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Stimulating Innovation in Urban Agriculture

Urban agriculture is a dynamic concept, given the wide range of urban situations and stakeholders. This diversity is one of its main attributes. Urban farming systems are in constant development as urban farmers adapt their existing practices or come up with new ones. Innovation is continuously taking place.

Editorial

Attention to urban agriculture is increasing in cities around the world. Previous UA-Magazines have looked at its multiple functions, its role in community building, experiences with policy development for urban agriculture and support to urban farmer organisations. Taking this line further, this issue looks at how urban farmers can be supported in their efforts to improve their livelihoods.

Urban farming systems need to be adapted to specific urban conditions such as confined space, closeness to consumers, and health considerations due to closeness of farming to people. Farmers who have recently migrated to cities bring along their rural farming knowledge that may not always apply in the urban settings in which they find themselves. Urban poor or entrepreneurs who are without a farming tradition may lack relevant knowledge. But there is little formal support to upgrading their knowledge and improving their farming practices. Because urban agriculture normally falls outside the mandate of conventional agriculture research institutes, little research has been done into the development of urban farming. Agricultural extension organisations usually give little attention to the urban areas. As discussed in UA-Magazine 17, the degree of organisation of urban farmers is often low.

However, urban farmers are not waiting until researchers find solutions for them. As in rural areas, farmers in cities are constantly adapting to changing circumstances and are experimenting and innovating on their own. How can this innovativeness be supported?

Throughout this issue, the difference in use of the words "innovation" and "innovations" should be noted. *Innovation* (without an s) is an ongoing process of generating and applying knowledge to bring about improvement in a production system (and/or related up- and downstream activities), in a way that the process can eventually be replicated in other localities. *Innovations* (with an s) are the outcomes of innovation processes. They can be *technical*, referring to strongly improved or new products or services and improvements in the production process and practices. Or they can be

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non-technical, such as improvements in the strategy or organisation of a group of farmers. In addition, a *system innovation* refers to improvements in the relations between various actors, e.g. chain development, which is often a combination of technical, organisational and market developments. Finally, *innovation capacity* (or innovativeness) refers to the creativity and ingenuity of farmers and other local actors, and their capacity to engage in innovation processes and thus continue adapting to changing conditions.

Some articles in this issue merely promote innovations (and some acknowledge the importance of doing this in a participatory way), while others do this by stimulating the innovation capacity of the farmers themselves. Supporting local innovation starts with identifying endogenous innovations developed by farmers and other local actors, as an entry point to more equal partnership in a process of participatory research and development ("participatory innovation") involving more than one type of stakeholder. This activity is aimed at: 1) stimulating and disseminating local innovations that are more widely applicable; 2) enhancing local capacities to interact in vibrant processes of participatory innovation; and 3) integrating this approach to research and development into mainstream institutions, in this particular case, into institutions concerned with urban development.

This issue of *Urban Agriculture Magazine* is a collaborative effort of the RUAF Cities Farming for the Future Programme; PROLINNOVA (Promoting Local Innovation), an international learning and advocacy network that currently involves governmental and non-governmental organisations in 16 countries in Africa, Asia and Latin America on promoting local innovation in ecologically-oriented agriculture and natural resource management (www.prolinnova.net); and Urban Harvest, a system-wide initiative of the Consultative Group of International Agricultural Research (CGIAR) to direct and coordinate the collective knowledge and technologies of the Future Harvest Centres towards strengthening urban and periurban agriculture (http://www.cipotato.org/urbanharvest/home.htm). More information is provided on page 61.

The issue starts with two articles that systematise rural and urban experiences in enhancing local innovation processes. In the first introductory article, Will Critchley, Chesha Wettasinha and Ann Waters-Bayer of PROLINNOVA present lessons learnt in a series of programmes that sought to scale up and institutionalise participatory approaches to innovation development in agriculture and natural resource management. The authors consider how the lessons from primarily rural settings can be applied in cities. They argue that, to be able to fully support local creativity and innovation in agricultural research and development, researchers and other development actors need to recognise and become involved in a joint process with farmers aimed at improving their innovations. The focus is on understanding how farmers innovate and learning how to facilitate the interaction of farmers with other holders of complementary knowledge and skills.

The second introductory article, by Henk de Zeeuw of ETC-Urban Agriculture (the coordinator RUAF-Cities Farming for the Future pogramme) and Gordon Prain of the International Potato Centre (the coordinator of the Urban Harvest programme), discusses how specific urban conditions influence the process of innovation in urban farming. Multiple livelihood strategies, less community cohesion, fewer possibilities for integrated farming, lower availability of indigenous knowledge, presence of urban markets requiring quick responses and the need to develop specialised production systems, all call for site-specific attention to innovation processes in urban farming. The urban setting, the authors argue, offers numerous opportunities and challenges for technical, organisational and institutional innovation. They draw several "lessons learnt", gained by RUAF's Cities Farming for the

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In this issue

Promoting Local Innovation in Rural Agriculture: Experience and lessons for urban settings

Since agriculture began some 10,000 years ago, it has been shaped and spread almost exclusively by the farmers themselves, and for the most part without the help of scientific research or extension agencies. Farmers came up with ideas, carried out experiments and arrived at their own conclusions. Innovation by farmers was the way forward: this local innovation, indeed, was the dynamic process that led to the development of farming traditions (Critchley 2007).

Will Critchley

RECPA members, Uganda.

Currently, public agricultural research and extension is under criticism for failing to deliver new technological leaps. As a result, there is a crisis of confidence in conventional research, extension services and national and international 'innovation systems', and funding has decreased considerably. Several alternatives have been proposed: one of the current favourite options is semi-privatisation of services catering to 'common interest groups' of farmers. However, many observers doubt whether the poorest farmers will benefit from such arrangements. So it is vitally important to remember that farmers – the poor as well as the well-resourced – continue to experiment, and they still learn from each other. Evidence abounds of local initiatives that have provided answers to problems faced by farmers; and these initiatives are the results of farmer creativity.

FARMER INNOVATION OCCURS EVERYWHERE

An example of a local innovation that has taken off and changed the livelihoods of a whole region in Serbia is given in Box 2.

Box 1: A community organising itself: the RECPA environmental association in Uganda

The Rwoho Environmental and Conservation and Protection Association (RECPA) in Ntungamo, Western Uganda, is a local group that was organised for environmental purposes. Thus, it can be characterised as a social, rather than a technical, innovation. Inspired by a charismatic leader, the association was formed – without any outside assistance – some years ago in order to protect a denuded hillside above the village of Rwoho. The government had previously cut down a plantation forest and left the land scarred and vulnerable to erosion. The formerly clear stream feeding the village had become sediment laden and the community was determined to take action. RECPA now has over 150 members, and it has started re-vegetating the hillside without any outside assistance. RECPA has been identified as a prime candidate for a new project entitled 'Stimulating Community Initiatives in Sustainable Land Management' (SCI-SLM). SCI-SLM, currently funded by the Government of Uganda, is eventually expected to receive funding from the Global Environmental Facility (GEF) and will then be active in Ghana, Morocco and South Africa as well as Uganda. The project will be working to stimulate efforts and share experience where there is spontaneous social innovation to control land degradation.
Source: Field notes (W. Critchley)

For every creative farmer – woman or man – the process of innovation is driven by an enquiring mind. Innovators commonly integrate locally available resources, such as by recycling organic 'waste' materials that others discard. In dry areas, where water is the limiting factor, innovators will tell you that they 'don't waste a drop'. They capture rainfall runoff and channel it to vegetable gardens and orchards. There are various examples of farmers who use

The process of innovation is driven by an enquiring mind

rainfall runoff to carry animal manure in their own, low-tech, version of what agronomists call 'fertigation'. Some farmers innovate in crop and livestock husbandry practices and breeding; some in developing pesticides from local plant materials; others focus on post-harvest processing of products; and yet others create tools and machines. Indeed, many innovators experiment in multiple ways, simultaneously. Groups may come up with innovative ways of marketing: this is a form of 'social innovation'. Another example of social innovation is when a community organises itself to deal with a common problem on community land. Box 1 describes such a locally formed environmental association in Uganda.

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Box 2: The 'Arilje method' of raspberry cultivation: a local innovation from Serbia

In the 1970s and 1980s, Dobrilo Nenadic was working as an extension agronomist in Arilje, Serbia. By chance, he stumbled across an innovation – and he had the skill to uncover and develop its potential. The innovation, which simply comprises removal of young raspberry shoots (which are usually allowed to grow alongside the fruit-bearing branches), came to light when one of the farmers whom he regularly visited decided to abandon his plantation after the harvest and removed the young shoots so that fruit picking would be easier. The following year, when Mr Nenadic visited the farmer's field, the new shoots had re-emerged vigorously, and were carrying good quality fruit – and an unexpectedly high yield. Mr Nenadic undertook various experiments and eventually established the combination of measures that, together with shoot removal, provided the best combination of yield, quality and profit. This innovation spread rapidly and, interestingly, women played a key role in promoting its adoption by showing each other what they had been able to buy (washing machines, etc) as a result of the profits: this put subtle pressure on their husbands. Not only is income from raspberry production important for local people's livelihoods, but it also provides them with the financial means to set up private enterprises: it creates the conditions for economic growth. The 'Arilje method' has become the accepted practice amongst raspberry growers and, in only a few years, this location has become the epicentre of raspberry production in Serbia.
Source: Treskic and Damljanovic 2007

Sanja Treskic

The innovator Mr Nenadic in between two members of the research team

Such local innovations – technical as well as socio-organisational – are the outcomes of a process through which people or individuals in a given locality discover or develop new and better ways of doing things, using locally available resources and their own initiative, without pressure or direct support from formal research or development agents.

If this local creativity is to be harnessed for agricultural research and development, then the scientific as well as the development communities need, firstly, to recognise and then become involved in improving and disseminating these improved practices, and – more importantly – to encourage the *process* of local innovation through 'participatory innovation development' (PID) (Wettasinha *et al.* 2006). In PID, all actors – farmers, development agents, research scientists and others – when they agree it is appropriate, come together in a process of 'joint experimentation' to further develop the local innovations, integrating relevant information and ideas from other sources. Thus, the research and development agenda builds on local realities and initiatives.

SUPPORTING LOCAL INNOVATION IN RURAL SETTINGS

Two recent development programmes that focused on promoting and stimulating rural farmer innovation in Africa were 'Indigenous Soil and Water Conservation' and 'Promoting Farmer Innovation'.

Indigenous Soil and Water Conservation (ISWC) in Africa was an action-research programme supported by the Netherlands Directorate for International Cooperation (DGIS) which operated from 1997 to 2001 in seven countries – Burkina Faso, Cameroon, Ethiopia, Tanzania, Tunisia, Uganda and Zimbabwe. The programme recognised and celebrated local innovators – men and women (see Box 3) – who were developing new ideas in land husbandry on their own, and then used them as a source of inspiration for development. In each country, researchers and extension agents were trained in participatory research methods so that they could combine forces with these innovative farmers in a process of joint experimentation to improve the effectiveness of their innovations. The programme's achievements were substantial, not just in revealing the remarkable creative potential of smallholder African farmers, but in 'opening the eyes' of many researchers and extension agents to see – often for the first time – this as a resource for development. The achievements of ISWC were published in the book *Farmer Innovation in Africa* (Reij & Waters-Bayer 2001) and in several magazines, journals and conference proceedings, as well as in various forms in the different countries. However, though some researchers, extension agents and farmers undertook experiments together, farmer-led participatory research as an alternative approach to agricultural research and development did not take firm hold among the institutions that were involved in the programme.

Box 3: Giving recognition to women's innovation in Tunisia

In Tunisia, one of the countries involved in ISWC, the local culture does not favour the idea of strange men going into a village and talking to women. Thus, it was a challenge for the ISWC country team, which was made up mostly of men, to identify women's innovations. The team therefore decided to invite a group of 15 women – mainly teachers and students from the city who were returning to their villages for the summer holidays – to help them out. The group was trained to conduct a study of women in their villages involved in farming and processing agricultural produce. Within two months, they had identified 31 women innovators. The women's innovations involved animal husbandry, cropping, handicrafts, use of medicinal plants, charcoal making and stoves, and processing milk from sheep and goats. This creative way of unearthing women's innovations helped many Tunisian researchers, development agents and policymakers recognise the innovative capacities of women.
Source: N Nour, B Chahbani and R Kamel, in: Reij and Waters-Bayer 2001.

Promoting Farmer Innovation (PFI), a project that ran from 1997 to 2000 in East Africa, was developed by the United Nations Development Programme (UNDP) and operated through host agencies in Kenya, Tanzania and Uganda. Focusing on soil and water management in dry areas, PFI was intended to be a pilot exercise within each country's National Action Programme under the Convention to Combat Desertification (CCD). PFI was very much a hands-on, action-oriented project, with the stated target of having 500 farmers – half of them women – adopt innovative technologies from other farmers within three years. It was favourably reviewed in October 1999, including two 'could do better' observations. These referred to a poor gender balance (too few women innovators had been identified) and lack of involvement of researchers in the overall programme. While gender balance was addressed with some success in the final year, PFI never managed to fully attract the interest and attention of researchers.

Nevertheless, the project was very effective on the ground: for example, in Kenya, 50 farmer innovators (16 of them women) were identified and, within three years, over 4400 farmers (60% of them women) had been taken to visit farmer innovators. In Uganda – the only country where an impact assessment was carried out – 700 farmers (at least) had adopted/ adapted innovations from farmer innovators (Critchley *et al.* 1999; UNDP 2001). PFI is featured in a 27-minute broadcast-quality documentary (UNDP 1999) and its basic methodology is described in a forthcoming publication *Working with Farmer Innovators* (Critchley 2007). Box 4 highlights one of the innovators identified by PFI.

Box 4: Grace Bura: Turning gullies into cropland in Tanzania

Grace Bura's husband is a retired teacher – and it is Grace herself who is the farmer in the family. In 1982 she acquired, and decided to reclaim, some severely gullied land. Her technique, which she developed herself, was to pack the gullies with strips/ checkdams of trash and soil 'sandwiches'. On top of these strips, she planted tree-cassava (These became strong vegetative barriers in due course, and the gullies filled up with sediment. The gullies gradually disappeared. In the PFI video (see above reference), Grace tells the interviewer that she has 'created new land to plant crops'. Other farmers in the area, Grace is not certain how many, learnt this technique from her as a result of farmer-to-farmer exchanges organised by the project. Being modest but also a good communicator, Grace was an ideal farmer to work with.
Source: Critchley et al. 1999

NGO-FACILITATED PARTNERSHIPS TO PROMOTE LOCAL INNOVATION

The experience and lessons gained from these two programmes served as a springboard for an international partnership programme called PROLINNOVA (Promoting Local Innovation in ecologically oriented agriculture and natural resource management). The programme was launched – initially in three countries – with inception funding from the International Fund for Agricultural Development (IFAD). Since 2003, with increased funding from several sources (the largest being DGIS), the programme has expanded to include 16 countries in Africa, Asia and Latin America. PROLINNOVA seeks to enhance local innovation systems in agriculture and to integrate participatory approaches to research and development into national institutions of agricultural research, extension and education. In each case, a local NGO convenes the major stakeholder institutions to design and implement a country programme.

As in ISWC and PFI, most partners in the PROLINNOVA country programmes started by recognising and documenting local innovations. This has been done through diverse means, including surveys, interviews, observations and seminars. These innovations have then been documented in various forms: catalogues, posters, magazines, photographs, radio and video clips, etc. Such documentation has not only created the opportunity for formally educated agricultural professionals to recognise the potential of local knowledge and creativity, but has also given a sense of pride and self-confidence to farmers about their achievements. Researchers and development agents within the country programmes are now embarking on PID – joining with farmers in a process of farmer-led participatory research.

Grace Bura created new land to plant crops

Will Critchley

Simultaneously, the country programmes are placing strong emphasis on partnership building and learning at all levels as a means of mainstreaming PID within the relevant institutions. A common strategy used in all countries is to set up a multi-stakeholder platform at national or sub-national level – in the form of a Steering Committee – and to get key people from research, education and development institutions on board. They are involved in a continuous process of reflection on the roles of different stakeholders in supporting the personal and institutional change required for farmer-led research. Action is being taken on all fronts – education, research, extension and policy – to bring about such change. Universities and colleges are moving beyond conventional teaching methods to enable students to have not only the knowledge, but also the attitudes and skills to facilitate participatory processes. Some researchers are breaking with tradition and publishing findings of joint experimentation with farmers as co-researchers, and thereby giving value to such research. In some cases, development workers are using farmer-led experimentation as an approach to extension. Events at which farmer innovators communicate directly with policymakers are being used to draw attention to issues around local innovation.

LESSONS AND CHALLENGES

The two projects, PFI and ISWC, taught us a great deal about working with farmer innovators and other partners – particularly extension agents and researchers – on the ground. Practical lessons were learnt. PROLINNOVA, on the other hand, which evolved from these two projects, has yielded important experience regarding networks, platforms and partnerships, and about institutionalisation of new concepts and practices.

Overall, our experience from working with farmer innovation in rural areas has been

very positive, although not without challenges, as discussed below. The main point is that farmer innovators were found to abound: nowhere did the programme partners fail to identify innovators with creative ideas: women and men, young and old, individuals and groups. Furthermore, the large majority of the innovators were very open and willing to share and learn from each other. Rather than simply copying the innovations of others, they were inspired to innovate further themselves. And most innovators responded well to the idea of organising themselves into groups for mutual support, although there were always a few who preferred to go it alone.
Probably because the farmer innovators were receiving praise and recognition for the first time, they welcomed the agricultural extension agents much more cordially than previously, when the outsiders had come in only to instruct. Both sides were more ready to listen to each other and thus the door was opened for collaboration in continuing the process of innovation, integrating both the ideas of the farmers and the ideas that the extension agents were bringing from outside. Thus, recognising local innovation is one promising entry point to empowering farmers and laying the foundation for participatory innovation development and, ultimately, to improving farmers' livelihoods.

One challenge we have faced is in keeping the spotlight clearly on current, local innovation. While traditional practices can be good and worthwhile, it is the dynamic and adaptive process of innovation by individuals and groups that we are trying to recognise and to strengthen.
Sustainability lies in the capacity of farmers to continue to innovate in the face of constant change, so it is this capacity that we are trying to promote.

Another key challenge is in building capacity and changing entrenched mindsets amongst both the scientific community and decision-makers. It is not so long ago that smallholder farmers' practices and knowledge were derided as being inefficient and obsolete. Therefore, pointing out the potential of local innovation represents a revolution in thinking. But many scientists still see this simply as going backwards instead of forwards and many find it difficult to accept a demand-driven farmers' agenda. But there are always some who warm to the idea of joint experimentation. Capacity building and change in attitudes cannot be achieved simply through training and orientation seminars alone – but through positive on-the-job experience.

In working with local innovation, issues of intellectual property rights cannot be avoided. The need to patent local innovation may occasionally arise, notably if an innovator hopes to generate income from a particular niche. However, vibrant innovation systems thrive from open and frequent sharing among people with different experiences and ideas. Our efforts to promote rural innovation have focused on innovators who are eager to share with and learn from others. They do, however, expect to be given recognition for what they have achieved. It is therefore important to 'give credit where credit is due', by naming innovators and rewarding them with the chance to learn more.

OPPORTUNITIES TO PROMOTE LOCAL INNOVATION IN URBAN FARMING

Farmers in urban settings are also involved in looking for new and creative ways to improve their farming and other productive activities, perhaps even more so than their rural counterparts on account of the specific conditions in urban settings such as limited space, intensive competition for resources, increasing demand for fresh and safe food, and opportunities to recycle urban waste. Migrants from rural to urban areas often end up having to adapt and innovate simply to survive – and urban farming is one option. Recognising local innovation in urban farming, bringing different innovators together to learn from each other and working together in joint experimentation could lead to forms of farming that are better adapted to the urban conditions of the city, effective in the use of limited resources, contributory to environmental sustainability and acceptable to city authorities.

From our experience of working with local innovation in rural areas, we see the following opportunities and possible challenges for stimulating innovation in urban agriculture.

- Recognising and documenting local innovation would certainly be a good starting point also in urban areas. Such documentation could yield many benefits. Many different stakeholders within the city will be exposed to what these innovators are actually doing and realise that they make a positive contribution to the city. By giving due recognition to the innovators, such documentation could help to overcome the common perception that urban farmers are more of a hazard than a help.

- As in rural settings, partnerships among diverse stakeholders will be vital to promote the process of innovation in urban settings. However, the range of stakeholders within an urban setting is likely to be far more diverse than in rural areas, involving public health workers, municipal authorities, consumer groups, housing associations, waste management entities and others. It is obvious that these stakeholders have conflicting agendas. Thus, such multi-stakeholder partnerships would be more complex to facilitate, and would certainly demand more facilitation skills.

- Supporting a process of innovation means looking beyond technologies and practices to new forms of social organisation; in the case of urban agriculture, this may include innovations in the legal sphere. Creative ways through which migrants have gained legal access to land or water. Contractual agreements made between urban and rural residents in order to stay within city laws are examples of the latter.

- Women play an often invisible but nevertheless important role in local innovation in rural settings, and may be equally or even more involved in innovation in urban agriculture; it would be necessary to take a close look at the gender roles in innovation and participatory research in cities and to ensure due recognition of women's contributions.

- Sharing local innovative practices with others who could benefit from and/or further adapt them is crucial in keeping the process of innovation going. Such sharing becomes easier in urban areas because people live in closer proximity, but ethnic and other social boundaries may still need to be overcome.

- As funding for agricultural research and development has almost exclusively been meant to benefit rural areas, there will inevitably be more difficulties in accessing funds for supporting research

and development in urban agriculture. Furthermore, this will be possible only where urban agriculture is legalised. However, there may be opportunities to access municipal funds for supporting local innovators in urban settings, especially if these innovators are at the same time helping to solve urban problems, such as waste disposal (see Van Beek and Rutt, this issue).

- Those supporting urban development generally have little or no background in agriculture and natural resource management, and will inevitably need relevant training – in addition to capacity building in recognising and supporting local innovativeness, just as it is also needed by rural development agents. Lobbying and policy advocacy will also be required so that promoting local innovation in agriculture is recognised as an approach to urban development.

- With many research institutes being located in or near cities, distance has made it difficult to get researchers to work together with local innovators in rural areas. With urban farmers being literally on the doorsteps of the researchers, it may be less of a challenge to get them involved in participatory innovation processes in urban farming.

- Cities are areas where many young people with relatively good education often find themselves without regular work. The energy and ideas of youth could be harnessed in programmes that stimulate people to search for creative ways of using the multitude of resources available in cities.

- In areas where programmes promoting rural innovation are in the vicinity of cities, there would be good opportunities to link emerging urban agriculture programmes to learn from the principles being applied in the rural settings.

- Currently, many donors are interested in supporting innovative approaches to creating 'green cities', so looking for, and building on, local innovation in urban agriculture is an opportunity not to be missed: the time is ripe.

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Training in Local Innovation for "Focus City" Researchers, Change Agents and Community Leaders

On the 29th and 30th November a course was held at Makerere University, Kampala, Uganda for Researchers, "Change Agents" and Community Leaders under the Focus City (or "Sustainable Neighbourhoods in Focus – Kampala") project. The training was given by William Critchley, Ronald Lutalo and Sabina Di Prima under the PROLINNOVA programme. Attended by 10 men and 8 women, the course was targeted at local innovation in urban agriculture, and focused on improving skills in the processes of identification, selection, characterization and joint experimentation. Dr Shuaib Lwasa, the project coordinator, expressed his satisfaction with the course, and looks forward to continued collaboration with PROLINNOVA.
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Future (CFF) and CIP's Urban Harvest programmes, about ways to support urban producers engaged in innovation processes. Two articles in this issue are from the Urban Harvest programme.

Following these two introductory articles, this issue presents 19 case studies on agricultural innovation in cities around the world. This issue of the UA-Magazine takes stock of a broad range of experiences related to innovation by urban farmers and the efforts of other actors to support the farmers' initiatives. It explains concepts and gives examples of farmers' innovation and how it is being stimulated. Contributions are on technical innovations in vegetable farming for confined spaces (for example in Colombia and Sri Lanka), social innovation as in community based agriculture (as shown in examples from USA and South Africa) or innovation in marketing and entrepreneurial agriculture (as presented in the articles on USA (SPIN) and Ethiopia). Also technical innovations in water use (from Ghana and China), in livestock production (from Democratic Republic of Congo and Peru), and waste recycling (Uganda and Ethiopia) are presented. These experiences show that technical innovations often have to go together with organisational or institutional innovations (as is argued by de Zeeuw and Prain in this issue and illu-strated by the articles on the development of Farmer Field Schools in Peru and new ways of urban planning in the USA). Special emphasis in this issue is given to the use of participatory methodologies for promoting innovation in urban farming systems.
Together, these articles cover a wide spectrum of experiences from a total of 18 countries in the North and the South.

We would appreciate your comments on the articles in this issue and welcome further reports on your own experiences in stimulating innovation in urban agriculture.

"Where there's muck there's money" .....but an anti-social smell as well: a cautionary tale from Jamaica

Dickie Morrison keeps goats in his yard, between his house and his neighbour's place within a residential suburb in Jamaica. Dickie is an innovator, producing fattened goats from his own feed-mix that he skillfully formulates himself. His goats are fed on a concoction of by-products from food processing plants, chopped-up fodder grass and leucaena leaves (a leguminous tree). Visitors are proudly shown how Dickie chops the vegetation with his specially modified electric chaff-cutter and mixes the feed. It is clear that the goats enjoy the food; and they appear sleek and healthy as well. Visitors likewise enjoy the spectacle.

Will Critchley

Dickie Morrison produces well-fed goats and makes good money

There is no doubt that Dickie produces well-fed goats and makes good money. Added to his accomplishments, he is also revered for his skills in livestock rearing by the Ministry of Agriculture, and is a member of the Jamaica Goat Breeders' Society: all this on only a few square metres of land. His goats command a good price, and are consumed curried and "jerked" with spices for which Jamaica is world renowned. The trouble is, Dickie's goats – and there are an awful lot of them – produce copious quantities of manure and urine, and the slurry smells and causes a local nuisance. Flies are attracted and this annoys neighbours: there have been a series of complaints. This therefore raises the question: how can we filter out what is "good" innovation from innovation that needs improvement?

A quick and simple guide to assessing technical innovation is provided in a new manual entitled "Working with Farmer Innovators" (Critchley, 2007). The "TEES test" is an easy-to-remember way of analysing a technical innovation.

"T" - *Does the innovation perform well technically: better than common practice?*
"E" - *Is the innovation economic: do the benefits outweigh the costs?*
"E" - *Is the technology environmentally friendly? Are there negative external impacts?*
"S" - *Is the innovation socially acceptable?*

This is not a numerical test, in which coefficients are applied and innovative technologies are rated according to a mathematical formula. Rather, it is a quick assessment to be applied in the field by a development worker – or by a team whose specific task is to identify and verify innovations. Many urban innovations will effortlessly pass the TEES test – for example the production of compost from organic urban waste (see examples in Van Beek and Rutt, this issue). Compost provides a rich planting material (T+); the ingredients and labour input cost very little and the product has a market (E+); compost helps recycle waste materials (E+); and it is neither a social nuisance, nor something that can only benefit one person (S+). Innovative urban compost making will be, therefore, usually TEES-test compliant.

Returning to Dickie and his goats, clearly here is a system which has merits. But the merits are confined to the "T" and the first "E" of the test. Technically the feeding system is good, and the innovator makes money. But it falls short of the second "E" because it pollutes the local environment, and fails the "S" because it annoys the neighbours.

What are the lessons to be learned then from this brief case study of - undoubted - innovation in urban agriculture? First, it is important to look further than just technically successful innovation. "Innovation" after all is a neutral term: it simply means something that is new in a given context. It is essential that development agents learn to distinguish between innovation that is positive and OK as it is from local innovation that needs improvement. Second, this is an example in which participatory research and development – in other words researchers and other development agents working together with the farmer – can help him improve his innovation for the benefit of all concerned. Increasing the farmer's access to information and knowledge is another way to enable him or her to experiment further and come up with his/her own solutions.

As an end note, before we chastise Dickie for the location of his goat house, we have to take a closer look at his situation. The construction of the goat house was completed before the area was fully urbanised. As years passed and housing development grew, Dickie soon found himself surrounded by displeased neighbours. Our last lesson is: don't always jump to conclusions when analysing innovation in urban agriculture. There are many dynamics at work, and it pays to be observant and, professionally speaking, inquisitive.

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Maxine Brown
Judith Ann Francis

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Enhancing Technical, Organisational and Institutional Innovation in Urban Agriculture

The preceding article by Critchley et al. presents important experiences gained in rural development programmes regarding how to support technological and socio-organisational innovation in farming systems. To what extent can such rural-based experiences be applied in the urban context? How do the specific urban conditions influence the process of innovation in urban farming systems? What are the main technological and socio-organisational challenges at hand in the urban context? In what ways can local innovation processes in urban farming systems best be supported?

This article explores such questions in order to identify key factors that influence innovation in urban agriculture and to come up with ways in which to strengthen innovation processes within it.

AGRICULTURE UNDER RURAL AND URBAN CONDITIONS

The role of agriculture in local livelihoods

Although rural people in most parts of the world engage increasingly in non-farm activities, agriculture remains their primary occupation and source of livelihood. Local farming and natural resource management knowledge and skills are generally passed on from elders to children. Cultural norms often define the division of tasks and responsibilities.

