

Introduction

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1. An annotated bibliography on urban agriculture

Food production in cities has a long tradition in many countries and the UNDP (1996) has estimated that urban agriculture produces between 15 and 20 % of the world's food.

Urban planners commonly used to consider urban gardening and livestock keeping as merely 'hang-overs' of rural habits, a marginal activity of little economic importance, or as a health risk and a source of pollution that has to be curtailed. Such biases, sustained by the limited exposure of policy makers and planners to grounded information on urban agriculture, have resulted in important legal restrictions on urban agriculture. Nevertheless, urban agriculture has continued to grow in most cities in the South.

Over the last decade an increasing number of national governments and city authorities, supported by international development agencies (including IDRC, FAO, UNCHS, UNDP, CIRAD, NRI, CGIAR, GTZ, ETC and others) have started to integrate urban agriculture into their policies and programmes, recognising the importance of (intra- and peri-) urban agriculture for solving persistent urban problems, such as increasing urban poverty and food insecurity, increasing problems with the disposal of urban wastes and wastewater, the growing ecological footprint of the city and the lack of green spaces in the urban environment.

One of the constraints that is encountered by these local policy makers, planners, researches, NGO's and other stakeholders in urban agriculture, is the limited access to relevant information on the presence, characteristics and impacts of urban agriculture. There is a rapidly growing body of literature, but a systematic overview of the more important documents is lacking.

The production of an annotated bibliography and its publication on Internet (www.ruaf.org) and as CD-rom will resolve this bottleneck to a great extent.

The present document is a product in development. The Resource Centre on Urban Agriculture and Forestry (RUAF) will continue to update and complement the existing bibliographic database and we hope and expect that organisations involved in the development of urban agriculture in one way or another will help us to do so by sending us their research and project reports, evaluation studies, policy documents and the like, both formally published documents and grey materials.

2. Types and characteristics of urban agriculture

Urban agriculture is not easy to define since a large variety of urban farming systems can be encountered, with varying characteristics according to local socio-economic, physio-geographic and political conditions.

One has to consider various aspects of urban agriculture in order to arrive at a definition that is meaningful in the local context:

- **Types of products**

Urban agriculture may include different types of crops (grains, root crops, vegetables, mushrooms, fruits) or animals (poultry, rabbits, goats, sheep, cattle, pigs, guinea pigs, fish, etc.) or combinations of these. Often the more perishable and relatively highly valued vegetables and animal products and by-products are favoured. Non-food products include aromatic and medicinal herbs, ornamental plants, tree products (seed, wood, fuel, etc.), tree seedlings, and so on. Production units in urban agriculture in general tend to be more specialised than rural enterprises, and exchanges take place across production units.

- **Types of economic activities**

Urban agriculture includes production activities as well as related processing and marketing activities, input production, services delivery (e.g. animal health services) by specialised micro-enterprises or NGOs, etc. The interactions between these activities are also important (chains, clusters). In urban agriculture, production and marketing (and also processing) tend to be more interrelated in terms of time and space than is the case for rural agriculture, as a result of greater geographic proximity and quicker resource flow. Economies of agglomeration seem to prevail over those of scale.

- **Types of location**

Urban agriculture may take place in locations inside the cities (intra-urban) or in the periurban areas. The activities may take place on the homestead (on-plot) or on land away from the residence (off-plot), on private land (owned, leased) or on public land (parks, conservation areas, along roads, streams and railways), or semi-public land (schoolyards, grounds of schools and hospitals).

- **Scales of production and technology used**

In the city, we may encounter individual or family farms, group or cooperative farms and enterprises, micro-, small- and medium-sized enterprises, as well as large-scale undertakings. The technological level of the majority of urban agriculture enterprises in developing countries is still rather low. However, the tendency is towards more technically advanced and intensive agriculture and various examples of such can be found in all cities.

