owned land to temporary production in the 1970s, private farms in the late 1980s were supplying Sofia with 48% of its milk and eggs, 53% of its potatoes and about 50% of its vegetables (poster...). Parks & Gardens and Community Development of the Metropolitan Municipality of Quito, Ecuador, are setting aside garden allotments within city parks for women's groups to cultivate, in return for their tendering the park where their plots are located (Marielle Dubbeling, 13 October 1999). In Cagayan de Oro, Philippines, the City Council has issued an initial ordinance allowing urban farmers to use parts of idle land and open spaces (poster,).

Officially promoted UA projects: In Bissau, where municipal urban regulations do not oppose UA (except roaming cattle), the federal government initiated with UNDP a Green Belt Project which in the early 1990s benefitted over 2000 cultivators, mostly women, in 14 urban districts (David and Moustier, 1993). In Ghana, the Ministry of Food and Agriculture has introduced peri-urban milk collection to encourage peri-urban dairying in the Accra-Tema municipality (NRI, 1995: 40). Brasilia D.F. furthers the integration of small food production with local food processing and marketing (de Carvalho, 1999). In Cuba, public support in La Habana includes 27 stores dispensing advice and selling inputs, 68 veterinary clinics, 10 seedling nurseries, 11 centres producing biological pesticides, and one extensionist per city ward, for a total of 68. In Metro Manila (10.7 m in 1998) the contribution of commercial land-based production to city

food supplies is minimal and so is its potential due to shortage of suitable land; the Department of Agriculture supports multiple indoor systems among poor families to curb rising malnutrition (Ali and Porciuncula, 1999).

Direct public engagement in UA production: National or metropolitan public utilities have leased out land (Brazil), entered in partnership with producers (Senegal) or have become direct producers themselves (Tunisia, South Africa). In La Habana, rather than producing it itself, the Ministry of Agriculture is now servicing and acquiring from individual small livestock producers a growing share of the basic meat supply for the city population and businesses (Jorge Luis Castellano, 13 October 1999). In the future, Departments of urban development, public health and agriculture are likely to increasingly provide coordinated and complimentary assistance, as opportunities and risks at stake become more apparent. Outside Latin America and with the exception of Church organizations, NGOs have been comparatively less active in UA, in Africa and Asia, where CBO activity probably remains under-reported.

International agency support to public UA interventions: Bi- and multilateral development agencies have been supporting more actively UA since the late 1980s: CIDA and GTZ, have supported UA as productive use of metro green belts (La Habana and Maputo), SWEDEPLAN has assisted with the inclusion of UA in the design of social housing (Maseru, Lesotho); NEDA has encouraged UA as productive open space use near high-density residential areas; DANIDA has funded fuel wood plantations and credit to female producer cooperatives; SIDA recently funded an East African workshop to inform policy research into rural-urban food production and is currently considering UA as part of a new urban environmental management program in SE Asia (Bo Gohl, 12 October 1999). French Cooperation has supported market assessments for specific commodities (peri-urban vegetable crops). UNDP and FAO have been providing technical training and feasibility studies for several production systems. UNCHS has supported formal consultations of UA as part of multi-stakeholder action plans for urban management. UNICEF and related humanitarian NGOs such as CARE, OXFAM, CEBEMO have supported UA projects. The WB IDRC and the EU have supported treatment and reuse of liquid and solid waste into peri-urban agriculture in Peru, Brazil, Chile and Cambodia (UNDP-WB Water Sanitation Program guidelines). The WB recently supported projects recommending inclusion of UA as legitimate land use in new city master plans, as in Uganda; it also commissioned an assessment for comprehensive Bank support to UA in SSA (Smit et al., 1996a). FAO has formalised an inter-departmental group and will lead, with ETC and UMP, a series of electronic conferences aimed at national and local authorities to identify policy assistance needs on particular UA issues.

In conclusion, the variety of policy interventions already on record is impressive. These have been largely led by local governments. Such local experiences are only beginning to be systematised (GTZ, 1999; ongoing project by UMP-LAC). Excepted for a review of impacts from IDRC-supported research projects in Latin America (In press) and Africa (Mougeot, 1999c), hardly any systematic review of lessons learned from past interventions by local and national governments or by international agencies could be found.

3.2 Why is UA Important?

This question enables us to turn to the external functionality of UA with greater detail. In principle, UA is but one source of supply in urban food systems and only one of several food security options for households; similarly, it is one of several tools for using productively urban open spaces, treating and/or recovering urban solid and liquid wastes, saving or generating income and employment, managing freshwater resources more effectively. In practice and undeniably in many regions and in a growing number of cities, UA has been re-surfing for over three decades now. It has become a sizeable supplier of certain foodstuffs to growing urban sectors, poor and not so poor, and a critical factor in poor households' nutrition. Additionally, it is conveniently managing open spaces, reducing disposal and treatment of urban wastes, generating supplemental income and/or affording cash savings, and providing employment, direct or not, part or full time, on a temporary or longer-term basis.

The divorce of agriculture from cities, of food production from urban economies, is very recent in urban history, has been far from universal and is being revisited. After Russian occupation, Chinese planners incorporated food production into city planning. Asian city-states such as Hong Kong and Singapore have evolved highly organized production systems and UA is expanding in metropolises elsewhere in Asia (Aziz and Amir, 1997). In newly independent African countries, governments have advocated greater urban food self-reliance, on ground of both equity and economics. Following wartime effort of victory gardens, large North American and West and East European cities have witnessed a resurgence in community-gardening since the late 1970s, based on more than strictly economics. The lack of awareness, recognition, promotion and management of UA has more to do with certain cultural attitudes toward urban policy than with the workings of classical locational as well as institutional economics (Ellis and Sumberg, 1998:218). This divorce is being revised as more information becomes available on urban dynamics, urban food supply systems and the logic of UA in urban livelihoods, and as political decentralization is placing more responsibility and means in the hands of local governments to support and manage UA.

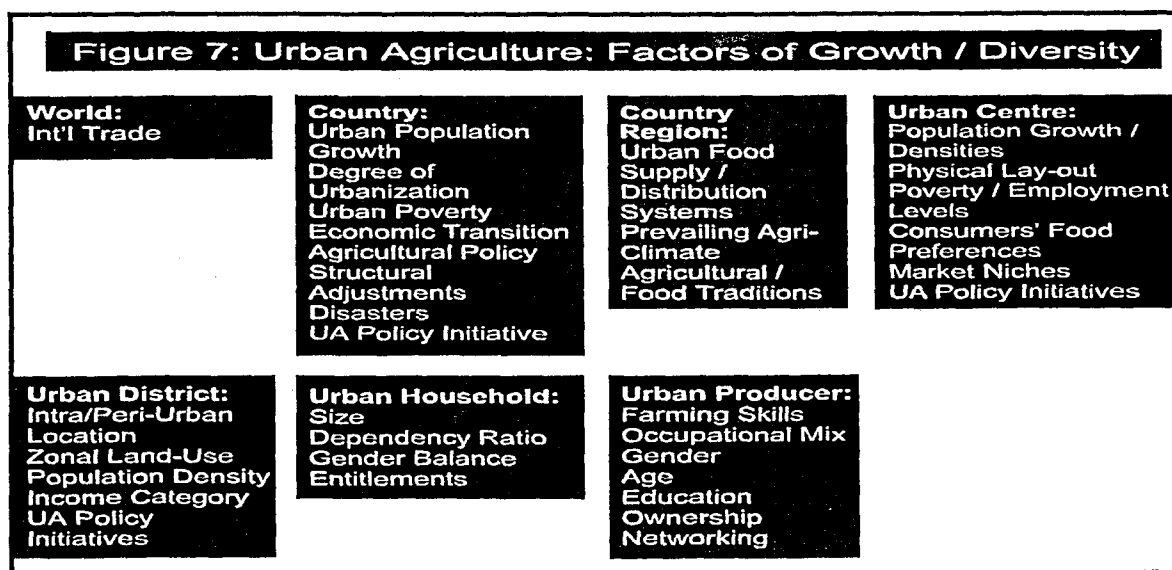
Today, Smit et al. (1996b) claim that an estimated 800 million people would be engaged in UA worldwide; of these 200 million would be market producers, employing 150 million people full-time (Smit et al., 1996b). When contacted in late 1997, Jac Smit explained that this estimate draws from various sources using different methodologies: census and other official national data, reports sponsored by the United Nations University Food-Energy Nexus Project and institutional surveys assisted by the IDRC, graduate degree studies, official city master plans and related data, samples by professional survey firms, periodicals and personal communications from organized local producers and others. Similar largely informal activities, including artisanal fisheries, face the same statistical problems. Even if we, very conservatively, believed reality to amount to half of such estimates only, still nearly half a billion urban producers point to a significant phenomenon clearly underway, largely in developing countries. Denninger et al. (1998: 6) estimate that nearly 25 out of the 65 million people living in urban areas of Eritrea,

Ethiopia, Kenya, Tanzania, Uganda and Zambia currently obtain part of their food from UA and that by 2020 at least 35-40 million urban residents will depend on UA to feed themselves.

Data on several production systems show dramatic growth in numbers of producers, production systems at work, area used, production and yields in several cities. Both output and yields have increased despite area reduction in market vegetable gardening in Dakar (Mbaye 1998; de Bon et al. 1997). Similar trends are observable in Kumasi (Abutiate, 1995: 50), Lomé (Kouvonou et al., 1998), local and export specialty crops in Bissau (Lourenço-Lindell, 1995). As in Singapore and Hong Kong years ago, La Habana in Cuba and Cagayan del Oro in the Philippines are now witnessing the expansion of small livestock systems relative to plant crops. Urban herds of cattle of varying size in Dar es Salaam (Mlozi, 1995) and dairy cattle in Nairobi (Staal, 1997) and poultry in Indian cities (Panigrahi, 1995) are growing. More performing cattle breeds are replacing native breeds in Kampala (Mougeot, 1994). Dramatic production increases based on official statistics are reported by Mlozi (1995) for the city of Dar es Salaam over the 1985-1993 period: heads of dairy cattle from 3,318 to 18,286, layers from 221,920 to 1,225,932, broilers from 146,205 to 565,579, local fowls from 88,720 to 131,891, ducks from 4,900 to 37,327, pigs from 6,795 to 33,564, and goats from 1,361 to 40,930. The growth of these systems in Dar es Salaam well exceeds that of the city's human population and city area; it can be attributed partly to the growing adoption of space-confined husbandry. Similar trends are probably observable in other major cities of the developing world. A majority of experts leading internationally-funded UA research or technical assistance projects in these and other cities believe that UA will continue to grow and evolve over the next decades, even where its resurgence was initially triggered by a crisis.

Since the late 1970s UA has been expanding in a growing number of developing countries experiencing rapid urbanization (Sub-Saharan Africa, South East Asia) and/or unable to supply sufficient, affordable food to large sectors of their urban population (Eastern and Central Europe). UA also has grown in highly urbanized societies, such as the U.S.A., Japan, Western Europe, Asian city states and Pacific islands such as Fiji. UA always has included a vibrant agribusiness sub-sector, which continues to expand. The new phenomenon is the very large number of mid and lower income people entering the sector for self-consumption and some trade.

The existence and policy needs of UA cannot be dismissed with the argument that urban systems today are more sophisticated than in Antiquity, the Middle Ages or the Industrial Revolution. Technologies have improved but the political economy of food production and supply probably has less so; new powerful factors have emerged which are making urban populations larger, and more of these in the South and now in the North poorer and food insecure (Werblow, 1997). The factors buttressing the growth of UA in the developing world are many, intertwined into a complex web of causation still little understood, if not under-estimated (Figure 7: Urban Agriculture: Factors of Growth / Diversity).



On the urban food supply side, crop choices, agricultural credit programs and incentives, technical extension and research, distribution networks often have been dictated by export and hard-currency earning policies. Official control of food prices has favored urban-wage earners and discouraged rural production. Subsidies are less frequent today but their removal often exacerbates price seasonality; high transaction costs may discourage rural producers from supplying critical markets; institutional frameworks may not be in place for markets to operate effectively. Economic liberalization also has made some urban-based productions more competitive than rural counterparts and has opened up an urban market for local input and implement suppliers; export-oriented crops even have become viable in urban areas (Accra, see Zakariah et al, 1998; Bissau, see Lourenço-Lindell, 1995). In rural areas, where high-quality food is produced, larger quantities of more varied products, formerly geared toward the local diet, now find attractive export markets for longer periods of the year (e.g.: Ivory Coast, Dominican Republic). As a result, quantities sold domestically may decline even when production increases, with supplies being less diverse or selling at higher (export) prices than available from UA. UA can also supply higher-grade products than imports dumped by over-producing countries. A growing number of civil and natural disasters very often disrupt food production and destroy supply lines to cities, thereby wiping out crops or increasing food prices; UA is often spurred by disasters, as mined fields in Mozambique and railway disruption in war-torn Congo (Moustier, 1998). City-ward emigration of rural youths affects rural food production on the longer-term, which is still largely small-scaled and labor intensive. So do land tenure concentration and conversion of food crops to industrial crops or to other uses (urban expansion).