The origin of the people involved in urban agriculture varies widely as does the contribution of agriculture to urban livelihoods. Urban farmers can be:

- *Farming families that have gradually become absorbed by the expanding city* and often adapt their farming systems to new urban opportunities, like closeness to markets with better opportunities to collect market information and to sell directly to urban consumers or shopkeepers (either in fresh or in processed form including vending street foods). Despite these opportunities, some periurban and urban producers continue to have a 'rural outlook' and need support to utilise new markets and market channels (Arce et al., 2007). They can also be constrained by other, negative changes, especially loss of customary land rights, increased competition for land from speculators and industry, quarrying activities (e.g. construction sand and stones), and more regulation, control and political pressure (Mubvami et al., 2003).
- *Recent migrants who engage in agriculture as a (temporary) survival strategy.* They often rely on relatives and people with common origins to get access to land, or else make use of vacant public land. They often bring farming knowledge and skills from their place of origin, part of which does not apply under the urban conditions and will need adaptation.
- *Very poor and food-insecure urban households* (including female-headed households with children, HIV/Aids-affected households, young unemployed people, elderly people without a pension, etc.). These socially excluded people may engage in food production out of necessity on very small plots on – often marginal –- vacant open private or public land and around/in/on their homes.
- *Low and middle class urban households* that seek to complement their incomes by engaging in agricultural activities, often on their homesteads, e.g. zero grazing dairy units, small poultry units, tree nurseries, ornamental plants, mushrooms, etc.
- *Richer people who see good investment opportunities in agriculture* and engage in larger-scale agro-enterprises often with hired farm managers and farm workers (large poultry and pig farms, flowers, strawberries, etc.).

Hans Peter Reinders

Organoponics are prominent in Havana

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The last three categories of urban producers are already urban citizens and many of them may have limited prior farming experience and skills when they start producing. Agriculture is often only a secondary or tertiary livelihood activity, alongside other employment by different family members. Typically female household members, supported by young children, carry out the major part of the agricultural work, while the male household members engage in off-farm employment. However, the reverse situation also exists, in which the woman works in an office, as a housekeeper or petty trader, while the husband takes care of the farming activities (Arce *et al.* 2004). The fact that agricultural production in urban areas is often combined with part- or full-time activities in other urban sectors means that urban household decision-making processes and strategies regarding deployment of household resources are more complicated than those for rural households.

Social context

Even though the socio-economic circumstances of rural communities are rapidly changing (Bebbington 1999), these communities continue to be relatively culturally homogeneous and stable. Networks of kinship and neighbourliness facilitate farmer organisation and intervention processes. Urban producers on the other hand often come from diverse socio-cultural backgrounds. They live in a highly dynamic environment with strong fluctuations. Under these conditions, there is often a low level of trust between households, thereby contributing to a sense of insecurity. Theft of products is much more common in urban compared to rural areas. These circumstances make interventions and the organisation of urban producers much more difficult.

Political and institutional context

In rural areas agriculture is accepted as a legal land use category, land ownership is usually customary and, in general, there are relatively few external stakeholders to contest land rights or to contest the direction of local development. In contrast, urban agriculture, especially in inner-city areas, is often not a legally accepted land use and is constrained by important legal restrictions (Mbiba, 1999). There are also a large number of urban stakeholders with competing interests in the natural resources necessary for agriculture, and their views on local development differ widely. Public sector agricultural research and extension services normally do not serve the urban areas; but urban producers have easier access to libraries and market information and are more exposed to the extension activities of agro-chemical companies, with not always positive results.

Productive resources: access and quality

In rural areas in many developing countries, land and water resources are rarely polluted. Water availability varies highly depending on the region; but where water is available, its price is generally low. Land and labour costs, especially in remoter rural areas, are normally low. The major part of production costs consists of inputs such as seeds, fertilisers and pesticides. Urban producers frequently work under difficult environmental conditions with land and water resources often polluted due to industrial contamination, traffic, and lack of collection and treatment of household wastes. Production close to a large population also brings along specific health risks, such as contamination of water, soils and/or products from agro-pesticides and zoonosis (Birkley and Lock, 2001). In urban areas land availability and security are low and land prices are high. Water may not be easily available or constrained by high prices (piped water) or low quality (polluted rivers or insufficiently treated wastewater). The costs of commercial inputs may be lower and alternative low-cost sources of nutrients are often available (in urban organic wastes and wastewater). Labour is almost always more costly than in the rural areas and less reliable, due to the availability of alternative, if uncertain, non-agricultural employment opportunities.

Yilma Getachew

Trench Garden in Addis Ababa, Ethiopia

Yilma Getachew

Bucket and drip irrigation for Vegetable Production in Urban Areas of the Philippines Robert J. Holmer

Farming types and agricultural innovation

The above factors have a strong impact on the types and styles of farming that one encounters in rural and urban settings. Rural areas are dominated by rain-fed farms that produce cereals, coarse grains or root crops or extensively raise livestock (cattle, sheep). Urban and periurban "farms" tend to become specialised micro-units of intensive livestock raising and horticultural production, sometimes without the need of cultivated land (as in rooftop, hydroponic and container production). Perishable and "special niche" products dominate, especially green vegetables, dairy products, poultry, pigs, mushrooms, ornamental plants, herbs and fish. Year-round production is common through multiple crop cycles, irrigation and use of cover.
Innovation takes place continuously in rural farming systems, and in some areas it is even intensifying under the influence of increasing market penetration and stronger rural-urban linkages, both driven by globalisation processes. But in the urban context the need as well as the opportunities for innovation appear to be higher, due to the factors mentioned above, leading to a higher intensity of technical innovation, more diversity in farming types as well as new forms of organisation and cooperation.

Demand for non-agricultural services

Various urban needs (other than food) influence urban and periurban agriculture, such as the demand for recreational services, management of urban and

periurban green spaces, heat/CO2 reduction, ecological education, storm water storage, and wind/dust protection, to name but a few. Many urban producers in Western countries, but increasingly also in and around large cities in the South, integrate these new functions in their micro-enterprises.

OPPOSTUNITIES EN CHALLENGES FOR INNOVATION IN URBAN FARMING SYSTEMS

The specific interactions between urban farming systems and their urban environment create various specific opportunities and challenges for technical, organisational and institutional innovation. Key areas requiring attention include the opportunities for and risks of accessing and recycling accumulated urban nutrients (Dubbeling *et al.*, 2005); the need to adapt and intensify production in space-constrained conditions (van Veenhuizen,, 2003); the risks of exposure to urban contaminants (Cole *et al.*, 2004); the opportunities for agro-enterprises and accessing diverse nearby markets (Holmer, 2001; Peters. *et al.*, 2002); and the need to engage with a dense and often intrusive regulatory, policy and planning environment, which impinges on agriculture in multiple ways and makes demands on the types of technologies that can be used (Dubbeling, 2001).

TECHNOLOGICAL INNOVATION

From rural programmes we have learned that successful innovation in more complex agricultural systems (such as the mixed upland systems) requires application of participatory methods and active farmer participation in situation analysis and the technology development process (Biggs and Farrington, 1991; (Critchley *et al.*, in this issue). Urban agricultural systems exhibit even higher levels of complexity than rural upland systems and call for a combination of farmers' knowledge and innovation skills with new technical and market opportunities. However, participatory technology development with farmers is more difficult in the urban context, due to multiple factors such as variable farming strategies, less organisation, commitment to other jobs, dispersal among the non-cultivating population, etc. Moreover, concepts such as "farming system" and "recommendation domain", which are used in rural agriculture to identify common opportunities for technological intervention (Norman *et al.*, 1995), are not as applicable due to the high degree of diversity and rapid changes in the urban production conditions. This makes it difficult to find broadly applicable innovations and interventions.

In the urban context the need and the opportunities for innovation are high

The more recent "sustainable livelihoods approach" seems to have special relevance in the urban context (Radoki and Lloyd-Jones, 2002; Prain, 2006), since it analyses households dynamically in terms of the use they make of all their assets (access to natural resources, physical equipment and infrastructure, their knowledge and skills, financial income and credit, social relations) in interaction with their environment (ecological conditions, market opportunities and practices, municipal regulations and policies, institutional services, etc.) to secure their livelihoods (Prain, 2006; Bailkey and Smit, 2006).

This approach takes into account the multiple livelihood strategies of urban households and the effects an agricultural innovation has on a household's non-agricultural activities (e.g. reduced availability of household capital or labour for non-agricultural activities), as well as specific contextual factors, such as municipal regulations restricting agricultural activities in certain locations (Peters *et al.*, 2002).

In the rural context, participatory technology development builds on the "indigenous" knowledge of the local farmers. But, as indicated above, in the urban setting the traditional technical knowledge and skills of producers may be restricted or may be of less value. However, the urban producers may have knowledge of other factors that are highly relevant for the innovation process, such as local socio-economic dynamics, opportunities to get access to resources, the market situation or typical urban risks, and the capacity to innovate and learn from experiences. Against this background, it is understandable that good results have been obtained with approaches like the Farmer Field Schools that combine elements of training with experiential learning and experimentation.

Technical innovation in urban horticulture

Innovation through intensification of urban and periurban horticultural systems, which can be described as maximising output from minimal space, is encouraged by the urban setting and occurs in different ways, each of which is associated with specific health and environmental risks:

A.Bradford

Container composting in Kumasi, Ghana

- ***Cultivation of high-value crops during the off-season.*** This requires irrigation and/or covering, the use of adapted varieties and/or increased pest control measures to control or avoid higher pest pressure. Risk factors are high cash investment, prolonged pesticide contamination and increased losses of urban biodiversity.
- ***Adoption of high-yielding varieties and/or increased use of agro-chemicals.*** This method leads to a higher output per unit of land. Risk factors are pesticide contamination, nitrate leaching and loss of urban biodiversity.
- A***pplication of bio-intensive gardening and permaculture practices.*** Both methods entail intensification and diversification of production through the application of ecological principles and low-cost improvements to agricultural management (IIRR, 1991; Getachew, 2002 and 2003). They have low health or environmental risks. The BIG approach is very suitable for use in the urban context due to its emphasis on intensive use of available space, as well as the nutritional quality and safety of the food produced. The same applies to permaculture that seeks to make optimal use of locally available resources by combining the cultivation of fruits, vegetables, herbs and the raising of livestock with rainwater collection, reuse of household wastewater, composting of household organic wastes, dry composting toilets, green building, etc. (Watkins,1993).

Two intensification methods used in the urban context are less common or non-existent in rural agriculture:

- ***Maximised use of available natural resources*** where these had not previously been used for agriculture. This includes the use of wastewater, as a source of water but also as a source of nutrients (Buechler *et al.*, 2006), the use of composted urban organic solid wastes (Cofie and Bradford, 2006) and the use of abandoned or marginal lands, such as old factory or workshop areas, riverbanks or wetlands. Risk factors in this strategy are exposure to pathogens, parasites and heavy metals.
- ***Intensified use of limited and vertical spaces.*** This strategy includes the use of patios, roof tops, cellars and balconies; the use of various types of container systems and hanging baskets, growing walls and cascades or pyramids ; the use of soil-less systems like hydroponics (Marulanda and Izquierdo, 2003) and "organoponics" (Premat, 2005), and other "low space, no space" technologies. Many examples of such technologies can be found in other articles in this issue and in the UA-Magazine no. 10.

RUAF

Rooftop Gardening in Senegal

Sustainable intensification in urban horticulture clearly needs to go hand in hand with:

- Reduction of health and environmental risks by facilitating the conversion to practices based on Integrated Pest Management (IPM) or organic farming practices and enhancing farmers' capacity to apply safe management practices when using urban wastewater and organic wastes;
- Improvement of the fertility of the soils - due to compaction, overuse, presence of trash and farming on marginal land, fertility in urban farming systems is often a problem (Evans *et al.*, 2000) asking for incorporation of organic materials, e.g. composted urban organic wastes, or transfer to popular hydroponics and organoponics;
- Enhanced access to low-cost seed and planting material, which is of major importance for the poor urban producers (Scheidegger and Prain, 2000). This can be addressed through the promotion of local seed networks (Arce *et al.*, 2004) and the use of indigenous species that produce easily harvestable and storable seeds (Poubom, 1999).

Innovation in urban livestock systems

The key challenges for technical innovation in urban livestock systems are the following:

- ***Diversification and adaptation to space constraints.*** In the urban setting more attention is needed for technology development regarding small and micro livestock (including guinea pigs, grass cutters, earthworms, snails, fish in small ponds and containers, and rearing young stock) as well as zero grazing dairy units and the inter-relations between urban crop and livestock production.
- ***Enhanced access to feed.*** In the urban context access to forage and other feed sources, and their efficient use in livestock nutrition, are important issues for technical innovation. Since forage is often scarce in urban and periurban areas, three responses are common: a. Forage is brought (e.g. Napier grass, fodder legumes, Para grass) from periurban areas into the city for use by livestock keepers in the sub- and intra-urban areas (e.g. in Hyderabad). In this case, frequent problems occur in relation to transport issues and the lack of space for forage markets (Njenga *et al.*, forthcoming). b. More intensive use is made of concentrates to feed the animals (at high cost). c. Large amounts of food residues are collected from restaurants, markets, agro-industries and urban households for the preparation of animal feed. The third option in particular should be given more attention.
- ***Reduction of zoonosis risks.*** The increased risk of transferring diseases from animals to humans in urban areas needs to be reduced by working with producers on the adequate management of animal diseases and wastes, preventing scavenging, and maintaining adequate slaughtering procedures, among other issues (Lock and De Zeeuw, 2001).

ORGANISATIONAL INNOVATION

For the reasons mentioned above, urban producers are often poorly organised. More research is needed to identify existing informal networks and groupings of different types of urban producers; to analyse their problems and needs; and to identify effective ways to support urban farmer organisations and their involvement in urban planning and development processes.

It is important to bear in mind that producer organisations in urban areas may take more diverse and unusual forms than those in rural settings. In the UA-Magazine no. 17 on "'Strengthening Farmer Organisations" Santandreu and Castro (2006) distinguish between *economically oriented organisations* (more like the rural agricultural cooperatives, with a main emphasis on improving production, cheaper inputs, savings and credit supply, and marketing), *socially*

oriented organisations (community groups / gardens organised with the support of churches, community centres and NGOs to help vulnerable households enhance their food security/nutrition and self-help capacities) and *politically oriented urban producer organisations* (focusing on advocacy and lobbying activities to improve their legal status, enhance access to land, and increase their participation in urban planning). Each of these types has its own dynamics and forms of innovation and will require different intervention strategies to strengthen that innovation (see UA-Magazine no. 17 and 18 for more discussion on these issues).

To deal with the low social capital in urban areas described earlier, a lot of attention will have to be given to capacity building in areas such as building group cohesion, conflict resolution, leadership development, participatory planning, etc. Preferably, such organisational capacity building will be closely linked with processes of technical innovation and enhancing technical analysis and problem solving capacities (Arce et al., 2007; Prain, 2006).

In urban farming, more than in rural farming, innovation takes place in the form of micro-enterprise development. Due to their closer proximity to consumers, urban producers tend to engage more in direct marketing of their produce, in the form of fresh products (farm sales, local outlets and mobile shops, farmers' markets, direct sales to shops, restaurants and supermarkets), processed foods (preparation and vending of foods in local food stands and small restaurants, packaging, etc.) or as inputs (e.g. compost, earthworms). Innovation in urban agriculture can be greatly enhanced when research and support organisations link up with the micro and small enterprises engaged in agricultural processing and marketing activities to support their local initiatives and strengthen their entrepreneurial skills and business development capacity (Holmer, 2001). A good example of a successfully implemented micro-enterprise approach to innovation in urban agriculture is the PROVE programme in Brazil (Homen de Carvalho, 2001), which combined capacity building and organisational strengthening, adaptation to municipal sanitary requirements, creation of a trademark serving as a quality seal, creation of "producers' kiosks" in supermarkets, and enhancing access to capital for investment in small agro-industrial processing facilities.
A "cluster development" approach might also be highly relevant in the urban context. In this approach groups of similar agricultural micro enterprises (e.g. small-scale mushroom producers) and closely associated (actual or potential) support services analyse how they might cooperate in order to overcome scale disadvantages, make more efficient use of scarce resources and facilitate innovation in their enterprises. This can be done through a small intervention leveraged across the cluster (Holmer, 2001).

Andrés Vélez-Guerra

Members of the farmers group Dyen Te Don meet in Bamako

POLICY AND INSTITUTIONAL INNOVATION

In the urban setting, innovations in agriculture are strongly influenced by local institutions, policies and regulations, which are more pervasive and invasive in urban areas than in the rural areas. Innovation in many cities is constrained by the informal legal status of urban agriculture, lack of land use security, and lack of support from technical and financial institutions. Innovation processes in urban agriculture have a better chance of success if they are part of an integrated approach to urban development and are embedded in an enabling institutional and policy environment.

Cuba serves as a useful example of how an enabling policy environment can impact the development of urban agriculture. Through effective policies and institutional support, urban agriculture developed between 1989 and 2000 from a marginal activity to a major component in the urban food system in Havana and other cities, a major employer of urban labour and an important source of micronutrients for the urban population. At the same time, it greatly reduced the accumulation of organic wastes (Novo, 2003).

No policy or institutional change related to urban agriculture can be achieved before the value and potential benefits of urban agriculture are recognised, the associated risks are made clear and the actual constraints to and opportunities for its development are known. Therefore it is necessary to raise awareness among politicians and institutional managers and to provide them with adequate information that will allow them to involve other local stakeholders.

Various communication and lobbying strategies are used to better inform decision makers (Dubbeling, 2005).
The most effective strategy is to stimulate institutional engagement in urban agriculture, that is, to engage all relevant institutional "stakeholders", including policymakers, right from the beginning in the situation analysis and design of research and action projects, in the monitoring and evaluation of results and in determining consequences for actual policies and programmes of the local

government, national organisations and other stakeholders.

The RUAF "Cities Farming for the Future (CFF) programme" brings together local authorities, NGOs, universities, farmer groups and other "stakeholders"' in a joint learning and planning process on urban agriculture by assisting in the establishment of a Multi-Stakeholder Forum on Urban Agriculture, the formulation of a City Strategic Action Plan, and the revision of existing policies and regulations on urban agriculture (see the city pages on www.ruaf.org).

The CGIAR Urban Harvest programme similarly emphasises engagement with policymakers and relevant local institutions to facilitate the development of safe and sustainable agriculture. This programme has implemented Stakeholder and Policy Analysis and Dialogue (SPAD) in Lima (Warnaars and Pradel 2007) and Hanoi (Tinh 2004), among other areas.

LEARNING POINTS FOR SUPPORTING INNOVATION PROCESSES IN URBAN AGRICULTURE

The experiences gained to date with promoting innovation in urban agriculture in the RUAF-CFF and CIP-Urban Harvest programmes have resulted in a number of "lessons learned" regarding the best ways to support urban producers in innovation processes.

a. Focus on livelihoods: For urban agriculture to be viable and sustainable, innovation needs to take into account that in the urban context agriculture usually complements other income-earning activities undertaken by the household and contributes to and draws on the diverse set of household assets. In order to come to a correct understanding of the actual role of farming in the livelihoods of the urban poor and the opportunities/ constraints for its development, a situation analysis should be based on the livelihoods concept.

b. Focus on enhancing innovative capacity and experiential learning

Given the dynamic and challenging urban conditions, innovation support to urban producers should focus strongly on building their problem-solving capacities (problem analysis, identification and testing of alternative solutions) as well as their capacity to identify and utilise new opportunities (e.g. analysis of specific requirements of various market segments, adaptation of crop choice and production practices, certification and trademarks, strategic alliances, etc.). The most effective approaches seem to be those that help urban producers identify gaps in their actual knowledge and skills and provide practical learning and experimentation opportunities to fill these gaps (like in the urban farmer field schools; Prain, 2001).

c. Combine technical innovation with building and strengthening urban farmer organisations

Considering the high socio-cultural diversity among urban producers their lack of producer organisations and the multiple livelihood strategies of the urban poor, continuous efforts are needed to enhance group cohesion, build up trust and cooperation, enhance motivation and self confidence, strengthen organisational skills, etc.,, when engaging in processes of agricultural innovation with urban producers of the poorer sections of the population. An emphasis on group building would facilitate the technical innovation process at hand as well as the organisation of urban producers and their claim-making capacity.

d. Link technical-organisational innovation with institutional innovation

The need for institutional innovation (both public and private) is even stronger in the urban context than in the rural areas due to the tradition of institutional neglect of the urban agricultural sector.

e. Focus on enterprise development

In the urban setting a focus on micro-enterprise development and enhancement of entrepreneurial skills, such as the capacity to analyse markets and react to new opportunities, will greatly enhance the innovation process (in production as well as in processing and marketing). The importance of enhancing the food security and nutrition of the urban poor should not be forgotten, but the need for cash income is high in the urban context; and in order to arrive at sustainable urban production systems, intensification (in a safe and ecological way) and a greater market orientation will be needed.

f. Recognise the diversity in urban farming systems

Urban farming systems vary widely from purely subsistence to fully commercial and from micro-units to large enterprises. The development needs and opportunities of the various urban farming systems thus also differ widely. The most promising approaches therefore appear to be those that recognise this diversity and tune support and interventions to the needs and opportunities of each specific type of producer (for example: jasmine growers, community gardeners, intra-urban zero grazing dairy units, periurban intensive horticulture).

F. Aroyo

Using available space and resources

Hans Peter Reinders

Havana

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Innovative Wastewater Recycling in an Indian village: Linking the rural with the urban

It is increasingly recognised that in rural areas of developing countries the microenvironment around the household/ home garden is the centre of productive resources (Chambers, 1990; Scoones, 2001; Critchley et al., in preparation). Not only are people based there, but animals tend to be housed close by and crop production is more intensive and diversified around the homestead. The most common hotspot of fertility and production is thus around the house and compound. From the point of view of water, the home is again a concentration point: not only is water brought there for various domestic purposes (and wastewater thus available after use), but also roof tops and compacted compounds give rise to runoff.

Will Critchley

Mr. Rautela working on an irrigated plot

This article describes a case of innovation within a village context in the foothills of the Himalaya mountains in India, where water has become a precious and limited commodity. Though nothing like Delhi or Mumbai, Chhabisa is a relatively densely populated village. In some ways – in terms of production within the village – it can be seen as a midway point between true urban agriculture and rural home gardens.

In Chhabisa village, just as elsewhere in Uttaranchal, the dry season water supply has been decreasing each year – for various reasons, but mainly due to a change in forest composition. Daily household rations in some villages may be as little as 40 litres per family during the summer months (Brommer, 2002). In the driest month of May, and sometimes for even longer, the villagers are solely dependent on the unreliable and limited supply from government pipelines. The four *naulas* (stepwells) are dry at that time. Dripping taps and broken pipelines are still common features in Chhabisa and other neighbouring villages.

Ten years ago, Mr. M.P.S. Rautela resigned from his job in Delhi and returned to his home village, Chhabisa. He soon invented a new post for himself: that of part-time "water volunteer". He wanted to help rationalise the use of scarce village water, and to oversee maintenance of the supply lines. He felt that someone needed to manage the water on community level to make sure that everyone has equal access, and to make the villagers aware that they don't need to be continuously dependent on the government for help. Wastewater from a main storage tank in Chhabisa is used by women to wash clothes. The wastewater then drains into an adjacent open storage pond with a capacity of 2,000 litres. Rautela skilfully overseas the use of that water for irrigation of people's kitchen gardens, where chillies, tomatoes, pulses and potatoes are planted. The total area irrigated is between a quarter and one hectare, depending on the season. He supervises a rotational system whereby each of 14 nearby families receives the flow on a given day. These days can be 'traded' through negotiation, under the oversight of Rautela.

This idea of a self-appointed, and locally accepted, innovative and imaginative water volunteer is new. Rautela realised that the seriousness of the water problem required that someone take charge in the village. That person is needed to keep an eye on technical problems with supply lines, to stimulate less dependency on the government and to rationalise the use of wastewater, as well as to mediate in local water disputes. This is a vital role, and while it doesn't address the causes of the low-flow problem, the position of water volunteer certainly helps to minimise the negative impacts. Mr. Rautela administers and adjudicates water for irrigation, making sure that it is used judiciously for supplementary irrigation, and is also fairly distributed amongst a user group. One of a growing band of water volunteers, Rautela is at the heart of a socio-technical innovation that makes a significant difference to people in his village. We conclude that there is potential for many more innovators to be identified in the field of water management within village and urban settings: local people who have specific and valuable technical skills and socially minded attitudes. It is important that we learn to look for local solutions to problems in urban areas that conventional agricultural research has feared, or not been permitted, to implement.

Based on a paper entitled "Innovation and Infiltration: Human ingenuity in the face of water shortage in India" prepared by William Critchley and Marit Brommer and presented at the International Symposium on Water, Poverty and Productive Uses of Water at the Household Level, Johannesburg, 21-23 January 2003.

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In Search of Safer Irrigation Water for Urban Vegetable Farming in Ghana

Irrigated vegetable farming is a common practice in and around many cities in low-income countries. It is also an important means for attaining urban food security and balanced diets, and it provides a livelihood to many urban dwellers. However, increasing contamination of irrigation water sources makes this practice a major risk factor for public health, especially as most vegetables grown are consumed raw. Urban vegetable farmers in Ghana use different water sources for irrigation, depending on the location of their farming sites. Surface water is most commonly used as it is easily accessible and thus most economical. Farmers collect it from streams, stormwater drains and gutters with greywater. However, these water sources are usually heavily contaminated with untreated wastewater.

IWMI Ghana

Source of irrigation water for urban vegetable farming in Accra

In Ghana, scientists and urban vegetable farmers are working together in identifying, testing and implementing a number of interventions to make the practice safer. This is being done in Ghana's three largest cities of Accra, Kumasi and Tamale. One of these interventions is the use of alternative water sources which are perceived to be safer. These alternative sources are the subject of this article.

Urban vegetable farming in Ghana is an informal activity; it is largely unregulated and farmers receive very limited extension support from relevant government institutions. We planned to actively involve farmers and relevant government authorities in the project at all stages. The farmers' help was needed in developing more appropriate interventions that could easily be adopted. This was in line with findings from many studies on technology development which have shown that innovations largely fail in resource-poor countries when local communities don't participate. The authorities' involvement was necessary for policy support and sustainability of the interventions, especially as urban vegetable farming was at that time not receiving appropriate support from authorities.

Initially, farmers were not motivated to participate as the local media and authorities had condemned this practice. Farmers were therefore very skeptical about any related "research". In addition, due to their proximity to academic and research institutions, farmers had already provided so much information with no visible benefit that they were very unwilling to give any more. Thus it was difficult to find farmers who were committed to the project. Likewise, relevant government institutions wanted first to see tested interventions, since they could not personally visualise any. However, the project was aimed at involving them in developing the type of proven interventions they were asking for.

This was overcome by clearly spelling out the objectives of the project and explaining the need for their involvement at all stages. For farmers, this was first done through the leaders of their farmers' associations, who explained it to their members. For government institutions, we presented quantified benefits from urban vegetable farming and showed some interventions from other cities in Africa and Asia that had been successful.

SHALLOW GROUNDWATER AS AN ALTERNATIVE SOURCE

Treated water (pipe water) was not considered as an alternative as it is too costly and very scarce even for domestic use. There are only a very few places where farmers have access to it, like in Dzorwulu, Accra. Also treated wastewater is largely unavailable for irrigation as very small amounts (less than 10%) of wastewater is treated in Ghana. In addition, the few existing treatment plants are not located where their effluents can be used for farming. In Ghana, only two farming sites i.e. La in Accra and Zagyuri in Tamale, use effluent from treatment plants serving nearby military camps is used for irrigation. In La, the effluents are poorly treated while in Zagyuri, the treatment plant is broken down.

Treated water is too costly and very scarce even for domestic use

Groundwater usually has better water quality than surface water. However, the costs for installation, operation and maintenance for infrastructure needed for water lifting increase with depth, so deep groundwater was economically prohibitive for a long time (1). Farmers were left with shallow groundwater, as the only feasible alternative water source to contaminated surface water. The use of shallow groundwater is common along the coastline in

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several West Africa countries and has been successfully used with vegetable farmers in Benin and Togo (Drechsel *et al*., 2006).

FARMERS' INITIATIVES IN USING SHALLOW GROUNDWATER

It is a common perception among farmers in Ghana that shallow groundwater is "pure" and uncontaminated. Hence, wherever feasible, farmers take initiative to construct and use dugouts (shallow wells) instead of using stream water which is generally perceived as more contaminated. These dugouts are usually less than 1 m deep and with surface area of less than 5 m2. They are located very close to vegetable plots which also lessen watering labor due to the lessened distance of carrying watering cans.

However, assessments on water quality from the dugouts currently used in irrigation show high contamination levels, but lower than other surface water sources used. We used participant observations and discussions to find out reasons for high contamination levels on dugouts and ways to reduce it. We observed two kinds of dugouts:

- Shallow wells: These are storage ponds for surface runoff while they also receive groundwater recharge. Some of these ponds are close to the polluted stream allowing water to infiltrate. However, surface run-off carries manure, greywater and other contaminants.

- On-farm ponds: Some farming sites have no chance of getting any shallow groundwater. This was more in Accra and Tamale as the two cities are drier than Kumasi. But farmers make earthen ponds (usually deeper than dugouts to collect surface runoff whenever it rains. In the dry season, some function as intermediate storage pond filled from streams nearby with motor pumps

WORKING WITH FARMERS TO IMPROVE THE USE OF DUGOUTS

We first held city level meetings i.e. in Accra and Kumasi where farmers from all main vegetable farming sites gathered in one farming site to identify suitable measures and practices to reduce contamination in dugouts. A wide range of measures were suggested, which were not very different for the two cities. To streamline the measures for field assessments, we conducted suitability analysis where farmers from different farming sites ranked measures from the most to least suitable. Measures ranked least suitable across farming sites like treating water in dugouts with chemicals were not given further consideration. In these meetings, we also agreed on the criteria for assessing the measures and practices proposed.