- **Product destination / degree of market orientation**

In most cities in developing countries, an important part of urban agricultural production is for domestic consumption, with surpluses being traded. However, the importance of market-oriented urban agriculture, both in volume and economic value, should not be underestimated (as will be shown later). Products are sold at the farm gate, from the cart in the same or other neighbourhoods, in local shops, on local (farmers) markets or to intermediaries and supermarkets. Mainly fresh products are sold, but part of these are processed for own use, cooked and sold on the streets, or processed and packaged for sale to one of the outlets mentioned above.

- **Types of actors involved**

Many of the people involved in urban agriculture belong to the urban poor. However, they are often not the most disadvantaged people, nor are they - contrary to general belief - recent immigrants from rural areas (since the urban farmer needs time to gain access to urban land, water and other productive resources). In many cities, one will often also find lower and mid-level government officials, school teachers and the like involved in agriculture, as well as richer people who are seeking a good investment for their capital.

Women constitute an important part of the urban farmer population, since agriculture and related processing and selling activities can often be more easily combined with their other tasks in the household. It is however more difficult to combine these with urban jobs that require travelling to the town centre, industrial areas or to the houses of the rich.

One striking feature of urban agriculture which distinguishes it from rural agriculture, is that it is **integrated into the urban economic and ecological system** (hereafter referred to as the “ecosystem”). It is not its urban location which distinguishes urban from rural agriculture, but the fact that it is embedded in and interacts with the urban ecosystem. Such linkages include the use of urban residents as labourers, use of typical urban resources (such as organic waste as compost and urban wastewater for irrigation), direct links with urban consumers, direct impacts on urban ecology (positive and negative), being part of the urban food system, competing for land with other urban functions, being influenced by urban policies and plans, etc. (Mougeot, 2000).

3. The impacts of urban agriculture

Urban agriculture plays an important role in enhancing urban food security and nutrition, local economic development, poverty alleviation and social inclusion of disadvantaged groups and sustainable environmental management in the cities.

3.1 Urban food security and nutrition

Research data clearly indicate that urban agriculture forms an important component of the urban food system

The local production of food, and associated local marketing of fresh and processed products, increase the food security of the poor by making food locally available, and at lower prices, and by improving the nutritional balance of the family diet. Creation of better conditions for periurban and urban families to produce and market vegetables, fruits, livestock products and fish, can positively affect the nutrition and health of vulnerable urban groups, especially in situations where women gain control over the destination of the produce and revenues from sales.

Food production in the city is in many cases a response of the urban poor to inadequate, unreliable and irregular access to food, and the lack of purchasing power. Most cities in developing countries are not able to generate sufficient (formal or informal) income opportunities for the rapidly growing population. The World Bank (2000) estimates that approximately 50% of the poor live in urban areas (25% in 1988). In urban settings, lack of income translates more directly into lack of food than in a rural setting (cash is needed).

The costs of supplying and distributing food from rural areas to the urban areas or importing food for the cities, are rising continuously, and it is expected that urban food insecurity will increase (Argenti 2000). Food prices in Harare, for example, rose by 534 percent between 1991 and 1992 due to the removal of subsidies and price controls, spurring poor urban consumers to gain access to food outside of market channels through home production or bartering (Tevera, 1996).

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Urban agriculture may improve both food intake (improved access to a cheap source of proteins) and the quality of the food (poor urban families involved in farming eat more fresh vegetables than other families in the same income category).

In **Harare**, sixty percent of food consumed by low-income groups was self-produced (Bowyer-Bower and Drakakis-Smith, 1996). 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). Urban producers obtained 40 to 60 percent or more of their household food needs from their own urban garden (Maxwell and Zziwa 1992). In **Cagayan de Oro**, urban farmers generally eat more vegetables than non-urban farmers of the same wealth class, and also more than consumers from a higher wealth class (who consume more meat) (Potutan et al. 1999).