On the urban food demand side, devaluated currencies, weakened purchasing power, frozen wages, retrenched public service and formal employment, removed subsidies on food and other basic needs, have curtailed the capacity of both the urban poor and middle class to purchase all of the food which they need. In 1990, households in nearly half of the largest cities in low-income countries were already spending on average 50-80 percent of their income on food (PCC, 1990). This figure was higher for low-income households; even so, their purchases often have been found to not cover daily minimum requirements. No matter how efficient the urban food supply market may be, rapid urbanization and growing urban poverty will complicate the demand side of the equation for decades to come. Where peri-urban production and marketing systems are considered to be efficient, as in Port-au-Prince, the retail price of local vegetables makes them simply unaffordable by the poor (Sumberg and Kleith, 1994). The changing diet of urban consumers and export markets are also strongly influencing substitution of some crops and the intensification of others, usually higher-valued. In Mexico City for instance, this explains the surging popularity of the "nopal-legume (*Opuntia ficus-indica*)" fertilized with urban livestock manure (also for export to Japan and USA), the substitution of black bean with broad bean for urban snacks, and that of white with blue maize for processed food, as well as mutton meat demand for barbecues (Losada et al. , 1998: 50).

In this context, governments are awakening to one undeniable and gathering trend, but need to better cope with its far-reaching economic, social and political underpinnings: poverty and

malnutrition are becoming increasingly urban.¹¹ More of the rural poor are migrating to the cities, more of the people in cities are being born to poor families and more urban middle class residents gravitate around the poverty line. If in 1988 at least 25 percent of the developing world's absolute poor were living in urban areas, by year 2000 these are expected to comprise 56 percent of the world's poor households (WRI/UNEP/UNDP/WB, 1996: 12; UNICEF, 1993: 13). This has been a census fact in Latin America and the Caribbean (LAC) at least since 1986, when more poor were first found to live in cities than in rural areas; the poor could make up as much as 47 percent of the region's urban population by year 2000. In the late 1980s LAC had seven of 20 countries with a low global index of household food security and the situation had deteriorated for 15 countries by the early 1990s (Izquierdo, 1997: 242-3, 252). UNICEF studies in Peru, Colombia, Ecuador and Haiti show increased food insecurity associated with growing urban poverty during the 1980s (Immink, 1994). UA is re-surfing strongly in Sub-Saharan Africa, where the fastest urban growth will occur in countries least equipped to feed their cities (Singer, 1997; Zarges, 1997; Ratta and Nasr, 1999).

The importance and diversity of UA systems in any given city seems to depend on multiple factors at levels ranging from global (international trade), to national (level of development, fiscal/ financial structural adjustment, disasters, agricultural policies), to regional (urban food supply system, prevailing agri-climate, strength of agricultural and food traditions), to urban (population growth and densities, physical layout, employment levels, consumers' tastes and market niches, legislation), to district within the city (urban vs. peri-urban, low vs high income, low vs high densities, residential vs other uses), to household (size, dependency ratios, income levels, gendered responsibilities) and to individual (education level, particular mix of occupations, farming skills, access to resources, contacts with suppliers/clients). No comparative analysis of cities was found which could show how different mixes of factors may determine and modify the food supply system and the role of UA in particular.

3.2.i Nutritional Benefits

The spread of low-income UA has increased the regularity and variety of affordable and nutritious food to the poor and others, thus reducing food insecurity. Most low-income urban farmers aim to generate surpluses for trade or simply trade all what they produce; fungibility of self-produced food in urban economies is what attracts and keeps growing numbers into UA. Self-production provides nutritious food otherwise unaffordable (all animal protein in low-

¹¹ A recent reading of the best available World Bank and WHO data on poverty and malnutrition in rural and urban areas (8 countries representing two-thirds of the LDC population, and 14 with most comparable data on rural and urban underweight prevalence), shows that in a majority of such countries: the number of urban poor is increasing; the share of the urban poor in overall poverty is increasing; the number of underweight preschoolers in urban areas is increasing, and the share of urban preschoolers in overall numbers of underweight preschoolers is increasing. Demographic health data from 11 countries show that, Brazil excluded, the ratio of stunting in poorer versus wealthier quintiles is greater within urban areas. Differences in stunting between low and high socioeconomic groups in urban areas are consistently larger than differences found between urban and rural areas (Haddad, et al. 1999).

income households of El Alto, Bolivia), replaces purchased food staples or supplements these with more nutritious foodstuff, affords savings (as much as 20 percent of income) which can be spent on non-produced foodstuff or other needs (school fees, transportation), generates supplemental or principal income which can be reinvested in other urban businesses (sewing machine, typewriter, kitchen appliance). Self-production represents anywhere from 18 percent (East Jakarta) to 60 percent (Kampala) of total food consumption in low-income households, with sample percentages depending solely on self-production reaching 50 percent (Nairobi) (Mougeot, 1994). In Harare, savings accruing to low-income farmers are equivalent to as much as several months of earnings (ENDA-ZW, 1997). In La Habana, urban gardens have significantly increased the quality and quantity of food available to the producers' households and their neighbourhood, improved the financial welfare of the households and enhanced the environmental quality of the community (Altieri et al., 1999).

Rigorous analyses are available on the nutritional impacts of UA on self-producing households; findings from these are encouraging. Low and very low-income farming households were compared with non-farming equivalents in Kampala, Nairobi and Harare. Using different methodologies to measure the relative impact of UA on food security indicators, all found that self-producing households achieved greater food security, particularly with regards to nutritional status measured by caloric and protein intake and anthropometric measurements (stunting, wasting). In Harare and Gweru, the farming sub-samples had more nutritious breakfasts; more of the farming households consumed protein-rich food over longer periods of the year than non-farming households (farming households also spent more on food, like beef, throughout the period than non-farming did). Children aged 0-5 years (particularly girls) in sampled farming households had higher growth rates in terms of height and weight than did children in sampled non-farming households (ENDA-ZW, 1997). In Kampala, children aged five years or less in low-income farming households were found to be significantly better-off nutritionally (less stunted) than counterparts in non-farming households (Maxwell, Levin and Csete, 1998).

In Nairobi, nutritionist Alice Mbogani Mwangi (1995; Mbogani-Mwangi and Foeken, 1999) found that average energy and protein intake was higher in the farming groups and percentages of households below recommended safe levels higher in non-farming group (differences increased when correcting for household size); these differences between farming and non-farming groups were more pronounced when comparing these two groups in terms of percentages of malnourished, wasted and stunted children or children's average scores on the indicators (differences increased when controlling for age distribution). The farming groups in Nairobi also showed higher percentages of households consuming, and larger amounts consumed of, dry maize, wheat flour, rice, sweet potato, dry beans, milk, beef and eggs. However, the Accra study based on a male-dominated sample, found little if any relationship between self-production and child nutrition, thus suggesting that the relationship could be gender mediated.

From an intervention viewpoint, non-food production may be the way to improve the income and nutritional status of households, depending on prevailing local constraints and opportunities. As Cox (1999) verified in the case of El Alto, severe water scarcity, the emphasis on exotic

vegetables and the local plant demand for beautification had NGO-project participating women abandon original community vegetable gardens in favor of more profitable tree and ornamental nurseries. Exclusive emphasis on food production may be less effective in improving nutritional health, where local food preparation and cooking practices should be corrected or the social status locally associated to particular foods should be accounted for, as verified in Dar es Salaam (Kogi-Makau, 1995).

3.2.ii Impact on Community Welfare

Few studies so far have examined interactions between UA and RA, at the country, city or household level (Tacoli, 1998). Very few countries discriminate official statistics on production and marketing by rural/urban origin; more but still a minority of major cities keep official statistics on various productions taking place within city limits. More surveys are needed on the origin and destination of agricultural products marketed at fairs located in intra- and peri-urban areas, as well as in surrounding rural areas. There is initial evidence for Dakar on inter-urban and international trade of UA products from Dakar (Abdou Salam Fall, personal communication May 1999). However, because UA is normally very small-scaled and dispersed throughout the city, much of the trade in UA typically taking place directly between the producer and the customer, often at the production site, will be missed by market-based surveys.

Information is available from household surveys on origin of food consumed by the household and on the destination of its production; this information is more available on urban residents (largely producers) than on peri-urban or rural households. Stevenson et al. (1996) has found that a considerable amount of the peri-urban vegetable production in Dar goes to supplying rural villages nearby. Systematic surveys covering all rural, peri-urban and intra-urban groups are particularly needed to better understand low-income urban households' food procurement strategies, including UA.

Within such strategies, the household's access to land in either rural or urban areas only, to land both in rural and urban areas, or to no land anywhere, is critical to understanding food procurement and to target policy support to more vulnerable groups (Foeken and Mboganie-Mwangi, 1998; Lee-Smith, 1998). Even where large percentages of urban producers may hold land in rural areas, they still may not be able to use it for food or income, given distances involved and the needs of other relatives. Shona Leybourne's doctoral thesis, in progress, will document the ravages of increased public transportation costs on rural-urban exchanges and poor urban households' food security. Self-provisioning by city dwellers through visits to and from parents in smaller towns and rural areas is often important. Conversely, remittances of food and transfer of innovative technologies by urban farmers to rural-based relatives have been reported (Dennerly, 1999; Mildred Delphin Régis, communication 1999). Additionally, in Lusaka households were also noted to gather and hunt in rural surroundings to supplement their diet (Drescher, 1999). Surveys in many cities indicate that urban self-production enables households to spend more money on processed foodstuff, largely of rural origin (oils, grains, cattle meat) (ENDA-ZW, 1997).

As to rural and urban incomes from market agriculture, in Bissau urban vegetable producers' margin of profit is larger, thanks to direct marketing by the producer; but volumes traded individually are small and corresponding incomes are only a fraction of rural traders' own. A similar principle applies to fresh-milk urban producers. The atomised structure of the production-trade network of UA has major benefits for both the producer and the consumer which have been largely under-estimated, when not openly discouraged, by attempts to dictate price controls and centralise collection and processing. Most attempts have been successfully resisted by the larger part of UA and will continue to be so, until more decentralised strategies are implemented which will safeguard and enhance such benefits.

UA's impacts on urban communities' welfare are more documented than those on the welfare of rural counterparts. In Bissau, Brazzaville and Nairobi, urban farmers in low-income urban districts contribute to community welfare and funerals groups, to formal and informal channels of food acquisition: they generate employment and additional or seasonal income for other basic needs (processed food), link up with the food trade, produce foodstuff otherwise unaffordable, reduce dependence on purchased food, enhance their own exchange entitlement, provide food gifts and meal sharing (Lourenço-Lindell, 1999; Moustier, 1996; and Dennery, 1999). In Bissau and Port-au-Prince the frequent gifting of food by home producers, which strengthens reciprocity within assistance networks and reduces incidence of theft. Open-space producers also unwillingly contribute to curbing food insecurity through loss of crops, animals, assets, to theft, commonly reported in surveys (Lourenço-Lindell, 1995; Delphin Regis, 1999).

3.2.iii Interdependence with Rural Agriculture

Can UA lead to greater food independence of cities from rural agriculture? UA is unlikely to turn any city or most households fully self-sufficient in all of the food which they may require. High degrees of food self-reliance are easier to achieve at smaller scales (specific city districts, income groups, households) and for specific food items. UA is demonstrably making cities more self-reliant in certain food items and poor households more food secure. In many instances, cities' food deficit would be severely aggravated if residents could not rely on UA, as in Lomé (Kouvonou, 1998) and Kampala (Maxwell, 1995). Greater Accra depends on production from within its area for 90 percent of its vegetable consumption (Maxwell and Armar-Klemesu, 1998a: 5). Highly urbanized island states such as Fiji or city states like Hong Kong have achieved very high levels of food self-reliance through UA.