In the last three years, we have worked with farmers who use dugouts in different farming sites and tested a number of measures and practices on their plots to reduce contamination in and from dugouts. Assessment was based on laboratory analysis on levels of microbial contamination, perceptions from farmers and socio-economic analysis. Regular feedback was given from farmers and scientists and modification on specific practices done and tested further. To illustrate the process, a typical example is given for Mr. Ofori, a farmer at the Engineering farming site in Kumasi in Box 1.

FROM DUGOUTS TO WELLS

As a further improvement to dugouts, the scientists proposed the use of tube wells as they are cheaper in construction and less prone to contamination from surface run-off than dugouts and shallow wells. We planned to use treadle pumps for water lifting so depths were restricted to 7 m. Shallow tube wells have successfully been used also in West Africa like in the Fadama irrigation project in Nigeria and Keta shallot farming in Ghana (Kortatsi et al., 2005). This initiative was fully supported by urban vegetable farmers in Ghana. Farmers provided labor during test drills.

However, the test drills showed that there was no potential to use tube wells. In Accra, the water was saline while in Tamale, the water table was too low and Kumasi had low water yields. We had feedback meetings with farmers where test drills were done and explained to them the outcome. Nevertheless, it was shown from test drills that hand dug wells could yield enough water. But due to the high costs involved (about USD 2000), it was not feasible for farmers in the area. This was explained to farmers. We however agreed to install hand-dug well, fitted with treadle pumps to lift water, for demonstration purposes.

Farmers' involvement in implementation and assessment of interventions
Farmers provided labor during the installation of the well system and almost all farmers in the farming site participated. However, due to system limitations, only

Box 1: Safe use of shallow groundwater in dugouts

Background: Mr. Ofori farms on a 0.2 ha farm. He mainly plants lettuce, cabbage and spring onions all year round. He has five dugouts (shallow wells) in his farm. Our first observations showed that shallow wells had no specific shape and the farmer usually walked into the wells with watering cans scratching the pond beds as he collects water.

Suggested Interventions:
- *Place an embankment around the dugouts to prevent contaminated surface runoff from entering the pond. The farmer declined as he depended a lot on surface runoff to supplement groundwater recharge. On this, we proposed then that surface runoff be channeled to one entrance on the shallow well where it could pass through a simple filtration system like sand bag to reduce contamination.*
- *Proper design of dugouts to improve sedimentation of particles and pathogens in water hence improving water quality. Mr. Ofori said he widened dugouts to get more water. We suggested channeling of surface runoff (as in (i) above). The pond bed could also be wedge shaped to allow sediments to collect in one end of the well while the farmer fetches water from the other end.*
- *Better water collection practices like using a "rope and bucket" system to draw water. To avoid walking into dugouts, he could place a plank of wood across the dugouts or by making steps on the edge of the well where he could step on as he draws water from the deeper parts. He was also advised to collect water with minimal disturbance which is a habit that he could change over time.*

Observed changes:
- *Improved channeling of water into the dugouts and water now has only one entrance to the dugouts. However, the filtration system has not been installed.*
- *Better shaped dugouts with wooden planks across the dugouts. Though not consistently, we observed him collecting water with minimal disturbance.*
- *We have had some improvements in water quality and hope as more discussions continue, further improvements will be attained.*

IWMI Ghana

Carrying raw wastewater for irrigation using head pan in Tamale

two farmers could use the system. These two farmers were given field observation sheets to assess the system. Other farmers were encouraged to make observations and where possible use the treadle pumps. Water quality tests were conducted and monitoring of the use of the system was also done by our field assistants. Farmers and scientists agreed to observe the system for about six months, after which we held a meeting to evaluate the system performance.

Laboratory results showed that the water quality from the system was much better than the dugouts that were being used in the same farming site and was well within the acceptable levels according to the WHO guidelines for irrigation (WHO, 2006). We collated observations from the two farmers using the system and our field assistant and had a meeting where we first discussed their observations. This was followed by group discussions at the farming site where all farmers participated. A number of issues were raised during the group discussions. Farmers identifying a number of challenges while using this system and interestingly suggested ways to modify the system to make it work better. An example of this is given in Box 2 on an issue related to labor.

CONCLUSION

It was clear that any intervention should allow for flexibility to be modified to better suit farmers. This calls for openness between scientists and farmers and having systematic feedback meetings. A number of important lessons were learnt from the process of implementing and assessing trials on dugouts, shallow tube wells and the hand-dug well system with farmers. But in general, the alternative safer water sources showed no much potential and that leaves many farmers to continue using wastewater. With such limitations on safer water sources, we are now focusing on minimizing risks while farmers use wastewater. While working closely with farmers, we have identified a number of interventions that we are currently testing with farmers while quantifying their risk reduction potential. These include;

- Measures based on improving water quality on farm: Appropriate design and use of on-farm sedimentation ponds, use of simple filtration systems like slow sand filters and fabric filters

- Measures based on irrigation management: Irrigation methods where we focus on appropriate use of watering cans and change safer irrigation systems like simple irrigation kits. We are also working on better scheduling in irrigation especially withholding irrigation some days before harvesting of vegetables

- Measure along the farm-to-fork pathway, in markets and food preparation to avoid further contamination and support decontamination, e.g. through appropriate vegetable washing.

IWMI Ghana

Improved practices can reduce contamination risks

We expect to develop appropriate and easily adoptable interventions for the different farming sites to comprehensively reduce health risks. The aim of this article was not to suggest universal appropriate interventions for risk reduction as they can vary widely depending on local conditions. However, we have shown how such interventions can be implemented and the study has shown that some might work while others fail under certain conditions. The study showed the need of working closely with farmers to identify the measures that are most appropriate, considering farmers' local opportunities and constraints.

Footnote

1) It was only recently that the Ministry of Food and Agriculture subsidised deeper borehole drilling also on selected urban farming sites, however often without success.

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Box 2: System assessment issues of concern: Example of labour

Strength: *Farmers said that the system lessened labor needed and estimated that they could irrigate 2-3 times more land using the system compared to when watering cans are used.*

Weakness: *The treadle pump system requires two people working at the same time; one person to pump water from the well, while another person on the other end pulls the hose and waters the crops. This is a big limitation as farmers usually don't work in pairs because every farmer has his own schedule of activities.*

Suggested modifications: Install an intermediate reservoir or have a big drum where a farmer could pump water into and then use it when needed.

Innovations in Greenhouse Rainwater Harvesting System in Beijing, China

Beijing is a city faced with a shortage of water. Less than 600 mm of rain falls per year; but this figure is highly variable and actual rainfall has been lower than average in the past eight years. Less than 300 cubic metres of water is available per person per year; this is one eighth of the average volume per person available in the country as a whole and one thirtieth of the world average. Because of the downward trend in rainfall, surface water is gradually drying up and the level of ground water is declining.

The agricultural sector consumes a large volume of water, 90% of which is groundwater. Excessive use of water for agriculture threatens Beijing's ecology and the availability of water for consumption. The lack of a sufficient water supply also influences glasshouse agriculture around Beijing since it is increasingly difficult to get access to groundwater. Thus, saving water in agriculture has become an urgent task and a common goal for the whole society.

In April 2007 the Beijing municipal government started to charge a fee for agricultural water use exceeding a particular quota (depending on the production type, e.g. paddy rice, wheat, aquaculture, vegetable gardening, fruit trees, or livestock). Now if farmers exceed their quota, they have to pay 0.08 Yuan per extra cubic metre of water used for grain crops and 0.16 Yuan per cubic metre used for other crops. Most farmers are able to limit their use to stay within the quota, but with decreasing rainfall, it is becoming more important to save water and find other sources, like rainwater. Farmers' water use for home consumption is not limited by a quota (a separate system has been implemented for this type of water use).

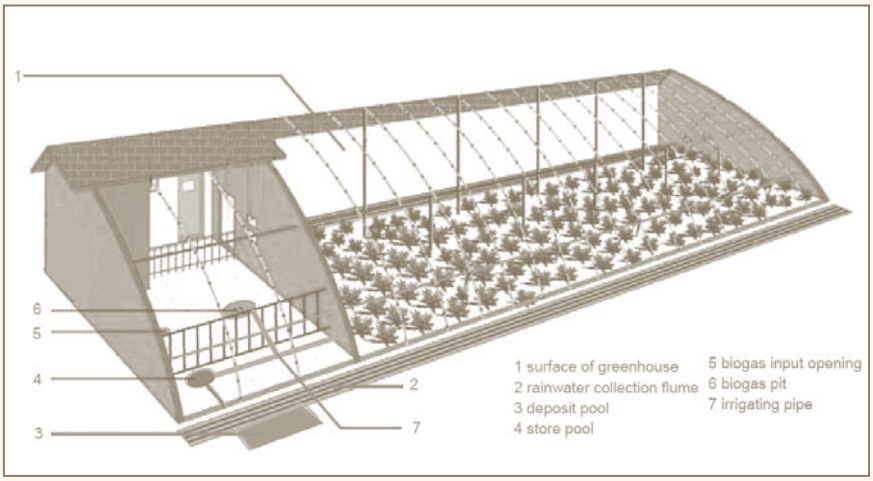
A NEW TECHNOLOGY

The Department of Water Saving, of the Water Authority, has undertaken a series of projects on saving water in agriculture under the motto "tap new sources of supply, reduce consumption and prevent pollution". Rainwater harvesting is one of these projects. The technology of using the surface of greenhouses to collect rainwater was developed in China in 2005 by the Beijing Agricultural Technology Dissemination Station and the Soil & Compost Work Station. Both authorities fall under the Beijing Bureau of Agriculture. The construction of this type of greenhouse is subsidised and farmers are supported by exhibitions, training, farmer to farmer exchanges and websites.

The capturing of rainwater is combined with efficient irrigation techniques (drip irrigation). The farmers are further stimulated to include a reuse component by composting and producing biogas (see figure).

The technology consists of a greenhouse (see figure) with a special roof that collects rainwater. Water is guided through the rainwater collection flume at the bottom of the greenhouse into a deposit pool and pumped into an underground storage pool, where the temperature of the water increases and it is mixed with micro-compost. The water is then again pumped into a basin and through gravity it enters the micro-irrigation system. An average greenhouse of this type is about 85 metres long and 8 metres wide. The plastic roof measures about 900 square metres, while the cultivable area under the roof is about 500 square metres.

This technology has a number of advantages. Firstly, it taps a new source of water – rainwater – thereby reducing the pressure on groundwater. In areas that are suitable for agriculture, but have limited access to water, the technology allows agricultural production and increases livelihood options. The rainwater is of good quality for irrigation and suitable for micro-irrigation. The chemical composition of rainwater is such that it rarely jams micro-irrigation pipes. The technology provides a reliable supply of water (especially important under erratic rainfall), and thus stimulates the production of several harvests of a wider diversity of crops. This increases the benefits for farmers, and subsequently stimulates the



Structure of rainwater harvesting system (one greenhouse)

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local economy. After the structure is built by local builders, it is relatively simple to use and maintain.

HUAIROU

Supported by the city of Beijing and implemented by the Bureau of Agriculture and the Beijing Water Company, two pilot projects have been started in Huairou disctrict (one of the 10 districts in Beijing). It costs 80,000 Yuan (8,000 euros) to build a small tank system, but these projects are being fully subsidised by the Beijing government. This technology is now being used for the production of about 10,000 ha in Huairou, and accounts for 85.3% of all land under irrigation. In 2007, twenty new rainwater greenhouses were built.

Each greenhouse can collect up to about 200 cubic metres of rainwater per year (capturing water from May to October). However, in the past years this amount has never been reached due to erratic rainfall. For one cropping cycle, grapes need 85-100 m3/mu, Chinese cabbage needs around 100 m3/mu, cucumber needs 60-80m3/mu, and tomato needs 80 m3/mu (1 mu is approximately 670 square metres; the standard greenhouse would have 500 square meters or about 0.75 mu).

Capturing 200 cubic meters of rainwater would allow for 2-3 cropping cycles per year. But due to the scarcity of rainfall and land to store the water, in practice most farmers using this technology still need to add groundwater.

IMPROVING THE SYSTEMS

Huairou Fruit and Vegetable Cooperative is one of the government's pilot projects (see UA-Magazine no. 18). The cooperative specialises in the production of grapes and Chinese dates. The cooperative currently encompasses 1108 households and it has built five greenhouses in its contracted farmland. But according to the cooperative's leaders, the potential of this system has not been fully explored. In light of the opportunities offered by the growing market in Beijing and the multiple functions urban agriculture can offer (see earlier papers on this in UA-Magazine), the cooperative plans to extend the single production units into an integrated system by combining the five greenhouses that do not include a rainwater harvesting system. The rainwater from five greenhouses will be collected in a big pond of about 500 cubic metres (20 m long, 10 m wide, 2.5 m high). In the rainy season, the big pond cannot contain all of the collected rainwater, so excess water will then be used for aquifer recharge. The cost of constructing a big pond is estimated to be 200,000 Yuan (20.000 Euro) (which is cheaper than constructing three smaller ponds).

By using a rainwater harvesting system and drop irrigation in Grapes production in a greenhouse, less money needs to be spent on labour, pesticides and electricity for pumping water, thereby reducing costs to about 950 Euro per greenhouse per year. This system is currently being tested.

The structure of a rainwater harvesting system under construction in Huairou

The RUAF-CFF programme supports the organisational development of the cooperative to improve its functioning and the support it provides to its members. This involves the establishment of a multi-functional rainwater harvesting system and development of the agri-tourism component. The SWITCH programme supports this endeavour by conducting research into water flows and water quality.

The proposed system will be composed of:
- five rainwater harvesting greenhouses that will support the activities of individual farmers in the greenhouse, additional farming on land outside the greenhouse, other activities and aquifer recharge;
- reuse of household grey and black water and organic waste for composting and a biogas installation (for light bulbs in greenhouses; compost dissolved in irrigation water);
- a pond system designed as an ecological landscape (with reed, duckweed and fish) and recreational facility;
- tourism/leisure infrastructure (fishing, houses, regional food and products).

The development of this project is based on the following arguments:
- It is easier to build a big pond than five small tanks (in terms of space available and design), although the initial cost may be higher.
- It could be used to promote agri-tourism activities, such as fishing, and lodging.
- A wider impact on the community is sought by developing the multiple functions of agriculture, by involving other farmers in vegetable and fruit production, aquaculture, fishing and other leisure activities.
- Due to the enormous pull of the labour market in Beijing, more and more farmers are getting jobs in urban areas, and as a result, only elders and women are engaged in agriculture. The potentially higher income of urban agriculture may keep labour in the area.
- It will improve the regional food system and development direct linkages between farmers and urban consumers of organic produce;
- It is important to improve the regional food system and develop direct linkages between farmers and urban consumers of organic produce;
- It provides an experience with participative/bottom-up development of cooperatives and famers' organisations.

A number of challenges remain, which are the focus of current research. A first challenge is the technical design of the pond, considering the distance over which water has to be pumped back to the greenhouses and for other uses. Another challenge concerns the amount of land needed for this system. Research will have to look into the supply of water and whether this pond could meet the needs of agricultural production every year. One of the main aims and challenges for the cooperative is to reduce the use of groundwater while at the same time improving the farmers' incomes.
In addition work needs to be done in demonstrating the potential of this pilot project to cooperative members and related institutions. Therefore, not only the technical aspects, but also the whole development process in Huairou, will be recorded for use elsewhere and for showing that the system can improve the quality of water, and provide benefits to various stakeholders. This approach is also still being researched by the cooperative.

René van Veenhuizen

Growing a wider diversity of crops in the greenhouse

Family Business Garden as an Innovative Enterprise in Urban Agriculture

Home gardening is usually seen as a subsistence-oriented production system. However, in urban and suburban areas land is a precious resource, which is why home gardening can be turned into a profitable production system. In this context the concept of the Family Business Garden was launched on World Environment Day 2000 in Sri Lanka.

Thilak T. Ranasinghe

Utilisation of limited space with vertical structures

The Family Business Garden (FBG) concept is based on the idea that a family's nutritional needs should be met through a proper mix of environment-friendly agriculture and commercial agriculture, and on the principle of sustainable agricultural entrepreneurship (Ranasinghe, 2005). The concept seeks to integrate Indigenous Technical Know-how (ITK) with effective forms of modern scientific knowledge available in different fields of sustainable development. Ultimately this will help optimise small or medium-scale productivity in the longer term rather than only maximise productivity for short-term benefits.

FBG CONCEPT

The FBG concept recognises five strategic components of farming in the urban context, represented by the various petals in the logo (figure) : i.e., family nutrition, technology adoption, crop management, post-harvest technology & value-addition, and landscaping & housekeeping. The centre petal represents a family's basic requirement of physical development. The dual-stalk symbolises the ability to farm based on either commercial or environmental principles, or on a combination of both for greater sustainability. The FBG logo also shows the feasibility of adopting various strategies according to the different socio-economic-cultural-environment conditions of urban communities.

Logo of the Family Business Garden

Each of the **five components** focuses on a specific aspect of urban agriculture:

Family nutrition: This component refers to the allocation of space, or maximisation of available limited vertical space of the homestead, for the cultivation of the nutritious vegetables, fruits, yams and spice crops preferred and selected by family members. Families that choose to focus on animal husbandry select small livestock, such as chickens, quails, rabbits and the like. More appropriate and attractive types of farming involve the development of creative methods and many vertical cultivation structures, such as cultivation towers, cultivation mega bottles, cultivation racks, cultivation cages, cultivation pyramids, cultivation ladders, cultivation tats, cultivation antennas, cultivation nets and edible airscapes. Simplified hydroponic cultivation is also popular. In the urban context, environment-friendly methods of plant protection are common, i.e., integrated pest management and the use of traditional methods.

Edible landscaping with cultivation tower

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My garden is a small one.... Everyday I consume one leafy vegetable out of it. My children are also interested in this activity. Overall, through gardening I gain a high level of mental satisfaction.
Female doctor and gardener,
17 September 2002

Technology adoption: This component stresses that wherever possible urban households should select economically viable crops or products that generate income for small or medium-level entrepreneurship. Practitioners of FBG have identified new crops/products, i.e., mushrooms, cut flowers, ornamental plants and processing of value-added food products, that satisfy the sustainability aspect of the concept. The proper integration of ITK and modern technology plays a major role here. Low cost, effective and efficient appropriate technologies are advocated.
Family Business Garden: in my opinion this is a timely project that would provide immense benefit to small-scale entrepreneurs.
Private trader, 30 August 2001

Crop management: Soil, water, pest and sunlight or shade management is treated with high priority within the FBG concept. Recycling of resources is implemented by recipients who adopt household waste management techniques, such as composting, crop rotation, use of green/animal manure, proper water utilisation and crop management practices (soil and water conservation, water harvesting techniques, micro irrigation techniques, and so on). Shade management is stressed to optimise use of the limited land available in urban areas. Integrated farming, which makes use of livestock, aquaculture, trees and crop production, is selected by only a limited number of the FBG practitioners for cultural or economic reasons.
The combination of vegetables and flowers in this small-scale Family Business Garden attracts many onlookers. By studying this, one can develop ample knowledge on simple irrigation, drainage and soil management systems in edible landscaping techniques.
Teacher, 17 December 2004

Post-harvest technology and value-addition: Even though products come from homesteads, marketable quality standards of the products have to be met in order to compete with international products available at local markets. As a response to the dynamic urban situation, FBG micro-entrepreneurs position urban agriculture in new areas of overall urban development. Post-harvest management is a must and product diversification, i.e. producing a variety of value-added products to meet the changing demands of urban consumers, is part of the success of FBG. Women who practice food processing and preservation receive handy income for their outputs.
I believe this [food processing] is the most suitable solution to the present problem of increased vegetable prices faced by c onsumers at the market. In future, I expect that our people will be more informed on this enterprise.
Female employee, 14 June, 2002


Thilak T. Ranasinghe
Creative living structure of edible airscape

Landscaping and housekeeping: This component focuses on environmental and psychological factors. FBG practitioners may reduce their mental stress and improve their capabilities as local managers and businesses. The creation of a pleasant, edible land- and "airscape" applies principles of landscape architecture, housekeeping, personal organisation, and psychology. The creation of a charming environment in and outside the home or business keeps the entrepreneur's business more manageable.
Here, you can see how to cultivate within a small space or a concrete slab. There you can easily produce 4-5 leafy vegetables and two pod vegetables. Moreover, vine vegetables cultivated in cultivation arches can be adopted in any homestead. By so doing, you can gain greater physical and mental satisfaction than by visiting a leisure park.
Chairman of the Lions Club, Kelaniya, Sri Lanka 28 August 2003

DISSEMINATION AND SUPPORT TO LOCAL INNOVATION

Several impact studies have revealed that family nutrition and the technology adoption components are the most attractive and the first to be adopted by practitioners. Once these practices are established, the business gardeners

Origin of the concept and innovations

The primary idea behind the FBG concept emerged while the author was working with remote rural populations of the Moneragala district, Sri Lanka, in launching the Homestead Development Campaign to celebrate the International Year of Shelter for the Homeless in 1987. The campaign demonstrated the similarities between rural and periurban or urban areas; for instance, the lack of nutritious food during the dry season, the scarcity of water for use in homestead cultivation, the variety of strategies adopted to conserve water, the simple methods developed to process and preserve fruits and vegetables, and the traditional pest management methods. Many urban dwellers used to apply these techniques in varied scales under different conditions, but much information has been lost and they currently lack the innovative strategies needed to adapt these techniques to the urban context.The FBG concept was launched in the form of an exhibition plot at Muthugama, Sri Lanka, on World Environment Day 2000 by the Western Province Department of Agriculture (WPDOA). A special strategy was developed to introduce low/no space cultivation techniques, especially the cultivation tower (an indigenous technique) and hydroponics cultivation boxes (a modern technique) and to monitor their application. Throughout this process recipients adjusted and adapted these techniques. For instance, Mr. Jayawickrama (a retired person) constructed his cultivation tower with cement and decided to plant seedlings in small pieces of PVC tubes for effective plant establishment. He further added some innovative vertical structures, namely, cultivation racks and cultivation tanks for rooftops. Mr. Jayathilake (an extension agent) contributed to the innovation process by training people and creating new vertical cultivation structures including hanging hydroponics bottles and a cultivation ladder. These structures are now spreading rapidly and private entrepreneurs are motivated to produce them on a commercial scale (eg. City Gardens Company). Mrs. Adlina Weerpura focused on edible landscaping and added fruits and vegetables to the cultivation tower. In addition, she started a plant nursery for additional income and now also produces honey with two bee colonies. These experiences have been used by the RUAF-CCF initiative to further popularise these practices. For example, an urban extension method of extension street walks was initiated by the WPDOA during the Promotional Week of 2007.

Thilak T. Ranasinghe

Food processing as a micro-enterprise

gradually develop the other components. For instance, one woman FBG producer mentioned that after two years she now produces fresh vegetables for the market and has joined micro-groups to meet the growing demand of local supermarkets.

However, the FBG concept does not have a blueprint model and the technology transfer process may occur in many different ways. Knowledge about FBG has reached many urban dwellers in Western Sri Lanka through a variety of communication channels: mass media methods – newspapers, magazines, posters, handbulletins, almanacs, radio and television; interpersonal methods – exhibitions, seminars, action-research sessions, workshops, training classes, demonstration sites, field days and field tours; individual methods – visit to information centres, telephone calls, letters, e-mail communication, project involvements, thesis assignments, so on.

Urban exhibitions of FBG have helped create new perceptions of urban agricultural micro-entrepreneurship, such as vertical living structures, and service provisions in edible-landscaping, or hydroponics and micro irrigation systems. In addition, the formation of micro groups facilitated by agricultural extension and training agents has opened up access to new, and diverse forms of, value-added product ventures. Innovative urban dwellers have joined the FBG initiatives by becoming involved in the knowledge management process of the concept, i.e. by attending seminars, training sessions, and demonstrations and by participating in adaptability testing trials conducted by extension agents. These activities are being further expanded and linked at the entrepreneurship level with the help of civil society groups that mainly work on women in development. Inspired by these activities, municipal authorities have embraced the concept of FBG as a means to achieve a cleaner city – as it effectively reduces the costs of urban waste management andhealth care and creates new income-generating opportunities through increased agro-tourism within city limits.

The FBG concept does not have a blueprint model

The innovative activities and initiatives of urban dwellers in the Colombo and Gampaha districts have also attracted the attention of policy makers, who have included urban agriculture in local and national policies. The innovative conceptual FBG approach adopted by the Western Provincial Department of Agriculture and its agricultural extension agenda assisted in getting urban agriculture into the National Policy of Agriculture and Livestock: 2003-2010, specifically Policy Statement No. 29 in the policy document of 2003. The government's latest Agricultural Policy of 3 September 2007 also included a specific focus on urban agriculture (in Statement No. 17).

Interactions with other government departments (like Health, Women's Affairs, Central Bank), and with other NGOs (like Sevanatha, Agromart, Red Cross Society), private organisations (Lanka Transformers) and community-based organisations has contributed to creating links between small groups or civil society groups and institutional networks. The attention currently being paid to FBG at schools, vocational agricultural training programmes and even at universities and in post-graduate courses ensures a bright future for the concept. Projects involving local government and international organisations like ICRC and RUAF have helped to influence city planners and to convince donors to address urban poverty through agricultural development strategies.

FUTURE OF FBG

National and international linkages offer promising opportunities to further develop the FBG concept in areas such as roofscape technology, tissue cultures, aquaponics, aeroponics and organoponics. Together with the rising interest in FBG among urban young entrepreneurs and the increasing demand of urban consumers for natural, healthy and nutritious food products, this suggests that the market for FBG will continue to grow in the future.

The FBG concept allows an urban dweller to receive on-the-job training, to learn about informal systems and procedures, and to become an independent manager in a sustainable form of development (Bridge, O'Neill & Cromie, 2003). Social capital development through micro-group formation and entrepreneurship will also help reduce urban violence and improve the lives of the poor by raising living standards. FBG is therefore an important step in the process of sustainable urban agricultural development.

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SPIN Farming: Improving revenues on sub-acre plots

SPINfarming

Backyard plots in Saskatoon, Saskatchewan

SPINfarming

Wally with a roto-tiller, the only mechanized equipment SPIN requires

Cities are impulsive, boisterous, spontaneous, and competitive, while agriculture is plodding, tranquil, deliberate and deferential. SPIN-Farming is helping to create a world where for one to be right, the other does not have to be wrong.

Re-engineering food production systems is central to addressing all of the modern world's major challenges – national security, finite resources, diet-related illnesses. At the same time, sustainability has gone beyond a buzz word and is now spurring specific plans for significant change in how cities function. Producing food for residents within city borders is a cornerstone of these plans. Some cities are considering or have actually implemented initiatives that require meeting a quota of their food needs through local food producers. This has very positive implications for urban agriculture. The emerging consensus on climate change is also providing impetus to rebuild local and regional farming systems and to support smaller, sustainable farms, which are less energy intensive. Urban agriculture is not a new concept, but cities are beginning to realise that to establish sustainable, secure and healthy food systems, they need to court professional farmers, either home-grown or from outside their borders, and accord them the respect and support the cities provide to other entrepreneurs.

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At the forefront of this new version of urban agriculture is SPIN-Farming. SPIN is two things. It is a mindset, enabling governments and NGOs to re-think who can farm and where they can farm. It is also a commercial farming system that is equipping a new generation of entrepreneurial farmers. SPIN stands for Small Plot INtensive. Much has been written about small-scale farming over the past 30 years; however, the term "small scale" is not definitive. It can mean anything from a couple of acres to a couple of hundred acres. SPIN is designed specifically for sub-acre parcels, i.e. less than an acre. What distinguishes SPIN from other farming methods is that it is non-technical and unencumbered by any specific ideology. It is a "franchise-ready system" that also accommodates creativity and the place-based nature of farming. Based on growing high-value, multiple crops intensely on sub-acre parcels, the organic-based SPIN system outlines how to produce USD 50,000+ in gross sales from a half-acre.

SPIN was developed over the last twelve years by Wally Satzewich in Saskatoon, Saskatchewan, Canada. Mr. Satzewich's farming career began traditionally. He and his wife Gail Vandersteen started farming 20 years ago on an acre-sized plot outside of Saskatoon. Thinking that expanding acreage was critical to their success, they bought some farmland adjacent to the South Saskatchewan River 40 miles north of Saskatoon, where they eventually grew vegetables on about 20 acres of irrigated land. After six years farming their rural site, the couple noticed that they were growing high-value crops, like spinach, salad mix, carrots and radishes, in their backyard plot in town, and they were growing low-value crops, like potatoes, peas and beans, at their acreage in the country. This led Satzewich to realise the advantages of sub-acre farming in town.

In town, his irrigation system was the water faucet – he did not have to rely on fluctuating river levels. The work crew for his sub-acre plots consisted of himself and his wife – he did not have to depend on outside labour. When he looked at the financial picture, it showed that although the overhead cost of a sub-acre operation is a fraction of that of a large-scale conventional farm, the bottom lines were similar. That is when he realised that a sub-acre farmer can earn significant income with a lot less stress and a lot less overhead and with much more certainty of success from year to year. So Satzewich sold his farm in the country and his experiment in sub-acre city-based farming became the basis for the SPIN-Farming system.

