Sustainable Use of Water in Urban Agriculture

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The number of people in the world who live in and around cities is increasing steadily. The "State of the World Cities" report by UN- Habitat (2004) predicted that by 2030, 60 percent of the world's population will live in cities, while the threshold of 50 percent of the world's inhabitants living in cities was reached in 2007. Most often, this rapid urbanisation is only demographic as it is not accompanied by a similar rate of infrastructural transformation, but rather puts pressure on limited urban resources. Coincidentally, the areas of the world with the fastest-growing population already have severe water problems, and the shortages will get much worse.

Urban producers need water for their crops and animals.
Photo: IWMI Ghana

Challenges of urbanisation

Some of the challenges that go with urbanisation are insufficient access to water and sanitation, rising world food prices, and poor local governance. In addition, climate change will also affect the urban water system and thereby the water supply for urban agriculture. Changes in precipitation patterns towards more dry periods and more intense storms may lead to an increased risk of flooding, and thus economic damage or the spread of diseases.
In developing countries, many cities suffer from water scarcity because the water resources are not sufficient or are polluted, or because the capacity to treat and distribute the water is limited. Although it is assumed that 86 percent of urban areas have access to water compared to 50 percent in the rural areas, much urban coverage refers to vendor supply rather than household connections. Only 16 percent of the population of Sub-Saharan Africa, for example, have household connections while this rate is 20 percent and 28 percent in Southern Asia and South-eastern Asia respectively (WHO/UNICEF, 2006). As a great number of urban dwellers (e.g. 52 million people in urban Africa) lack access to improved domestic water supply, the possibility that this limited water resource will be used for productive activities such as agriculture in and around cities is minimal. Many municipal authorities actually forbid the use of domestic water for irrigated agriculture even at the lowest scale. As a greater proportion of economic activity is concentrated in space-confined urban areas, and competition for scare natural resources increases, the development of new (re)sources of water will be needed. Alternative water resources that could be put to productive use in the city are rainwater or stormwater and wastewater.

Although the proportion of people with access to sanitation services in urban areas is considerably greater than in rural areas, insufficient sanitation facilities in many countries has led to the degradation of the quality of water resources. Moreover, improved living standards and socio-economic conditions have led to the generation of waste and wastewater which are mostly discharged untreated into the environment. Open drains function as sewers for domestic wastewater and surface runoff, and as dumping sites for urban wastes. The volume (and value) of untreated human waste which flows directly into water courses and pollutes the environment is of concern.

At the same time, global food demand is increasing and the current food crisis is hitting the urban areas, thereby seriously impacting the urban poor in particular. This has also pushed agriculture higher on the political agenda in recent times with requests for more applicable, diverse and flexible food systems. Farming in and around urban agglomerations is a way of providing some of this food as well as serving other urban functions.

Water for urban agriculture

The link with water is obvious not only for food production but

also for greening the cities, among other services (see the articles on Beijing and Lima). These water uses could become much more efficient if stormwater and wastewater were reused for agriculture. The reuse of wastewater for agricultural purposes is common practice, although not always regulated. Farmers fall back on using wastewater as water sources become more scarce. This appears to be an efficient way to save fresh water which could be used for other purposes, and at the same time protect water sources from uncontrolled pollution. However, there are related health risks (see the article on Nigeria). The introduction of urban water reuse requires changes in policy and infrastructure that would affect various stakeholders. Experiments with such reuse are ongoing in a number of cities, and some of these experiments are presented in this issue.

Water, sanitation and food problems affect people directly. Maintaining a healthy environment calls for sustainable management of urban resources. Cities need a longer-term and broader vision of the use of urban space to reduce poverty and promote sustainability. Access to affordable water, good sanitation and food is essential.

Achieving these goals will require integrated approaches and multi-stakeholder participation in the development of service provision and facilitation, and in the management of urban water. In most cases urban planning, urban water and urban sanitation are managed separately. Consultation, joint planning, and joint decision making will be needed to adapt existing policies or develop new ones. New institutions may also need to be created as most cities have various institutions that are independently responsible for certain elements of the urban water and food system (see the experiences in Beijing).

The SWITCH approach is designed to contribute to a reduction in the vulnerability of cities and an increase in their capacity to cope with global changes pressures

Capturing rainwater allows for several harvests
Photo: René van Veenhuizen

In this issue of the UA-Magazine, the importance of the water-sanitation-agriculture nexus is highlighted. Increasingly it is realised that urban agriculture may contribute to resolving urban problems related to water and waste/wastewater management as well as poverty, social exclusion, and the environment. This issue is a collaborative effort of RUAF, SWITCH and SuSanA.