The proposition that UA can significantly reduce cities' ecological footprint on rural areas may be valid under specific circumstances, but it needs to be demonstrated (Rees, 1997); a fuller use of organic wastes may reduce the need for energy imports and for waste exports to rural sinks. Low-energy treatment and application of wastewater in UA can reduce fresh water demand by RA, reduce fresh water imports for UA as well as wastewater exports to rural areas, boosting urban food self-provisioning in the process.

What is certain is that cities with more advanced UA become largely self-sufficient in higher-

valued, nutritious perishables (fruits, leaf produce and herbs, milk and eggs, small livestock meat); some cities even export surpluses to others. Still, such cities continue to depend largely on rural sources of supply for bulkier, less perishable foodstuff with lower growth cycles and profit margins (some fruits and vegetables, grain and root crops, large livestock meat).

UA tries to complement supplies from rural areas and should be supported to do so. David and Moustier's study of the vegetable supply system of Bissau showed that urban production promoted by the government to diversify and buffer the seasonality of supplies to the city, has been truly complementing other (rural and foreign) sources. West African cities also frequently offer better conditions for breeding, sheltering, watering or fattening livestock otherwise kept in rural areas (Centres, 1991). Stevenson et al. (1996:37) found that the urban, peri-urban and rural zones complemented each other in supplying specific produce to the city of Dar es Salaam: tomatoes, African eggplant, cabbage and onions from upcountry; eggplant and okra from peri-urban; sweet pepper from urban and peri-urban; hot peppers from peri-urban and up country. In India, both the inability of rural production to meet the growing urban demand for poultry products and the continuing relocation of traditional food processing to urban areas concur to explain the long-term proliferation and intensification of peri-urban poultry systems in that country (Panigrahi, 1995). Overall, this two-way flow of knowledge, resources and goods for specific productions, and its impacts on both rural and urban communities, remain largely undocumented; such information is needed to devise socially acceptable and economically viable local food systems.

4. MAIN DOUBTS AND RISKS RAISED BY UA

Little could be found in the academic literature which would condemn UA at large and advocate its ban under any form. The debate is likely to heat up as UA practice and policy grow in scale and in complexity in the next decades, thus affecting interests in very different and tangible ways. Some have argued that greater public support to UA in large cities would fuel rural-urban migration, while surveys show that most migrants to large cities come from smaller ones, not the countryside, that they initially ambition to work in anything but agriculture; a majority of urban producers are not recent arrivals. Others have contended that such public support to UA could significantly reduce public investments in rural agriculture, when UA needs inter-sectoral coordination of current financial flows much more than major new funding: there is a gathering perception that in an increasingly urban world development challenges, among which poverty and hunger reduction, will not be met unless holistic agricultural policies tap on urban and rural complementarities, rather than ignore them. UA certainly challenges those who believe that swelling urban populations of developing countries should rely on global trade for the most basic of their needs, regardless of the social and economic costs inflicted by recent disfunctions to Mexico, Russia, Brazil, and several South East Asian countries.

Where irregular UA practice has been overtly opposed, this has been more so initially than

recently, with reactions shifting from repression to tolerance, selective support and issue management (Cosgrove 1994 on Montreal; Mbiba 1995 on Harare). UA as a use of public open space remains an issue, and more so than as a use of private and residential space; there is more contention over animal husbandry anywhere than plant cultivation and, in the latter case, more so over the growing of food than of non-food products (ornamentals).

Opposition to UA in developing countries has tended to come more from urban planning, public health and environmental management in local government, than from offices dealing with employment, community services or agriculture.

4.1 UA Hampers Urban Development?

The more frequent argument from urban planning is that agriculture should be confined to rural areas, as it can interfere with more productive use/rent of land by other economic activities. Yet, there is little evidence so far that UA at large, or most RA for that matter, has stood in the way of urban development; its land-extensive forms are interim and interstitial use of urban land which, as other land-extensive uses (single-storey housing, ground-level parking, warehouses, airports, etc.), migrate to less central locations during city expansion. UA does serve as a buffer between otherwise incompatible urban land uses. Different UA systems do combine with a range of non-agricultural land uses; for instance, the Centre for Urban and Rural Studies of the Universidad Catolica Madre y Maestra in Santiago de los Caballeros, Dominican Republic, (del Rosario, 1999) found that in 1997 food crops and livestock were being produced in a third of all 2 734 city blocks (38 % of the blocks classified as poor, 24 % of low-income, 44 % of mid-income, 48 % of high-income residential, 6 % of commercial, 15 % of industrial and 23 % of institutional).

The land rent argument must be put in perspective. On one hand, urban planning is responsible for creating and protecting several land uses which are quite legitimate on grounds other than their mere land rent; on the other, not only is the rent of many urban land uses well below that which is deliverable by specific UA activities, but the rent of several such uses can actually be increased through their combination with UA. UA in public areas has shown to increase the land value of residences in derelict districts, UA has been effectively combined with right-of way management or recreational uses in urban parks, and reduces operational costs of wastewater treatment when coupled with this to recover treated effluents for commercial crops and aquaculture.

4.2 UA Threatens Public Health?

Such concerns refer to contamination risks of producers, handlers, consumers and people in vicinity of production areas caused by crop and husbandry inputs, products and by-products (nuisances, safety hazards). These concerns are legitimate and must be addressed; they arise from practices carried out at wrong places or in the wrong way; they have to do with the

quantity and use of agricultural inputs (including feed), choice of production for site characteristics, density of use of site and in vicinity (number of animals per unit area), handling of products and by-products.¹²

Human and environmental health risks often interact one with another. A review of literature by Flynn (1999) on public health risks associated with UA - particularly with regards to contamination and zoonoses -, suggests that: (a) generally, more attention has been paid to documenting actual evidence and producing effective measures, than merely raising concerns or proposing new research - it provides a good basis to inform interventions and future research; (b) more emphasis has been given to health risks triggered by ambient factors where UA is being practised than to those risks introduced by UA in the environment; (c) regarding the latter, evidence is sparse, local, and, with regards to zoonoses associated with urban animal husbandry, hardly any measures or research needs are identified. There is great concern for instance over risks posed by open patches of cropland as breeding grounds for anopheline malaria vectors, but little actual evidence¹³; (d) there is comparably much more evidence on risks introduced by ambient factors, particularly on toxicity and pathogenic risks; here the roll of measures is also more impressive and emphasizes prevention and then, soft strategies (knowledge based and more affordable to LDCs)¹⁴; with some needs identified, although assessments in some cases are quite dated (1980s).

Somewhat discrepant with the aforementioned survey, risks introduced by UA mis-practices are a major concern among public officials throughout the developing world and have even been used to repress specific forms of UA. Many such risks may stem from the inappropriate handling of agrochemicals by producers, the application of unsorted or insufficiently treated solid and liquid organic wastes to specific crops, as well as crop selection or location regardless of site

¹² For instance, stall-fed poultry and dairy cattle in Calcutta was found to be particularly vulnerable to contaminated feed; fungus-generated contaminants (mycotoxins) depress animal performance and deposit a carcinogenic compound into animal by-products (milk and eggs). Proper feed storage, treatment or dilution can minimize feed contamination (Panigrahi, 1995: 22-23.), but available mitigation seems much less effective in dry or drought-prone climates where the fungus infects plants more generally, beyond the root system (Don Peden, personal communication, July 1999).

¹³ Urban malaria incidence was found to be closely associated with the incorporation of breeding sites through urban expansion in Djibouti (Rodier et al. 1995; quoted by Flynn, 1999).

¹⁴ Measures inventoried by Flynn (1999) include: food testing and education of farmers on hazards and prevention as in Poland; several easy provisions to protect gardens from lead contamination; controlled use of sites (dumps) more exposed to contamination as in Zambia; pollution assessment and zoning of areas; monitoring of fresh urban solid waste treated soil and crops as in Hyderabad, India; composting methods and variable sorting to control chemical and microbiological agents; bacteriological quality standards for fish reared in wastewater-fed ponds (to reduce occupational transmission); programs to eliminate schistosomiasis occupational risks in freshwater fish farming as in China; washing and peeling to reduce microbial loads of vegetable and fruit crops irrigated with polluted river water as in Nigeria; safe and inexpensive night-soil composting systems as reviewed by World Bank; proper excreta storage periods to reduce pathogen survival in faecal wastes, treatment, crop restriction, control of wastewater application, exposure control and promotion of hygiene for safe reuse of wastewater in UA.

exposure to ambient air, soil or water pollution. In cities of the North, UA (community gardening) has been promoted as a source of better food than that provided by agro-industries. In developing countries, the risks posed by UA products, particularly those from low-income farming at polluted sites, need to be compared with those posed by other food sources. Conditions under which food is grown in rural areas tends to be less subject to control: food is shipped over longer distances and stored for longer periods of time, often in questionable conditions. Food handling at market outlets is a concern, regardless of where the food comes from: research in Lima and Accra revealed that fresh produce sold at markets was extensively contaminated, regardless of urban or rural origin. Attention to health risks and benefits of UA is likely to grow, as more urban people engage into some food-growing and as cities use more of their solid and liquid waste to both curb ambient pollution and optimize freshwater use.

Particular attention must be given to human health risks and nuisance posed by urban livestock. Flynn (1999) states that the relationship between UA and the rural-urban transition of zoonoses remains largely under-researched. There is evidence from major cities in Nigeria, India, Brazil and Saudi Arabia on human brucellosis infection and echinococcus infection transmitted by domestic livestock. The risk of such diseases spreading is real, as a result of inappropriate zero-grazing and animal waste disposal in slaughterhouses or densely peopled areas, where space-confined husbandry of swine, goats and sheep is growing (Ayanwale et al., 1982; Pillai et al., 1996; Larrieu et al., 1988; Cooper, 1991). Chicken provide a potent organic manure and manure handling is a problem. Excessive use of nitrate-rich manure on crops can contaminate groundwater. Several cities have regulatory controls on the scale, location and conditions of husbandry operations, as Kumasi (ca. 730 000) in Ghana regarding broiler/layer farming, but enforcement is an enduring and almost universal problem (NRI, 1995: 40).

With regards to human wastes, indoor composting toilets are now available on Northern markets and more affordable equivalents are being developed in the South. Safe and inexpensive technology for large-scaled farming with safely composted human waste exists and has been reviewed by the World Bank (Shuval et al., 1981). Health aspects of human excreta reuse have been extensively reviewed by the former International Reference Centre for Waste Disposal (1985); a comparative study of 1989 WHO guidelines for wastewater/excreta reuse confirmed their appropriateness (Blumenthal et al., 1991/92). Problems seem to reside with implementation and acceptance. Chinese cities have a long tradition of collecting human wastes and applying "night-soil" to peri-urban crops, although Ling (1994) argues that treatment processes have yet to be standardized to reduce potential health risks posed by the use of human waste as crop fertilizer or fish feed. In Malian cities, current practices of applying human excreta to fields were found to introduce new and uncontrollable points of contamination (Visker, 1999). Socio-cultural factors seem critical to adoption and improvement of excreta utilization; these need to be elucidated as human waste reuse into UA still meets with cultural resistance in western societies: in 1999 France passed legislation which bans the application of night-soil to food crops (André Fleury, personal communication, June 1999). UNICEF plans on convening a workshop in late 1999 to further explore the issue of treatment and reuse of human excreta in UA (Steve Esrey, personal communication July 1999).

In order to increase acceptance and demand for safe compost by urban farmers, more work can be done by NGOs with producer groups to inform them on the advantages of different types, verify long-range effects of toxic elements applied through continuous use of compost, determine appropriate scales of composting for cost-effectiveness and point to land use combinations that reduce transportation costs from waste source to composting site and users.

Municipal sewage combines water and nutrients and is used widely by urban farmers, mostly in its untreated form. Most municipalities in the South still do not treat their effluents and more often than not trials have failed because systems are big, expensive and mismanaged. However, several cities use treated or untreated municipal waste-waters to irrigate woodlands, orchards, pastures, grain crops, produce or fish (international overview in Edwards and Pullin, 1990; Niang, 1999, on Dakar; Moscoso on Lima, 1999).