The most well-documented SPIN application is in Philadelphia, Pennsylvania, the

sixth largest city in the U.S. Five years ago a commercial urban farming project was undertaken by the Philadelphia Water Department in partnership with the Institute for Innovations in Local Farming. The Department was seeking ways to save on maintenance costs on its significant land holdings as well as to encourage new businesses that would contribute positively to the environment. Wally Satzewich served as the agricultural advisor to the project, and a half-acre demonstration farm called Somerton Tanks Farm was created on Department land following the SPIN-Farming system. In 2006, its fourth year in operation, the farm was operated by a husband and wife team and one part-time labourer and produced USD 68,000 in gross sales from a half-acre. A study of this urban farm pilot recently completed for the State of Pennsylvania projects that this sub-acre farming model can produce USD 120,000 annually, with operating expenses of USD 60,000, and net income to the farmer couple of USD 60,000, which is above the city's median household income. This study makes the case for developing a network of small farms based on the Somerton Tanks Farm model and outlines the major economic and fiscal benefits an agricultural industry will have for both the city and state. A regional planning organisation recently stated that "Farms in and around Philadelphia stand to become major forces in Philadelphia's economy and welfare."

Philadelphia is not alone in creating a city-based commercial farming industry. The Queen City Farm project in Buffalo, New York, is following Philadelphia's example by applying the SPIN-Farming model in a programme that integrates the community development aspects of urban agriculture with commercial production. And several pilot projects throughout Canada are using SPIN-Farming to foster entrepreneurial farming activity. An immigrant senior centre in Edmonton, Alberta, is using SPIN to create an urban farming training programme for immigrant seniors. An edible school grounds project in Vancouver is planning to implement SPIN-style high school gardens in response to a City Councilor's challenge to develop 2,010 new food producing gardens by 2010 as an Olympic Legacy. Different cities and towns have different priorities and resources on which to build their local farming industries, and SPIN-Farming is providing both a mindset to envision what is possible as well as a system for implementation.

At its root, SPIN integrates agriculture into the built environment in an economically viable manner. SPIN Farm models can be incorporated into any existing neighbourhood, any new school, housing development, or shopping mall. The applications are far-reaching, and planners and developers are just beginning to understand how SPIN fits into the sustainable development tool kit. An architect is re-developing a mobile home trailer park in rural Napa County, California, and is incorporating SPIN-style farm plots into the individual residences. A woman is re-developing 8 acres in Milton, Florida, after extensive hurricane damage and is incorporating sub-acre SPIN-style farms as a way for residents to generate income to offset the cost of their homes.

At the same time that it is helping governments, developers and NGOs envision farming as an integral part of urban and periurban economies and communities, SPIN's non-technical, easy-to-learn, inexpensive-to-implement farming system is also enabling aspiring entrepreneurial farmers around the world. What these backyard and front lawn farmers are responding to is the availability of a farming method that removes the two big barriers to entry - land and startup capital. SPIN can be practiced on as little as 1,000 square feet, or it can be located on a half-acre of city-owned land, or it can be multi-sited on several residential backyards. It requires minimal infrastructure and is therefore low capital intensive. Irrigation relies on the local municipal water supply, and the only mechanised equipment is a rotor-tiller. Because of its sub-acre scale, labour requirements for a SPIN farm are minimal and can be readily obtained within the network of family, friends or the local community. By re-casting farming as a small business in a city or town, SPIN is making the farming profession accessible and relevant again to a new generation.

It is important to note that SPIN-Farming is not one size fits all. Some farmers are practicing it in their backyards in the city. Others are doing it in front lawns in the suburbs or as part of larger acreages in the country. Some are doing it part-time, others full-time. Some are young and just starting out, while others are older and on their third or fourth career. Some have more money than they know what to do with, and others have less than they need. Some are convinced the world is doomed while others are trying to save it. For more information and examples, please visit www. spinfarming.com

SPIN is helping to move urban agriculture beyond the realm of environmentalists and social activists, and is demonstrating that it makes good business sense. It is undoing urban agriculture's image of a downwardly mobile profession of last resort. It is re-defining farming for the 21st century – sub-acre, low capital intensive, environment-friendly, close to markets, entrepreneurially driven. And it is helping to advance a farming revival that cuts across geography, generations, incomes and ideologies to provide common ground, quite literally, beneath everyone's feet.

SPIN-Farming Key Concepts

- **Standard size bed** – one that measures 68 cm by 8.5 meters
- **High-value crop** – one that produces USD 100 per harvest per bed
- **Relay cropping** – the sequential growing of crops
- **Intensive relay cropping** – growing 3 high-value crops per bed per season
- **Bi-relay** – growing 2 lesser-value crops per bed per season
- **Single relay** – growing 1 low-value crop per bed per season
- **1-2-3 rule** – divides the farm into 3 different areas of crop intensity
- **Land allocation** – the smaller the farm, the more of its area needs to be devoted to intensive relay production
- **Revenue targeting formula** - 1 acre accommodates 400 standard size beds, including paths, walkways and infrastructure; if all are intensively relay cropped they will produce USD 300 per bed per season; 400 beds x USD 300 = USD 120,000 per acre per season

Open house tour in 2004, showing the distance of the farm from neighbouring houses

SPINfarming

Technologies for the Production of Edible Plants in Bogota, Colombia

The population of the Bogota Capital District is increasing rapidly. A major reason for this is internal migration. The need for housing for these displaced people has contributed to the accelerated use of periurban and urban areas for construction of houses, affecting the availability of land suitable for urban agriculture. Meanwhile, there is an increase in the demand for arable land and for food that contributes to a balanced diet.

Rob Small

Cultivation in beds Botanical Garden of Bogota

Given their serious social and environmental impacts, the District Administration has developed different alternatives for overcoming poverty and exclusion, which affect approximately 55.3% of the population of the Capital District (Dane, 2003).

CHANGE-ORIENTED RESEARCH

As a contribution to this search for alternatives, the José Celestino Mutis Botanical Garden of Bogota – a municipal centre for scientific research and development – is conducting various urban agriculture research projects. The aim is to generate alternative technologies that can improve urban production systems.

The Bogota Capital District is located at 4° 35' north longitude and 74° 4' west latitude at an altitude of 2640 metres above sea level. Its annual temperature varies between 4 and 14 °C (46 °F – 68 °F), with averages of 12-13 °C. It is home to a population of close to 7 million people (6,824,510), who live on a surface area of nearly 400 square kilometres.

The new urban residents quickly adapt to urban cultural practices, but at the same time they are in danger of slowly losing traditional knowledge on the production, consumption and use of autochthonous resources such as native plant species. The Botanical Garden's research therefore promotes the use of cold-weather Andean and exotic plant species as an alternative crop for household food production and to help improve the nutrition and diversify the food patterns of the community. The Botanical Garden promotes the cultivation and consumption of promising native species that have been shown to have high nutritional value, and potential food, medicinal and industrial uses, and which also require knowledge about how to grow and use them. Some of these species are the amaranth *(Amaranthus caudatus)*, cold-weather chilli pepper *(Capsicum pubescens)* cubios (or mashua, Tropaeolum tuberosum) guasca *(Galinsoga parvifolia)*, passion fruit *(Passiflora cumbalensis)*, oca *(Oxalis tuberosa)*, llantén *(Plantago australis)*, mountain papaya *(Carica cundinamarcensis)*, melon pear *(Solanum muricatum)* and quinua *(Chenopodium quinua)*.

The search for new technologies is focused on adaptability and potential acceptance by the community (based on indicators like low implementation cost, easy replication in the urban spaces and adaptability for use in limited spaces that are not ideal for agriculture).

In order to develop technologies suitable for the many different conditions of the urban environment in Bogota (which includes very limited availability of agriculturally suitable land, reduced physical space and differences in terms of bio-climactic areas, ranging from wet areas to dry areas with irregular rainfall and high levels of solar radiation), an experimental scheme was designed. Experiments at the Botanical Garden and with urban farmers were set up, which

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included the cultivation of urban crops on hard surfaces (flat roofs and terraces) in built-up areas, using plastic containers (like tubes, cushions, bottles, beds and trash bins) and five types of substrates based on compost in different proportions.

The containers were selected based on their suitability for the crop to be produced, keeping in mind the characteristics of the plant such as its size, architecture (tree, bush, grass), the shape and size of the useable part (leaves, fruits, flowers, tubercles or bulbs), the growing cycle (short, medium or long) and its depth and type of root growth (vertical and deep or lateral and on the surface). In addition, the size of the container had to be sufficient to hold the amount of substrate necessary to permit the adequate growth and development of the plant. The type of material was also taken into account in selecting the container, with a preference given to inert materials like plastic, for example trash bags, soft drink bottle etc., in order to avoid the interaction of undesirable substances with the nutrients. For this reason, metal pails or barrels were not used, nor containers which had contained paint or other chemical products.

In terms of the mixes of substrates used to grow crops in the containers, an effort was made to define the characteristics of the "ideal" substrate, including the availability of nutrients for the plants, good water retention capacity, and good aeration. The substrate also needed to be easy to produce or be available at a low cost.

Compost offers a high organic content, can retain water and is relatively easy to produce, since in many communities it is produced in order to reduce solid organic household wastes (for example, food scraps). In an effort to improve the supply of air and reduce the weight of the substrate that the container would have to support, burnt rice husks were added to some mixes. Solid organic household wastes are readily available and, with a good procedure, can be processed into compost in just five months.

In this way, the researchers of the Botanical Garden could study the influence of the type of container, the type of substrate and the different bio-climactic conditions of the Capital District on agronomical behaviour in terms of planting, maintenance, harvest and productivity of Andean and exotic cold-weather plant species, when cultivated as an alternative crop for household consumption.

MAIN RESULTS

Based on the results obtained in the study, Table 1 presents the different systems of production recommended for growing urban crops in containers in built-up areas under the climactic conditions of Bogota.

VERTICAL TUBES

Black plastic bags with the necessary amount of substratum and an irrigation system. For various small fruit and vegetables.
Tubes can hang free, or can be placed vertically against walls, terraces, or cement yards, where they receive maximum sunlight.
Vertical tubes make optimal use of horizontal growing surfaces as more crops can be grown per unit of area.
They also reduce the time needed for weeding, and the plastic cover prevents possible damage or diseases.

- Area required per tube: 0.09 m^2
- Number of plants per tube: chard (16), celery (12), coriander (16), spinach (16), strawberry (12), lettuce (16), mint (16), parsley (16), spearmint (16), thyme (16), lemon balm (16)
- Compost-husk ratio of 2:1

HORIZONTAL CUSHIONS

Black plastic bags with the necessary amount of substratum and an irrigation system. For various bulb plants.
This type allows for the efficient use of water and for a better use of space and easy harvesting. The use of this container is recommended for planting bulbs. It also reduces the time needed for weeding, and the plastic cover prevents possible damage or diseases.

- Area required per cushion: 0.3 m^2
- Number of plants per cushion: garlic (10), red onion (10), radish (16), beet (10), carrot (12)
- Compost-husk ratio of 2:1

BOTTLES

A bottle, preferably painted on the outside in a dark colour for growing different vegetables and medicinal herbs. Cut off the top of the plastic bottle, and use the resulting part that is 20 cm deep and 10 cm in diameter. Holes should be made in the base in order to facilitate drainage during watering.
This type of container is one of the most accessible and low-cost receptacles. The individual containers prevent possible contamination at the roots.

- Area required per bottle: 0.014 m^2
- One plant per bottle of for instance chard, garlic, peas, marigold, red onion, coriander, cauliflower, spinach, lettuce, herbs (like mint, parsley, thyme etc.), radish, beet, carrot.
- Compost-soil-husk ratio of 2:1:1

PLASTIC WASTEBASKETS

In order to plant bulb plants or tubercles, the depth of the container should be a minimum of 20-30 cm, in this case a plastic wastebasket. Drainage holes should be made in the bottom.

- Area required per wastebasket: 0.11 m^2

- Number of plants per wastebasket: amaranth (1), broccoli (3), cubios (4), lima beans(1), ibias (4), potato (1), native potato (2), quinua (1), cabbage (3), uchuva or Inca berry (1).
- Compost-soil-husk ratio of 2:1:

BEDS

Beds are one of the most commonly used containers for growing urban crops. One needs to have a horizontal space that allows the plants to absorb maximum sunlight. The beds can be built with used or new boards.

- The dimensions of the beds vary in width and length, depending on the available space and depth needed. There should be a minimum depth of 10-12 cm for chard (Acelga), cilantro, lettuce, parsley, and other leafy vegetables; and 20 cm for beets, radishes or carrots in order to allow for the proper development of the roots. Recommended dimensions for the beds are: 2m long and 1.2m wide (depending on the space).
- Suitable plants: chard, garlic, pea, marigold, red onion, coriander, cauliflower, spinach, lettuce, herbs (mint, parsley, thyme etc.), radish, beet, carrot.
- Compost-soil-husk ratio of 2:1:1

Production

Tubular and bottle containers turned out to be the most favourable for the growth and development of most of the species, in all of the ecological strata analysed. The type of container clearly influences plant growth (measured by weight in grams) and productivity (quantity of biomass produced per unit of volume and area of substrate). The tubular containers have a vertical orientation, which makes optimal use of the limited horizontal space (in one tube occupying 0.09 m2 of horizontal space, 16 chard or spinach plants can be grown easily [1]). For example, a bed container covering 0.76 m2, of horizontal space allows for the cultivation of 20 plants; thus, on one square metre it is possible to plant approximately 190 plants distributed among 12 tubular containers, or just 25 plants if using bed containers (see figure 1).

Species

The species that are recommended for planting in tubes have morphological characteristics (fairly shallow roots and thin stems) that make them able to easily grow and develop in tubular containers. Among these are chard (Beta vulgaris var. vulgaris), celery (Apium graveolens), cilantro (Coriandrum sativum), spinach (Spinacia oleracea), strawberry (Fragaria vesca), lettuce (Lactuca sativa), mint (Mentha piperita), parsley (Petroselinum crispum), thyme (tymus vulgaris), grapefruit (Melissa officinalis) and spearmint (Mentha spicata).

In addition, for garlic (Allium sativum), pea (Pisum sativum), pot marigold (Calendula officinalis), onion (Allium cepa), cedron (Lippia triphylla), flowering kale (Brassica oleracea var. acephala), chamomile (Matricaria chamomilla), nettle (Urtica urens), radish (Raphanus sativus), red beet (Beta vulgaris var. conditiva), rue (Ruta graveolens) and carrot (Daucus carota), better productivity was reported in bottle containers, since although this container produced plants with less weight than those in the beds or cushions, for example, the space occupied by the bottle is 0.014 m2 and the reduced amount of substrate required meant that more bottles and thus more plants could be located in one square metre.

Substrata

In terms of the evaluation of the different substrata, it was found that the different mixes affected the adaptability, growth and development of the different plants. The substrates made up of two or more materials mixed together demonstrated superior properties to those that only contained one element. For example, a mixture of rice husks, dirt and compost had superior characteristics in terms of moisture retention, capillarity and nutritional content than any of these substrate components individually, thus allowing for superior development of the plants studied.

CHANGING THE QUALITY OF LIFE OF THE POOREST

The research showed that extremely poor and excluded groups can grow vegetables effectively in an urban environment like that of Bogota, by optimising the use of spaces in built-up areas using containers. Based on the research results, recommendations can be made on the use of substrates containing compost and husks, which can reduce the (environmentally unsustainable) use of dirt from natural ecosystems in cultivating produce.

The research results have been shared with more than 2000 urban farmers in Bogota who, with the help of technical assistance provided by the Bogota Botanical Garden, have replicated the alternative technologies and are further adapting their vegetable production systems in built-up areas like patios or flat roofs of homes, including the design of their household productive units. By using containers, tubes, bottles, cushions and beds, they have been able to take better advantage of the scarce amount of space available, and to plant a wider variety of species for their own consumption and for sale, which allows them, through their own efforts, to improve their family's diet, diversify food patterns, and generate complementary income.

NOTES

1) In calculating the number of plants of leafy vegetables like spinach or chard, an average was taken because the number may vary depending on the plant's characteristics.

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Micro-gardens in Dakar

Micro-gardening is an innovative response by farmers to urban constraints, but also to urban demands with respect to the quality of products. The urban context in that sense is conducive to technological innovation because of the numerous developments and interactions which take place.

Awa Ba

A meeting of the UPROVAN Farmer Association in Dakar

The city plays a prominent role in technlogical development (Lefebvre, 1968): "For a very long time, the Earth has been the great laboratory, (..) it was just recently that this role was taken over by the city". Specific circumstances in Dakar have stimulated the development of micro-gardening, such as the annual arrival of many new inhabitants (about 100,000 according to IUCN, 2002), the subsequent search for new livelihood opportunities, the problematic access to farming land (Mbaye and Moustier, 1999; Fall and Fall, 2001), and several efforts of NGOs and researchers promoting urban agriculture.

A micro-garden is a soil-less farming system, which involves the cultivation of plants on either solid substrate or in water (hydroponic). This technology has been tested by FAO in Latin America and the Caribbean (see for instance articles by Abensur Riós and César Marulanda in UA-Magazine no. 10, 2003). Since 1999, the Department of Horticulture in Senegal has been coordinating a project called the Micro-gardens' Programme. This department has played a crucial role in innovation, firstly by taking the decision to entrust researchers with the project, which was to be developed together with the farmers. Another innovation was to have the researchers and farmers experiment with a number of solid substrates such as groundnut shell, rice husk and laterite. These ideas originated from the researchers but were tested by ten beneficiary families.

A micro-garden consists of a container and a planting substrate on which the crops grow. In the Micro-gardens' Programme the plants are most often first raised in nurseries by the farmers themselves using a solution of nutrients. The stock solution is made by chemical industries and bought at the market Initially the programme provided the solution free of charge to the farmers, but after special training the farmers started to make their own (Programme Report, 2004).

The innovative character of the technology is in the application of a modern production technology – hydroponics – in small areas, such as a courtyard, terrace, roof, the city council compound or school grounds. This is done, for example, in the backyard of the municipality building *(commune d'arrondissement)* of Ouakam and in the *Centre de Sauvegarde* of Pikine-Guédiawaye. The major determinants are the availability of land and the willingness of the municipal authorities to support the implementation of micro-gardening. Micro-gardens are generally managed by women's economic interest groups (EIGs).

HUMAN RESOURCES IN AGRICULTURAL RESEARCH

Before the project could be launched, the organisation of the Department of Horticulture's research management and agricultural administration (under the Ministry of Agriculture) needed to be adapted. First, agricultural technicians of the Horticultural Development Centre (CDH), particularly those working in the agricultural supervision services like the Departmental Rural Development Service (SDDR), needed to be familiarised with this new technology. This department was responsible for the training of the beneficiaries. The programme particularly worked with farmers who were members of economic interest groups (EIG). An EIG is an association of people who join forces to create a small enterprise oriented at processing and marketing local products. Each EIG has 12 members and the beneficiaries' training sessions were decentralised and held at district level. According to the Department of Horticulture, "a five-day training workshop addressed to the regional technicians of the project

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was organised in December 2002. At national level, some 1440 people from the country's ten regional capitals, the departments of Dakar, Kaffrine and Linguere, benefited from the training". The trainees were selected according to their degree of poverty and willingness to participate in (micro) gardening (in line with the objectives of the Micro-gardening Programme).

Most of the trainees were women (more women than men are members of EIGs), and since women's access to land is very limited, their role in urban agriculture is strengthened by providing them with a micro-garden. It is also mostly women who are involved in hydroponics. A survey conducted by the author in 2005 found that, 36 of the 180 Dakar-based farmers (market gardeners, orchardists, flower growers, micro-gardeners, animal breeders, fishermen and rice farmers) were women. Twenty-five of these women were engaged in micro-gardening.

The programme is ongoing and new farmers are being trained and supported in Dakar as well as in the regions. Individuals or agents from private institutions wishing to undergo training pay only the cost of materials. The agricultural technicians who conduct the training are paid by the project. Another survey conducted in 2006 among 98 of the farmers in Dakar showed that participants found the duration of the training rather short.

The success of the micro-gardening activity is due primarily to the micro-gardeners' higher production. According to the Programme, a micro-garden can provide 6 cropping cycles each year and obtain an average yield of 30 kg of vegetables/m2/year. The 2006 survey also showed that most participating families consume between 5 and 9 kg of vegetables per month, which is more than what non-participating families consume (on average between 1-4 kg). Surplus production is sold to neighbours and friends, or others interested in organic produce, and provides additional income.

No marketing training is currently provided, but the programme is looking into ways of including this in the regular training. In addition, in order to better manage this marketing effort, micro-gardeners would like to have a specific place to sell their products. This would provide them with the opportunity to explain the quality of micro-garden vegetables and their benefits to consumers' health. Already a few restaurant owners have started using micro-garden lettuce: who verify their origin.

Micro-gardens can be located in various places, 75% of micro-gardens in Dakar and Pikine are located on terraces (roof gardens). In other parts of the country, they are placed on the ground in courtyards or outside the home.

USING URBAN WASTE

Many micro-gardens are made out of recycled materials, both the containers as well as the substrate. Containers can be made of wooden boards from boxes found at the port of Dakar, plastic bowls, buckets, tyres cut longitudinally and polystyrene boxes formerly used to package fish.

RUAF

Micro gardens on rooftop in Dakar

The solid substrate or water (for the hydroponic production of leafy vegetables) filling of the containers is often made up of waste. Solid substrates are made from agricultural waste: groundnut shells (60%) and rice husks (40%), both of which can be replaced by laterite gravel (a material that is used less and less). The shells and husks needs to be cleaned and stored for at least twenty-four hours to facilitate fermentation. The different researchers and the project team experimented with these materials with a view to improving access to the technique: by using the most abundant substrate in each regional context, the price for farmers could be minimised. In Dakar, these inputs are offered in an increasing number of places, to ensure their proximity to the beneficiaries and thus reduce transportation costs. These materials have to be bought by the farmers.

Macro and micro-stock nutrients have to be kept in a cool place. In addition, micronutrients need to be stored in a dark place. Their dosage depends on the substrate (liquid or solid), the type of plant and its growth stage. The two examples in the box were given by the micro-gardening project for liquid, hydroponic substrates. The water is often tap water used for irrigation. However, well water is also used and the possibility of using rainwater is also being considered.

CONCLUSION

In Dakar, researchers and farmers collaborated in the development of micro-gardens. Research contributed to the understanding of plant nutrients and the use of solid substrates to replace the soil. In addition, participative training was provided to the farmers, in farmers' schools. This innovation is a technical response to the constraints and advantages found in the city. In Dakar, the port and food processing industries can be considered as advantages for the supply of substrates and wood used in the fabrication of micro-gardening tables. The soil-less fresh vegetable production system has been adopted by some inhabitants (50 percent of the surveyed producers mentioned that they commenced their agricultural activity in 2000). However, the poorest beneficiaries need help in order to strengthen their self-reliance.

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From Eradication to Innovation: Towards healthy, profitable pig raising in Lima

Pig raising is an important livelihood activity in the District of Lurigancho Chosica, which is a low-income periurban neighbourhood located in the Rimac valley in the eastern part of the city of Lima. As many as 1600 families are thought to depend on this activity for some or all of their income. Without organisation, technical support or regulation, they mostly operate in small clusters of informal livestock units perched on the arid hillsides of this desert city. This type of production raises concerns about public health risks and environmental pollution, and yet relatively simple changes in management can make pig raising a profitable, sustainable activity that can contribute significantly to the well-being of urban and periurban families.

Urban Harvest

Group discussion and Capacity building with pig breeders of the Association Haras El Huayco

Before 2005 the municipal authorities in Lurigancho-Chosica focused only on the most negative aspects of informal pig raising activities. It was not even considered an informal production system, rather it was perceived as a clandestine activity. Since the creation of the municipal *Sub-department for* Urban Agriculture (UASD), as described in UA-Magazine no. 16 (Arce et al. 2006), the local government has changed its views. Now, instead of eradication as the major strategy, the government has begun to support a transformation process towards more organised pig raising. In this process the municipality has been supported by some local institutions and enterprises which have identified market opportunities for producers and themselves deriving from the pig raising transformation process.

In 2004 officials of the Ministry of Health (MINSA) identified the presence of a number of serious diseases such as cisticercosis and leptospirosis in several pig raising settlements in Lurigancho-Chosica. At the same time Urban Harvest was working on a case study of the *"Asociación de Criadores Ganaderos Porcinos de Saracoto Alto"* in Cajamarquilla, the largest pig raising settlement in the district (129 producers with an average of 3000 animals). This study also identified some public health concerns and highlighted a lack of knowledge about certain aspects of livestock management as one of the main causes. As part of efforts to broker a better understanding between the municipality and the pig raisers, Urban Harvest convened the first round-table discussion between the parties, in August 2004, to discuss improvements in management on the one hand, but also formal recognition of pig raising as a small enterprise by the municipality, on the other.

However, a study about sanitation in relation to pig raising undertaken by the Health Directorate found negative effects on public health and the environment in Lurigancho – Chosica. Based on this information, MINSA requested the municipality to eradicate the Saracoto pig raising settlement in January 2006, because of the continuing unsanitary production conditions. Thanks to the ongoing dialogue between the municipality and the pig raisers, however, the municipality (UASD) did not call in the local police, but instead called a meeting between the MINSA representatives and the Saracoto pig raisers.

Eventually, eradication was not seen as the first choice, because its sole effect would have been to force the producers to move to other unoccupied areas, thus spreading environmental and health risks to other parts of the district. The alternative approach was to eliminate the origin of those risks. The result of the meeting was a "transformation roadmap" in which MINSA postponed the order for eradication for six months and producers undertook to improve the management conditions, following a transformation agenda.

Urban Harvest supported this agenda with the organisation of a training course for over 100 producers during June and July of 2006. The course presented the technical, biological and nutritional aspects of a healthy pig farm, drawing on the resources available in the area and focusing on the transformation criteria agreed with MINSA. Farmers who successfully finished the course were invited to join the Healthy Pig Raising Organisation, a

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council initiative created by the UASD to bring together those farmers interested in bringing about positive change in agriculture in the district. This course was the beginning of a new working style for the UASD, which involves promoting several linkages between public and private institutions to help producers face and overcome a negative situation.

PIG DEVELOPMENT PROGRAM (PDP)

The Pig Development Program (PDP) is a UASD initiative which formalises the pig raising transformation agenda in municipal policy. It was approved by municipal authorities in January 2007 and is thus a direct result of the round-table discussion meetings promoted by Urban Harvest.

PDP works towards the creation of sustainable pig raising parks by promoting the formalisation of pig raising based on MINSA criteria in three fundamental areas: order, cleaning and vaccinations. If producers meet the criteria in these three areas, they can effectively apply the new livestock management skills acquired in the courses. Application of these management practices can reduce health risks, better protect the environment and improve the quality of life of the small urban pig raiser (Figure 1).
PDP has been following these steps in the transformation process:

To date the actors involved in the process are: the Ministry of Health (district department (DISA IV – Este), the Agricultural Health National Service (SENASA), the Urban Harvest Program (UH/CIP), the Municipality of Lurigancho–Chosica, Two private teaching institutions, and the National Policy of Peru (PNP).

ACHIEVEMENTS AND CHALLENGES

Inter-institutional work promoted by UASD and supported by Urban Harvest and partners has led to the identification of 40 informal pig raising settlements throughout the district, involving about 1,600 families and an estimated annual stock of 5,000 female pigs and a total production of about 60,000 head per year (sourced from map of pig raising park2). This represents an important sector of the local economy, which the district authorities cannot afford to ignore. Actually the main beneficiaries of the system at present are the traders who represent the "legitimate" part of the pig production system through their links to the market, allowing them to extract higher margins for themselves and maintain low margins for the small producers. With the transformation to a more formally organised pig raising system with an emphasis on quality and safety, it is expected that small-scale raisers will be able to sell their pigs directly to the market, leading to higher incomes.

To date about 200 pig raisers have participated in training courses. Of these, 25 production units have already transformed themselves into clean, organised and healthy farms and a further 70 production units are in the process of transformation. This means that almost 50% of trainees have applied their learning to radically change their livestock management. It also shows that after only five months the PDP has reached about 13% of informal producers, who are now aware of how to raise pigs under healthy conditions. Nevertheless, there is still resistance to change among some producers, even with the risk of eradication. Since the market still accepts their pigs as they have been produced for decades, they see no reason to change those practices, especially since transformation requires some additional investment in new infrastructure.

Pig producers who are unwilling to transform their systems present two challenges. First, there is a need to enhance the level of inter-institutional collaboration, especially the formation of a multi-actor quality monitoring system, involving public health and municipal authorities in coordination with the Healthy Pig Raising Organisation. The monitoring system needs to be given formal recognition through a Municipal Regulation on Healthy Pig Raising. To protect those producers who have transformed their systems, the regulation must be strict with those pig raisers who, even after completing the training course, retain the unhealthy practices, because they are risking public health and the future of all pig raisers.

Secondly the UASD should help raisers get in touch with small credit institutions to finance the transformation of their management systems. Other UH/CIP experiences show that responsible participants in training courses are also responsible when receiving credit. To better facilitate the use of micro-credit, future courses will offer schemes for small-scale, gradual change in production systems, which can be financed with micro-loans, rather than present the option of a one-time, full farm restructuring.

Finally, a major achievement of this intervention has been the interest and support shown by the MINSA representatives with regard to the idea that innovation is an alternative to eradication when it comes to pig raising. They recognise that innovation protects public health and the environment whilst offering bigger benefits for local producers.