In addition to production for their own consumption needs, large amounts of food are produced for other categories of the population. It is estimated (UNDP 1996; FAO 1999) that 200 million urban residents provide food for the market and 800 million urban dwellers are actively engaged in urban agriculture in one way or another. These urban farmers produce substantial amounts of food for urban consumers. A global estimate (data 1993) is that 15-20% of the world's food is produced in urban areas (Margaret Armar-Klemesu 2000).

Research on specific cities and products yields data such as the following:

- in **Hanoi**, 80% of fresh vegetables, 50% of pork, poultry and freshwater fish, as well as 40% of eggs, originate from urban and periurban areas (Nguyen Tien Dinh, 2000);
- in the urban and periurban area of **Shanghai**, 60% of the city's vegetables, 100% of the milk, 90% of the eggs, and 50% of the pork and poultry meat is produced (Cai Yi-Zhang and Zhang Zhange in Bakker et al. 2000);
- in **Java**, home gardens provide for 18% of caloric consumption and 14% of protein intake of the urban population (Ning Purnomohadi 2000);
* **Dakar** produces 60% of the national vegetable consumption whilst urban poultry production amounts to 65% of the national demand (Mbaye and Moustier 1999). Sixty percent of the milk consumed in Dakar is produced in or around the city;
- in **Accra**, 90% of the city's fresh vegetable consumption is from production within the city (Cencosad 1994).
- over 26,000 popular gardens cover 2,438.7 hectares in **Havana** producing 25,000 tons of food each year; a total of 299 square kilometres of urban agriculture produces 113,525 tons/year (Mario Gonzalez Novo and Catherine Murphy in Bakker et al. 2000);
- in **Mexico City** production of swine can bring in 10-40% of household earnings, urban cowshed-based milk can supply up to 100% of household income and in sub and periurban areas maize production provides 10-30%, vegetable and legume production even up to 80% of the household income (Pablo Torres Lima, L.M.R. Sanchez, B.I.G. Uriza in Bakker et al. 2000).

Urban agriculture complements rural agriculture to a large extent and increases the efficiency of the national food system in that it provides products that rural agriculture cannot supply easily (e.g. perishable products, products that require rapid delivery upon harvest), that can

replace food imports and it can thus release rural lands for export production of commodities (IDRC, 1998).

3.2. Local economic development

Urban production of food reduces food costs in view of the savings in transport, and storage, and because fewer middlemen and lower marketing costs may be involved.

Since the largest component of household expenditure is that spent on food (low-income households usually spend over 50-70 % of their income on basic food), any savings on food expenditure translates into a significant portion of the family income becoming available for other, non-food expenditures.

If urban agriculture results in surpluses that are sold, the resulting addition to the income can be sizeable.

In **Dar es Salaam** urban agriculture is the second largest urban employer (20 percent of those employed). Urban fresh milk production was worth an estimated USD 7 million in 1993 (Mougeot 1994). The annual gross output of over ten thousand urban agriculture enterprises in the city of Dar es Salaam totalled 27.4 million USD, with an annual added value amounting to 11.1 million USD. In 1991, the individual urban farmer's annual average profit was estimated at 1.6 times the annual minimum salary (Sawio 1998).

In **Addis Abeba**, above-average profits are earned by even the smallest-scale backyard producers with very low capital (Staal 1997).

In **Harare**, savings accruing to small-scale urban farmers are equivalent to more than half a month's salary (Sanyal (1986,1987) cited in Tevera, 1996).

In **Nairobi** in the early 1990s, agriculture provided the highest self-employment earnings among small-scale enterprises and the third highest earnings in all of urban Kenya (House et al. 1993).

The commercial agriculture in **Mexico City's** periurban area contributes substantially to the local economy. In the periurban regions, up to 19 percent of total employment is in agriculture (Pablo Torres Lima, L.M.R. Sanchez, B.I.G. Uriza in Bakker et al. 2000).

In addition to the economic benefits to the urban agricultural producers, urban agriculture stimulates the development of related micro-enterprises: the production of necessary agricultural inputs and the processing, packaging and marketing of outputs. The activities or services rendered by these enterprises may owe their existence wholly or in part to urban agriculture. Other services may also be rendered by independent families and groups (e.g. animal health services, bookkeeping, transportation).