Cities are being encouraged by WB and UNDP to seek synergies between municipal wastewater treatment and agricultural applications. Epidemiological and microbiological standards exist for using wastewater in agriculture and aquiculture; these are achievable with simple and inexpensive treatment methods. Most public health problems arise from making the wrong farming uses of different qualities of wastewater. Untreated sewage sludge, mixed with fly ash, can be applied to non-edible trees and grasses as a good soil amendment (shown to be more cost-effective than imported chemical fertilisers in Orissa, India). In Lima, a sequence of settlement ponds allows at each step effluents of a higher quality to be safely applied to a more noble use (from woodland irrigation to fish farming). The system requires land area and is particularly effective in humid tropical settings. In Dakar, a treatment system combining different low-cost technologies is being developed to deliver irrigation water which meets the quantity and quality needs of market vegetable farming (Niang, 1999). When introducing treatment, municipalities must devise creative cost recovery, without evicting or being perceived as penalizing wastewater-using farmers. In Cochabamba, Bolivia, peri-urban farmers pay for the treated effluents with freshwater from their land holdings which is distributed to the city. In Tacna, Peru, the city utility agreed to letting urban farmers use its treated wastewater in return for their keeping up public green areas (Julio Moscoso, 1997, personal communication).

4.3 UA Has Negative Environmental Impacts?

Environmental health issues include visual untidiness, soil erosion, destruction of vegetation, siltation, depletion of water bodies and pollution of resources (soil, air, water) (see below).

The use of agrochemicals in UA does exist but so far seems more limited than often alleged. First, most UA is largely for self-consumption, which uses very few agrochemicals, if any (Lourenço-Lindell, 1995: 6). Even in risky settings, urban farmers, the majority of whom are food providers to their own children, are inclined to grow or raise organically. Second, agrochemicals usually are not affordable by small producers with some surplus for trade; the removal of subsidies on imported agrochemicals has been a further disincentive. Third, in market-oriented

systems such as vegetables, short-cycle crops have little need for pesticides and manure use is widespread. Fourth, small scale and crop diversity concur to lessen dependence on agrochemicals. Organic practices have been seen to apply more to the smaller plots in urban settings, where ground-space is limited: rooftops, basements, rooms, walls, and yards are used. Here growing is more labor intensive, lesser quantities of more diverse crops are grown, small surfaces can be fertilized with kitchen wastes; pests and fungi are less problematic and non-chemical pest control can be more effective. De Bon et al. (1997: 85) in Dakar and Kouvonou et al. (1998) at Lomé found that market vegetable farming makes more extensive use of organic than of mineral fertilisers, thereby valuating animal husbandry sub-products (still much potential to increase use of leguminous crops, compost and IPM). Chemical fertilizers have been used sparingly in intensive market vegetable paddies at central city locations; less so at peri-urban sites surveyed, particularly in Asian cities (Cagayan del Oro, Metro Manila, Vientiane, Ho Chi Minh City) with much scope for reduction through IPM in all cases (Ali and Prociuncula, 1999; Schnitzler et al., 1999a, 1999b, 1999c). In Cuba, the use of chemical fertilizers is prohibited within city limits and producers rely on integrated pest management and organic soil management (Altieri et al., 1999: 135).

However, peri-urban systems tend to be more land extensive, with larger expanses of fewer crops, thus more susceptible to pests. They are more distant from sufficient supplies of organic fertilizers; if under secure tenure they may require and afford chemical pest control and fertilizers. However, this said, peri-urban farms often use larger quantities of crop and cattle waste (may combine both as in Nairobi), arrange for truck delivery of un-composted urban solid waste (as in Kano) and irrigate with local stream water or wastewater, often untreated (as seen in Santiago, Chile). Some peri- and intra-urban farmers cater to niche markets for organic food; in the South, these tend to be a minority with secure access to resources, organic-growing technology and consumer markets. Where access to resources may be more limited, knowledge may be deficient or the energy intake and market volumes may be a concern. rain-fed grain and root crops often are the option.

UA can be used to reduce in a decentralized, small scaled and affordable way, environmental pollution by solid and liquid waste and generate food and income in the process. Heavy-metal and pathogenic contamination are a particular concern. Uptake of heavy metals by plants does vary across plant species (grains versus vegetables) and varieties (cabbages versus beets) from one part of the plant to the other (roots versus foliage), as well as from one heavy metal to another (cadmium versus lead). A plant's tolerance of heavy metals may be greater than human tolerance of that plant's actual contents of heavy metals. Contamination sources may be air, soil, water, excreta and other solid and liquid waste and may reach producers, handlers, and consumers via other plant and/or animal vectors or carriers.

Organic compost comes in four types (raw, fresh, mature and special) and can be used as fertilizer, soil conditioner, feed for fish, landfill material or soil medium for horticulture. Its use remains limited even in low-income cities, where half or more of the municipal refuse load is made up of organics. Lewcock (1995) found that in Kano, Nigeria, peri-urban farms are a

traditional informal and growing market for large quantities of minimally composted waste; he also found that these producers lacked knowledge on the safety of waste materials for use as fertilizer or feedstock. Few cities outside Asia sell and deliver truckloads to large clients on the urban fringe, or encourage at-source sorting and pre-collection of organics by organized groups for local composting and UA use. In Egypt compost was found to be severely contaminated with heavy metals due to poor sorting of inorganic waste (Lardinois and van Klundert (1994).

In most developing countries, municipal solid waste management remains centralized, capital-intensive and deficit-ridden. Yet, in several African cities, neighborhood and micro-enterprise composting has been effective, while most larger plants have failed. At-source sorting and doorstep collection are crucial to increasing usable volumes and improving the safety and acceptance of organic waste use in UA; it facilitates at-source retrieval of organics, lowers health risks to collectors, producers and consumers alike, including livestock, and increases the value of all waste byproducts, compost or humus included.

Despite public concerns, few systematic studies are available on the degradation of natural resources posed by UA mis-practices. When confirmed, this is usually limited, given the scale and dispersal of activities. It is also controllable, given expertise and resources readily available in cities. In her study of environmental effects of open-space vegetable production in Dar es Salaam, Muster (1997) found few serious agrochemical pollution or soil erosion problems, all of them manageable. In Harare, Bowyer-Bower and Tengbeh (1995) found that open-space cultivation contributes more to land degradation than to pollution; chemical pollution of water bodies by non-agricultural sources was far more serious than the worst possible polluting effects of chemicals used in UA. Agrochemicals are generally expensive in developing countries, less affordable by low-income farmers; lesser amounts on small plots, although excesses have been noted among market vegetable producers in Bamako and Lomé. Organic fertilizers are more widely used. In Harare, open-space cultivation had reduced rainwater infiltration into the soil, particularly in long-cropped sandy granite soils, and crusting had multiplied surface runoff many-fold; rain-splash and runoff had increased markedly sediment movements, soil erosion and siltation. However cultivation techniques were found to influence considerably soil erosion and the majority of plots had acceptable levels of loss. Ridges and furrows could bring erosion rates within tolerable levels elsewhere. There is a need for both technical (proper siting, agro-forestry) and policy (land tenure security) interventions for open space cultivation to be more productive, profitable and sustainable.

4.4 UA Is Not Very Profitable?

In all but a few cities (e.g., Dar es Salaam, Mexico City), UA is omitted from official statistics. It is probably a significant sector of activity in more cities than only where official records are kept and then, is certainly more important than what such records reveal: censuses tend to focus on particular productions (e.g. livestock in Kampala), then only on officially recognized activities, thus disregarding the larger share of the producers. Data available from various sources for several LDC capital cities nevertheless indicate that UA is an important employer, land use

and value-generating activity in the South. In Dar es Salaam, Tanzania, it is the largest land user (23 percent of city region; 34 000 hectares under crops turning out ca. 100 000 tons of food annually in 1988) and the second largest employer (20 percent of those employed). In the early 1990s, agriculture provided the highest self-employment earnings in small-scale enterprises in Nairobi and the third highest earnings in all of urban Kenya (House et al., 1993). People engaged in some form of UA for part of the year vary between 15 and 70 percent of households in cities surveyed in Africa (Mougeot, 1994), Russia and eastern Europe (Smit et al., 1996b).¹⁵ Certain systems have expanded more dramatically than others. Cultivated open space within the city limits of Harare has doubled since 1990 and 1994 to more than 9000 hectares or 16 percent of the city area (Gumbo and Ndiripo, 1999: 210); this excludes cropping on built plots, open-space fallows or crop fields which fringe the built-up area but lay beyond official city limits.

Despite heavy losses and severe constraints, non-agribusiness UA generates goods valued annually at tens of millions of dollars in any given major city. But very few studies so far have provided citywide estimates of largely unrecognised UA productions. The Mazingira Institute estimated the total worth of on-plot crops grown in urban Kenya, at USD 4 million in one growing season of 1985. Freeman (1991) estimated the value of Nairobi farmers' 1987 annual (two-season) off-plot crop production alone to be USD 4 million. Mazingira further estimated the worth of livestock found on plots at survey time in Kenyan cities at USD 17 million in 1985. (less than half of the total livestock raised by urban farmers during the year; excludes milk and eggs); an additional USD 1.3 million worth of livestock was eaten and USD 2.4 million of livestock was lost to disease in 1985. Specialty markets can be particularly attractive; urban fresh milk production in Dar es Salaam was worth an estimated at USD 7 million in 1993 (Mougeot, 1994). The annual gross output of over ten thousand UA enterprises in the city of Dar es Salaam totaled 27.4 m USD, with an annual value added amounting to 11.1 m USD, in 1991 (Sawio, 1998).

In Dar es Salaam, in 1991 the individual urban farmer's annual average profit was estimated at 1.6 the annual minimum salary (Sawio, 1998). In Cairo, where UA is officially held as detrimental to the modern city image, small livestock rearing, particularly on rooftops, is practiced by 28 of households in informal housing, where animal value represents between 62 and 109 % of the household's monthly income (average 86%) (GTZ, 1999). Overall, in Lomé as in other cities, the mean monthly income of a market gardener was found to equal ten minimum salaries or that of a senior public servant. Cost-benefit analyzes of market-oriented productions, such as vegetable crops, have shown net incomes to largely depend on low-input practices, as in Lomé (Schilter, 1991), and low-overhead (Abutiate, 1995: 50), profit margins are high where sales are less middle-manned. The vegetable producer-retailer (may double as wholesaler if output abundant) seems to be very competitive, more efficient, stable and committed, than the non-producer-retailer (vegetables cheaper to consumer and retailer's revenues higher). In Bissau, the category of producer-retailers is the largest of all in most markets, varying from 33 to 59

¹⁵Estimates from household surveys are often not comparable as some, depending on survey focus, are based on samples drawn from city sectors where some form of UA is more prevalent.

percent of retailers (Lourenço-Lindell, 1995: 8). However, due to smaller amounts which these market, their overall net incomes are lower than those going on average to city-supplying rural producers (Moustier, 1996).

UA can be practiced with limited cash. Steve Staal of the International Livestock Research Institute says that dairy production is affordable even by resource- and technology-poor farmers in Kenya; above-normal profits are earned by even the smallest-scale backyard producers relying on purchased feed in peri-urban Addis Ababa (Staal, 1997). Official statistics grossly underestimate reality but show growth in livestock numbers of all sizes in sub-Saharan cities.

The effect of UA up and downstream on the rest of the urban economy remains un-quantified; it could be considerable. UA requires materials and labor for fencing, netting, storage, planting, drainage, pumping and irrigation, feeding, fertilizing, phyto- and bio-sanitary controls, transportation, processing (milling, cooling, drying, cooking, packaging). In turn, it supplies wastes to farmers and products to street food stalls, public fairs, supermarkets, agri-industry (dairy), school and business cafeterias, upper-market food outlets (fast-food franchises in Chile, hospitals, hotels, embassies in Bolivia). Income from UA is used to buy processed food, appliances, clothes, services and invest in other small businesses. More information on the domino effect of UA could be used in policy-making to assess and promote a greater integration of UA with the rest of the urban economy.

4.5 City Government in Developing Countries Do Not Have Capacities and Means to Manage UA Adequately?

Official controls exist for legal UA activities; however, these increasingly are a minor part of the full UA industry in developing-country cities. Official interventions into non-legal UA activities have been more prohibitive than enabling. Privileges and corruption have enabled illegal practices by the powerful to be assisted, subsidized and allowed to prosper, while on the other hand mis-practices by vulnerable producers have been abused, constrained, if not repressed, in a number of ways. Some governments have begun to review the rule of the law, regulations and standards. More so need to recognize and approach non-legal UA by the poor in a constructive way; this means educating producers on rights and obligations, as well as facilitating their access to information and resources which they need to implement appropriate practices.