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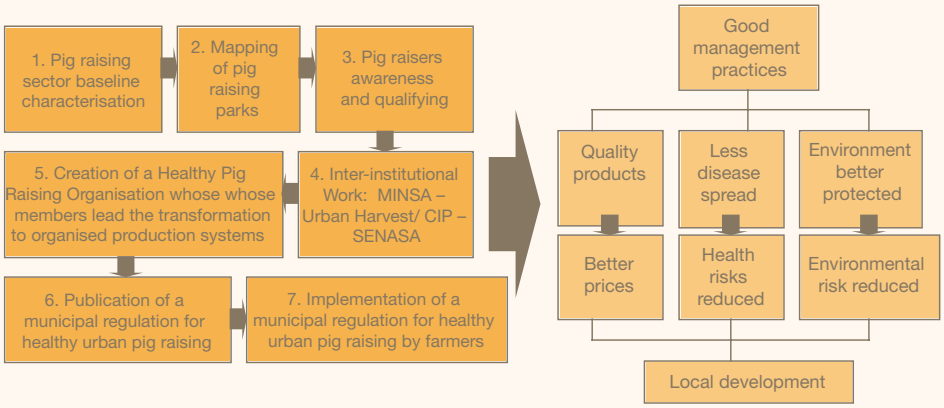

Innovativeness of Dutch Vineyards

Wine production in the Netherlands is increasing. Since the Netherlands is not a traditional wine-producing region there is a tremendous need for new knowledge. This knowledge is partly imported from other regions with similar characteristics, such as Germany. But since every location is unique, specific knowledge also needs to be developed. Research is limited for such a small sector in the Netherlands, so a lot of innovations are developed by the growers themselves. A good example of an innovative enterprise is the Dutch vineyard El Placer, located in the city of Lelystad.

Hans Peter Reinders

Exchanging knowledge with visitors interested in viniculture

El Placer was established in the year 2000 on half a hectare close to the city of Lelystad. The municipality had made it possible for entrepreneurs to start up new agricultural activities on small plots of land around the city. The new owners of El Placer chose to start a vineyard rather than establish a horse stable, tree nursery or flower-growing business like their neighbours. This initiative, which was quite innovative for the Netherlands, proved to be successful as the vineyard now produces nearly 1300 bottles of wine a year. While the neighbourhood slowly became a suburb of the city in the following seven years, the vineyard developed into an exclusive urban agriculture enterprise.

This article is based on the experience of a project with Dutch winegrowers developed by ETC Urban Agriculture and initiated by El Placer Vineyard.

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AN URBAN VINEYARD

Due to the city's expansion, it would now be difficult to find available land in or near Lelystad on which to expand this successful concept. However, since grape growing and winemaking provide relatively high revenues per hectare it is possible to produce them profitably on a limited space. Marketing the wine has been relatively easy, since the urban population likes the idea of exclusive regional wines, and people often buy them to give away as presents or souvenirs.

Like El Placer, many Dutch vineyards are characterised by intensive land use, high labour and capital inputs and high revenues, which make wine production possible on relatively small parcels of land. Most of the winegrowers are urban citizens who started to make wine as a hobby, but eventually became part-time professional growers. These urban vineyards represent a new kind of enterprise and product, which do not have a tradition and are therefore not supported by any traditional or localised knowledge. By definition, these, often part-time, farmers are very dynamic and flexible.

DUTCH VINICULTURE

The Netherlands did in fact once have a grape-growing and winemaking tradition, however, this ancient production system came to an end during the French occupation of 1795 to 1814, when Napoleon decided that wine could only be produced in France. At the same time grapevines were plagued by the pest Phylloxera that came from Northern America, and more aggressive varieties of mildew. As a result, traditional knowledge about Dutch winemaking vanished. The defeat of Napoleon and rootstocks of varieties that are resistant to soil-borne Phylloxera created new possibilities for viniculture in the Netherlands. But the practice was not reintroduced until the 1990s when newly developed grape varieties became available from Germany. These varieties resist downy mildew (a very destructive fungal disease) and ripen early in the season – characteristics that are perfect for the Dutch circumstances. However, due to the lack of local knowledge and tradition, it took several years before these new possibilities were utilised by innovative farmers in the Netherlands. The El Placer vineyard was able to make use of these new varieties and thereby contributed to the redevelopment of the Dutch wine sector in close collaboration with other new wine growers.

NEED FOR LOCAL KNOWLEDGE

When El Placer started it seemed easy to copy the German system of grape

growing and winemaking. However, the Dutch reality turned out to be different. For example, the early ripening of the grapes was not always as successful as expected. Fungal diseases were still a problem because of the more temperate Dutch climate, and the particular Dutch soils made the cultivation of these varieties more difficult than in Germany. These problems where specific for the Dutch situation and needed a local solution. Unfortunately, traditional knowledge was not available and the farmers received very little formal support from the agricultural establishment, including the government extension service. Thus, the only way for the winegrowers of El placer to find solutions for these problems was to start their own innovation process in combination with intensive knowledge exchanges with colleague growers.

INNOVATION IN DUTCH VINICULTURE

El Placer started several experiments and tried out several new ideas. The owners started experimenting with transparent little and permeable fleece-bags placed over every bunch of grapes, to improve ripening. These little bags work like small greenhouses (to generate higher temperatures) and result in a higher sugar content in the grapes. To avoid attacks of downy mildew, so-called "compost tea" was used. This traditional treatment consisting of vegetable water extracted from compost was first described by Vergilius in Roman times for use on grapes. The compost tea is sprayed on the soil, vines, leaves and fruit. In this way, other, harmless, fungi from the compost occupy the grape plants, thereby ensuring that an attack of the mildew fungus will be less successful.
To get rid of the numerous snails, chickens where introduced in the vineyard. And a self-constructed insect-hotel was used to ensure a sufficient diversity of insects. This insect hotel contains a wooden block with a variety of holes that provide a wide range of insects the possibility to winter and hatch in the spring.

Several new methods were also tried out in the wine-making process. To avoid the high costs of oak barrels, but still produce wine with this typical taste, successful experiments were carried out with the addition of specially arranged pieces of oak timber during the ripening of the wine. With the objective of developing a unique taste (part of the famous "terroir"), successful experiments were also carried out with spontaneous fermentation, so that no artificial yeast needed to be added. The natural yeasts supplied by the compost tea allowed the grape juice to ferment.

All in all, the small urban vineyard became a local laboratory where a lot of innovation took place and new knowledge was generated. Some of these innovations also had unexpected side effects. For example: the little bags placed over the grape bunches, which were intended to hasten the ripening process, also turned out to be a perfect way to avoid damage by birds, insects and hailstorms, and they simplified the harvesting process by making the pre-packed grape bunches easier to handle. This multi-purpose effect compensated for the enormous labour input needed to apply a "personal" bag to every bunch of grapes. Other innovations were not always successful: although the spontaneous fermentation process almost always leads to perfect-quality wine, in one particular year all the wine had to be specially treated to get rid of a bad taste it caused. Also, compost tea needs to be of a specific and perfect quality, otherwise it will not effectively prevent the growth of downy mildew in rainy weather conditions..

INNOVATIVENESS

Innovations are only possible if the winegrower has the interest and time to carry out numerous trials, is prepared to learn from the errors, and is willing to take risks. Because El Placer is not a very large farm, the time spent on learning and innovation is relatively little. In addition, if some experiments fail the consequences are, to a certain degree, limited. Both owners are not fully dependent on the vineyard - one is retired and the other has another part-time job – so a financial loss caused by a failed innovation is less dramatic. Therefore, the owners are willing to take risks in order to come up with innovations. It also helps that both owners have a high level of education, are curious and open to new experiences.

ACCEPTANCE BY OTHERS

An important indicator of a farmer's innovativeness is the acceptance by other growers of his or her innovations. El Placer shared its innovative experiments with several other vineyards and tried to compare the results with other realities in the Netherlands. The grape bag method, although highly labour intensive, has been applied successfully in several other Dutch vineyards. The specially designed bag is doing now so well that it is being sold commercially and is already providing El Placer with extra revenue in addition to the sale of bottles of wine. Some colleagues also apply the compost tea developed by El placer, and have indicated that they benefit from it. Other, more sceptical, colleagues remain doubtful. Despite positive data and experiences from other growers and researchers, also in the USA, New Zealand and South Africa, these sceptics claim that there's no real evidence that this tea works in the Netherlands. The somewhat phenomenological explication provided by the owner of El Placer (the effect is clearly visible and understandable) is not convincing enough for them – they want more research and statistics.

THE PROCESS OF INNOVATION

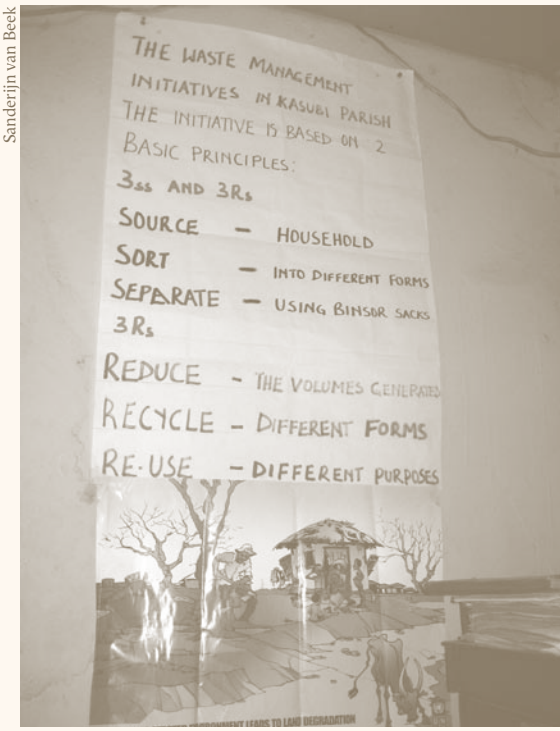
Although the reality of the urban Dutch winegrowers may differ from the situation of urban producers in low and middle-income countries, the processes show a number of similarities. Innovativeness of producers will especially arise when there is a need for new knowledge and when traditional knowledge is limited. Innovativeness of urban producers is especially needed when there is limited external institutional support. Furthermore, innovativeness can result in unexpected positive side effects and trials can lead to different new technologies that were not foreseen during the initial stage of the experiment. Persons who like to, and are used to, thinking outside the traditional boundaries and structures are crucial in the process of innovation. Not being risk averse is an important condition for innovativeness. This is often related to the producers' economic situation. Additional income or some level of economic prosperity enhances the ability to take risks. Producers also need to have time to dedicate to their pioneering activities. Whether the innovation is applied and shared by others depends on the applicability of the innovation to improve (urban) production. If the innovation shows clear results in practice, others will easily adopt it, especially if the new technique solves urgent problems for colleague producers.

Hans Peter Reinders

Cleaning, Greening and Feeding Cities; *Local Initiatives in Recycling Waste for Urban Agriculture in Kampala, Uganda.*

Uncollected solid waste is one of Kampala's most visible environmental problems, and one of the main causes of environmental degradation within the city. While this poses a critical health hazard to the livelihoods of the urban poor, it also hinders economic growth and social achievement (Sengendo, 1994). However, amidst the gloom, there are local initiatives – developed by enterprising individuals and groups – which are helping to address waste problems through the creative reuse of organic waste in urban farming (1). Some of these innovations are rapidly becoming common practice; others are still experimental.

Sanderijn van Beek



The 3 S's and 3 R's

Recycling organic waste is of profound significance in the "garden city of Africa" – where more than 30% of households practice urban agriculture, which plays an important role in ensuring food security and incomes. Mougeot (2006) argues that by linking waste management to urban farming, we can speak of a "triple-win" situation: the urban environment gets cleaned up, health hazards are reduced and agricultural production is increased.

The focus of this paper is on the process of local innovation in the recycling of organic waste for urban agriculture. Local innovation, defined by UN HABITAT (2002) as "a locally initiated, acceptable, creative and adaptive solution in response to a local condition or challenge", has also been referred to as the "dynamic process that leads to the development of tradition" (Critchley, 2007). Whether the innovative schemes or strategies have already become accepted practice over decades, or are altogether new, the process of local innovation that underpins them is increasingly recognised as being an important, sustainable, means towards poverty reduction within cities of developing countries.

Local innovation can be technical or social. The value of a technical innovation can be determined by a simple analysis using the TEES test, which examines technological, ecological, economical and social attributes (see Critchley et al., this issue). Social innovations, on the other hand, identified as "new forms of institutional arrangements to improve agriculture and the environment" can be evaluated in terms of their sustainability, ease of replication, and inclusiveness of the poor and marginalised (Critchley, 2007).

Local innovation in agriculture has been demonstrated in rural environments for decades and is increasingly receiving attention from development practitioners. Yet with the rise of urbanisation and associated farming, local innovation in these urban situations reveals itself to be uniquely adapted to the characteristics and constraints of the metropolitan context. Organic waste and other common city by-products constitute useful inputs to urban farming. Recycling of this waste is the basis for, and inspiration behind, various innovations.

In Kampala urban agriculture was legalised two years ago (in 2005), and has been steadily encouraged by municipal authorities. This policy change is a remarkable milestone. Simultaneously, awareness of the importance of reducing waste, of re-using and recycling it, is gradually gaining ground in Uganda. These principles are embedded within Uganda's 2002 Solid Waste Management Strategy and the Solid Waste Management Ordinance. However, the extent to which recycling is practiced is still limited in Uganda due to lack of appropriate technologies and awareness of benefits. Yet on a small scale there are individuals, groups, and now some projects experimenting with

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the reuse of nutrient-rich organic wastes in the field of urban agriculture, thereby building more sustainable neighbourhoods and helping to secure livelihoods.

The following stories of two individuals and two organisations illustrate how local innovation, in the creative use of urban waste, has helped to shape and improve urban agriculture in Kampala.

Mabel Bikandema is a mother of seven and an enterprising urban farmer. "You won't find me throwing out any rubbish!" said Mabel during an interview. To supplement waste from her own farm and household, Mabel regularly goes to the market and pays boys 2,000 Ugandan shillings (USD $1.15) each to gather leftover organic matter. She creates homemade compost that is sold to other urban farmers at a price of 8,000 USh (USD 4.60) per 50-kg sack. Her compost mix consists of animal waste (from her own pigs and hens) and foodstuff by-products, such as peelings of bananas and dead leaves and plants. Mabel generates profit for herself, provides a small yet significant income for local youth, and contributes in her own way to a cleaner Kampala.

Interested in teaching others, Mabel is enthusiastic about spreading the values of home-grown organic crops, homemade compost and generally providing a household with productive activities. She says, "I cannot have the knowledge of farming and keep that knowledge to myself". With the help of the Kampala District Farmers Association (KADIFA), Mabel organised an agricultural radio programme at Radio Sapiensa. As a volunteer she hosts a show that provides free farming tips to listeners. Mabel also extends an open invitation to curious farmers to visit her home and see firsthand her many projects, including oyster mushroom growing, livestock rearing, horticulture, and composting. She even makes all-natural medicines, creams and cosmetics from plants like the Moringa tree. Mabel emphasises the fact that income is not only found in office or shop jobs. If one grows food at home then no matter how Kampala's economy may fluctuate, the family will at least have some measure of nutritional and financial security. While many of Mabel's technical initiatives are based on the innovations of others (that she has further modified), her approach to sharing her knowledge is innovative. It is a form of social innovation.

In many similar ways, Damalie Namusoke is an inspirational agent of change within her neighbourhood. Living in a low-lying, densely populated area in the north-east of Kampala, her community is characterised by informal settlements with limited access to services and infrastructure. Roadsides, wetlands, drainage channels and streams are littered with rubbish, plaguing the area. However, Damalie, just as Mabel, is determined not to become a victim of these hazardous circumstances. Instead, she attended workshops on proper solid waste management and disposal at the nearby Kasubi Parish Local Community Development Initiative, where she got inspiration on how to "turn the waste burden into a livelihood benefit".

Today Damalie encourages her neighbours to separate banana peelings from other waste and bring them to her home. After drying them, she sells the banana peelings for animal feed to livestock owners at USh 2,000 (USD 1.10) per 100 kg sack. The peelings that have already begun to decompose (and are therefore not appropriate for animal consumption) are mixed with animal urine to create nutrient-rich manure for her kitchen vegetable garden, where she grows cabbages and eggplants. Part of the produce is for domestic consumption while the rest is put up for sale. Furthermore, Damalie makes charcoal briquettes from the peelings, by mixing them with charcoal dust and anthill soil, which she sells in batches of around 30 – a small jerry-can full - for USh 1,000 (USD 0.55). She also uses the briquettes herself for cooking, and thus reduces her requirement for firewood or "real" charcoal. The income generated from these activities helps Damalie take care of her family. She points out, "I have enough vegetables, some I sell, and some we eat. My children are satisfied". Beyond these personal benefits, Damalie contributes to a better living environment.

Damalie is another case of an adopter and adapter of a series of techniques, who has instigated a social innovation. In addition to adapting the technologies and organising her recycling system to suit her own reality, she has involved her neighbours by creating a social network to make mutually beneficial reuse of organic waste in urban farming. Her neighbours have learnt the technologies from her, and they have also joined hands to improve the cleanliness of their immediate environment.

Damalie is also an active member of the Kasubi Community Development Association (KACODA), a grassroots initiative set up by the members themselves that deals with the issue of solid waste in their part of Kampala. KACODA provides about 45 community members with two bags each to separate biodegradable from non-biodegradable wastes. After separation, employed youth collect the garbage from the households. After collection and separation, wastes are reused in multiple ways. For example, banana peelings are sold as feed to livestock keepers, and like Damalie does, dried banana peelings are mixed with charcoal dust and anthill soil to form briquettes for fuel. The mixture comprises one basin of anthill soil, three of charcoal dust and three of banana peelings.

The KACODA initiative is based on "the 3 S's and 3 R's". These are: **S**ourcing, **S**orting and **S**eparating waste (into bins and sacks) and **R**educing, **R**ecycling and **R**eusing waste (for various purposes). This principle originates from an NGO ("Living Earth Uganda") but has been adopted by KACODA as an inspirational motto.

KACODA has played an influential role for youngsters in the area, who were inspired in 2004 to start the Community Life Skills Empowerment and Development Centre (CLEDC). While their ideas and some skills originated from KACODA, the initiative is essentially theirs. Althouth the techniques applied by the centre are once again not in themselves groundbreaking, the social dimension which lies at the core of this initiative is interesting. This group of youngsters has set up a demonstration site to involve the community in waste-problem solving. These youngsters are demonstrating what community action can achieve.

Sanderijn van Beek

You won't find me throwing out any rubbish

CLEDC has set up a demonstration centre for sorting and reusing waste that is collected from households. Peels are picked by volunteers and sold as feed for animals at 2,000 USh (USD 1.10) per 100-kg sack, selling on average 20 bags a week. Some of the peels are used to make organic manure. At the demonstration site vegetables such as carrots and cabbages are grown in sacks filled with manure. Furthermore the CLEDC promotes door-to-door sensitisation on issues of waste management.

This last example clearly illustrates the benefits of these local initiatives and social innovativeness that link waste disposal with productive systems of urban agriculture.

All four initiatives extend beyond the idea of waste disposal. Waste is rather seen as an under-used resource, which can be re-utilised in food cultivation. In this shift of mindset towards what Furedy (1992) calls "resource recognition", the reuse of organic waste contributes towards a cleaner environment, to more healthy living conditions and to providing food. People feel empowered, and this power is channelled into achieving these "triple benefits".

The case studies presented give good reason to be optimistic about the potential of local innovation, both technical and social, within the connected fields of urban agriculture and waste disposal. However, the diffusion and widespread implementation of these practices are hindered by a variety of factors. The legal status of both urban agriculture and recycling practices create more stability on the surface, but this legislation is not as enabling as it may seem at first glance. New permit requirements outlined in the Solid Waste Management Ordinance and the Urban Agriculture Ordinance may, ironically, restrict rather than stimulate innovation by creating barriers that did not previously exist (2). Legality is indeed the crucial first step. Yet the policies that guide urban agriculture and Solid Waste Management (SWM) must be carefully and thoughtfully constructed to ensure maximum gains for society as a whole.

Additionally, community groups and individuals lack support from local authorities in terms of capacity building, financial resources, information-sharing and training on both issues. Policy ought to encourage the scaling-up of improved local innovations. One way forward is by using government researchers to help urban farmers experiment, and by using extension workers, together with the innovators themselves, as agents of dissemination. Government-supported radio programmes, a proven success in the rural environment, are also valuable in the urban context as shown in the case of Mabel. Policy can, and should, build an enabling environment that is more than simply regulatory.

The innovators we have described have been a motivating influence on their friends, families and neighbours. However, in order to best facilitate community farming groups and individuals to explore the opportunities of waste recycling, local authorities must involve these knowledgeable actors in further development of urban agriculture and solid waste management strategies. This kind of participatory action will also stimulate further innovation by giving confidence to farmers, thereby amplifying the benefits.

There is a critical need for the local authorities to formalise waste collection for public health and safety. The recycling and reuse of waste must also be formally driven through integration with municipal waste policies, be they publicly or privately managed. Using farmer innovators as contributing experts, authorities can learn how the process currently operates, what the farmers' exact needs are, and what they recommend to increase efficiency and efficacy – things which the farmers we interviewed value highly.

This paper is based on fieldwork for Master degrees from the University of Amsterdam. Fieldwork was conducted with Environmental Alert in the Focus City Research Project in cooperation with the International Development Research Centre IDRC: case studies and interviews are cited with permission. We express our gratitude to Dr. Shuaib Lwasa (Urban Harvest), Dr. William Critchley (CIS), and Mr. Ronald Lutalo (Environmental Alert) for their support in our field research and valuable comments on this article. We would also like to sincerely thank Mr. Moses Nadiope (Community leader from Kasubi Parish, Kampala), Ms. Mabel Bikandema, Mr. John Kisiga Director of KACODA, Ms. Damalie Namusoke and Mr. Francis Kizito, Executive Secretary of CLEDC, for sharing their stories and time with us.

Notes

1) It is important to understand that Kampala imports vast quantities of green cooking bananas from the adjacent countryside to prepare the national dish "matooke". The result is a massive quantity of banana peel waste.

2) The Kampala City Council (Solid Waste Management) Ordinance states in part VI –Disposal, Paragraph 38 (i) that "No person shall operate an establishment for the purpose of recycling solid waste without a valid permit issued by the Council".

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Separation of garbage

Sanderijn van Beek

Urban Agriculture in Msunduzi Municipality, South Africa

In Msunduzi Municipality of KwaZulu-Natal in South Africa, backyard gardens are growing in popularity. People use small pieces of land to produce crops, often municipality-owned open grounds or wastelands in their vicinity. Some councillors encourage this and may provide tools and seeds. This policy support is also based on the realisation that sustainable agriculture can contribute to a reduction in pollution in the city.

Farmer Support Group

Trench preparation in Msunduzi Creche site

Due to poverty and high rates of unemployment, people in urban areas may resort to agriculture. For some of them, this is a practice they were accustomed to before migrating to urban areas, for instance women who were used to participating in community gardens in the rural areas. The production of food helps to alleviate poverty caused by HIV/Aids, which has left many families, in particular women and children, without income.

A number of governmental and non-governmental organisations have put urban food security at the centre of their development strategies (1). In 2004, the African Roots Project was formed out of the recognition that good nutrition is the most important requirement for good health, particularly for people affected by HIV/Aids. The project, which ran through 2005, was a partnership between the Children in Distress Network (CINDI), the Institute of Natural Resources (INR) and the Msunduzi Municipality. It also included the University of KwaZulu-Natal, and local and provincial government departments, e.g. Agriculture, Health and Education.

The aims of the African Roots Project were to address food insecurity and the nutritional needs of poor urban communities affected by HIV/Aids through the propagation of indigenous plants and the coordination of food garden initiatives in the Msunduzi Municipality.

Wild edible plants were identified as crops that can assist in ensuring food security, nutrition and ultimately good health. Such crops require less intense care, can be grown organically, are fast growing, and are hardier than many other conventional crops. They also contain many of the micronutrients required for good health, usually at concentrations greater than conventional crops.

The African Roots Project developed a strategy to increase the variety of nutritious plants cultivated by a large number of affected urban households (Njokwe and McCosh, 2005). The following activities were implemented during the first phase of the project:

Strategic planning workshop
Identified stakeholder groups, partners and community gardeners were invited to a workshop to develop a strategy for the implementation of the indigenous vegetable project. They set out the project's aims, objectives and activities.

Situation analysis
In 2004, a survey was conducted on the prevalence and contribution of indigenous vegetables to the family diets of households in the city of Msunduzi. The survey sought to improve urban farmers' understanding of their own consumption patterns, the diversity of crops that can be produced and their nutritional values. Twenty-eight different garden groups participated in this participatory assessment, e.g. community garden associations, groups organised around gardens at clinics, youth groups, support groups of people living with HIV/Aids (PLWHA) and community- based organisations (CBOs).

The following activities were implemented during the second phase of the project:

Identification of indigenous vegetables
Indigenous vegetables were promoted as a supplement to conventional crops, particularly because of their high micronutrient content. The choice of crops to be promoted was based on their popularity as indicated in secondary information and in the survey. In Msunduzi (Njokwe, 2005) the following indigenous vegetables were selected for propagation: blackjack (Bidens pilosa), amaranth (Amaranth spp.), spiderweed (Gynandropsis gynandra), cowpeas (Vigna spp.), orange sweet potato (Ipomomea batatus), lambsquarter (Chenopodium album), calabash (Lagenaria spp), wild mustard, and quickweed (Galinsoga parviflora). These crops were chosen because they are common in the Msunduzi area, grow easily in cultivation and have a high nutritive value, particularly in micronutrients. These crops are also well known by both the young and older generations.

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Farmer Support Group

Indigenous vegetables are promoted as a supplement to convential crops, because of their high micronutrient content

Bio-intensive gardening
At all sites in Msunduzi, demonstrations were conducted on bio-intensive gardening techniques such as trench beds, container gardens, raised beds and no-till systems. Organic farming was promoted to avoid the negative health and environmental impacts of agro-chemicals and poisons that cause problems for people with compromised immune systems and to save money that many of the target groups do not have.

Seed collection and propagation
Apart from amaranth and sweet potato, seeds of these indigenous vegetables were not available commercially. Therefore participants learned to collect their own seeds for propagation. They were trained in collection and competed with each other in seed collection workshops, in which prizes were awarded according to variety, quantity and quality of seed collected. The workshops also created an opportunity for the participants to share experiences in seed collection, which enhanced the knowledge of all participants. Demonstrations on the propagation of indigenous vegetable seeds were easily conducted in areas where miniature nurseries had been established. Youth groups and school children in particular liked to be involved in nurseries.

Nutrition training officer
A nutrition training officer, employed by CINDI, worked closely with the agricultural coordinator employed by the Institute of Natural Resources. This made it possible to take a more holistic approach to nutrition. Project participants were informed about the agronomic aspects of both conventional and traditional food production as well as the importance of nutrition and the four food groups. Demonstrations of appropriate methods of food preparation were conducted to ensure that maximum nutrients are retained in the food.

Promotion and upscaling
The project maintained close links to several government departments, (e.g. Agriculture, Education and Health) as well as to NGOs and CBOs in order to raise awareness of the benefits of indigenous vegetables within technical services in an effort to upscale the use of indigenous crops. Promotional activities were also undertaken during the above-mentioned activities, such as presentations on nutrition, health and indigenous vegetables, and the production of posters on nutrition, health and HIV/Aids. An Indigenous Vegetable Awareness Day was organised, during which dieticians and other speakers talked about the role of indigenous vegetables in mitigating the effects of HIV and Aids and in promoting good health in general. Farmers also displayed seeds they had collected. Demonstration sites on organic production of indigenous vegetables were developed in community gardens, local clinics, special and pre-primary schools, and Drop-in-Centres.

UKULINGA FARM / URBAN TO RURAL

The support that institutions and organisations such as the African Roots Project have been offering to the HIV affected and infected areas is widely recognised. Some provide implements and inputs, but in general support for production techniques is rather limited and inconsistent. Hence, most urban farmers still operate with inadequate implements, technical know-how, land, water and other agricultural inputs, yet they manage to adapt to the circumstances they face.

The Farmer Support Group (FSG) recognised the need to support innovation in urban agriculture. It developed a multi-pronged approach to address the need for information and innovation in urban agribusiness/gardening. This approach includes some of the strategies used by the African Roots pilot project.
FSG has many years of invaluable experience working with resource-poor and HIV/Aids-affected people in the Msinga and Bergville rural areas. It uses approaches similar to the one piloted by the African Roots Project in Msunduzi Municipality. The main difference is that FSG promotes identification, action research and development of innovations by farmers in their fields. It conducts experiments on its own research farm, and promotes action research conducted by the farmers in their fields. FSG is a member of PROLINNOVA, a global coalition of organisations that promote participatory innovations development (PID).

The indigenous vegetables that are experimented with at Ukulinga Research and Experiment Farm were identified by both young and old, urban and rural farmers in Msinga (Njokwe and McCosh, 2005; Njokwe, 2006). The plots on the farm are used to create awareness and to research and demonstrate sustainable techniques for the production of specific indigenous vegetables. Its target group includes both urbanites who want to participate in urban farming and rural farmers who want to adopt, adapt and practice urban farming principles relevant to their rural situation. Through cross visits, farmers make their own assessments that lead to informed decision making.

LESSONS LEARNED

The involvement of multiple segments of the urban population, e.g., youth groups, People Living with HIV/Aids (PLWHA), school children, clinic volunteers, traditional and elected leaders, in the promotion and production of indigenous crops should be supported by all stakeholder groups. Schools, clinics, churches and community centres should have food gardens on site, through which potential gardeners in the community can be taught, encouraged and mentored.