Input production and delivery may include activities such as the collection and composting of urban wastes, production of organic pesticides, fabrication of tools, delivery of water, buying and delivery of chemical fertilisers, etc.

Transformation of foodstuffs may include the making of yoghurt from milk, or the frying of plantains or yams, chicken or eggs, etc. This might be done at the household level, to sell at

the farm gate or in a local shop or market, and in larger units to sell to supermarkets or even for export.

The urban farmers and the small agro-enterprises often form informal clusters or networks.

3.3 Poverty alleviation: social integration of disadvantaged groups

Urban agriculture may function as an important strategy for poverty alleviation and social integration, as should have become clear from the above.

There are several examples of municipalities or NGOs that have initiated urban agriculture projects that involve disadvantaged groups such as orphans, disabled people, women, recent immigrants, or elderly people, with the aim of integrating them more strongly into the urban network and thereby providing them with a decent livelihood. The participants in these projects feel enriched by having the opportunity of working constructively, building their community, working together and in addition producing food and other products for consumption and for sale.

In more developed cities, urban agriculture may be undertaken to enhance the physical and/or psychological relaxation it provides, rather than for food production *per se*. Urban and periurban farms may take on an important role in providing recreational opportunities for citizens (recreational routes, food buying and meals on the farm, visiting facilities) or having educational functions (bringing youth in contact with animals, teaching about ecology, etc.).

3.4 Urban environmental management

Urban agriculture is part of the urban ecological system and can play an important role in the urban environmental management system.

The growing cities produce more and more wastewater and organic waste products. For most cities the disposal of waste has become a serious problem. Urban agriculture can help to solve such problems by turning urban waste into a productive resource.

In many cities initiatives have been taken (by groups of poor people, NGOs, municipal departments or private enterprises) to collect organic refuse from households, vegetable markets and agro-industries in order to produce compost or animal feed. Quality compost is an important input that can fetch a good price. Compost allows an urban farmer to use less chemical fertilisers and pesticides and by doing so preventing problems related to the contamination of groundwater. In addition, compost-making initiatives create employment and provide income for the urban poor. One can also find urban farmers who use fresh organic waste (which may cause environmental and health problems) which is often bought from the drivers of the lorries belonging to the municipal waste collection system.

Urban wastewater may be wholly or partly treated and used for irrigation in agriculture.

However, the wastewater system in most cities is still mainly oriented to disposal of the urban wastewater (with or without treatment) and so far little attention has been paid to the possibilities for recycling this water. In a growing number of cities untreated or partially treated wastewater is used to water parks, woodlands, pastures, orchards, tree nurseries, etc.

Farmers may use fresh wastewater for irrigating their farms when they lack access to other sources of water or because of its high price. The use of fresh (untreated) wastewater has the additional advantage for poor urban farmers that it contains a lot of nutrients (although often not in the proportions required by their soils and crops). It was estimated that at least one tenth of the world's population consumes food produced on wastewater (Lundven, 1992). Increasing water scarcity forces people to make optimal use of available water. However, without proper guidance, the use of untreated wastewater may lead to health and environmental problems.

Therefore, cities need to improve the facilities for treatment and recycling of urban wastewater in agriculture, especially decentralised treatment facilities applying low cost and bio-technologies. However, in most municipalities, the treatment capacity will remain far lower than what is needed for many years to come, and farmers will continue to use raw wastewater - a fact that should prompt municipalities and other actors to take proper accompanying measures. Farmers need to be trained in self-protection during handling of the wastewater, proper crop selection and adequate irrigation methods, in order to minimise the risks associated with the use of raw wastewater.

Technologies such as hydroponics or organoponics, drip irrigation, zero tillage etc. substantially reduce water needs as well as health risks and are very interesting for the urban environment.