Local governments can be very innovative in promoting through a range of incentives and disincentives a more productive use of abundant idle urban resources such as unemployed youth, idle land and polluting municipal liquid and solid wastes. Partnerships between organized groups of producers and land-endowed institutions can increase access to land considerably. Air, water and soil pollution of crops can be easily mitigated or avoided in most cases, but most low-income urban producers usually lack the know-how or resources to do better.

Authorities must realize that low-income urban food producers and consumers are generally concerned with the quality of the food they grow, sell or consume. Although they may not fully

understand the chains of causation, they do try and reduce contamination risks through avoiding or limiting the use of organic or chemical fertilizers on specific crops, or drawing water from wells rather than rivers. Consumers wash leafy vegetables and peel other produce, or boil fresh milk. Women producers and consumers are particularly wary. But producers often have no option other than to grow and trade food crops in hazardous conditions; they may be deterred from investing in safer ways due to insecurity. Where possible, crop choices become critical. Some short-cycle crops take up less heavy metals or nitrates than longer-cycle ones. The Developing Country Farm Radio Network has produced radio-scripts explaining simple ways of reducing lead in roadside crops for instance. In Xochimilco, Mexico, urban producers have shifted from vegetable growing to a lucrative floriculture when untreated canal waters became unfit for food-growing (Canabal, 1997). In Dakar, vegetable producers using untreated municipal wastewaters have been convinced to adopt treated wastewater irrigation for a safer product, even if this implies their reducing acreage and yields (Niang, 1998).

This discussion on governments' capacities and means to manage UA in developing countries is re-cast in the next and final section: main policy challenges, in terms of issues and delivery strategies to be emphasised, are identified against the backdrop of foreseeable development trends in UA.

5. WHAT FUTURE FOR UA?

5.1 Development Trends

A paper commissioned by IDRC points to several trends which are likely to expand and transform UA well into the XXI the century. Most of these trends are underway and provide vectors which can be better managed through appropriate policy changes. For instance, lower-density urban expansion will increase land opportunities for interim or permanent UA, particularly in Africa. This will continue to compete and outrun RA in certain crop lines as improved UA technologies spread to other production systems (aquiculture, small livestock, hydroponics, specialty crops for niche markets). Beyond promotional programs and projects of the 1970s and 1980s, more national and local governments and specific public sectors will support UA in the South for food security, jobs and environmental benefits, and in the North because it gives a healthier product. UA will be accepted and implemented more systematically as a major intervention in food security and social security programs, and environmental agencies and programs will also include more UA. Urban waste will be more commonly applied as a production input, as home and community-based treatment of waste outperform massive and non-selective disposal systems. Information and communication technologies will enable small producers and processors to access and share prompt and reliable technical and market information, credit, and to organize into virtual corporations. Community and civic organizations will increasingly support UA and women will continue to dominate the industry. As women inexorably achieve greater legal and financial rights, UA will grow apace. Public-private

partnerships are accelerating and national and local UA organizations appear destined to come together into regional networks. Food markets in many of the world's countries will carry an increasing share of products grown and raised in cities. Informal food markets will behave like today's formal ones, and formal and informal markets will be better interrelated. Urban planning will more widely incorporate UA as another land use in urban space-economies (Smit, 1996). In the South and at least for some decades to come, the low-income type of UA will continue to expand, diversify supply, reduce price seasonality, and make fresh perishable and nutritious food more affordable to larger sectors of city populations.

5.2 Policy Challenges: Issues

Smit et al. (1996) very ably summarized the main risks and benefits, constraints and opportunities which can be posed by and to UA in any particular context; in principle, all are susceptible of meriting some form of policy intervention. The question to this paper is to short-list those policy needs which represent the main "challenges" ahead. Given the literature review, this paper discussed those aspects of UA which currently raise the more important policy "challenges", in other words, issues where there persists clearly a discrepancy between the perceived urgency of interventions and the lack of experience on record to do so. This is why the paper discussed a limited number of issues (food security, land access, gender implications, land use dynamics and urban planning, public health and sanitation, environmental impacts, interaction with RA). The paper cannot claim to treat such challenges comprehensively; fortunately, a very large number of references used for this paper do contain some policy analysis dealing with particular UA systems in intra- and peri-urban zones, relevant sectoral support needs, governmental levels involved and problem focus (from land provision to marketing).

Still, it is probably fair to say that most recent policy analysis comes from agricultural circles, much less so from urban planning sectors. Without overlooking the critical contribution of the former, the latter is even more fundamental to UA's adequate integration into the urban economic and ecological system. Earlier this year, Canadian Institute of Planners awardee Soonya Quon (1999) reviewed the international literature and surveyed in writing and orally some 26 urban planning professionals from 18 cities around the world, on tools and strategies for urban planners to incorporate UA into city planning, including responsibilities and limitations of urban planners. Opportunities to account for UA include: input to municipal plans and planning policy, use of tools and strategies to realize planning goals (zoning and zoning by-laws, urban land databases and urban baseline studies, environmental impact assessment, public capital investment, subdivision control, economic and other tools.). Urban politicians have been more accommodating of UA than urban planners have been for-sighted about it. Urban governments need to listen to their planners and these need to evolve a concept of the city more fitting with local reality. Quon also found that, beyond planners' competence and willingness, the planning policy context in which they operate may be inimical to UA, as a result of a lack of awareness of the socio-economic and environmental role of UA, a lack of clear government responsibility,

resistant attitudes or cultural norms held by parties in the land use planning process, and a lack of resources, technical and financial support. Quon's recommendations include: changes to land use planning policy to recognise and support UA; recognition of UA through land use zoning with UA being primary or tertiary land use; measures countering the potential negative health and environmental effects of UA activities; new multi-disciplinary institutions responsible for UA, records of UA and of land use and land tenure in communities; education to overcome ingrained attitudes against farming in cities held by various parties in the planning process.

5.3 Policy Challenges: Delivery

Policy challenges regarding the issues discussed in this paper must be tackled through interventions involving actors working at different levels. Smit et al. (1996) have proposed a list of interventions in information and research, projects, access to services and resources, policy and planning and cooperation; they indicate in each case which levels of intervention should be involved, for greater effectiveness. The following paragraphs highlight those types of interventions from Smit et al.' (1996) s list which should merit a relatively greater policy effort by actors involved at each of the four levels identified by Smit et al.: community, city, national, international.

At the community level (e.g.: city district). good progress has been made to integrate UA into ongoing projects and activities of community development, including environmental regeneration. The more effective and lasting interventions are those that are perceived by the community as assisting with solving key community problems, that actively engage local actors into design and implementation and that strengthen local capacities for pursuit. At this level, more experiences in the North could act as useful references to incorporate UA into local food systems of the South, largely through developing communities' capabilities in this area (Dahlberg, 1999; Hamm and Baron, 1999). Also, more surveys are being conducted to document UA and inform local institutions. Such surveys are more effective when driven by issue resolution through multi-stakeholder processes, where research alternates with policy formulation for practical interventions (e.g.: Dakar, Harare and Dar es Salaam in Africa); the participatory dimension of such experience is being emphasized in new models (e.g.: Spies, 1998; van der Blik and Waters-Bayer, 1999). A range of modalities to improve access to resources, services and inputs, as well as security, have been experimented worldwide, largely through innovative partnerships between key actors. However, much less has been done for providing training in good practice or for assisting urban producers in establishing representative and effective organizations. National and international actors in both the governmental and non-governmental arenas share responsibility in this regard.

At the city level, several urban centers have initiated or completed background studies and discussions for designing or adopting regulatory or promotional policies on UA. Several also have adopted enabling legislation or recognized agriculture as an urban industry. Many more have supported disadvantaged citizen groups. However, much less progress has been recorded in taking stock of that wealth of experience, and in creating institutional structures to implement

UA policies; even fewer cities have created city-level food system plans embracing both rural and urban sources. Maxwell (1999) argues that the relative invisibility of urban food security as a political issue in Africa may be due to governments still perceiving this as a household-level responsibility. Pothukuchi and Kaufman (1999) recently examined city institutions that can address more comprehensively urban food systems, such as the city department of food, the food policy council and the city-planning department. Outside Asia, the developing-country experience with citywide integration of the waste management system with the food system is very limited; this includes the use of UA to achieve environmental sustainability. Land use plans and regulatory systems still need to be designed and implemented that promote access to land, water and markets for urban producers; the same can be said of public and work safety programs.

At the national level, little progress has been made for setting up national UA or food policies, even though these can greatly influence city-level policies. There are very few national food policies outside Asia that establish synergies between rural and urban production systems and guide urban-agricultural integrated programs. Northern countries' own governments are increasingly being criticized for having agricultural/production policies instead of genuine food policies (Allen, 1999; MacRae, 1999); the de-politicization of food is contributing to the lack of data, understanding and policy on local food systems (Dahlberg, 1998). The application of U.S.A.'s Community Food Security Act to urban community agriculture projects since 1996 is a step in the right direction and may provide a useful reference (Pothukuchi and Kaufman: 1999: 122), as well as growing public lobbying for a healthier food policy in Britain (Lang, 1999). Several agricultural departments do extend technical extension to urban areas; this should be adapted, through research and training, to urban conditions and needs of urban farmers (women). There is a good range of experiences with economic incentives (tax alleviation, input subsidies), but much less on model health and land use codes, despite creative partnerships known to have facilitated access to land and water areas.

At the international level, the development of agreements on common research methods is very recent; model codes still need to be developed as a basis for national and city regulatory programs. Very few projects on record have been thoroughly evaluated for lessons to inform models that could assist local agencies with introducing improved UA practices. Comparative studies of the industry's performance are also lacking, across cultures, climate zones and levels of development and city sizes; these are needed to better advise governments. Hardly any systematic effort has been expended so far to document, evaluate and propose models of effective urban producer organizations. Regional and global networks are developing but these have had a limited impact so far in the creation of national and local networks.

In conclusion, while prohibitive policies are bound to be ineffective, several constraints and risks are clearly associated with non-regulated UA; also, conflict, corruption and competition for scarce resources do exclude from legal UA those who stand to benefit most from it. Clearly, a permissive approach to policy-making would not address these problems and in fact could defeat its well-intended purpose. The tendency of local governments is to move beyond accommodation and into issue management (see Mougeot, 1999c). From the experience reviewed, multi-stakeholder governance may still be local governments' best way of managing, if not resolving,

such issues. More authors have been calling for a re-regulation of urban food systems and for UA policies to target vulnerable groups, in order to effectively strengthen local sustainability and equity (Smith, 1998; Lee-Smith, 1998; see Koc et al., 1999). To be effective, such policies probably will need to include measures that enhance equity and entitlement to food and other resources, that improve urban environmental/sanitation systems managed by the urban poor in their own neighborhoods, and that actively involve urban producers in ranking their problems, developing workable solutions and self-regulating their activities and the quality of their products.

ACKNOWLEDGEMENTS

This review was commissioned by the conference organisers and would not have been possible without the support received from many individuals. These supplied first-hand information, personal expert opinions, unpublished reports or data and references from their own field. The author wishes to thank particularly Henk de Zeeuw, David Drakakis-Smith, Axel Drescher, Marielle Dubbeling, Steve Esrey, Abdou Salam Fall, André Fleury, Kathleen Flynn, Alice Hovorka, Petra Jacobi, Diana Lee-Smith, Julio Moscoso, Paule Moustier, Don Peden, Mildred Delphin Régis, Greg Rose, David Satterthwaite, Jac Smit, James Sumberg, and Soonya Quon. Jeff Pelletier's assistance with assembling and laying out the document is much appreciated. Errors and views which persist in this version are the author's sole responsibility.