Facilitating multi-stakeholder platforms and learning alliances

Urban agriculture is often not recognised as an urban livelihood strategy, often due to perceived and real health risks in the use of wastewater. This constrains the reuse of urban water for agriculture. The RUAF programme on Cities Farming for the Future facil-

Managing water for the city of the future

A consortium of experts with academic, civil society, urban planning, water utility and consulting interests are working directly with stakeholders in twelve cities around the globe, namely Accra, Alexandria, Beijing, Birmingham, Bogota, Cali, Chongqing, Hamburg, Lima, Lodz, Tel Aviv and Zaragoza. The overall goal behind this global consortium is to catalyse change towards more sustainable urban water management in the "City of the Future".

SWITCH activities consist of training, research and demonstration. The research process is a combination of:

Learning Alliances – SWITCH is linking up a wide range of stakeholders at city level to interact productively and to create win-win solutions along the water chain. Their activities consist ideally of a series of structured platforms at different institutional levels designed to break down barriers to both horizontal and vertical information sharing, thereby speeding up the process of identification, adaptation, and uptake of new innovations.

Action Research – SWITCH is carrying out more demand-led, action-orientated technological research in cities with a view to achieving greater integration and wider impact through the Learning Alliances.

Multiple-way learning – SWITCH is also promoting multiple-way learning, where cities learn from each other.

The "paradigm shift" in urban water management promoted by SWITCH is based on some key concepts of urban water management: resilient systems; integrated approach; and balanced supply and demand. Resilient systems refer to adaptability and flexibility, providing the best solutions in an uncertain world. Under SWITCH the participating institutions in the learning alliances are facilitated through a number of steps: visioning, scenario (and micro-scenario) building and the subsequent joint development of strategies. Participatory monitoring of progress is undertaken by using agreed sustainability indicators.

www.switchurbanwater.eu

itates action planning and policy development on urban agriculture with multiple stakeholders. Follow-up studies and demonstrations of promising innovations are being carried out under the SWITCH programme.

SWITCH (Sustainable Water Management Improves Tomorrow's Cities' Health; www.switchurbanwater.eu) is an EU-funded action research programme being implemented and co-funded by a cross-disciplinary team of 33 partner institutions from across the globe, including 17 from the EU and 12 from developing countries. SWITCH promotes innovation in integrated urban water management (IUWM) and has organised its training, research and demonstration activities in thematic work packages, which are embedded in the independent city 'learning alliances'. Some of its experiences are presented in the articles on pages 7-20.

The Sustainable Sanitation Alliance (SuSanA) is an open global competence network of more than 90 organisations active in the field of sustainable sanitation that are developing joint initiatives in support of the UN International Year of Sanitation, 2008. More on SuSanA and some experiences with the use of sustainable sanitation for urban agriculture are presented on pages 38-46.

City working groups on urban agriculture

One of the thematic work packages in SWITCH focuses on sustainable water for urban agriculture, which is also related to other themes such as scenario development (for example see page 19), training, joint learning, sustainable sanitation and social inclusion (as presented on page 17). The SWITCH activities on urban agriculture in Lima, Beijing and Accra are complementary to the activities of the RUAF partners under the Cities Farming for the Future Programme, and the institutional innovations already set in motion in the RUAF process (see UA-Magazine no. 16). To link the urban agriculture multi-stakeholder platforms and the SWITCH city learning alliances, specific working groups have been set up in these three cities with the task of developing improvements in agricultural production, and other livelihood activities, using freshwater, rainwater and wastewater. Technical and institutional innovations being applied involve techniques like cooperative horticulture and agro-tourism using rainwater harvesting (Beijing), improvements in water storage, on-farm treatment of poor-quality water and its use for agriculture (Accra and Lima) and parks and gardens (Lima). The intention is also to increase awareness of health risks along the farm-to-fork pathway (as in Accra). Changes sought in the three cities include more integrated planning and development of policies (see Accra and Lima), organisational innovations (cooperatives in Beijing and urban producer organisations in Accra) and action to reduce risks to the environment and health of producers and consumers.

Coping with realities

Urban and periurban producers need water (year round or seasonally) to irrigate their crops and provide drinking water to their animals or fish. In the event of water shortages or decreasing quality of the available water sources, urban producers apply various strategies, including the enhancement of access to existing water sources or using these more efficiently, and using other water sources (e.g. rainwater collection, wastewater).

Farmers will take advantage of any water source, especially in the dry season, whether it is polluted or not. They use, for example, the water of streams and canals, shallow or deep wells, pipe-borne (potable) water, water collected during the wet season in tanks, drums or through another storage method, greywater, or recycled municipal wastewater (at different stages of treatment, as shown in the article on Beijing).