Urban agriculture and forestry also contribute to the greening of the city, improve the micro-climate (shade, windbreaks) and the air quality and prevent erosion by planting and managing bare lands and steep slopes.

Urban agriculture may also have a positive impact on the cleanness of the city by turning derelict open spaces into green zones. Degraded open spaces and vacant land are often used as informal waste dumpsites and are a source of crime and health problems. When such zones are turned into productive green spaces, not only is an unhealthy situation cleared, but also the neighbours will passively or actively enjoy the green area.

Urban agriculture can be used to maintain reserve zones free of housing and to act as a buffer zone between conflicting land uses (e.g. between residential and industrial zones).

Urban agriculture conserves energy (less transport, lower storage losses, less packaging).

3.5 Health and environmental risks associated with urban agriculture

The risks that may be associated with the promotion of urban agriculture must be recognised. Food produced in or near cities may be detrimental to human health if soils or irrigation water are contaminated by industries (heavy metals), if untreated urban wastewater is used for irrigation of food crops or fresh solid organic wastes are used as fertiliser, or if hygiene is lacking in the processing and marketing of food. Traffic may have a direct polluting effect on urban crops (lead contamination). Cultivated areas and livestock in cities may attract or provide breeding grounds for rodents and flies and thus can contribute to the spread of diseases they may carry if proper precautions are not taken. Urban agriculture may

contaminate local water sources if high input levels of fertilisers and pesticides are used. Neighbours may complain of the dust, smell and noise created by urban farms.

However, such risks can be prevented and managed by appropriate urban policies, including the provision of adequate extension services to urban farmers. Experience has indicated that urban farming does not stop because city policies prohibit such activities. Hence, a shift is needed from prohibitive regulations to policies oriented towards managing the risks associated with urban agriculture and creating the right conditions for safe food production in urban and periurban areas. In the section on health policy in the next part of this introduction a number of policy measures and actions that may be effective are suggested.

4. Suggested policy measures

The experts participating in the international workshop "Growing Cities, Growing Food", (Cuba, 1999) recommended a series of policy measures and actions to secure sustainable development of urban agriculture and to enhance its importance for urban policies on urban land use, on urban environmental management, on public health, and economic development.

The workshop on "Appropriate methodologies in urban agriculture research, policy development, planning and implementation" (Nairobi, October 2001) came up with a number of additional recommendations.

The overview presented below provides the local actors with a repertoire of policy options to consider when designing local policies and programmes on urban agriculture. Each of these options requires specification according to local priority needs and conditions.

4.1 A framework for policy and programme development on urban agriculture

Urban agriculture is a cross-sectoral issue that requires a multi-sectoral and multidisciplinary approach, and active participation by the direct stakeholders (farmers' groups, small enterprises involved in input delivery, processing and marketing) and indirect stakeholders (advisory services, credit services, city authorities, health departments, etc.) in the planning and implementation of policies and action programmes.

Analysis of a number of experiences in several cities regarding the integration of urban agriculture in urban planning and programmes (Dubbeling et al., 2001) leads to the conclusion that these experiences, although developed separately, follow a similar logic and methodological process.

In general, the following phases can be identified:

a. Creation of an enabling institutional policy framework

Historically urban agriculture does not have an institutional home, institutions with primary responsibility in agriculture lack a political mandate for urban agriculture, urban agriculture projects are rarely integrated in overall urban planning and little co-ordination between farmers, NGOs and municipal agencies is found.

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Against this background, it is recommended that the sectoral department be selected that will act as the *lead agency on urban agriculture*. The lead agency will facilitate communication and co-ordination between the various stakeholders in urban agriculture, guide the process of policy formulation and action planning on urban agriculture, support local initiatives and stimulate documentation and exchange of experiences.