REFERENCES

- Abdelwahed, Said I. ed. & transl. (1999) **Future of Urban Agriculture in Gaza: Regional Workshop: Programme, Papers, Minutes and Outputs (IDRC)**. September 1998. Palestinian Agricultural Relief Committee (PARC), Gaza.
- Abutiate, W.S. (1995) "Urban and Peri-Urban Horticultural Activity in Ghana - An Overview." In **"Peri-Urban Interface Research. Workshop Proceedings (United Kingdom Overseas Development Administration - British Council), 23-25 August, pp. 45-50**. Edited by the Natural Resources Institute (NRI), Kumasi, Ghana.
- Adams, Robert M. (1994) "The Origin of Cities." **Scientific American** special issue on ancient cities: 12-19.
- Aldington, Tim (1997) "Urban and peri-urban agriculture: some thoughts on the issue." **Land Reform, Land Settlement and Cooperatives 2**: 43-44.
- Ali, Mubarik and Fe Porciuncula (1999) "How urban agriculture can benefit the urban poor of Metro Manila, Philippines." Delivered at international workshop **Growing Cities Growing Food (DSE/GTZ/SIDA/ACPA)**. German Foundation for International Development (DSE), La Habana. October.
- Allen, Patricia (1999) "Contemporary Food and Farm Policy in the United States." In **For Hunger-proof Cities: Sustainable Urban Food Systems**, pp. 177-181. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh. International Development Research Centre, Ottawa.
- Altieri, Miguel A., Nelson Companioni, Kristina Canizares, Catherine Murphy, Peter Rosset, Martin Bourque and Clara I. Nicholls (1999) "The greening of the "barrios": Urban agriculture for food security in Cuba." **Agriculture and Human Values 16/2 (June)**: 131-140.
- Atukunda, Gertrude (1998) "An Analysis of the Impact of IDRC Funded Research Projects on Urban Agriculture in Uganda," Makerere Institute of Social Research, University of Kampala, Kampala. Presented at **IDRC Cities Feeding People Workshop on Lessons Learned from Urban Agriculture Projects in African Cities**, Nairobi. July.
- Atukunda, Gertrude and Daniel Maxwell (1999) "Farming in the City of Kampala: Issues for Urban Management." **African Urban Quarterly (May-August 1996) 11/2-3**: 264-275.
- Ayanwale, F.O., O.O. Dipeolu and G.O. Esuruoso (1982) "The Incidence of Echinococcus Infection in Dogs, Sheep and Goats Slaughtered in Ibadan, Nigeria." **International Journal of Zoonoses 9**: 65-67.
- Aziz, Sartaj and Pervaiz Amir (1997) "How Is Rapid Urbanization Affecting Food Production and Agricultural Research?" Delivered at **Symposium on Selected Regional Issues for Agriculture and Agricultural Research (ISNAR)**, The Hague, 24 February.
- Binns, Tony and Kenneth Lynch (1998) "Feeding Africa's Growing Cities Into the 21st Century: The Potential of Urban Agriculture." **Journal of International Development 10** : 777-793.
- Blumenthal, Ursula J., Bakir Abisudjak, Enrique Cifuentes, Stephen Bennet, and Guillermo Ruiz-Palacios (1991/2) "Recent epidemiological studies to test microbiological quality guidelines for wastewater use in agriculture and aquaculture." **Public Health Review, 19**: 237-242.

Bowyer-Bower, T.A.S. and George Tengbeh (1995) "The environmental implications of (illegal) urban agriculture in Harare, Zimbabwe". Delivered at **Workshop on the Environmental, Social and Economic Impacts of (Illegal) Urban Agriculture in Harare** (ODA), Zimbabwe.

Cabannes, Yves and Luc J.A. Mougeot (1999) "El Estado de la Agricultura Urbana en América Latina y el Caribe." **La Era Urbana**, 5/3 (invierno), Suplemento para América Latina y el Caribe I: iv-v.

Canabal Cristiani, Beatriz (1997) **Xochimilco: una Identidad Recreada**. Universidad Autonoma Metropolitana, Unidad Xochimilco, Coyoacan, Mexico.

Centres, Jean-Michel (1991) "Améliorer l'approvisionnement de Bamako en produits maraichers et en protéines animales." Groupe de recherche et d'échanges technologiques (GRET). GRET, Paris. November.

Centres, J.M. (1992) "**Agriculture et élevage urbains et péri-urbains à Bobo Dioulasso: les filières d'approvisionnement en intrants et de commercialisation des produits agricoles.**" Groupe de recherche et d'échanges technologiques (GRET) - Géographie, Université de Ouagadougou - Institut national de recherche agronomique (INERA). Paris, Ouagadougou, Bobo Dioulasso.

Chauca de Zaldivar, Lilia (1999) "Proyecto Sistemas de produccion familiar crianza de cuyes (Peru) - IDRC 93-0028." Presented at **IDRC Cities People Workshop "Investigando el Desarrollo de la Agricultura Urbana en la América latina y el Caribe: Balance y optimizacion de impactos de proyectos"** (IDRC/FLACSO/Alternativas para el Desarrollo), San José de Costa Rica. May.

Cooper, C.W. (1991) "The epidemiology of human brucellosis in a well defined urban population in Saudi Arabia." **Journal of Tropical Medicine and Hygiene** 94: 416-422.

Cosgrove, Sean (1994) "Une histoire de deux villes: Comparing Canadian Community Gardening Programs in Montreal and Toronto." **Cities Feeding People Report 11**. International Development Research Centre, Ottawa.

Cox, Stephen (1999) "Oases of food-security in the urban sprawl? The case of El Alto, Bolivia." **Gate technology and development** 2 (April-June): 34-37.

Cruz, Maria Caridad (1999) "Resultados, problemas y retos de la agricultura urbana." **La Era Urbana**, 5/3 (invierno) Suplemento para América Latina y el Caribe, I: viii-x.

Dahlberg, Kenneth A. (1999) Promoting Sustainable Local Food Systems in the United States." In **For Hunger-proof Cities: Sustainable Urban Food Systems**, pp. 41-45. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh. International Development Research Centre. Ottawa.

Dahlberg, Kenneth A. (1998) "The Global Threat to Food Security." **The Urban Age** 5/3 (Winter); 24-26.

David, O. et P. Moustier (1993) "Systèmes maraichers approvisionnant Bissau." CIRAD/UR ECO-FIL no. 7. CIRAD, Montpellier.

de Bon, H., F. Faye and J. Pages (1997) "Development of Vegetable Cropping Systems in the Niayes Zone of Senegal." **Expl Agriculture** 33: 83-90.

de Carvalho, José Luiz Homem (1999) "Combatir a la pobreza ayuda a dinamizar la economia." **La Era Urbana**, 5/3 (invierno), Suplemento para América Latina y el Caribe, I: xiv-xvii.

del Rosario, Pedro Juan (1999) "La agricultura en la ciudad." **La Era Urbana**, 5/3 (invierno) Suplemento para América Latina y el Caribe I: xi-xiii.

de Zeeuw, Henk (1998) "The promotion of Urban Agriculture: What Cities Can Do." Presented at **International Healthy Cities Conference** (WHO), Athens, 20-23 June.

Dennerly, Pascale (1999) "Urban Food Producers' Decision-Making: A Case Study of Kibera, City of Nairobi, Kenya." **African Urban Quarterly** 11/2-3 (May-August 1996): 189-200.

Dennerly, Pascale (1997) "Urban agriculture in informal settlements: How can it contribute to poverty alleviation?" **Agriculture and rural development** 4/2: 46-48.

Denninger, Mats, Bertil Egero, and Diana Lee-Smith (1998) **Urban Food Production: A Survival Strategy of Urban Households**. Report of a Workshop on East & Southern Africa. RELMA Workshop Series No. 1. Regional Land Management Unit (RELMA), Mazingira Institute, Nairobi.

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) (1999) "Growing cities - growing food: workshop materials." Distributed at international workshop **Growing Cities Growing Food** (DSE/GTZ/SIDA/CTA/ACPA). La Habana, German Foundation for International Development (DSE). October.

Dixon, Jane (1999) "A cultural economy model for studying food systems." **Agriculture and Human Values** 16/2 (June): 151-160.

Drakakis-Smith, David (1997) "Third World Cities: Sustainable Urban Development III - Basic Needs and Human Rights." **Urban Studies** 34/5-6: 797-823.

Drakakis-Smith, David (1996) "Third World Cities: Sustainable Urban Development II - Population, Labour and Poverty." **Urban Studies** 33/4-5: 673-701.

Drakakis-Smith, David, Tanya Bowyer-Bower and Dan Tevera (1995) "Urban Poverty and Urban Agriculture: An Overview of the Linkages in Harare." **Habitat International** 19/2: 183-193.

Drescher, A.W. (1999) "Urban Microfarming in Central Southern Africa: A Case Study of Lusaka, Zambia." **African Urban Quarterly** (May-August 1996) 11/2-3: 229-248.

Drescher, Axel W. and David Iaquinta (1999) "Urban and Peri-Urban Food Production: A new challenge for the Food and Agriculture Organisation of the United Nations." (Draft August)

Edwards, P. and R.S.V. Pullin (1990) **Wastewater-Fed Aquaculture**. Proceedings of the International Seminar on Wastewater Reclamation and Reuse for Aquaculture (UNDP/WB/ESCAP/Government of India), Calcutta, December 1988.

Egziabher, Axumite G., Diana Lee-Smith, Daniel G. Maxwell, Pyar A. Memon, Luc J.A. Mougeot, Camillus Sawio (1994) **Cities Feeding People: An Examination of Urban Agriculture in East Africa**. International Development Research Centre, Ottawa.

Ellis, Frank and James Sumberg (1998) "Food Production, Urban Areas and Policy Responses." **World Development** 26/2: 213-225.

Engberg-Pedersen Poul and Lars Udsholt (1997) "Limits of adjustment programmes in Africa." **Agriculture and rural development** 4/2: 29-32.

Environment and Development Activities - Zimbabwe (ENDA-ZW) (1997) "Urban Agriculture in Harare: Household nutrition, economic costs and benefits." ENDA-ZW, Harare.

Feix, Andrea (1997) "Advisory services for municipal authorities: small scale agricultural projects." *Agriculture and rural development* 4/2: 55: 57.

Flynn, Kathleen (1999) "Urban Agriculture and Public Health: Risk Assessment and Prevention for Contamination and Zoonoses." Cities Feeding People Program Initiative. International Development Research Centre, Ottawa (draft).

Foeken, Dick and Alice Mboganie Mwangi (1998) "Does Access to Land Have a Positive Impact on the Food Situation of the Urban Poor? A Case Study in Nairobi." *East African Social Science Research Review* 14/1 (Mimeo.)

Fonds des Nations Unies pour l'enfance (UNICEF) (1993) *Rapport annuel 1993*. UNICEF, New York.

Freeman, Donald B. (1991) *A city of farmers: informal urban agriculture in the open spaces of Nairobi, Kenya*. McGill-Queen's University Press, Montreal.

Food and Agriculture Organization of the United Nations, Committee on Agriculture - COAG/FAO (1999) "Urban and Peri-Urban Agriculture." COAG/99/10. Presented at Fifteenth Session of the COAG, 25-29 January. FAO, Rome.

Food and Agriculture Organization of the United Nations (FAO) (1996) "Urban Agriculture: An Oximoron?" in *The State of Food and Agriculture 1996*, pp.43-57. FAO, Rome.

Ganapathi, R.S. (1983) "Development of urban agriculture in India: public policy options." Presented at the IDRC Urban Agriculture Seminar, Singapore. July.

Gertel, Jorg (1997) "Animal husbandry, urban spaces and subsistence production in Cairo." *Agriculture and rural development* 4/2: 49-51.

Giles, José (1997) "Agriculture in "Green Belts" of urban centres." *Agriculture and rural development* 4/2: 58-60.

Girardet, Herbert (1992) *The Gaia Atlas of Cities: New directions for sustainable urban living*. Anchor Books Doubleday, New York.

Gonzales Novo, Mario (1999) "Urban Agriculture in the City of Havana." Delivered at international workshop *Growing Cities Growing Food* (DSE/GTZ/SIDA/CTA/ACPA). La Habana, German Foundation for International Development (DSE). October.

Gumbo, Davison J. and Takawira W. Ndiripo (1999) "Open Space Cultivation in Zimbabwe: Case Study of Greater Harare, Zimbabwe." *African Urban Quarterly* (May-August 1996) 11/2-3: 210-216.

Haddad, Lawrence, Marie T. Trudel and James L. Garrett (1999) "Are Urban Poverty and Undernutrition Growing? Some Newly Assembled Evidence." IFPRI Discussion Paper Briefs 63. International Food Policy Research Institute, Washington, D.C.

Hamm, Michael W. and Monique Baron (1999) *Developing and Integrated, Sustainable Urban Food System: The Case of New Jersey, United States*. In *For Hunger-proof Cities: Sustainable Urban Food Systems*, pp. 54-59. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh. International Development Research Centre, Ottawa.

Heidhues, Franz (1997) "The devaluation of the CFA franc - impact on agricultural production." *Agriculture and rural development* 4/2: 37-39.