Partnerships should be developed with local and provincial governments, NGOs and CBOs to facilitate upscaling of the results. The Department of Health can offer clinic sites, educate its staff about the importance of indigenous crops and ensure that Community Health Workers and home-based care volunteers educate beneficiaries about the benefits of indigenous crops and encourage them to produce and eat indigenous crops. The Department of Agriculture can train its technicians on the value of indigenous crops and their production techniques and provide extension support services in upscaling the project. The Department of Education can include urban agriculture and the importance of indigenous crops in relation to HIV/Aids in education material. The municipality and traditional leaders can allocate land for urban

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Solid Waste Recycling in Addis Ababa, Ethiopia: Making a business of waste management

IBH

Training crop production using soil mixed with bio compost

Solid waste management is a major challenge facing the cities in the developing world. The commercial recycling of organic waste into a valuable organic fertiliser called "Bio-compost" is new in Addis Ababa and it is having a noticeable impact on improved organic waste management and urban agriculture.

Integrated Biofarm Enterprise (IBE), a private limited company in Ethiopia, began operations in Addis Ababa in 1998, based on a philosophy of working with nature to achieve high quality, sustainable productivity and low levels of waste and environmental loss. Since then, IBE has served as a national model for waste management, environmental restoration, resources management and food production to benefit the surrounding community (Getachew Tikubet, 2002).

For the past eight years, IBE has also functioned as a training and demonstration centre. It now also operates field stations in different regions of the country (Assella, Mekele, Assossa and Gurage), which strengthen training and research opportunities has involved urban organic waste recycling and utilisation in collaboration with different partners.

The major objectives of this project are to increase awareness, set up the production of organic fertiliser from solid waste collected from residential areas and marketplaces and stimulate its use for urban and rural agriculture.

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The major partners in this Solid Waste Management (Bio Recycling) project are:
Bioeconomy Association (BEA) – Non-governmental organisation
Addis Ababa City Administration (Clean, Beautifiction and Park Agency) - Governmental organisation
Arada Sub City of Addis Ababa - Governmental organisation
Birhane Clean and Environment Sanitation Association – Private business organisation.

ORGANIC SOLID WASTE

Organic solid waste is collected from the central fruit and vegetable marketplace in Addis Ababa and from residences and shops located around the market. Tackling this waste takes up a considerable part of the municipality's budget.

The *assembly* of wastes occurs at two levels. The first is at market and household level. The fruit and vegetable wholesalers and retailers at the market collect wastes in garbage tanks, while waste from residences and shops around the market area is collected by a private business organisation called Birhane Clean and Environment Sanitation Association. A fee is paid for this service to the association. The second level of assembly from the market area to the project area and other dumping areas is carried out by the municipality. About 40 m3 or 3500 kg organic waste is collected from this market area per day. But only 16 m3 or 1400 kg is used for this project because of capacity problems. The rest needs to be dumped outside the city by the municipality. IBE received about 534,000 kg of waste in 2006. Separation of organic wastes from non-organic wastes and sorting are done at both levels of collec-

tion. The non-organic wastes go to other industries, and the income generated by this is designated for Birhane Clean and Environment Sanitation Association.

The various participants in the waste management system all learn about proper handling, collection, sorting, transportation and loading. In addition, training is given to 100 youths employed by the Birhane Clean and Environment Sanitation Association, who participate in the solid waste management process with the assistance of the Bioeconomy Association (BEA).

The compost preparation area of IBE in Addis Ababa is located 6 km from the waste source area. The project uses an above-ground compost preparation method to recycle the organic waste. Each phase of the process takes about three months, and IBE completed three phases in the past year; hence it converted the 534,000 kg of waste into 265,800 kg of bio-compost, which was sold packed and unpacked.

BEA determined the nutrient content of the bio-compost through laboratory tests conducted by the International Livestock Research Institute (ILRI), These showed that it provides more than the average nutrient requirements for plant growth and by far more nutrients than the local soil prepared with the inorganic fertilisers DAP and Urea. The high percentage of organic matter in the bio-compost, which is not present in the inorganic fertilisers, also gives the soil better structure, water absorption capacity and aeration. In addition, bio-compost is applied usually only once every 2 to 3 years, making it less expensive to use than inorganic fertilisers, which are applied every year.

IBH

Urban waste turned into marketable compost

The bio-compost is packed in plastic bags that are sealed and labelled with a bio-compost logo in two languages, English and Amharic (the local language), a list of ingredients, available nutrients, instructions for use and a contact address. The bags are prepared in three different weights, 2 kg, 4 kg and 25 kg, intended respectively for small and medium size compost beneficiaries and middlemen (super markets). In addition, 100 kg bags of bio-compost are packed without a seal or label. These are used by IBE or sold to direct customers. Certification is in progress and IBE has already been granted official support and recognition for this by the Ministry of Agriculture and Rural Development and the Environmental Protection Authority.

The standard instructions for use of bio-compost are to mix 3 to 4 kg of bio-compost with an equal part of local soil and apply this to each square metre of land. The price of bio-compost was 2 Birr/kg (about 0.235 USD/kg) in 2006 and 2.5 Birr/kg (about 0.294 USD/kg) in 2007. This is nearly half of the current market price of inorganic fertiliser.

IBE uses and markets the bio-compost in three ways.

a) For internal use: IBE in Addis Ababa has about 5 ha of horticultural land and a nursery site. Here IBE applies about 185,000 kg of organic fertiliser (before packaging).
b) To project-based trainees: IBE has given practical training and backstopping assistance to more than 21,000 trainees, most of whom have their own farms. All of these trainees bought bio-compost from IBE when they started farming. For example, 200 members of the former Fuel Wood Carrier Women's Association bought 10,450 kg for 26,100 Birr (about 3,071 USD) at a rate of 2.5 Birr/kg (about 0.294 USD/kg) for their horticultural farm at the City of Addis Ababa, Keraneyo subcity in May 2007 (which is 1999 in the Ethiopian calendar).
c) To shops and supermarkets: IBE sells the bio-compost from its main distribution centre. Customers include Abader, Abrico and Adgemu supermarkets and agricultural input suppliers at Addis Ababa. It also promotes the product to different flower farms.

Nearly 70% of the bio-compost produced in 2006 was used by IBE itself. However, it is estimated that 80 to 90% of the bio-compost produced in 2007 and 2008 will be sold. The majority of customers are urban dwellers, who use the bio-compost on their homesteads, and periurban farmers, who use it for the production of horticultural crops. IBE also gives training courses to different groups and sells its products for project-level urban agricultural production. These groups are made up of youths, women cooperative members, fuel wood carriers, partially sited individuals, students, retired persons, orphans, nuns, etc. More than 90% of the bio-compost marketed is for use in urban agriculture, but the rural market for bio-compost will also grow as awareness of the product increases among rural farmers. IBE is the first and only entity in Addis Ababa engaged in the commercial collection and recycling of organic waste.

FINANCIAL ANALYSIS

The financial analysis below is based on incurred costs and revenues and estimated opportunity costs. IBE has incurred costs for labour, implements, soil nutrient analysis, packing, marketing, salary and administration, which are estimated to be 404,136 Ethiopian Birr (47,545 USD). This also includes the costs for assembling, loading, transporting and unloading wastes that are covered by the partners. Without these opportunity costs, the estimated total is 226,936 Ethiopian Birr (26,698 USD) (see table). The business has the capacity to earn 135,189 Birr (15,905 USD) and 312,389 Birr (36,752 USD) with and without consideration of opportunity costs, respectively.

Birhane Clean and Environment Sanitation Association has a training service and provides assistance on waste management. The city's waste dumping site is located 13 km from the waste source area, whereas IBE's waste recycling area is located 6 km from the source area. As a result, by dumping at the IBE site, the municipality saves the time and costs associated with transporting each truckload of waste the extra 14 km. Therefore, IBE is not expected to cover this opportunity cost. After evaluating the previous year's performance, the partners extended their agreement for the coming years and the Environmental Protection Authority of Ethiopia also approved the expansion in size and scale.

Table 1. Cost-benefit of IBE		
Items	Revenue/ Cost	
	In Birr	In USD
Revenue (from sale of bio-compost)	539,325	63,450
Labour	49,746	5,852
Implements	15,000	1,765
Soil nutrient analysis	4,500	529
Packing costs	85,440	10,052
Marketing costs	12,000	1,412
Salary and administrative costs	48,000	5,647
Others	12,250	1,441
Opportunity costs	177,200	20,847
Assembling at the market	14,400	1,694
Loading	10,800	1,271
Transport to project area and unloading	144,000	16,941
Others	8,000	941
Total Cost (including opportunity costs)	404,136	47,545
Total Cost (not including opportunity costs)	226,936	26,698
Profit (including opportunity costs)	135,189	15,905
Profit (not including opportunity costs)	312,389	36,752

The business is financially feasible if the bio-compost is sold at a price that is not lower than the break even price of 1.52 Birr (0.18 USD) considering opportunity costs and 0.85 Birr (0.10 USD) per kg without consideration of opportunity costs. Since IBE is a private limited company, any profit earned is reinvested.

PROMOTION

IBE promotes bio-compost organic fertiliser and urban waste management recycling in general in the following ways:

- By managing bio-compost marketing centres.
- By inviting officials of different governmental and non-governmental organisations to visit the project.
- Through the media (advertisements) and publications including brochures, newsletters and posters.

The municipality also actively promotes urban agriculture and the use of bio-compost.

CONCLUSIONS

Waste management is a big issue in urban management, especially in mega cities like Addis Ababa. Land is scarce in these cities and it needs to be used productively and efficiently. Therefore, businesses that recycle organic wastes and produce standardised and packed organic fertilisers as described here are vital. They contribute to urban waste management but also indirectly to the promotion of safe agriculture in the city by providing organic fertiliser to urban farmers in small packs.

Agriculture is an important part (85%) of Ethiopia's economy and labour force. But, due to land degradation, agricultural production has become dependent on fertiliser application. As a result, Ethiopia imports vast amounts of inorganic fertiliser. Bio-compost thus has important potential in this country.

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IBH

Partial view of Biofarm, Assela Branch

IBH

Tree seedling production using biocompost

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agriculture projects and encourage local communities to produce and consume traditional crops.

The sharing of experiences and innovations between urban and rural farmers is important and efficient because rural farmers have knowledge that has been generated over many decades. For instance, the Msinga people have developed innovative ways to cook, process and mix indigenous vegetables in order to preserve them and balance nutrients in their diet (Njokwe, 2006). Rural areas have more wild varieties of indigenous vegetables than urban areas, which have fewer or no wild areas at all. On the other hand, urban farmers have invaluable experience on how to survive on very scarce resources with limited or no support, and they have access to markets. These and other lessons are being shared through the network of rural and urban farmers interacting through the FSG. The farmers' evaluation reports showed that the yield of exotic and indigenous vegetable cultivated in trench and raised plots is very high. Production costs are low compared to the conventional farming system.
Through various experiments conducted together with farmers and at Ukulinga farm, FSG will further strengthen the exposure of urban and rural farmers to innovative techniques Eventually, a market development strategy will be adopted to allow the communities to raise income to meet some of their needs.

Notes
1) In Msunduzi, these institutions include CINDI Network, Institute of Natural Resources, Department of Health, Department of Social Welfare, Department of Agriculture, the Farmer Support Group (FSG) of the University of KwaZulu-Natal, and the School of Agricultural Science and Agribusiness of the same university.

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Enhancing Local Knowledge in Urban Livestock Breeding in Bukavu, D.R. Congo

The city of Bukavu, the administrative centre of South-Kivu Province, is situated in Eastern DR Congo some 2,000 km from the capital, Kinshasa. It is an important commercial, administrative and university centre with a population of over 600,000 inhabitants. For several reasons many of them have turned to farming to secure their livelihoods.

Innocent Balagizi, Diobass Kivu

Women belonging to a farmer's research team

Many people face problems in supporting their families. Salaries in the civil service and other state-run services are paid irregularly or not at all, and to make ends meet, civil servants are engaged in backyard gardening and animal keeping in the city. Due to recent conflicts in the eastern part of the country living conditions in those areas deteriorated. Armed conflicts in the agricultural zones, which used to be the city's breadbasket, forced the inhabitants of entire villages to leave their homes in search of peace. Many of these displaced people, both women and men, and young unemployed ex-combatants, sought refuge in the city of Bukavu. The already fragile conditions in Bukavu further deteriorated and the city saw an increase in the number of homeless people and street children. The increase in the population led to urban sprawl, and the lack of urban planning in these areas around the city resulted in the parcelling of plots to allow for the construction of new dwellings.

The migrants rapidly adjusted to the new circumstances and were creative in finding new livelihood strategies like gardening and animal breeding in backyards and open spaces, such as along the avenues. Urban agriculture also helps to clear the wild grass of vacant sites and dumping grounds in the city of Bukavu.

Vegetable gardening is prominent in Bukavu and is predominantly for home consumption. Animal breeding in the city provides small incomes to households, and is also seen as a way to ensure a supply of extra cash when needed. It is integrated with vegetable farming.

ANIMAL BREEDING

Diobass Platform works with internally displaced people and has a programme focused on urban farmers. In 2003 and 2004, Diobass observed a rapid increase in animal breeding and received requests to support animal breeders of Bukavu. A preliminary exploration of animal breeding was done, and support was provided to the Animal Breeder Federation (FEDE/PREIV).

The prevailing animal breeding activity is raising small numbers of goats, pig, rabbit or poultry. In a survey of 96 households conducted in the periurban areas of Bukavu in 2003, it was found that vegetable production and animal keeping is often combined. The average number of animals kept per household is 29 goats, 24 pigs, 19 rabbits or 31 hens.

Over time, changes were observed in urban agriculture in Bukavu. In the survey, Diobass noticed that animal breeding had increased and shifted in focus. Traditionally, animal breeders kept goats, which is still common practice

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among older people for savings. However, goat breeders allow the animals to roam free in the city, which allegedly destroys trees and gardens, and leads to conflicts between small gardeners and the breeders. Therefore, the current tendency especially among new and young immigrants in Bukavu is to breed pigs instead.

PIG BREEDING

Pig breeding is profitable. In Bukavu, the price of a pig varies between USD 20 and 150, according to its weight and age. This represents an important contribution to household income, in addition to food produced in small gardens. The study undertaken in 2003 by Diobass included 96 households involved in pig breeding. Of these households, 87 mentioned that the activity was providing a substantial income for them (Lawahira Ntagenwa, 2003). Thirty-eight households used the income from pig breeding to pay school fees, while 15 used the income to meet family needs other than food requirements.

CHALLENGES

Over the past few years, pig breeders have been working to improve the feed they give their pigs in order to reduce the risk of swine fever. Despite some success in this area, they are still confronted with a number of challenges. The key challenges are access to land for extending breeding space, poor access to ingredients for the feed, inaccessibility to veterinary services, lack of quality breeding stock, and the need for (or lack of access to) credit.

To address these challenges, animal breeders of the city of Bukavu organised themselves into the Animal Breeders Federation (FEDE/PREIV) to share their experiences and consolidate their activities. The members of the federation jointly started experimenting with pig breeding, both recent migrants and those who have lived in the area all of their lives.

Inspection of the dried plants

Walere Sahini, Diobass Kivu

The animal feed now used is composed of palm seed cake, brewers' grains (residues from local breweries and sometimes from local banana and/or corn-based alcoholic drink breweries) and a lot of herbs. The breeders have to buy these ingredients at the market of Bukavu Town and from local small soap factories. Eighty out of the 112 households favour this mixture and feed their pigs a daily maintenance ration of 2-3 kg of blended foodstuffs, or 4- 6 kg for the pregnant and young pigs that need to be fattened. Seventy of the breeders agreed on the need for a back-up ration in the form of roughage given at will.

To improve the quality of the breeding stock, urban animal breeders exchange high-performance reproducers and acquire the best breeds from major local firms like the Pharmakina consortium, from religious communities and from leading farmers of the city. The members of the federation collect contributions to buy the pigs. In this way poor breeders also have access to improved animals.

The issue of swine fever is recurrent and causes heavy losses in animal breeding households. In 2002, Diobass organised a local animal breeding and farming knowledge and practices trade fair. These proceedings resulted in the creation of a local knowledge promotion centre. One of the priorities of this centre is the validation of suitable recipes for the prevention of African swine fever in the region around Bukavu. Since 2004, FEDE/PREIV has been distributing a recipe composed of veterinary plants useful for the prevention of African swine fever. This knowledge was developed by sharing experiences between traditional urban breeders and recent migrants from rural areas. Experienced rural breeders were also invited to the meetings. Improved recipes were tested by breeders in different locations.

This practice made it possible for breeders to increase the number of livestock and better meet the needs of their families. Most of the livestock around Bukavu was decimated by the war in 2004 and by swine fever (based on our own information and from Diobass partners). However, there is currently ample livestock in the city itself, where the impact of the war

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Breeding rabbits to improve livelihoods in South Kivu, DRC

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The war that took place from 1996 to 2003 in Eastern Democratic Republic of Congo (DRC) caused a strong decrease in livestock numbers in villages and cities. Traditionally cattle plays a key role in rural and urban agriculture, providing milk, nutrients and social status. Cattle breeding used to be an important livelihood activity for the Bashi ethnic group, in South-Kivu. However, restocking of cattle is expensive, and most of the Bashi are poor.

Therefore, periurban farmers took up breeding of rabbits as a strategy to slowly build up capital and be able to start breeding cattle again. Rabbit breeding is not as expensive and very fast. A couple of rabbits might cost around 10 USD, and can generate 72 rabbits in one year, producing up to 4,000 new rabbits in the following year, which have a value of about 80 cows – that is, if they survive, since intestinal coccidiosis is a major constraint. Intestinal coccidiosis kills about 80% of young rabbits at the age of 2 to 3 months.

In 2003 a research group of periurban farmers (called OPELABU) supported by the Diobass Platform used indigenous knowledge to develop a local drug that prevents this early mortality caused by coccidiosis. The drug is a mixture (in equal quantities) of powdered fruits of Capsicum frutescens (Chilli), leaves of Tetradenia riparia (local name mutuzo), bulb of Gladiolus psittacinus (Gladioulus in English, Glaïeul in French), and Piper guineense (African pepper). Every 2-month-old rabbit is given 1 ml of this mixture per week and from 3-4 months they are given 2ml per week, This treatment has reduced the incidence of this killing rabbit disease from 80% to 5%.

OPELABU members had around 200 rabbits in 2003, and this stock has increased to 13,000 rabbits now, which when sold, together will allow for restocking of 260 cows. The product is sold by OPELABU for the accessible price of USD 7 per litre, which allows treatment of about 100 young rabbits.

The development of local knowledge is important in the promotion of urban and periurban farming and the support of livelihood strategies of small-scale producers. The rabbit breeding model developed by OPELABU facilitates self-reliance in livestock breeding systems.

Innovations in Producer-Market Linkages: Urban field schools and organic markets in Lima

Organically-produced food is increasingly in demand among more affluent urban populations of developing countries, and these city dwellers are willing to pay a premium for food quality and safety. Agricultural producers living in and around these cities are well placed to take advantage of this lucrative market.

Urban Harvest

Evaluating the yellow tramp during the agroecological analysis

As well as offering higher prices, the organic market also usually provides more stable prices throughout the year. However, most urban producers are unfamiliar with the specific techniques for organic production or else doubt the economic opportunities this market offers. Moreover, the organic market has strict quality demands, such as organic certification, and often requires negotiation capacity from producers because they often sell directly to consumers or specialised distributors. Most local producers are not used to these requirements. They especially lack business management skills and the capacity to organise themselves for better marketing.

Thus, innovative approaches are needed to enable producers to take advantage of this new demand. "Agricultores en la Ciudad" (Farmers in the City) is a collaborative programme of the CGIAR Initiative Urban Harvest (1) and local partners, which is being undertaken in Lima, Peru, to help producers take advantage of this opportunity and overcome their constraints. The programme is using the locally developed methodology of Urban Field Schools to strengthen farmers' internal organisation and help develop novel linkages to diverse types of organic markets.

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DEVELOPING A NEW "SCHOOLS FOR URBAN FARMERS" METHODOLOGY

A baseline study undertaken in 2004 identified strengths and limitations for agro-enterprise development among local agricultural producers and capacity building needs. An important conclusion that emerged was the need for capacity building in enterprise development, but it was also concluded that there was a lack of learning methodologies compatible with the urban life style. Based on its use in rural contexts by the International Potato Center, the Urban Harvest research team identified the Farmer Field School (FFS) methodology as a high-potential tool for use in urban environments, if it could be adequately adapted. Adaptation of the FFS model was undertaken over a period of two years in two districts of Lima where the urbanisation pressure on agricultural land was highest. The objectives were to:

- Enhance access of urban producers to high-value markets for organic products
- Increase the access of consumers to fresh and healthy foods and improve family diets
- Eliminate harmful effects of agriculture on the environment.

Urban Harvest was supported by the "Junta de Usuarios Rímac (JUR)", which is the local irrigation system management institution, and by the local government, the District Municipalities of Lurigancho Chosica and Santa María de Huachipa.

The Schools for Urban Farmers methodology has three steps. Although these were elaborated over a period of two years, the three stages can be completed in as little as 15 months, depending on local circumstances.

First, a participatory field diagnosis is conducted over a period of about six months. Using different diagnostic methods (participatory workshops, group interviews, surveys) this step involves documentation of local practices, opportunities and production constraints. This diagnostic process also includes information and sensitisation about the project

goal and objectives.
The second step involves the creation of an urban-adapted farmer field school (FFS) about integrated crop management, with particular attention given to pests and soils. Preliminary sensitisation workshops help create awareness among farmers about the value of natural and human capital – protecting the environment and human health – and the value of social capital, in other words, the relevance of group organisation. An important part of the urban adaptation of the FFS involves intensive preparatory work with time-constrained urban producers on the advantages of this kind of agriculture. More intensive interactions take place between the research team and the selected producers than typically occurs in rural-based FFSs primarily because of the way that agriculture competes for time and space with other urban livelihood strategies, so that sensitisation to the value and potential of agriculture needs more time. The third step is an urban field school, involving capacity building on organic production and the development of a market orientation towards new commercial opportunities (Figure 1). These steps are discussed below in more detail.

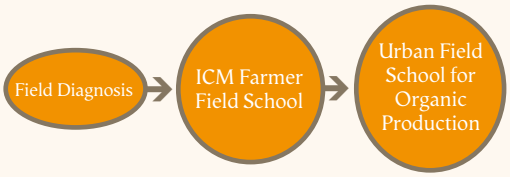

Figure 1: Three step "Schools for Urban Farmers" methodology for stimulating organic production

PARTICIPATORY FIELD DIAGNOSIS

The diagnostic study in Eastern Lima used preliminary workshops, group interviews, key informants and surveys to understand the local production systems and livelihoods. From the study it emerged that local producers are poorly organised. Farms are very small and marketing relies on a complex array of intermediaries. Farmers have very limited information about market prices and the tendency is to grow the same products in the same seasons, leading to saturated markets and low prices. In this scenario, farmers try to maximise productivity and product appearance and minimise production costs and labour, which result in high dependence on chemical products (especially highly toxic pesticides, often without paying much attention to safety procedures). With high input costs and fluctuating market prices, the economic returns on this kind of horticulture are frequently negative. Instead of selling the land to urban developers in the face of low returns, as some producers are doing, an alternative identified through the diagnosis is to take advantage of new, close by, urban markets. There is a local commitment to horticulture, but there is urgent need to find ways of making production more profitable.

ADAPTED FARMER FIELD SCHOOLS

The International Potato Center has extensive experience with the use of Farmer Field School (FFS) methodologies for building farmer capacity in rural areas, especially on integrated pest management (IPM) of potato. This method has also been shown to contribute to the strengthening of social capital among farmers (Pumisacho & Sherwood 2005).

The FFS methodology needs to be adapted to urban conditions because participants are urban producers involved in urban lifestyles and production systems that make different demands on time, labour and physical resources, and involve different crop rotations, soils etc., compared to the rural sector. The focus of the urban-adapted Farmer Field Schools (FFSu) was integrated crop management because the management of pests and soils were identified as the main weaknesses of urban producers. At the beginning of the FFSu (in 2005), the following comments were commonly heard:

- "Nobody can produce lettuce without Furadan" (a highly toxic local insecticide). "Chupadera [Fussariun spp an important fungal disease] wins."
- "They lie when they say they don't apply chemicals. They apply them during the night when nobody can see them."
- "You can get a higher price, but if you grow without chemicals leaves are damaged."
- "Plants grown without urea, grow with a yellow colour. Who will pay for them then?"

The FFSu aimed to change these sentiments, making farmers conscious of the possibility of using diverse means of controlling insects and diseases in order to reduce the use of agrochemicals. It also sought to show the advantages of self-organisation so that they could exchange experiences and learning, reduce costs and improve their marketing abilities.

URBAN FIELD SCHOOL ASSOCIATIONS

The Urban Field School Associations (UFSA) are the result of self-organisation among some members of the FFSu, mainly for the purpose of strengthening organic or ecological production capacity and organisational and entrepreneurial skills. Members are thus self-selected from among the membership of the FFSu and are those with a strong interest in the organic or ecological production techniques introduced in the second step of the methodology. The third step encourages these self-selected and motivated producers to elaborate their specific needs and plans as part of the UFSA enterprise activities and capacity building. In the Lima case, producers expressed the need for more formalised organisation, more training in enterprise management, training and research on organic production and for support to apply what they learnt at the FFSu. They also sought help to reach the production conditions required to become formally certified for organic production. The participatory design of the methodology ensures that producers themselves implement and maintain the UFSA, whilst the R&D organisations provide technical support. Other local institutions, like the municipality or the Irrigation Users' Authority (JUR), supported market research and enterprise dialogues with new business opportunities.

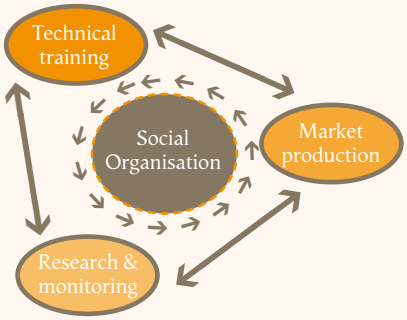

Figure 2: Urban Field School Association operational model

The UFSA is composed of three physical areas (Figure 2). A pilot production area is used for the application of organic methods for growing crops and raising livestock for the market. A participatory research area is used to evaluate new

organic technologies. A training and meeting room is used for capacity building. The UFSA Center aims both to train those farmers who were involved in its design and establishment and also to train other local producers who want to learn from the first group's experiences and ultimately join their organisation.

The UFSA is based on the self-organisation of farmers who take part in it. It takes approximately one year to reach the level of farmer participation, organisation and autonomy that can ensure the sustainability of the UFSA. Thus training begins with social subjects: self-esteem, leadership ability acquisition, networking, negotiation. From this base the group deals with the generation and application of integrated organic agricultural and farming techniques and its adaptation to the urban environment, processing to add value to the produce and finding marketplaces (Urban Harvest 2007). The farmers involved are also responsible for diffusion of the knowledge that they have learnt to other farmers in Lima. "Graduate farmers" begin to give farmer-to-farmer training about six months after the establishment of the UFSA and after they themselves have received different kinds of capacity building training. They also increasingly participate in demonstration and commercial fairs organised by municipal authorities and Urban Harvest, which is another type of horizontal sensitisation of peers and other stakeholders.

ACHIEVEMENTS AND CHALLENGES

The main achievement is the establishment of two stable and sustainable UFSAs for producing and marketing organic vegetables, known as Cosecha Sana SAC (COSANACA) and the Asociación de Productores Agropecuarios Orgánicos de Huachipa (APAHO) (Urban Harvest 2007; Alegre et al. 2006).

Other specific achievements include the following:

- Producers are experts at organic production and know the technical information.
- Producers are now able to negotiate for themselves sales to different markets, without the intervention of intermediaries.
- Currently 2.5 ha of urban land is managed by the two associations, which are officially certified as organic production areas by an independent certification organisation.
- A diversity of market outlets has been established for organic products.
- A second-level organisation, "Organización de Productores Orgánicos de Lima y Callao" has been established, linking producers in the Eastern Cone with other production areas of Lima.
- There is an increase in the farmers' own consumption of healthy organic vegetables and increased local sales to neighbours.
- The original group of organic producers is beginning to train other farmers.
- Organic production has restored farming as a profitable means of earning a living. Data from 5 farmers growing on 0.25 ha show that they now sell S/.2,800 (approximately $930) monthly during the lower demand winter period (vegetable consumption increases in summer).

Nevertheless the participating organic producers identify several issues still to be dealt with. The farmers need to:

- Better exploit their proximity to diverse city markets
- Improve their organisation and crop planting planning to respond better to increasing demand. (The SWOT analysis conducted by producers themselves points to communication, perseverance and responsibility as weaknesses.)
- dedicate themselves full-time in the future, to respond to developing markets, with part-time producers supporting production from small plots
- continue to develop production technologies, such as installing more efficient irrigation and crop protection practices
- Use more widely those technologies which have already been locally tested and implemented to improve poor urban irrigation water quality.

Notes

1) The Consultative Group on International Agriculture Research (CGIAR) is a unique global partnership that works to promote food security, poverty eradication and the sound management of natural resources throughout the developing world. The International Potato Center, which is one of fifteen Centers sponsored by the CGIAR, convenes the Urban Harvest System-wide Program.