The lead agency will also facilitate the organisation of a *city working group on urban agriculture* and the establishment of *stakeholder platforms* for dialogue and consensus building at neighbourhood levels. All indirect and direct stakeholders in urban agriculture will be invited to participate in the city working group and stakeholder platforms. The city working group and local platforms are the main mechanism for diagnosis of the situation, prioritisation, development of workable solutions for technical problems and resource conflicts, action planning and monitoring.

b. Diagnosis and prioritisation

In this phase, consultative and participatory processes are developed to facilitate and strengthen dialogue between the urban administration and local stakeholders (farmer groups, NGOs, community groups, universities and research centres, the private sector, etc.), in order to decide how best to address and solve priority problems. Diagnosis and prioritisation are implemented using various tools:

- *Participatory diagnosis of the actual situation* through community mapping, field visits, focus group interviews, etc., in order to gain a better idea of the present state of farming in the city (or in a specific part of the city): types of farming, their locations, characteristics of the people involved, inputs used and outputs produced, processing and marketing, main problems, main development potentials, the perspectives of the stakeholders on causes of and solutions to the main problems and future development of UPA.
- *Definition of priorities/objectives and general strategies* with active participation of the various actors involved (local government, farmers groups, NGOs, government sectoral organisations, private enterprises) through discussion meetings or consultative workshops.

Such joint diagnosis and planning is crucial in order to arrive at common understanding of the situation and to create a social and institutional basis for the development of effective policies and action programmes. Working relationships among various actors are thus established or strengthened, and commitments and resources for further action programming are generated.

c. Elaboration of Action Plans

The results of the first phase lead to a period of participatory action planning and budgeting and definition of the commitments and contributions of each of the partners through working groups and plenary sessions of the local stakeholder forums and city working group. The general aim is not only to identify operative solutions to local needs and problems, but also the strengthening of the capacities of local actors. The resulting action plans are operational plans for action by local actors, endorsed by local governments and with identified financial and human resources for their implementation.

d. Implementation and monitoring

The action plan represents the starting point of the implementation of activities to realise the objectives set.

The implementation phase can include a combination of several types of activities:

- Implementation of specific pilot projects (farmer education and training programmes, technology development activities, creation of market infrastructure, lease of public land to farmer groups, etc.)
- Formulation of appropriate policies on urban agriculture, specified for locations and type of farming
- Revision of existing land use and city development plans to integrate urban agriculture as a legitimate form of land use
- Elaboration and adoption of an appropriate legal framework on urban agriculture and removal of unfounded legal restrictions
- Creation of new models of financing for urban agriculture and related micro-enterprises and/or integration of agriculture in existing financial programmes
- Strengthening of urban farmer organisations and related micro-enterprises and their linkages (market chain, cluster development)

Careful monitoring of the experiences gained is an important condition for continued learning and improvement of the approach. Participation of the range of stakeholders in the periodic evaluation of the ongoing process is crucial, since the various actors may have different views on the same incidents. Focus interviews and multi-actor evaluation workshops are two of the methods that may be applied.

e. Institutionalisation / upscaling

The process set in motion should be anchored within the existing institutions in order to become sustainable.

In many cities (e.g. Dar es Salaam) the success of the initial activities has led to the creation of a Department of Urban Agriculture.

The development of an appropriate and differentiated legal framework for urban agriculture is an important step. In addition, the integration of agriculture in official statistics, urban land use surveys, etcetera is important for the institutionalisation of urban agriculture.

The experiences gained with participatory planning on urban agriculture should lead to its acceptance as an integral part of urban strategic development and land use plans. Also, the inclusion of urban agriculture in the regular programmes of sectoral organisations (agriculture, environmental department, health department, economic department) deserves a lot of attention in this phase.

4.2. Integration in urban Land Use Planning

Access to land and water resources as well as security of user rights are crucial factors in the development of urban farming. Urban agriculture is - to a large extent - being done on land that is not owned by the user: roadsides, riverbanks, along railroads, vacant private lands, parks, etc. The use of such areas is, in principle, transitional and user rights are minimal.

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However, various systems of informal rent, lease and inheritance exist. Fear of eviction leads people to plant quick-yielding seasonal crops and to avoid investments in soil quality, tree and shrub components, erosion prevention, water-harvesting measures, etc.