- Hovorka, Alice (1999) "Women Urban Farmers: Emerging Trends and Areas for Future Research." Submitted to the **Women Farmers: Enhancing Rights and Productivity Conference**, Center for Development Research, Bonn, Germany, 26-27 August 1999. Draft.
- House, W., G. Ikiara and D. McCormick (1993) "Urban Self-Employment in Kenya: Panacea or Viable Strategy?" **World Development** 21/7: 1205-1223.
- Jaquinta, David L. and Axel W. Drescher (1999) "Defining Periurban: Towards Guidelines for Understanding Rural-Urban Linkages and Their Connection to Institutional Contexts." Rome, Food and Agriculture Organization (FAO). June.
- Immink, Marteen D.C. (1994) "The Urban Poor and Household Food Security." **Urban Examples** 19. United Nations Children's Fund, New York.
- International Development Research Centre (IDRC) - The Urban Agriculture Network (TUAN) (1996) "The Third Meeting of the Support Group on Urban Agriculture (SGUA): Proceedings, March 18-19. **Cities Feeding People Report** 17. International Development Research Centre, Ottawa.
- Izquierdo Fernandez, Juan (1997) "La hidroponia popular y su potencial en procesos de superacion de la pobreza: Rol de la FAO." In **Hidroponia: Una Esperanza para Latinoamérica**, pp. 239-262. Edited by Alfredo Rodriguez Delfin. Universidad Nacional Agraria La Molina - IDRC- FAO. Lima.
- Jacobi, Petra (1996) "Economy of *Amaranthus* ssp. (Mchicha) growing on Open Spaces in Dar es Salaam." **Urban Vegetable Promotion Project** (Tanzania's Ministry of Agriculture and Co-operatives/GTZ), Dar es Salaam.
- Jacobi, Petra and Jorg Amend (1997) "Vegetable farming in Dar es Salaam: an important source of income, and not only for the poor." **Agriculture and rural development** 4/2: 52-54.
- Jacobs, Jane (1969) **The Economy of Cities**. Random House, New York. Esp. Chapter 1, pp. 3-48.
- Kiango, Susan and Tabu Likoko (1996) "Vegetable Production on Open Spaces in Dar es Salaam City." **Urban Vegetable Promotion Project** (Ministry of Agriculture and Co-operatives/GTZ), Dar es Salaam. November.
- Kironde, J.M. Lusugga (1992) "Received Concepts and Theories in African Urbanisation and Management Strategies: The Struggle Continues." **Urban Studies** 29/8: 1277-1292.
- Koc, Mustafa, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh (1999) "Introduction: Food Security is a Global Concern." In **For Hunger-proof Cities: Sustainable Urban Food Systems**. Edited by idem. International Development Research Centre, Ottawa.
- Kogi-Makau, Wambui (1995) "Consumption and the State of Nutritional Knowledge and Beliefs on Fruits and Vegetables Among the Urban Poor in Dar es Salaam." **Urban Vegetable Promotion Project**. Dar es Salaam, Ministry of Agriculture and Co-operatives and Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ).
- Kouvonou, F.M., B.G. Honfoga and S.K. Debrah (1998) "Sécurité alimentaire et gestion intégrée de la fertilité des sols: contribution du maraîchage péri-urbain à Lomé." In **Agriculture urbaine en Afrique de l'Ouest: Une contribution à la sécurité alimentaire et à l'assainissement des villes**, pp. 83-103. Edited by Olanrewaju B. Smith. Technical Centre for Agricultural and Rural Cooperation and International Development Research Centre, Ottawa.
- Lang, Tim (1999) "Food Policy for the 21st Century: Can It Be Both Radical and Reasonable?" In **For Hunger-proof**

Cities: Sustainable Urban Food Systems, pp. 216-224. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh. International Development Research centre, Ottawa.

Lardinois, Inge, and Arnold van Klundert (1994) "Recovery of organic waste in cities." *ILEIA Newsletter* 10/3 (October): 6-8.

Larrieu, Edmundo, Jorge Iriarte and Omar Zavaleta (1988) "Aportes al conocimiento de la hidatidosis como zoonosis urbana." *Revista do Instituto de Medicina Tropical de Sao Paulo* 30/1: 28-31.

Lee-Smith, Diana (1998) "African urban policy: issues and priority." Presented at **International Conference on Urban Agriculture Policy in Southern Africa**, Technikon Pretoria, 30-31 March 1998.

Lee-Smith, D., M. Manundu, D. Lamba, P. Gathuru Kuria (1987) **Urban food production and the cooking fuel situation in urban Kenya - national report: results of a 1985 national survey**. Mazingira Institute, Nairobi.

Lewcock, Chris P. (1995) "Farmer Use of Urban Waste in Kano." *Habitat International*, special issue on urban agriculture and cities in the developing world, 19/2: 225-234.

Lifecycles (1998) "Urban Agriculture and Food Security in Canada: A Survey of Canadian Non-Governmental Organizations." *Cities Feeding People Report* 25. International Development Research Centre, Ottawa.

Ling, Bo (1994) "Safe use of treated night soil." *ILEIA Newsletter*, (October) 10/3 : 10-11.

Losada, H., H. Martinez, J. Vieyra, R. Pealing, R. and J. Cortés (1998) "Urban agriculture in the metropolitan zone of Mexico: changes over time in urban, suburban and peri-urban areas." *Environment and Urbanization* 10/2 (October): 37-54.

Lourenço-Lindell, Ilda (1999) "How Do the Urban Poor Stay Alive? Food Provision in a Squatter Settlement of Bissau, Guinea-Bissau." *African Urban Quarterly* (May-August 1996) 11/2-3: 163-168.

Lourenço-Lindell, Ilda (1995) "Food for the Poor, Food for the City: The Role of Urban Agriculture in Bissau." Delivered at **Workshop on The Social and Environmental Implications of Urban Agriculture (ODA)**, University of Zimbabwe, Harare, 30-31 August.

MacRae, Rod (1999) "Policy Failure in the Canadian Food System." In **For Hunger-proof Cities: Sustainable Urban Food Systems**, pp. 182-194. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot and Jennifer Welsh. International Development Research Centre, Ottawa.

Maxwell, Daniel (1999) "Urban Food Security in Sub-Saharan Africa." In **For Hunger-proof Cities: Sustainable Urban Food Systems**, pp. 26-29. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh. International Development Research centre, Ottawa.

Maxwell, Daniel G. (1995) "Alternative Food Security Strategy: A Household Analysis of Urban Agriculture in Kampala." *World Development* 23/10: 1669-1681.

Maxwell, Daniel, Carol Levin and Joanne Csete (1998) "Does Urban Agriculture Help Prevent Malnutrition? Evidence from Kampala." International Food Policy Research Institute and UNICEF, Washington D.C. and New York. January.

Maxwell, Daniel and Margaret Armar-Klemesu (1998a) "The Impact of Urban Agriculture on Livelihoods, Food

and Nutrition Security in Greater Accra." Presented at **IDRC Cities Feeding People Workshop on Lessons Learned from Urban Agriculture Projects in African Cities**, Nairobi, June 1998.

Maxwell, Daniel and Margaret Armar-Klimesu (1998b) "Urban Agriculture: Introduction and Review of Literature." Noguchi Memorial Institute for Medical Research, Accra. March.

Maxwell, Daniel, Wordsworth Odame Larbi, Grace Mary Lamptey, Sawudatu Zakariah, and Margaret Armar-Klimesu (1998) "Farming in the Shadow of the City: Changes in Land Rights and Livelihoods in Peri-Urban Accra." **Cities Feeding People Report 23**. International Development Research Centre, Ottawa.

Mbaye, Alain (1999) " Production des légumes à Dakar: importance, contraintes et potentialités." In **Agriculture urbaine en Afrique de l'Ouest: Une contribution à la sécurité alimentaire et à l'assainissement des villes**, pp. 56-66. Edited by Olanrewaju B. Smith. Technical Centre for Agricultural and Rural Cooperation and International Development Research Centre, Ottawa.

Mbiba, Beacon (1998) "Urban Agriculture Policy in Southern Africa; From Theory to Practice." In **Productive Open Space Management with a Shared Focus on the Potential of Urban Agriculture (Urban Food Production) Policy and Agenda 21**. Draft papers for an International Conference, Pretoria, 3-5 March 1998 (Draft).

Mbiba, Beacon (1995) **Urban agriculture in Zimbabwe: implications for urban management and poverty**. Aldershot, Avebury, United Kingdom.

Mbiba, Beacon (1994) "Institutional responses to uncontrolled urban cultivation in Harare: prohibitive or accommodative?" **Environment and Urbanization** (April) 6/1: 188-202.

Mboganie Mwangi, Alice (1995) "The Role of Urban Agriculture for Food Security in Low Income Areas in Nairobi." **Food and Nutrition Studies Programme Report No. 54**. Ministry of Planning and National Development, Nairobi, and African Studies Centre, Leiden, 82 p.

Mboganie-Mwangi, Alice and Dick Foeken (1999) "Urban Agriculture, Food Security and Nutrition in Low Income Areas of the City of Nairobi, Kenya." **African Urban Quarterly** (May-August 1996) 11/2-3: 170-179.

Mekouar, Mohammed Ali (1997) "La ville et la nature." **Réforme agraire, colonisation et coopératives agricoles 2**: 53-60.

Metzger, René, Jean-Michel centres. Laurent Thomas and Jean-Claude Lambert (1995) "L'approvisionnement des villes africaines en lait et produits laitiers." **Etude FAO Production et Santé animales 124**. FAO, Rome.

Midmore, David (1995) "Social, economic and environmental constraints and opportunities in periurban vegetable production systems and related technological interventions". In **Vegetable Production in Periurban Areas in the Tropics and Subtropics - Food, Income and Quality of Life**, pp. 64-87. Edited by Jürgen Richter et al. Food and Agriculture Development Centre, Zschortau. Germany, 160 p.

Mitlin, D. and D. Satterthwaite (1996) "Sustainable development and cities." In **Sustainability, the Environment and Urbanization**, pp. 23-62. Edited by C. Pugh. Earthscan, London.

Mlozi, Malongo R.S. (1998) "Urban vegetable Production in Low-Density Areas of Dar es Salaam." **Urban Vegetable Promotion Project**. Dar es Salaam, Ministry of Agriculture and Co-operatives and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). August.

Mlozi, Malongo R.S. (1995) "Information and The Problems of Urban Agriculture in Tanzania: Intentions and

- Realizations." Ph.D. Thesis, University of British Columbia, Vancouver.
- Montero, Alejandro (1999) "Seguridad alimentaria y agricultura organica urbana." *La Era Urbana*, 5/3 (invierno), Suplemento para América Latina y el Caribe 1: xxii-xxiv.
- Moscoso, Julio (1999) "El uso de aguas residuales en la agricultura urbana." *La Era Urbana*, 5/3 (invierno), Suplemento para América Latina y el Caribe 1: xix-xxi.
- Mougeot, Luc J.A. (1999a) "For Self-reliant Cities: Urban Food Production in a Globalizing South," in **For Hunger-proof Cities: Sustainable Urban Food Systems**, pp. 11-25. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh. International Development Research Centre, Ottawa.
- Mougeot, Luc J.A. (1999b) "Introduction: An Improving Domestic and International Environment for African Urban Agriculture." *African Urban Quarterly* (May-August 1996) 11/2-3: 137-152.
- Mougeot, Luc J.A. (1999c) "Urban Agriculture Research in Africa: Reviewing and Enhancing Project Impacts." *Cities Feeding People Report* 29. International Development Research Centre, Ottawa.
- Mougeot, Luc J.A. (1998) "Farming Inside and Around Cities." *The Urban Age* 5/3 (Winter): 18-21.
- Mougeot, Luc J.A. (1994) "Urban Food Production: Evolution. Official Support and Significance." *Cities Feeding People Report* 8. International Development Research Centre, Ottawa.
- Moustier, Paule, ed. (1999) *Filières maraîchères à Brazzaville: Quantification et observatoire pour l'action*. CIRAD - Agrisud International - Agricongo, Montpellier.
- Moustier, Paule (1998) "La complémentarité entre agriculture urbaine et agriculture rurale." In *Agriculture urbaine en Afrique de l'Ouest: Une contribution à la sécurité alimentaire et à l'assainissement des villes*, pp. Edited by Olanrewaju B. Smith. Technical Centre for Agricultural and Rural Cooperation and International Development Research Centre, Ottawa.
- Moustier, Paule and Jacques Pagès (1997) "Le péri-urbain en Afrique: une agriculture en marge?" *Economie rurale* (septembre-octobre) 241: 48-56.
- Moustier, Paule and Olivier David (1997) "Dynamique du maraîchage périurbain en Afrique subsaharienne." Delivered at *Séminaire sous-régional sur l' approvisionnement et distribution alimentaires des villes de l'Afrique francophone* (FAO-ISRA). Dakar, 14-18 April.
- Moustier, Paule (1996) "Organization in the Brazzaville Vegetable Market". Doctoral thesis. University of London, Wye College.
- Moustier, Paule (1993) "On Performance of Urban Vegetable Supply in African Countries." *Acta Horticulturae* 340: 307-313.
- Muster, Gisa (1997) "Environmental Problems of Urban Agriculture: A Case Study of Dar es Salaam / Tanzania." Dissertation for MA Development and Environment, University of London, London. September
- Murray, Sharon (1997) *Urban and Peri-Urban Forestry in Quito, Ecuador: A Case Study*. Forestry Department, Food and Agriculture Organization, Rome.
- Mwamfupe, D.G. (1994) "Changes in Agricultural Land Use in the Peri-urban Zone of Dar es Salaam, Tanzania."