Sources of wastewater include surface runoff, city drainage canals, sewage, greywater or blackwater and drainage channels, as well as hospital and industrial wastewater, and combinations of all of these (with varying concentrations). Urban producers/farmers have a variety of motives for using untreated or partly treated wastewater. In semi-arid and arid areas it is often the only source of water available and it is available year-round. It is also an inexpensive source, not just of water but also of nutrients (Raschid-Sally and Jayakody 2008). Detailed case studies of water reuse for urban agriculture with its positive and negative impacts have been widely documented (see UA-Magazine no. 8, and no. 19 for instance). Irrigated urban agriculture produces very competitive profits, and flourishes and spreads without any external initiative or support. It takes advantage of market proximity, the demand for perishable cash crops, and the common lack of refrigerated transport as well as access to wastewater resources.

Producers' choices regarding water sources depend on the intended uses of the water, available and accessible water sources,

Technical and institutional innovations are being applied.
Photo: IWMI-Ghana

Stabilisation ponds reduce contamination risks
Photo: IPES

the price of the water from each source, the degree of contamination and related health risks, the nutrients the water contains, the costs related to transporting and storing the water and the distribution equipment needed, the reliability of the supply, farmers' knowledge (e.g. awareness of health risks), amongst other factors. This is illustrated well in the articles on Ghana and Burkina in this issue. As the contribution from Burkina on page 25 mentions, farmers could be assisted through (training in) safer and more efficient water use management. In addition a constructive dialogue among urban farmers' and their organisations with local authorities should be facilitated.

Recognition of the importance of using various sources of water for urban livelihoods has led to a number of initiatives to cope with this reality. IWMI has undertaken a number of research and development activities with FAO, WHO, and RUAF to ensure safe urban vegetable production. The revised WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater in Agriculture and Aquaculture were published in 2006. Some initiatives have started to use different management options to reduce risk where comprehensive wastewater treatment is too expensive and not feasible in the near future, following the proposed methods and procedures in different urban and periurban farming settings. A number of low-cost risk-reduction interventions have been developed with key stakeholders on the "farm-to-fork" continuum, which are based on the WHO multiple-barrier approach in which barriers (risk-reduction strategies) are implemented along the food chain for cumulative risk reduction. Some of this work is presented in this issue. See for example the articles on the WHO Guidelines on page 21, on reducing health risks on the farm-to-fork pathway as described on page 29, and on the search for alternative water sources like rainwater (illustrated by experiences from China, India and South Africa) and sustainable sanitation (pages 38-40). Werner (2004), cited in the article on SuSanA on page 38, shows that at present farmers worldwide use around 150 million tons of synthetically produced nutrients (N; P2O5; K20) annually, while at the same time conventional sanitation systems dump more than 50 million tons of fertiliser equivalents with a market value of around $ 15 billion into water bodies. A paradigm shift in sanitation towards a recycling-oriented closed loop approach is needed. However, there are still a number of challenges related to awareness and knowledge, regulation, and the need for data on the existing gap between actual and potential reuse, and on organisational and infrastructural issues, which have been discussed in this International Year of Sanitation (2008).

Because awareness of potential health problems is typically low (and because consumers often have more pressing problems like malaria, poverty and/or HIV), there is little market demand and pressure for greater safety measures in urban agriculture, and hence joint research, joint learning and awareness raising activities are necessary.

The way forward

Urban agriculture faces common challenges as well as city-specific ones. The role and importance of water for urban agriculture and livelihoods varies across the cities, as presented in this issue, both currently and in terms of future perspective. However, there are similarities in terms of water management, water scarcity and the need for new and innovative systems that allow for the use of different sources of water (rainwater and wastewater). Access to water and irrigation is a crucial requirement for farmers to earn sufficient revenues to pull them up and over the poverty line. Sufficient profits with nich products may also allow them to innovate and adopt improved technologies that will improve the complementary role of urban agriculture in the city. While market proximity supports urban farming, urban expansion and environmental pollution constrain its sustainability. Based on proper analysis of farming under urban conditions, the actual role of farming in urban livelihoods, and current opportunities and constraints for its development, ongoing action research in these areas (as presented in this issue) is important to inform city planning and policy making. The process of developing joint action within a multi-stakeholder context requires time and has to be adapted to the particular institutional arrangements and research and planning cultures of the different countries.

Urban challenges related to the water-sanitation-agriculture nexus definitely call for a number of initiatives or interventions, advocacy, multi-stakeholder dialogue and joint action planning. New forms of governance, institutions and policies are needed which are constructed through the synergy created by initiatives, such as RUAF and SWITCH.

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