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Urban Harvest

Group photo of the organic producer organisation of Huachipa after the school

From page 45

was less severe than in the rural areas, pig breeders managed to prevent their pigs from contracting African swine fever, and the federation has been active in joint breeding and the exchange of feeding and breeding innovations. The city even has a livestock bank that supports the reactivation of animal breeding in the rural areas. In December 2006, the federation of pig breeders organised several exchanges with rural animal breeders and offered them 117 female piglets of good stock.

Encouraged by these results from farmers' action research on endogenous practices in breeding and prevention of African swine fever, the federation, which currently has 112 members, further embarked on the fattening of piglets (purchased at 2 months and sold at between 5 and 8 months). Fattening piglets for sale will be a major activity in the forthcoming years and is currently taking place at three pilot sites in Bukavu.

Animal breeding in the city provides small incomes to households engaged in this activity. To reduce the constraints encountered by these households, urban breeders pooled their efforts and developed exchanges which resulted in the validation of feed recipes to prevent swine fever, with the backing of action research undertaken by the Diobass Platform. However, animal breeders need to further develop strategies to jointly access credits and be able to boost their viable micro-enterprise initiatives.

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Urban Agriculture as a Social Justice Change Agent and Economic Engine

Growing Power is a national non-profit organisation and land trust that supports people from diverse backgrounds and the environments in which they live. Growing Power provides hands-on training, on-the-ground demonstration, outreach and technical assistance through the development of Community Food Systems that help people grow, process, market and distribute food in a sustainable manner.

Growing Power

Youth Corps at the Chicago Avenue Community Garden

Growing Power was established in 1998 as Farm-City Link, a farmer-operated greenhouse and small farmers' cooperative located in Milwaukee, Wisconsin, USA. It was formed to assist small farmers in their efforts to compete for business contracts with wholesale buyers. Soon the property's owner and farmer, Will Allen, began to field requests from the community to install gardens, often with youth involvement at the core of the programmes. Supported by Heifer International, Growing Power established the first youth project consisting of youth training in and production of aquaponics and vermicomposting.

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PROFITABLE AND SUSTAINABLE

Vermicomposting is now at the core of Growing Power's vision and activities to make urban agriculture a viable option in cities. Compost is the key to viable farming. Nutrient-rich waste and organic material are sourced from local restaurants and food wholesalers and are broken down by worms to produce a sustainable fertiliser that outperforms synthetic fertilisers. Growing Power embraces reuse, recycling and reclamation in its economic and ecological model for intensive production.

Allen has combined his knowledge of farming and his understanding of the city as a series of interconnected food and ecological systems to develop an urban food production system. Part of Growing Power's philosophy is that there is always more than one right way to do things, and that a variety of solutions offers community members options. The multi-cultural nature of the organisation and its policy that everyone is welcome and valued lead to innovations and new approaches as additional perspectives and skills are shared.

"Growing Power inspires communities *to build sustainable food systems that are equitable and ecologically sound, creating a just world, one food-secure community at a time".*

Growing Power greenhouses are made of salvaged frames from local nurseries and farms that were unable to compete with large-scale industry. These greenhouses have several levels of plant growth: hanging baskets (for pea shoots, sunflower sprouts, rugula lettuce and Bull's Blood beets), pots partially submerged in water in aquaponic systems, and beds edging along the sides. In one of the greenhouses a swimming pool serves as a water reservoir and home for tilapia fish. They clean the water, which is drawn upward to the top of the structure to flow down through the growing levels.

The hoop greenhouses used by Growing Power are unheated and draped with shade cloth in the summer for cooling. Growing Power has developed so-called "Living Biological Worm Systems" to grow food in the winter months using the "hoop

Grant Park Potager

within the hoop" method of hot beds covered with mini hoops to preserve heat that is generated from the composting process. Growing Power's Living Biological Worm System approach is an active learning tool to teach young people and adults the importance of closed loop systems and how to grow food in urban soil and depleted/contaminated spaces.

All of this leads to an important economic reality: this type of year-round production has a yield value of nearly $200,000 per acre per year! This type of production is labour intensive, but that labour means jobs in urban environments.. It also translates into healthy, sustainable produce for local restaurants, which allows them to spend more money on healthy food and less on shipping produce from California or international sources. Nearly every aspect of the organisation's production, programmes, and products directly benefits the local community. Some of the most under-served populations in the United States are starting to produce their own food. In addition, facilitators across the nation and around the world are being trained to set up similar community food centres in their own communities (most recently in Skopje, Macedonia).

URBAN AND RURAL

The Growing Power Community Food Centre is the last remaining farm and greenhouse operation in the City of Milwaukee. It is currently owned by Growing Power Director, Will Allen, but plans are being developed for the organisation to purchase the property from Allen in order to build a new premise where it can expand its training, youth development and food processing capacities.

The property in Milwaukee currently includes six greenhouses, three hoop houses, a small retail store, a utility building, a small barn that houses some of the livestock and the beekeeping operation, outdoor pens for livestock, and a large plot of land on which the first stage of the organisation's sophisticated composting operation is located. The centre offers opportunities to a wide array of city stakeholders to learn from and participate in the development and operation of Community Food Systems.

In addition to this urban centre, Growing Power has a rural farm site in Merton, Wisconsin. On this 17 hectare parcel of land Growing Power hosts the Immigrant Farming Project and the Food and Fitness Initiative with the Greater Milwaukee Boys and Girls Club. Two hectares of this rural farm are devoted to intensive vegetable production. The rural site compliments the urban facility. In addition to growing the vegetables sold at the market, it houses a herd of meat goats, raises pasture poultry, cultivates grasses for the variety of animals on site and produces large volumes of compost.

ACTIVITIES

Growing Power's projects fall essentially into three areas (consistent with its objectives):

Training: On-site workshops and hands-on demonstrations are given in Milwaukee and Chicago.

Technical assistance: Training and assistance in project development focus on the development of Community Food Centres and on transforming urban areas into gardens and urban farms. This includes national and international outreach to farmers and communities.

Food production and distribution: Food production takes place in the organisation's urban demonstration greenhouses and on the rural farm site. The distribution of produce and value-added products takes place through the Rainbow Farmers' Cooperative and the year-round food security programme: Farm-City Market Basket Program (including Community Supported Agriculture);

Growing Power undertakes community outreach through education programmes that show how the organisation is contributing to the availability of locally grown, fresh, safe and healthy food that exceeds certified organic standards. This food is supplied to Chicago's farmers' markets, Farm-City Market Basket (Growing Power's CSA-style food security programme) and partners in procurement contracts. All of these activities provide important opportunities for individuals and communities to network as they work together to promote food security and environmentally sound food production practices.

A number of factors are currently contributing to the need for training programmes for emerging producers: available land, growing consumer demands for food safety and environmental responsibility, and the increasing interest among the youth in growing food and new employment opportunities.

MILWAUKEE

Growing Power serves as a "living museum" or "idea factory" for the young, the elderly, farmers, producers, and other professionals. Over the last ten years, Growing Power has developed a number projects in Milwaukee.

- ***Growing Power Youth Corps:*** This is a year-round, youth leadership programme offering both academic and professional experience in Community Food System development and maintenance. Young people from primary school through college work at the Growing Power Community Food Centre during the summer and gain competencies in all active demonstration areas of the facilities.
- ***"Urban Farm Girls" Program (launched fall 2005):*** A diverse group of young women, ranging from 7th- to 11th-graders, from eight different schools attend weekly meetings and plan, grow, and market their own crops and value-added products.
- ***Farm-City Market Basket Program (FCMB):*** This is a weekly, year-round, food security programme that supplies safe, healthy, affordable vegetables and fruit to communities at a low cost. The programme effectively increases city residents' access to affordable food, while providing a viable market for small farmers and urban gardeners in which to sell the food they grow.

- ***Rainbow Farmers' Cooperative:*** Growing Power helped create the Rainbow Farmers' Cooperative, a network of small family farmers who grow and market food using sustainable techniques.
- ***Growing Together: Community Food Systems "From the Ground Up":*** This is a national, grassroots training programme of neighbourhood-based food and gardening projects.

> ***A Community Food Centre*** provides wonderful spaces for hands-on activities, for large demonstration projects, and for growing a myriad of plants, vegetables, and herbs. A space no larger than a supermarket can hold some 20,000 plants, thousands of fish, and a livestock inventory of chickens, goats, ducks, rabbits, and bees.

Demonstration and training modules include:

- ***Large- Scale Food Residue Processing.*** Using aerobic and anaerobic digestion methods, food waste is diverted from landfills and made into organic compost, which is then used in local community garden and urban agriculture projects.
- ***Vermicomposting and Composting:*** These "living" systems are composed of carbon residue, customised microorganisms, minerals, and red wriggler worms. The resulting "material" is remarkably fertile, giving plants access to the nutrients needed for both plant growth and for human nutrition.
- ***Aquaponics:*** A closed-loop plant and fish growing system that can be utilised in small spaces, with minimal cost and maintenance. Growing Power does not use chemicals or artificial additives in this system.
- ***Living Skills:*** A training series on food production, processing, marketing and distribution, utilising year-round horticulture, agriculture, composting, vermiculture, and aquaculture techniques.

CHICAGO

In 2002, Growing Power opened a Chicago office to assist urban agriculture initiatives in the Chicago area. It currently operates three urban agriculture farming projects, delivers to eight Farm-to-City Market Basket drop sites, manages an active stall at the Green City Farmers' Market and delivers local produce to premier restaurants. In addition, Growing Power is involved in food policy issues via the Chicago Food Policy Advisory Council and provides guidance to thirty high school and four college interns and one apprentice. Their projects include the following:

The Grant Park Urban Agriculture Potager (Urban Farm) partnership with the Chicago Park District is proving that the social benefits of urban agriculture reach beyond local food miles and food security and encompass youth economic development and education. This edible garden of 1850 square meters in the midst of Grant Park has over 150 varieties of vegetables, herbs and flowers, and it is used as a hands-on educational site for 10-30 youth interns, sponsored by the City of Chicago's After School Matters programmes

El Conuco Farmers' Market in Chicago's largest Puerto Rican neighbourhood is in its first season. Growing Power is the primary vendor at the market and another youth project, God's Gang, also sells produce at this market. Customers are beginning to ask for produce that is more specific to Puerto Rican cuisine, such as "Recao", a staple herb. It is a challenge to find new farmers who are willing to produce these vegetables and sell them at a small and developing market.

The Jackson Park Farm Site and Education Center was established in June 2007. Most of the site is dedicated to production for Growing Power and community farming. Supported by Growing Power's Chicago Youth Corps, community members learn gardening basics and apply the Living Biological Worm Systems. The Chicago Youth Corps is a year-round teen development programme. Teens work five days per week for 4.5 hours per day in the summer months to learn both farming skills and "soft" job skills, such as appropriate communication skills for the workplace, conflict resolution, and teamwork. This year during the spring and fall, these teens helped develop a food literacy campaign to inform other teens about local agriculture and healthy food options. They produced a button with the slogan "Turnip the Volume on Vegetables", and painted a mural at the office in Chicago.

GROWING FOOD AND JUSTICE FOR ALL

This Initiative, hosted by Growing Power, is an new comprehensive network that views dismantling racism as a core principal bringing together social change agents from diverse sectors that are working to bring about new, healthy and sustainable food systems and support and build multicultural leadership in impoverished communities throughout the world.

Coupled with our vision for social and food justice, Growing Power has a vision to share and help others grow food where we all live, thereby decreasing our reliance on petroleum-fuelled industrial farming while maintaining technically complex and flourishing biological production systems that are accessible to all people regardless of economic circumstances or environments. This is the future of agriculture: using natural processes to create highly productive, urban food sources, and introducing healthier alternatives for people and the environments in which the systems are implemented.

Youth Corps at the Chicago Avenue Community Garden

Growing Power

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Selected Appropriate Technologies for Urban and Periurban Agriculture

Urban and periurban agriculture requires the use of appropriate technologies that reduce environmental impacts, are easy to implement by the urban farmers, are low-cost, and use local inputs. Since 1996, the United Nations Food and Agriculture Organization (FAO) has been promoting the use of a number of appropriate technologies.

Gilda Carrasco.

Seedbed in Toril

The technical teams of the urban agriculture projects that the FAO implements in Latin America and the Caribbean together with the beneficiary urban farmers have validated a series of procedures as good practices for planting and harvesting fresh, healthy and clean food. This was done by using participatory methodologies in a "learning by doing" approach. Several farmer-oriented technical manuals have been developed and are also available (1).

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The FAO recommends that the following elements be taken into account in each **production and training component** of a project on urban and periurban agriculture for household consumption and on the generation of income through the commercialisation of surpluses:

1. Selection of crop species
2. Sustainable use of local seeds and efficient forms of propagation
3. Sustainable use of irrigation water
4. Sustainable management of soil and substratum
5. Efficient use of space
6. Plant nutrition
7. Comprehensive Pest and Disease Management (CPDM)
8. Protection from adverse weather conditions

Together with the urban farmers, the FAO has identified, for each of these elements, a series of innovative and appropriate technologies. This article describes just a few of these technologies that have been validated by the urban farmers: floating seedbeds in central Chile, solar tents in El Alto, Bolivia, mulching of family plots in Medellin, and the use of plant-based biopesticides in Bogota, Colombia.

FLOATING SEEDBEDS

Small urban gardeners in the central area of Chile, with the support of agronomy students from the University of Talca and the FAO Regional Office for Latin America and the Caribbean (Carrasco and Izquierdo, 2005), have developed a system of floating seedbeds. This technique guarantees more vigorous and resistant seedlings as well as efficient use of the seeds, thereby improving crop yields.

The technique has long been utilised by the tobacco industry to obtain tobacco transplants under sophisticated conditions and to sterilise soil using Methyl bromide (a practice that is now prohibited). The simplified floating seedbed "method" was designed for urban and periurban farmers as a way to achieve high-quality seedbeds and transplants of different vegetable species.

The floating seedbed, also known as the floating system for seedling production, is a hydroponic technique that can be

implemented on a large scale to obtain seedlings for transplantation either into another hydroponic system or into the ground. The advantage of this system is that seedlings can be produced in a reduced space, which is especially useful in urban or periurban areas.

This technique consists of building a shallow (20 cm) pool, which is filled with a nutritional solution; on top of this, seed trays or plastic bottles are placed horizontally, and filled with substratum, in which seeds are planted. This facilitates irrigation and fertilisation. Currently, it is possible to cultivate all types of horticultural and ornamental plants, independently of the end system that is chosen: nutritional solution, substratum or soil.

Gilda Carrasco.

Broccoli in two cell sizes

Floating seedbeds must be located in a protected environment that is free of frost, so if located in the open air they are placed under a tunnel of polyethylene, or they are placed within a greenhouse. In a protected environment, the temperature conditions allow for an earlier and more uniform emergence of the seeds planted in the seedbed.

If a small farmer has to produce, for example, 500 lettuces per week, he will need to seed two seedbeds per week. Each seedbed costs USD 4 to produce and lasts at least two years. The procedure can be simply and easily adapted to the farmer's conditions: if he has a small greenhouse or plastic tunnel, the seedbed could be located there, or if he just has a plastic structure or a small shed, he could install the transplanting area in this location.

MULCHING: PROTECTING CROPS

Mulching technology has long-proven benefits and is especially recommendable for urban agriculture in arid or desert areas of Latin America. The technology comes from old research on crop management and soil conservation by North American and European universities.
In general, mulching consists of covering the soil with organic and inorganic materials at a thickness of 5 to 10cm. This technique has many benefits, the most important of which are that it:

- protects the soil from extreme temperatures and brusque weather changes,
- keeps the soil temperature constant, which in urban areas helps prevent bad odours on patios and terraces caused by decomposing organic material
- maintains soil structure, since in pots or containers the soil or substratum tends to become compact due to the impact of water drops from rain and irrigation
- saves water: mulching conserves moisture in the soil, preventing evaporation
- reduces the intensity of maintenance work, since it helps prevent the proliferation of weeds.

The material used to make mulch from plant remains can be found on the patios or on nearby land including places where municipal garbage is dumped. Grass cuttings, newspapers, ground-up paper, dry leaves, and other plant-based materials are excellent sources of mulch for home gardens.

The time of year to apply the mulch depends on the results that one wants. The application of mulch as an insulation between the soil and the air moderates the soil temperature. This means that the soils that are mulched in the summer will be fresher than those without any coverage. In winter, mulching prevents the soil from freezing deeply, acting as a layer of insulation.
Mulch has been used for decades in traditional agriculture and was recently recast as a part of urban agriculture. Aside form the advantages that it offers in terms of caring for and protecting UPA crops, the different kinds of mulch can be combined in order to enhance the aesthetic beauty of crops. In the city of Medellin, 200 urban farmers, beneficiaries of the emergency project of the FAO and the Italian Cooperation in Colombia, grow eggplants and peppers on wooden beds or recycled containers in their family gardens. They use straw and grass mulching cut into little pieces to prevent the soils from dehydrating in the high temperatures. This technology has been promoted by the FAO through community farms or Demonstrative and Training Centres (DTC), where technicians use "learning by doing" techniques such as seeding, transplanting, composting, harvesting, and integrated pest management (IPM). These technologies were previously validated at the DTC. Similarly, the use of mulching is a common practice for the 80 periurban strawberry growers in the coldest areas of Uruguay, who are working with the FAO in an urban agriculture project. Here, the mulch material is used to protect the harvest during the winter to prevent the plants from flowering too soon. The plants that have early flowers are damaged by the cold during the beginning of spring. The mulch also helps keep the strawberry plants in the fields clean by protecting them from soil particles when it rains.

SOLAR TENTS IN THE ALTIPLANO OF THE ANDES

In cities characterised by low temperatures, frost, hailstorms, snowstorms and scarce availability of water during much of the year, agricultural production in open fields is very difficult. Still one can find urban and periurban agriculture here. It is possible to overcome the limitations imposed by nature, by building protected environments or greenhouses. In the Altiplano they are also called solar tents, and some families with more affection for the Aymara language call them "juntu uta", which means warm house. They provide an alternative space for growing fruits and vegetables, aromatic plants, medicinal plants, flowers and other crops.

With a lot of wind, a tunnel-type tent is recommendable

The Municipal Government of El Alto, the third most populous city of Bolivia, and the FAO (supported by Belgium) have together been implementing this technology since 2003 at an altitude of more than 4000 metres above sea level. The solar tents accumulate heat during the day and give it off slowly during the night, in this way avoiding frosts and low temperatures that could damage the crops. It is important to remember that low and high temperatures do not allow for the normal development of crops. In the greenhouse, the growth of the crops is accelerated. The following are some of the many advantages of this system.

1. The yields are greater because a larger quantity of products are obtained in less space; up to 50 plants of different species have been planted per square metre, using all of the interior space of the tent.
2. It improves the quality of the crops, because it reduces certain problems like pests and diseases.
3. Temperature and humidity can be controlled, primarily because inside the greenhouse water does not evaporate rapidly.
4. Different production systems can be used. Hydroponics has also produced good results in solar tents, and therefore the crops can be organic and/or hydroponic.

The solar tents are just normal greenhouses with walls made by adobe blocks and black bodies made by painted bottles full of water. Experience shows that in areas with a lot of wind, a tunnel-type tent is recommendable, (10 metres long and 4 metres wide), while the model attached to the house performed best.

Juan Jose Estrada

Inside the solar tent. Hydroponic and organic farming

Juan Jose Estrada

Hanging tent. Municipality of El Alto, Bolivia. Household micro-garden project GCP/ BOL/035/BEL

The materials used by the urban farmers in El Alto are low cost and available locally. The walls are built with stones, mud and adobe, the roof has a wooden frame using mainly logs and a few strips of wood, and the roof covering is polyethylene agrofilm (with 250 micras of UV protection).

In training workshops undertaken in 2004, 10 solar tents were built by all of the participating farmers. At the beginning, the production was done collectively, but some started replicating the technique in their family gardens, by adapting their domestic area for the solar tent. Farmers and the technical team reached the conclusion that the key aspect of production within the solar tents is management: maintaining proper temperature and humidity, keeping a schedule of when to open and close doors and windows, and above all carefully handling the agrofilm. Taking care of all of these items will allow a tent to have a useful life of at least 10 years.

Spreading the concept is important but public policies are necessary

The problem of frost and low temperatures can be reasonably managed using disposable plastic bottles painted black, barrels of boiled water, thick and dark covers, rustic sawdust stoves and other methods.

PLANT-BASED BIOPESTICIDES

In the San Vicente neighbourhood in Tunjuelito near Bogota, Colombia, 25 urban producers, supported by the FAO Telefood fund, grow garlic in the grooves of their wooden beds and containers. They use the garlic extract in dry times to control mildew on potatoes and tomatoes, and to repel slugs and other leaf eaters.

In a family garden or when raising small animals, there are always micro-organisms and invertebrates that threaten the proper development of the plant or animal species. This is a problem even in the city, where the presence of these organisms may be more limited, but where their management has to be more rigorous and properly-done to prevent the intoxication of people and animals, the pollution of water and soil sources and damage to property through the misuse of agro-toxins.

In household and urban agriculture, daily monitoring is the best prevention, however when there are sudden temperature changes in the crops, this can trigger a growth in the population of some pests that have to be controlled with a more effective treatment. In their own homes, farmers can make simple preparations from plants to control small outbreaks of insects.

Nowadays, there are many recommended ways to achieve the holistic management of pests and diseases. Many of these have been scientifically proven to be effective, and many are the product of traditional know-how and experience. There is still much research and field testing that needs to be done with these formulas; however, the most important innovation has been the change in attitude of the urban farmers regarding the use of sustainable and cleaner technologies in the phytosanitary management of the crops. There has been a clear trend towards the use of local biodegradable and more economical inputs.

CONCLUSIONS

Urban and periurban agriculture provides food and income and is therefore important for poverty alleviation. Urban and periurban agriculture can have an important impact on the food and nutritional security of urban families if the production yield in family and community gardens can be guaranteed. This requires appropriate and simple technologies that are low cost, easily adopted and replicated by the farmers, , and above all environmentally safe. This is how Chilean, Uruguayan, Colombian and many other urban farmers in the world, in the described cases supported by the FAO, have managed to validate cleaner, innovative and appropriate production techniques that facilitate the incorporation of food production in their household dynamics. This has allowed them to, above all, reap good harvests that they consume at their tables, exchange with neighbours, and even sell in local markets.

Notes
1) Visit http://www.rlc.fao.org/es/agricultura/aup/tecno.htm

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The Suburban Farm: An innovative model for civic agriculture

Innovative US developers are integrating farmland into their residential areas (subdivisions), providing space for food production and linking residents to their farmer-neighbours, with positive consequences for both. Suburban farms can be an important part of a sustainable regional food system.

Nevin Cohen

Farming is an integral part of Prairie Crossing

Growing concerns about the negative environmental and social impacts of the agro-industrial food system have led to the rise of an oppositional movement promoting alternative food systems, shortened food chains, or what is broadly defined as civic agriculture (Feagan, 2007; Lyson, 2000). Civic agriculture implies a commitment on the part of producers and consumers to developing and strengthening a sustainable system of agriculture and food production and distribution that relies on local resources and serves local markets. The institutions that make up a civic agriculture system are a part of the local economy, produce and sell food that matches the ecological and cultural needs of the community, are small-scale, not capital intensive, and rely on the knowledge of the individuals who live in a particular place (DeLind, 2002).

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Civic agriculture includes flexibly organised farms and food producers, including urban farms. On the retail side, civic agriculture comprises various forms of direct marketing, such as farmers' markets, community supported agriculture (CSA), or cooperative production and distribution, all of which closely connect food producers and consumers.

CIVIC AGRICULTURE AND CIVIC SPACE

This civic engagement is critical and is related to the locality in which civic agriculture occurs. Specific spaces that bring producers and consumers together, like a weekly farmers' market, can help restore a sense of community to a city or town (Feenstra, 2002; Norberg-Hodge et al., 2002; Allen, 2004). Creating social spaces for civic interaction is an important part of fostering civic agriculture and the creation of successful food system alternatives (Feenstra, 2002). And, according to DeLind (2002), civic agriculture has the potential for "grounding people in common purpose" and for "nurturing a sense of belonging to a place and an organic sense of citizenship."

THE FARMING SUBDIVISION

The farming subdivision is an innovative response to the desire to foster civic agriculture. A small but growing number of residential developers are producing housing subdivisions designed from the start to include working farms (Munoz, 2007). These farmland subdivisions are geographically dispersed, and are built in both suburban and more rural locations. The type of farming practiced varies, too, from simple haying to diversified organic vegetable farming. In comparison to traditional subdivisions, they have numerous potential environmental benefits, including land conservation, land restoration (if organic growing methods are used), and production of food destined for local markets. They also provide social benefits as well. Residents in developments with common spaces report that the shared open space in these communities enables them to meet and connect with other people (Plas and Lewis, 1996).

By bringing homeowners and farmers together in a cohesive community, these types of developments also have the potential to reduce the physical and emotional distance that has grown between consumers and food producers.

By carving out farmland and farm markets in the midst of homes, these communities offer spaces for individuals to interact with their neighbours and with the people growing and selling food, thus contributing to the development of a civic agriculture system.

FARMING VENTURES AT PRAIRIE CROSSING

Prairie Crossing is a 267 ha residential development with 359 single-family homes and 36 condominiums, located 60 km north of Chicago (but considered suburban, since many commuters live here). It is an excellent example of the farming subdivision. The project was built on farmland. Designed from the start as a conservation development, it features clustered homes and approximately two-thirds of the land is set aside for open space, ecologically-restored wetlands and prairie grasslands, two commuter rail stations that connect to Chicago, and (62 ha) organic farming activities (Prairie Crossing, 2007).

The area supports Sandhill Organics, which is a small, organic, family farm enterprise, on approximately 16 ha. Sandhill Organics relies on a CSA model to sell its produce, with CSA shares providing approximately 60% of its annual $300,000 revenue, and farmers' market sales accounting for another one-third. In addition to leasing land to Sandhill Organics, the subdivision also supports a 1.2 ha educational farm on the site that works with 375 students from two local schools. An additional area of farmland has been set aside as a beginning farmer incubator programme, enabling individuals interested in becoming farmers to develop business skills and gain experience on relatively small parcels. The incubator programme is in its second year, with five beginning farmers who have been recruited through informal networks growing food on approximately 2 ha parcels a piece.

Farming in Prairie Crossing, as in many suburbanising communities, presents logistical challenges. One common concern, according to Sandhill Organics, is that the agricultural infrastructure does not exist in this community in the way it would in a more rural community. On the other hand, farming in a more densely populated community also has its advantages. Among the biggest advantage is Sandhill Organics' proximity to its markets.

Residents interact with the farm in a variety of ways because the farm is a point of interest in the Prairie Crossing landscape. A walking trail on a rise separating the homes from the farm enables residents to look over the working landscape. The farmers' market has become an important meeting place for the community. Residents can interact more actively by helping with farm chores. A little over one-quarter of those residents surveyed reported that they had volunteered on the farm at least once (Watson, 2006).

The owners of Sandhill Organics go so far as to say that they have more in common with the people who live in Prairie Crossing than with the handful of nearby farmers they know. They think of themselves first as neighbours to the people who live in Prairie Crossing and second as the community's farmers.

CONCLUSIONS

As a farming subdivision, Prairie Crossing embodies many of the values of civic agriculture. Farming is an integral part of Prairie Crossing, with homeowners and farmers interacting as neighbours, friends, and food producers and consumers. Residents have a close physical connection to the farmland through trails and roads that border and cross the farm, and have a connection to the process of farming. The farm itself is embedded in the identity of the community, serving as an important common space. In addition, Sandhill Organics is clearly part of the economy of the development itself. By growing food organically, the farmers are meeting the conservation goals of the community as well as satisfying the tastes of Sandhill's customers.

An important feature of civic agriculture is that it is a system of food production "characterised by networks of producers who are bound together by place (Lyson, 2004)". As one of a growing number of organic produce farms in Northern Illinois, Sandhill Organics is an integral part of the region's diverse, civic network of family farmers.

If Prairie Crossing does nothing more than to increase the connection of residents to their food system and demonstrate the feasibility of integrating organic farmland into the growing number of suburban and exurban residential communities being developed across the nation, it is likely to move us a small, incremental step towards food system reform. By participating in and supporting alternative agricultural models, such as communities built around small farms, both consumers and farmers help to create an opening for more significant restructuring and transformation.

Prairie Crossing is a unique project, the challenge for planners and developers is to design truly affordable versions of the farming subdivision that accommodate a diverse population and fit into a wider variety of residential communities, including older suburbs and urban neighbourhoods undergoing redevelopment.

Diffusing the farming subdivision innovation throughout the residential development industry would require the education of planners and developers about the financial feasibility, marketing advantages, and public benefits of these types of developments. The US Green Building Council's Leadership in Energy and Environmental Design programme for Neighbourhood Development (LEED-ND) has taken a step in that direction by awarding a credit for projects designed with permanent farms and gardens, helping to legitimise and promote the idea of farming subdivisions. Other organisations, from cooperative extension offices to non-profit land trusts, can educate developers about the value of integrating farmland into their projects, and the methods by which they can do so.

Spreading the concept of a farming subdivision is important, but public policies are also necessary to make it easy, and cost-effective, for a developer to build farmland into a residential project. At the federal level, federal farm subsidies should be shifted to smaller-scale fruit and vegetable growers. State and local governments should set stricter limits on the development of prime farmland surrounding cities, update zoning ordinances so that they encourage conservation developments, and provide financial assistance to developers who preserve, restore and enhance the value of the farmland on their properties.

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Innovative livestock-keeping in Ethiopian cities

As urbanisation increases in Ethiopia, city dwellers are responding in innovative ways to problems of high unemployment and opportunities of high market demand by growing crops and raising animals. Many people in poor families, especially women and youth, take these initiatives because they already knew farming before they migrated to town, or they learned it from others who were farming in town.