Ph.D. dissertation, University of Glasgow.

- Mwangi, Muthoni M., comp. (1998) **Urban Food Production: A Survival Strategy of Urban Households**. Report of a Workshop on East and Southern Africa (SIDA), Nairobi, 3-5 May. The Regional Land Management Unit - Mazingira Institute, Nairobi, and Programme on Population and Development, Lund University, Lund.
- Natural Resources Institute (NRI) (1995) **Peri-Urban Interface Research. Workshop Proceedings**. (United Kingdom Overseas Development Administration - British Council), 23-25 August. NRI, Kumasi, Ghana.
- Ndebele, J.J. (1996) "Urban Agriculture in Bulawayo - Issues and an Inception of Policy Guidelines for its Sustainable Development." Bulawayo City Council, Bulawayo, Zimbabwe. June.
- Niang, Seydou (1998) "Épuration des eaux usées domestiques." Presented at **IDRC Cities Feeding People Workshop on Lessons Learned from Urban Agriculture Projects in African Cities**, Nairobi. July.
- Niang, Seydou (1999) "Épuration et réutilisation des eaux usées domestiques en maraîchage périurbain à Dakar, Sénégal." **African Urban Quarterly** (May-August 1996) 11/2-3: 250-257.
- Nugent, Rachel (1999) "Measuring the Sustainability of Urban Agriculture." In **For Hunger-proof Cities: Sustainable Urban Food Systems**, pp. 95-99. Edited by Mustafa Koc, Rod MacRae, Luc J.A. Mougeot, and Jennifer Welsh. International Development Research Centre, Ottawa.
- Panigrahi, S. (1995) "Parallels in Dairy and Poultry Development Strategies and Issues Relating to Urbanisation in the Eastern India Region". Natural Resource Institute, Chatham. Draft.
- Pillai, K., P.L. Narayana Rao and K. Surya Rao (1996) "A study on the prevalence of hydatidosis in sheep and goats at Tirupati municipal slaughterhouse." **Indian Journal of Public Health** 30/3: 160-165.
- Population Crisis Committee (PCC) (1990) **Cities: life in the world's 100 largest metropolitan areas**. PCC, Washington, D.C.
- Pothukuchi, Kameshwari and Jerome L. Kaufman (1999) "Placing the food system on the urban agenda: The role of municipal institutions in food systems planning." **Agriculture and Human Values** 16/2 (June): 213-224
- Potutan, G.E., W.H. Schnitzler, J.M. Amado, L.G. Janubas, R.J. Holmer (1999) "City Harvests: The Case of Cagayan de Oro City (Philippines)." Delivered at international workshop **Growing Cities Growing Food** (DSE/GTZ/SIDA/CTA/ACPA). La Habana, German Foundation for International Development (DSE). October.
- Prudencio Bohrt, Julio (1997) **Agricultura urbana en América latina. Memoria**. Secretaria Ejecutiva AGUILA, La Paz.
- Quon, Soonya (1999) "Planning for Urban Agriculture: A Review of Tools and Strategies for Urban Planners." **Cities Feeding People Report** 28. International Development Research Centre, Ottawa.
- Rabinovitch, Jonas and Hartmut Schmetzer (1997) "Urban agriculture: Food, jobs and sustainable cities." **Agriculture and rural development** 4/2: 44-45.
- Rakodi, C. (1995) "Poverty lines or household strategies? A review of conceptual issues in the study of urban poverty." **Habitat International** 19/4: 407-426.
- Ratta, Annu and Joe Nasr (1999) "Urban Agriculture and the African Urban Food Supply System." **African Urban**

Quarterly (May-August 1996) 11/2-3: 154-161.

Rees, William (1997) "Why Urban Agriculture?" Notes for the IDRC Development Forum on **Cities Feeding People: A Growth Industry**, Vancouver, 20 May.

Régis, Mildred Delphin (1999) "Horticultura urbana en Haiti. Taller de evaluacion." Presented at **IDRC Cities Feeding People Workshop "Investigando el Desarrollo de la Agricultura Urbana en la América latina y el Caribe: Balance y optimizacion de impactos de proyectos (IDRC/FLACSO/Alternativas para el Desarrollo)**, San José de Costa Rica. May.

Republic of South Africa, Department of Environmental Affairs and Tourism (DEAT)/Technikon Pretoria (PT) (1998) **Productive Open Space Management with a Shared Focus on the Potential of Urban Agriculture (Urban Food Production) Policy and Agenda 21**. Draft papers for an International Conference, Pretoria, 3-5 March 1998 (Draft).

Richter, Jurgen, Wilfried H. Schnitzler, Susanne Gura, eds. (1995) **Vegetable Production in Periurban Areas in the Tropics and Subtropics - Food, Income and Quality of Life - Proceedings of an International Workshop**. German Foundation for International Development (DSE) - Council for Tropical and Subtropical Agricultural Research (ATSAF), Zschortau, 14-17 November 1994. Food and Agriculture Development Centre (ZEL), Feldafing, Germany.

Rodier, G.R., J.-P. Parra, M. Kamil, S.O. Chakib and S.E. Cope (1995) "Recurrence and emergence of infectious diseases in Djibouti city." **Bulletin of the World Health Organization**. 73/6: 755-759.

Sawio, Camillus (1998) "Managing Urban Agriculture in Dar es Salaam." **Cities Feeding People Report 20**. International Development Research Centre, Ottawa.

Sawio, Camillus (1993) "Feeding the urban masses? Towards an understanding of the dynamics of urban agriculture and land use change in Dar es Salaam, Tanzania." Ph.D. Thesis Graduate School of Geography, Clark University, Worcester, MA, U.S.A..

Schilter, Christine (1991) **L'agriculture urbaine à Lomé: approches agronomiques et socioéconomiques**. Karthala, Paris.

Schnitzler, W.H., Kham Sanatem, G.E. Potutan, L.G. Janubas, and R.J. Holmer (1999) "Case study: city harvests in Vientiane City." **Gate technology and development 2**(April-June): 23.

Schnitzler, W.H., Pham Van Bien, Ngo Quong Vinh, G.E. Potutan, L.G. Janubas, and R.J. Holmer (1999) "City harvests: the case of Ho Chi Minh City (Vietnam)." **Gate technology and development 2**(April-June): 26.

Seré, Carlos and Rainer Neidhardt (1995) "Urban-Rural integration in periurban animal production." **Agriculture and Rural Development 2/1** : 19-23.

Settlements Information Network Africa (SINA) (1998) **SINA Newsletter 42** (September) special issue on urban agriculture. Nairobi.

Shuval, Hillel I., Charles G. Gunnerson and DeAnne S. Julius (1981) "Nightsoil Composting." **Appropriate Technology for Water Supply and Sanitation** vol. 10. The World Bank, Washington, D.C.

Singer, H.W. (1997) "A global view of food security." **Agriculture and rural development 4/2**: 3-6.

Smit, Jac (1996) **Urban Agriculture: Progress and Prospect: 1975-2005**. **Cities Feeding People Report 18**.

International Development Research Centre, Ottawa.

Smit, Jac, Annu Ratta and Janis Bernstein (1996a) "Urban Agriculture: An Opportunity for Environmentally Sustainable Development in Sub-Saharan Africa". **Building Blocks for AFRICA 2025 Paper No. 11**, Post-UNCED Series. Environmentally Sustainable Division, Africa Technical Department, The World Bank, Washington, D.C., 33 p.

Smit, Jac, Annu Ratta and Joe Nasr (1996b) **Urban Agriculture: Food, Jobs and Sustainable Cities**. United Nations Development Program. Publication Series for Habitat II, Volume One. UNDP, New York.

Smit, Jac and Joe Nasr (1992) "Urban agriculture for sustainable cities: using wastes and idle land and water bodies as resources." **Environment and Urbanization** 4/2 (October): 141-152.

Smith, David W. (1998) "Urban food systems and the poor in developing countries." **Transactions of the Institute of British Geographers** 23: 207-219.

Spies, Lood (1998) "A Participative Management Model for Urban Open Space Projects." In **Productive Open Space Management with a Shared Focus on the Potential of Urban Agriculture (Urban Food Production) Policy and Agenda 21**. Draft papers for an International Conference, Pretoria, 3-5 March 1998 (Draft).

Staal, Steven J. (1997) "Potential Impacts of Periurban Dairying on Smallholder African Producer Households and Communities." Draft background note for discussion. International Livestock Research Institute, Nairobi. September.

Stevenson, Christopher, assisted by Peter Xavery and Acquiline Wendeline (1996) "Market Production and Vegetables in the Peri-Urban Area of Dar es Salaam, Tanzania." **Urban Vegetable Promotion Project** (Ministry of Agriculture and Co-operatives - Deutsche Gesellschaft für Technische Zusammenarbeit GTZ). UVPP, Dar es Salaam.

Sumberg (1999) "The Dar es Salaam Milk System: Dynamics of Change and Sustainability." **Habitat international** 23/2: 189-200.

Sumberg, James (1998) "Poultry production in and around Dar es salaam, Tanzania: competition and complementarity." **Outlook on Agriculture** 27/3: 177-185.

Sumberg, James (1997) "Policy, milk and the Dar es Salaam peri-urban zone: a new future for an old development theme?" **Land Use Policy** 14/4: 277-293.

Sumberg, J. and U. Kleith (1994) "Production and Marketing of Vegetables in the Port-au-Prince Peri-Urban Area". University of East Anglia and Natural Resources Institute.

Tacoli, Cecilia (1998) "Rural-Urban Interactions and Socio-Economic Change: A Preliminary Outline of Research Issues." International Institute on Environment and Development, London.

Van der Bliek, Julie and Ann Waters-Bayer (1999) "Farming in the City: From Analysis to Action." **African Urban Quarterly** 11/2-3 (May and August 1999): 259-262.

Visker, Cindy (1999) **La gestion des excréments humains à Bamako et à Niono, Mali: une utilisation comme fertilisant dans l'agriculture**. Institut Royal des Tropiques (KIT), Amsterdam.

Von Braun, Joachim (1997) "Food security for all by the year 2020?" **Agriculture and rural development** 4/2: 14-17.



Wade, Isabel (1987) **Food Self-Reliance in Third World Cities**. The Food-Energy Nexus Programme. The United Nations University, Paris.

Werblow, Uwe (1997) "A radically changing world: globalisation and food security up to the year 2020." **Agriculture and rural development 4/2: 7-9**

World Resources Institute, The United Nations Environment Programme, The United Nations Development Programme, The World Bank (WRI/UNEP/UNDP/WB) (1996) **World Resources**. Oxford University Press, New York.

Yachkaschi, Jasmin (1997) "Urban and Peri-Urban Production, Marketing System and Consumption of Fruit and Vegetables in Selected Cities of Tanzania." **Urban Vegetable Promotion Project**. Ministry of Agriculture and Cooperatives and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Dar es Salaam. October.

Yi-zhang, Cai (1999) "Case study: urban agriculture in Shanghai." **Gate technology and development 2 (April-June): 18-19**.

Zakariah, Sawudatu, Grace Mary Lamptey and Daniel Maxwell (1998) "Urban Agriculture in Accra: A Descriptive Analysis." Noguchi Memorial Institute for Medical Research and International Food Policy Research Institute, Accra and Washington D.C., February.

Zarges, Winfried (1997) "Food security for all by the year 2020? Who will meet increased import demand from the developing countries?" **Agriculture and rural development 4/2: 18-19**.