Access to prime locations is fiercely disputed. In the periurban areas the growing city leads to rising land prices and gradual conversion of agricultural lands into built up areas (with or without legal permission). The changing conditions also lead to changes in the farming systems, from extensive to more intensive production systems, both in space utilisation as well as in labour and capital investment.

Meanwhile, studies indicate that in most cities in developing countries large amounts of public and private land are vacant or under-utilised, even in the inner-city areas.

Important measures that could be taken to improve access of urban agriculturists to land and water include the following:

- The revision of actual urban zoning by-laws and indication in which zones specified modalities of urban agriculture are allowed or even promoted, and other zones where certain farming systems will be prohibited due to special conditions (capturing of drinking water; area sensitive to erosion).
- Access to land can be enhanced by offering vacant urban open spaces and semi-public spaces (grounds of schools, hospitals, prisons, etc.) with a medium-term lease for gardening and other agricultural purposes to community groups, farmer co-operatives and/or unemployed people (purpose-specific leaseholds).
- Promotion of multifunctional land use and promotion of community participation in the management of urban open spaces. Under certain conditions urban farming can be combined with other compatible land uses; farmers can be used as co-managers of parks, recreational areas, water storage areas, nature reserves, fire break zones, zones with high earthquake or flooding risk, etc.; by doing so the management costs of such areas may be reduced, and protection against unofficial uses and informal re-zoning may be enhanced. Agriculture can be used to make degenerated “green zones” green and keep reserve areas free from being built upon. It can also act to form a buffer zone between competing land uses (e.g. residential and industrial areas).
- The inclusion of space for individual or community gardens in new public housing projects and requiring the inclusion of such spaces in private building schemes. In case of planned conversion of agricultural areas for other land uses, the urban farmers could be supplied with alternative lands (land swaps).

4.3. Inclusion of agriculture in urban food security policies

As we have shown in the first part of this introduction, urban agriculture plays a crucial role in the urban food systems and food security and nutrition of poor and disadvantaged urban citizens. Even though cities will remain largely dependent on the input from the rural areas and international supply, cities can and should consciously pursue a greater degree of self-reliance in food.

The attention of agricultural service institutions has been mainly been directed to rural agriculture. Access of urban farmers to extension services, training, technical advice and

animal health services in most cities is very restricted and focuses mainly on fulltime commercial larger scale farms. As a consequence the technologies that are applied by the large majority of the urban farmers are often underdeveloped and not well adapted to the specific requirements of the urban environment, although the scope for technology development and an increase in efficiency and output is vast.

The existing credit and marketing services and programmes supporting micro-enterprise development often pay little or no attention to agricultural micro-enterprises (involved in production and/or processing and marketing of agricultural products).

Recommended policy measures and actions include the following:

- Provision of budget and expertise to boost the preparation of broader urban agriculture programmes (see the examples of Dar es Salaam and Cuenca).
- Stimulation of participatory adapted research, oriented towards development of technologies suitable for farming in confined spaces and with low risks for health and the urban environment (ecological practices, space intensive technologies, water saving technologies, health risk reducing practices, etc.). Organisation of farmers' study clubs that actively engage in the technology development and adaptation process.
- Provision of training and technical advice to urban farmers, with a strong emphasis on ecological farming practices; organisation of low cost and participatory systems for animal health services.
- Improvement of the access of urban farmers (with an emphasis on the women producers and the resource poor) to credit schemes for investments in the production infrastructure and innovation of production technologies ; revision of loan conditions and/or establishing micro-credit schemes for urban farmers.
- Facilitating the local marketing of fresh urban produced food, by
 - Authorising local farmer markets, food box schemes and other forms of direct selling of fresh agricultural produce from urban producers to local consumers (under condition of safe-food handling requirements and control of product quality).
 - Creation of the minimum infrastructure required for local farmers markets.
- Promotion of small-scale enterprises linked with urban agriculture, i.e. input suppliers (compost production, plant and fruit tree nurseries, vermiculture, local seed and fodder production) and enterprises for processing and marketing locally produced food (processing, packaging, street vending, local markets, transport), by:
 - Provision of licences to starting micro-entrepreneurs
 - Provision of technical and management assistance to small enterprises
 - Enhancing access to credit and technical support to enable the creation and improvement of local infrastructure for small-scale food preservation and storage facilities (i.e. canning, bottling, pickling, drying, smoking).

4.4. Integration of agriculture in the urban environmental policies

The potential of urban agriculture for improving the urban ecology was explained above.

The following measures may be applied in order to enhance the positive environmental impacts of urban agriculture and to prevent negative effects on city environment:

- Establishment of low-cost facilities for sorting of organic wastes (households, vegetable markets, agro-industry) and production of compost and animal feed or biogas; stimulation of practical research to develop adequate composting and digesting technologies.
- Promotion of investments in systems for rainwater collection and storage, construction of wells and the establishment of localised water-efficient irrigation systems (e.g. drip irrigation) in order to reduce the demand for expensive piped (drinking) water.
- Implementation of pilot projects with decentralised collection and treatment of household wastewater (preferably with biological methods) with view to its reuse in agricultural production.
- Promotion of use of untreated or partially treated (household) wastewater for the irrigation of woodlands and parks, orchards, pastures, root crops and grains, nurseries for tree seedlings and ornamental plants, etc. in order to reduce the demand for expensive piped (drinking) water and make productive use of wastewater and included nutrients.
- Promotion of the supply of natural fertilisers, biopesticides, soil amendments and quality seeds to urban farmers, e.g. by providing incentives (such as reduced taxes) for enterprises that produce ecological friendly agricultural inputs.

4.5 Integration of agriculture in urban health policies

Urban agriculture has a important role in improving the health and nutrition status of large groups of the urban population and elsewhere in this introduction various measures have been mentioned that may lead to further development of that potential.

We have also indicated that urban agriculture may have some detrimental effects on the city environment and health if no proper guidelines are offered or regulatory measures taken.

City managers will have to combine the stimulation of urban food production (with a view to enhancing food security, local economic development, recycling, etc.) with preventive and regulating measures to address the health risks associated with food production in the city.

The following measures may be taken to prevent and diminish the health risks associated with urban and periurban food production:

- Farmer education on the health risks associated with urban farming, their causes and practical ways to prevent such problems can be highly effective. Examples of preventive measures that can be taken by farmers themselves include proper choice of crops in relation to the location of production and the quality of the soils and water, proper choice of irrigation methods, proper handling of the products (e.g. washing or scraping of products in areas with air pollution), adequate siting of animal housing, hygienic handling of feed and manure handling, proper handling of waste products and wastewater.
- Promotion of ecological farming practices such as integrated pest and disease management, ecological soil fertility management, soil and water conservation, etc. through:
 - Farmer training and practical demonstrations
 - Promotion of the production and supply of natural fertilisers, biopesticides, soil amendments and quality seeds to urban farmers, by providing incentives (e.g. reduced

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taxes) for enterprises that produce environment-friendly agricultural inputs and meet certain quality standards (nutrients, health standards)

- Support to local initiatives for marketing of ecologically grown food and the establishment of “green labels” for organically grown and safe urban produced food.

- Consumer education on preventive measures (washing, cooking), safe food labels and locations where these can be obtained, etc.
- Organisation of joint agriculture/health programmes on prevention of vector born diseases with emphasis on adequate environmental management (e.g. proper design of irrigation systems, good drainage of surface water and proper selection of crops in malaria sensitive periurban areas).
- Restrictions on production of certain types of crops or animals or certain farming practices in specific parts of the city where such crops, animals, practices may cause unacceptable health risks (and related measures to effectively control and maintain that restriction).
- Education of food processing and marketing micro-enterprises on health risks and the hygienic standards to be maintained and strict control of slaughterhouses.

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