Wolfang Bayer

A donkey can earn income through fetching water, flour and other goods

Irrigated vegetable farming in Addis Ababa, Ethiopia's capital, is now partly in the formal sector. Eleven marketing service cooperatives of urban farmers produced almost 12,000 tons of vegetables for the city market in 2006 (Addis Ababa City Government 2006). In contrast, livestock production is mainly in the informal sector. The forms of livestock-keeping differ depending on the space and initial capital available.

SPECIES FOR SPACES

Households with more living space keep dairy cows, sheep, goats, or oxen for fattening, sometimes combined with bees and poultry. Poorer households with less space – usually in rented rooms, with several people living in one room – keep only one or two sheep or goats, or a donkey or chickens.

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Poor urban families that have little to invest usually start with chickens, which need little space, find their feed almost anywhere and bring quick returns for immediate needs. A local chicken costs about 25 Ethiopian Birr (roughly 3 USD). Families with a bit more money for initial investment (about 50 USD) buy a donkey, which can earn income through fetching water, flour and other goods.

Livestock-keepers in the larger towns face problems in obtaining feed and water for their animals. Another problem is conflicts with neighbours because of the smell of the animals and the manure. Ruminants (cattle, sheep and goats) often have intestinal problems because, to supplement their daily rations, they scavenge in urban wastes and sometimes eat indigestible plastics.

INNOVATION BY NECESSITY

In many large regional towns and cities in Ethiopia, e.g. Mekelle in Tigray Region, the municipal governments are gaining interest in urban farming. As part of their poverty-reduction programmes, they encourage urban dwellers, especially the poor and formally unemployed, to raise "fast-return" animals. In some cases, even some technical advice and veterinary services are provided for urban livestock-keepers.

Most of the urban farmers, however, still have to depend primarily on their own knowledge and ingenuity. Faced with many problems of keeping animals in the cities, they have been obliged to find innovative ways of obtaining animal feed, water and medicines.

Some urban farmers collect residues from local beer-making, flour-mill dust, grain residues etc to use as feed. Some collect grass or tree foliage from woody areas in and around the town. Others access feed by taking waste from vegetable markets; this also helps to keep the marketplaces clean.

Only better-off urban dwellers can afford to give tap water to their animals.

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Although the water of rivers and streams is often polluted, many poorer livestock-keepers use these sources, but they prefer to use springs. Some have innovated by feeding residues from local beer-making, which have high water content.

Most urban farmers of rural origin have traditional knowledge about treating animal diseases, e.g. chopping and mixing local plants to control lice in chickens; or using the flesh of Ire (an Aloe species) to treat bloat in cattle. Some farmers without traditional knowledge use modern (chemical) human medicines such as Ampicillin and Tetracycline as an immediate measure for sick sheep or goats.

People who keep large ruminants (especially cattle) sell the manure for use as fuel or compost, or use it at home to reduce their fuel expenses. Youth groups collect manure and other urban waste from city streets and compounds and make compost that they either use in gardening or sell to other growers of vegetables or flowers.

RURAL LEARNING FROM URBAN LIVESTOCK-KEEPERS

Innovations made by urban people are showing also rural people new possibilities. Grazing by unattended livestock is a problem in many parts of rural Ethiopia. Without extension support, urban livestock-keepers have developed systems of tethering and cut-and-carry feeding. Government extension agencies use these urban examples to show farmers living near towns the importance of controlled grazing. Also the innovative feedstuffs such as vegetable wastes provide examples to rural farmers.

In some cases, the women's and youth groups keeping livestock in towns, e.g. in Addis Ababa and in some municipalities in Tigray Region, have been successful in building up their animal numbers. Some youth have accumulated so many animals that they want to go back to rural areas to have easier access to feed and more space for the livestock. This illustrates the cycles of innovation and development in urban farming that can even lead to urban-to-rural migration.

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Yilma Getachew 1950-2007

Yilma Getachew, sharing experiences on vegetable farming in Addis Ababa, Ethiopia

It is with great sadness that we announce the loss of Yilma Getachew who passed away in 2007. For all those of us who were fortunate enough to have worked with such a dignified and knowledgeable practitioner, there is no questioning the prolific role that Yilma played in the development of urban agriculture, as an activist, researcher, teacher, innovator and pioneer of the urban field. With over thirty years of work experience as a researcher, lecturer, rural development practitioner and writer Yilma dedicated his life to food security issues and in particular the development of innovative grass root technologies in both the rural and urban settings. But his greatest passion was the small food-producing garden. Growing walls, container gardening, intercropping with legumes, basket composting, manure tea and organic waste recycling were some of the technologies that he promoted but always holistically and in one garden or on one plot. Yilma's greatest challenge was to develop gardens that could sustain poor families on the smallest possible plot size, using an approach that Yilma referred to as bio-intensive gardening. His own homegarden in Addis Ababa bore testament to this approach.

A. Adam-Bradford

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Books

Facilitating multi-stakeholder partnerships: Lessons from PROLINNOVA

Critchley W, Verburg M & van Veldhuizen L (eds). 2006. Silang, Cavite, Philippines: International Institute of Rural Reconstruction (IIRR). 55pp.

Small-scale farmers often have good ideas, but in order to maximise the rewards, these ideas need to be shared. To address this, the Prolinnova programme brings multi-stakeholder partnerships to the fore. It proposes that effective collaboration between farmers, researchers, extension staff and marketing professionals is essential in turning a good idea into an innovation with widespread benefits. This concise booklet looks at ways to foster participatory innovation development (PID) at a regional, national and global level, drawing on lessons from Prolinnova projects in Africa and Asia. Development professionals interested in the mechanics of agricultural innovation and management will find this a useful, readable resource.

http://www.prolinnova.net/fmsp-booklet.php

Recognising local innovation: experiences of PROLINNOVA partners

Wettasinha C, Wongtschowski M & Waters-Bayer A (eds). 2006. Silang, Cavite, Philippines: International Institute of Rural Reconstruction (IIRR). 64pp

Although far-removed from the high-tech laboratories of formal academia, small-scale farmers are agricultural researchers in their own right and as sources of creativity and good ideas, they should be admired as valuable partners in innovation. This Prolinnova booklet aims to raise the profile of these talented farmers. Four case studies (Ghana, Ethiopia and two from South Africa) are complemented by sections on identifying, celebrating and sharing innovations from both men and women, laying the foundations for a new era of farmer-led participatory research.

http://www.prolinnova.net/rlinnova-booklet.php

Farmer innovation in Africa: A source of inspiration for agricultural development

Reij C & Waters-Bayer A (eds). 2001. Earthscan, 120 Pentonville Rd, London N1 9BR, UK (earthinfo@earthscan.co.uk). 362pp.

One of Africa's major untapped resources is the creativity of its own farmers. This is the main message of this volume of studies on how, despite adverse conditions and lack of appropriate external support, small-scale farmers – both men and women – have experimented and innovated in order to improve their livelihoods. Numerous lively examples show how a participatory approach to agricultural research and development – one that builds on local knowledge and initiatives – can stimulate the creativity of all involved, not only the farmers. This rich source of case studies has been written primarily by African extensionists, researchers and farmers to document and analyse their experiences and to inspire other development workers, researchers, policymakers, students and teachers.

Communication for rural innovation: Rethinking agricultural extension (third edition)

Leeuwis C (with contribution from A. van den Ban) 2004. Blackwell Publishing, CTA

This book is the third edition of "Agricultural Extension", which is published under another title. Since the last edition, the number and type of organisations that apply communicative strategies to foster change and development in agriculture and resource management has become much more varied. This book is aimed at those who use communication to facilitate change in agriculture and resource management. It consists of 6 parts, including part one on "Rethinking Extension" and part three on innovation as a process of network building, social learning and negotiation.

Grassroots innovation

ILEIA. 2000. ILEIA Newsletter 16 (2). ILEIA, POB 2067, NL-3800 CB Amersfoort, Netherlands. 40pp. Downloadable at: www.ileia.org

This special issue of the ILEIA Magazine (now the LEISA Magazine) is devoted to indigenous experimentation and innovation in agriculture and natural resource management, including local innovation in communication about farmers' innovations. It is also available in French and Spanish.

Documentary: "Another world is plantable!"

Buenos Aires, Berlin, Cape Town

In the film series, "Another World is Plantable!", community gardens in different parts of the world are presented. At the core of the film series are the activists from the community gardens, the gardens themselves, and the visions the activists have of them. They recount how and why their gardens are not just green oases in the middle of the city, but projects that bring into being 'another world'. Please visit: http://eineandereweltistpflanzbar.urbanacker.net/4-1-dokumentarfilme.html

PTD/PID Circular

This is a periodic update on participatory technology/innovation development, aiming to make experiences on farmer innovation, participatory technology and innovation development in ecologically-oriented agriculture and natural resource management more widely known to development practitioners. The circular is published under the PROLINNOVA global partnership programme (see separate rubric in this section). The main part of the circular is an annotated bibliography of publications, including "grey" reports on work in progress. It also reports on past and upcoming events (workshops, training activities, exchange meetings etc.) on-going programmes and networking activities. Back issues of the circular are archived at PROLINNOVA's website at http://www.prolinnova.net/circular.php. Contact Chesha Wettasinha at c.wettasinha@etcnl.nl or prolinnova@etcnl.nl to subscribe to the circular.

Impacts of Urban Agriculture, Highlights of Urban Harvest research and development, 2003-2006

Organised within a research framework that encompasses the themes of Ecosystem Health, Livelihoods and Markets and Stakeholder and Policy Analysis and Dialogue, Urban Harvest presents the impacts of innovative work undertaken in Africa, Asia and Latin America to enhance, the food, nutrition and income security of the urban poor through agriculture. www.cipotato.org/urbanharvest/home.htm

Books

Unlocking farmers' potential: Institutionalising farmer participatory research and extension in Southern Ethiopia

Eijgu Jonfa & Waters-Bayer A. 2005. London: FARM-Africa. 46pp. ISBN: 1 904029 06 X.

This second publication in FARM-Africa's Project Experiences Series draws from work carried out by FARM-Africa and partners to incorporate Farmer Participatory Research into the activities of government organisations involved in developing and disseminating agricultural technologies. The publication presents the key elements that supported the institutionalisation process and the challenges that stemmed from working within bureaucratic procedures. With its focus on the lessons generated by the project, the booklet is essential reading for those working to institutionalise Farmer Participatory Research in Ethiopia and beyond. Available to download at: http://www.farmafrica.org.uk/resources.cfm

Farmer-centred innovation development: Experiences and challenges from South Asia

Kolff A, van Veldhuizen L & Wettasinha C (eds). 2005. Bern: Intercooperation. 155pp. ISBN 984-32-2674-7

Various projects and programmes of Intercooperation (IC) in South Asia promote farmer-centred development of innovations towards sustainable NRM. Approaches such as PTD, farmer-led experimentation, and farmer-oriented extension through Farmer Field Schools are applied in different ways, depending on the institutional capacities, partnerships and prevailing farming systems. In November 2004, IC organised a regional workshop at which representatives of these projects and programmes shared their experiences from Bangladesh, India, Nepal and Pakistan. This publication is based on the proceedings and papers of this regional workshop and provides substantial documentation of the approaches used and the lessons learned.

Enabling innovation: A practical guide to understanding and fostering technological change

Boru Douthwaite. 2002. ZED Books, 7 Cynthia St, London N1 9JF, UK (zed@zedbooks.demon.co.uk).

ISBN 1 85649 972 3. 266pp.

An agricultural engineer takes a critical look at his research work in Asia in designing technologies for and with small-scale rice farmers, and reflects on the many failures in developing "appropriate technology" when there is no awareness of the social processes involved in innovation and technology diffusion. The final chapter is a guide to launching a "learning selection" approach to understanding and catalysing technological change.

Farmer-led documentation for sustainable agriculture and natural resource management

Ruter D, Wuhib E, Lutalo SG, Chavez J. 2007. Kampala, Uganda: Ashek Systems.

Successful development of sustainable agriculture and natural resource management depends on the effective interaction between knowledge and experiences of local farmer communities with expertise of development agents. Development organisations are therefore documenting and sharing local knowledge as an important part of the development process. Farmer Led Documentation (FLD) is an empowering process in which local communities take the lead role in the documentation process.

The potential of using composted municipal water in agriculture: The case of Accra, Ghana

Hofny-Collins AH. 2006. Uppsala, Sweden: SLU Service/Repro

This thesis addresses the relationship between urban waste and agriculture using an interdisciplinary systems approach. The economic, socio-cultural and political and environmental potential for using municipal waste compost (MWC) in urban and periurban agriculture in Accra, Ghana, was explored from different stakeholder perspectives.

Innovative ways of engaging the private sector in provision of municipal services with special reference to selected Sub-Saharan African countries

Osiche M. 2007. In: Local Governance and Development Journal Volume I, Number I, June 2007. Harare, Zimbabwe: Sable Press

The paper examines the role of the private sector in municipal development in Africa. Although the paper is written in a conceptual manner, the use of case studies makes it a more practical subject with a number of pragmatic lessons to be learnt. The discourse identifies the extent, mechanisms and conditions for the efficacy of private sector involvement.

Food and the city in Europe since 1800

Atkins P, Lummel P, Oddy DJ. 2007. United Kingdom: Antony Rowe Ltd.

There has been a rapid urbanisation throughout Western Europe since the nineteenth century. Bringing together studies from across the continent, this edited volume looks at the impact this urbanisation has had upon diets and food systems over the past 200 years. It stresses the fundamental links between food systems, food cultures and food politics on one hand and the key changes in European social history on the other.

Producer organisations and market chains: Facilitating trajectories of change in developing countries

Edited by: Giel T, Bijman J, Oorthuizen J. 2007.

320pp – paperback – ISBN-13: 978-90-8686-048-7

The role of producer organisations in market chains has received increasing attention in recent years, both from governments and donors. In UA-Magazine no. 17 urban experiences were discussed and in 2008 we will seek to focus more on market chains. This book presents various approaches to support producer organisations in terms of providing economic services to their members, with a focus on developing countries. Markets are increasingly fragmented in value chains that link farmers with specific processors, retailers and consumer segments. Several contributions in this book analyse these dynamics in specific value chains, such as the fair trade and organic agriculture and their potential to provide market outlets for smallholder farmers. This book is the result of a Dutch partnership between policy makers, researchers and practitioners organised in a platform called Agri-ProFocus.

Web sites

www.prolinnova.net
PROLINNOVA is an international NGO-led initiative to build a global learning and advocacy network on promoting local innovation in ecologically oriented agriculture and NRM. The focus is on the dynamics of indigenous knowledge, and on how research, extension and other actors in development can strengthen the capacities of farmers to adjust to changing conditions: to develop and adapt their own site-appropriate systems and institutions of resource management. Country/regional programmes have been built up in Bolivia, Burkina Faso, Cambodia, Ecuador, Ethiopia, Ghana, Kenya, Mali, Nepal, Niger, Peru, Senegal, South Africa, Sudan, Tanzania and Uganda, supported by the International Institute of Rural Reconstruction (IIRR) in the Philippines, ETC EcoCulture and the Centre for International Development at the Free University of Amsterdam in the Netherlands.

www.cipotato.org/urbanharvest/home.htm
Here you will find information about the ongoing work of Urban Harvest, the CGIAR system-wide initiative on urban and periurban agriculture. Available in both English and Spanish, the website explains the aims of Urban Harvest and focuses on its activities in Africa, Asia and Latin America. It contains a photo gallery and links to other relevant organizations, and highlights current research and documentation in the field of urban agriculture. A new webpage is currently under construction.

www.cip-upward.org
UPWARD (Users' Perspectives With Agricultural Research and Development) is an Asian network of scientists and development specialists working to increase participation by farmers and other users of agricultural technology in research and development. The UPWARD website provides news and information resources on participatory research and development and innovations for sustainable root-crop livelihoods.

www.leisa.info
The Centre for Information on Low-External-Input and Sustainable Agriculture (ILEIA) is an independent organisation that seeks to contribute to alleviating poverty by promoting agro-ecological approaches. Documentation, analysis and publication of successful experiences in low-external input and sustainable agriculture (LEISA) are the major activities. The website provides access to large, searchable databases on LEISA and PTD.

http://knownetgrin.honeybee.org/
Honeybee Network is a global initiative to give voice to creative and innovative people at the grassroots level. The Honeybee Network is run by SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) in India. The Network has an online database of innovations, primarily from India but also from other countries. Honeybee tries to connect innovators with each other through communication and networking in local languages. Innovations can be submitted via the innovation registry form on the website and, after verification, will be added to the innovation database.

http://km.fao.org/fsn
The Global Forum on Food Security and Nutrition Policies and Strategies (FSN) is an on-line community whose members share experiences, identify resources, provide peer coaching and support and find collective solutions to food security and nutrition issues, focusing on policies. It is supported by the FAO.

http://portals.kit.nl/rural_innovation_systems
The Royal Tropical Institute (KIT) in Amsterdam is an independent centre of knowledge and expertise in the areas of international and intercultural cooperation. The KIT Information Portal – Rural Innovations Systems (RIS) – provides access to free, full-text electronic documents on RIS, both as an analytical concept and a development tool. It is also a unique entry point for all other Internet sources on RIS, including newsletters, discussion groups, websites, bibliographic databases, and directories of organisations and projects. The Institute is a not-for-profit organisation that works for both the public and the private sector in collaboration with partners in the Netherlands and abroad.

www.sustainablefoodcenter.org
The Sustainable Food Center (SFC) supports and is active in local food system development in the USA. SFC teaches sustainable food gardening practices to children and adults; organises markets for locally grown produce in urban areas accessible to low-income residents; donates produce to area food pantries, and develops training courses for individuals and institutions on how to prepare healthy and affordable meals.

www.purple-eu.org/default.aspx?intCategoryId=1095
Periurban regions in Europe are facing extreme pressure on their rural areas. The balance between sustainable open space, sustainable agriculture and urban spatial and economic dynamics needs to be re-established. This demands a combination of European, national and regional policy strategies and objectives. Therefore it is essential to recognise the specific periurban agenda in the new European regulations on rural development and structural funds. Purple consists of the regions Mazovia, Ile de France, Flanders, SE England, Dublin region and Regio Randstad.

http://www.permacultura.cl
On this website on permaculture in Chile you can find and download folders describing practices of intensive organic gardening. Downloading is free, but a commitment to work on a garden or distribute this information to at least two other gardeners is requested.

www.avrdc.org/susper
SUSPER is dedicated to enhancing food security and strengthening and promoting technical and institutional issues relating to periurban agriculture. The project works in four Southeast Asian cities: Hanoi, Ho Chi Minh City, Phnom Penh and Vientiane.

Urban Grown
This is the newsletter of the Kansas City Center for Urban Agriculture. Read more at www.kccua.org/urbangrown.htm

Events

2008 International Year of Sanitation

On the occasion of the launch of the International Year of Sanitation (IYS) on November 21st 2007 in New York the partners of the Sustainable Sanitation Alliance agreed to come up with a short press statement of the SuSanA, which can be found at: www.sustainable-sanitation-alliance.org

13th World Forestry Congress (Buenos Aires, Argentina)

18-25 October 2009

The conference theme will be "Forests in development - a vital balance". You may visit www.wfc2009.org for more information.

14th International Symposium on Society and Resource Management (ISSRM) (Burlington, USA)

10-14 June 2008

ISSRM is the official annual meeting of the International Association for Society and Natural Resources. The theme of the 2008 Symposium, which will be held at the University of Vermont in Burlington, is "People and Place: Linking Culture and Nature", and will focus on the human dimensions of environmental and natural resources issues. Abstracts are due by 8 February 2008. For more information: http://www.issrm2008.org

2008 Greening Rooftops for Sustainable Communities Conference, Awards & Trade Show (Baltimore, USA)

April 30 - May 2, 2008

The conference will raise awareness of the many benefits of green roofs, share new research findings, provide information on the latest designs, implementation techniques and products, and broaden networks while working towards building more sustainable cities through green roof implementation. For more information: http://www.greenroofs.org/baltimore.

Impact Assessment of Land Use Changes (Berlin, Germany)

6-9 April 2008

The conference will bring together scientific expertise on impact assessment, land use and landscape research, environmental economics, agriculture, forestry, rural sociology, urbanisation and the science policy interface. The conference is meant for researchers, political decision makers at national and international levels and professionals. For more information: http://www.sensor-conference2008.eu/

European Climate Conference Rovigo 2008 Climate Protection and Renewable Energy: Medium and Small Communities facing the Challenge (Rovigo, Italy)

2 – 4 April 2008

This conference is a capacity-building event that aims to transfer good practice and know-how from experienced local governments to medium and small communities who are currently starting up with climate protection or busy revising their local action plans. The event is jointly organized by the Province of Rovigo (Italy) and ICLEI –Local Governments for Sustainability, as a follow-up to the conference 'A Future with Zero CO2 Emissions' held in Stockholm in 2006.
More details www.iclei.org/rovigo2008, or contact: rovigo2008@iclei.org

Water and Sanitation in International Development and Disaster Relief, (Edinburgh, Scotland, UK)

May 28-30 2008

This International workshop is sponsored by UNESCO and organised by the University of Edinburgh. A broad range of issues will be discussed, which will be published in proceedings and an edited book. For more information www.lifelong.ed.ac.uk/water_and_sanitation_2008

Workshop on Rethinking Impact - Capturing the Complexity of Poverty and Change (Cali, Colombia)

26-28 March 2008

The objective of the workshop is to draw from the experiences of professionals from multiple disciplines of natural and social sciences regarding evaluation of research aimed at poverty reduction, social inclusion and sustainable development, with particular interest in new methods and metrics and impact assessment efforts supporting learning. For more information: www.prgaprogram.org/riw.

Pollinating our Future, urban agriculture conference (Milwaukee, USA)

28 February – 1 March 1 2008

This conference invites everybody interested in urban agriculture to participate and share needs, experiences, questions, and project ideas. Leading urban agricultural experts from around North America will participate in a series of forums, workshops, exhibitions, presentations, videos and networking opportunities leading up to the actual conference to take place on March 1,. For more information: www.growurban.org.

FAO-IWMI-RAID Second African Forum on Irrigation and Drainage & Regional Workshop on `Informal irrigation: importance and prospects in West and Central Africa' (Ouagadougou, Burkina Faso)

7 - 8 February 2008

The Regional Association on Irrigation and Drainage for West and Central Africa (RAID) will host the forum, which will offer a platform for exchanging experiences and fostering dialogue. More information can be found at the RAID website (http://www.arid-afrique.org) or you may contact the Secretariat at info@arid-afrique.org During the forum, a regional workshop will be organised jointly by FAO, IWMI and RAID, with the main objectives of making a situation analysis of informal irrigation in a few African countries and contributing to the development of joint inventory methodologies to assess its extent, performance and impacts. In addition, the regional workshop will make specific proposals for the sustainable development of informal irrigation in West and Central Africa.

Growing Power Workshop Series (Milwaukee, USA)

January- May 2008

Growing Power is offering two workshops: Growing Your Community Food System "From the Ground Up" and Growing Farmers! Commercial Urban Agriculture Training Programme. The latter training programme will be offered January 12-13, February 16-17, March 15-16, April 19-20, and May 10-11, 2008.

You will learn how to build a profitable farm by developing a business plan. For more information: www.growingpower.org

Urban Agriculture Course – 'Understanding Urban Agriculture (CVFN 410)' (Distance learning)

8 January 2008

Responding to the demand for training in urban agriculture, ETC-Urban Agriculture and the international network of Resource Centres on Urban Agriculture and Food Security (RUAF) are developing a portfolio of distance education courses on urban agriculture in partnership with Ryerson University's Centre for Studies in Food Security and
The Chang School. The courses are offered in two modalities. An accredited course (as part of Ryerson University's education program), which starts on 8 January 2008 and will run for one semester (14 weeks). And a free and self-paced (independent learning) course. This course will be offered starting in February 2008. The materials developed for the university courses will also be offered for free on the RUAF website (www.ruaf.org) and as a CD-Rom.
Please go to www.ryerson.ca/ce/foodsecurity for more information on how to enrol.

Courses by the Institute for Housing

2008

The Institute for Housing and Urban Development Studies (IHS) is an international centre of excellence associated with the Erasmus University Rotterdam. A new series of executive courses for managers and decision makers has been announced, aiming to help them prepare their cities for the future. The executive courses, with a duration of 5 to 10 days, include field trips to European cities. For more information: http://www.ihs.nl/start.htm

IndigenoVeg International policy dialogue workshop (Grahamstown, South Africa)

23-26 January 2008

IndigenoVeg is a EU-funded coordinated action partnership to promote the sustainable production of indigenous vegetables through urban and periurban agriculture in Africa. IndigenoVeg is organising an international policy dialogue workshop on "Production, consumption, poverty alleviation and policy" at Rhodes University (www.ru.ac.za). Next to joint learning, the purpose is to explore synergies and opportunities between the fields of urban agriculture and distil key policy lessons. For more information: www.indigenoveg.org

Emerging Issues Along Urban-Rural Interfaces II: Linking Land-Use Science and Society (Atlanta, Georgia, USA)

9-12 April 2007

This conference was a natural extension of a similar-themed Urban-Rural Interface conference held in 2005 in London, UK. The conference attracted 240 attendees from 16 countries, and the many presenters represented a wide spectrum of perspectives, both academic and non-academic. All of the presentations made at the conference are available at www.sfws.auburn.edu/urbanruralinterfaces

SPIN Cities: Farming Where We Live (Milwaukee, WI, U.S.A)

February 28 and 29, 2008

To equip a new generation of farmers with the know-how to farm commercially without having to own much, if any land, and without having to make a large financial investment, SPIN organises a training for backyard, front lawn or small lot farmers in urban and peri-urban areas. Wally Satzewich, a veteran urban farmer and developer of SPIN, will show how to replicate his success using this unique sub-acre farming system. The cost is $200. To register, contact Roxanne Christensen at 610-505-9189 or rchristensen@infocommercegroup.com or register online at http://growurban.org/schedule <http://growurban.org/schedule> . For more on SPIN, see the article in this UA magazine on page 25 or go to www.spinfarming.com <outbind://60/www.spinfarming.com> .

From page 64

- An analysis of the (mix of) strategies that urban producers apply when faced with water shortages or decreasing water quality and the technical or organizational innovations they develop in this field
- Stories on successful efforts to create alternative water sources for/with urban producers (rainwater collection, recycling grey household water, etc.)
- Well documented cases on (cost-effective) ways to reduce the water needs of urban producers
- Recent experiences with innovative approaches to enhance the safe recycling of urban water for agriculture
- Experiences gained with promoting the integration of agriculture in integrated sustainable urban water and sanitation management strategies

We would appreciate if you clearly mention in your article where these experiences have been gained and who were the main actors involved and the conditions under which the activities were developed. The article also should present clearly the impacts achieved, costs related, problems/challenges encountered and solutions found, the major lessons learnt and recommendations for practioners and/or planners and policymakers.

Articles on urban agriculture submitted to the UA-Magazine should consist of approximately 2,300 words (for three-page articles), 1,600 words (for two-page articles), or 700 words (for one–page articles), preferably accompanied by an abstract, references (maximum of 5), figures and good-quality digital images or photographs. The articles should be written in a manner that can be readily understood by a wide variety of stakeholders all over the world. We also invite you to submit information on recent publications, journals, videos, photographs, cartoons, letters, technology descriptions and assessments, workshops, training courses, conferences, networks, web-links, etc.

Issues of the UA-Magazine planned for 2008

The following other issues will be produced in 2008 and your ideas and contribution of articles are already most welcome:
No. 21: Role of Urban Agriculture in Emergency Situations and Rehabilitation
No. 22: Marketing of Urban Agriculture Production and Chain Development

Of course, all other suggestions and comments on the UA-Magazine are also welcome. Please take a moment to voice your opinion by sending a letter or an email to the editor.

Urban Agriculture Magazine

We invite your contributions to the next two issues of UA-Magazine:

NO. 20: SUSTAINABLE USE OF WATER IN URBAN AGRICULTURE
JULY 2008
Please send us your contribution before: 15 MARCH 2008

Urban and periurban producers need water (year round or seasonally) for irrigating their crops and provision of drinking water to their animals or fish. Apart from rainwater, other sources of clean water are usually scarce. They use the water of streams and canals (with varying degrees of contamination), shallow or deep wells, pipe-born (potable) water, water collected during the wet season in tanks, drums or other storing method, grey water, recycled municipal wastewater (at different stages of treatment) among others. Producers' choices regarding water sources depend on: the intended uses of the water, available and accessible water sources, the price of the water from each source, their degree of contamination and related health risks, the nutrients the water contains, the costs related to the water lifting, storing and distribution equipment needed, the reliability of the supply, farmers' knowledge (e.g. awareness of health risks), among others.

In case of water shortages or decreasing quality of the available water sources (chemical pollution; coli bacteria and helminths, salt, irregular supply), urban producers may apply various strategies, including:

- seeking to enhance access to actual water source
- complement with -or switch to- other water sources (e.g rainwater collection, use of wastewater)
- seeking to reduce water needs (adapting crop choice or type/number of animals, use of shade nets, mulching, production in plastic tunnels, applying water-saving irrigation methods, shift to other production period, etcetera)

These farmers are important in that they provide the perishable vegetables that feed the cities. In a number of cities around the world, urban producers and other stakeholders engage with policy-makers to develop well-integrated sustainable water management strategies that link provision of water for various urban uses (including urban and peri-urban agriculture) with recycling, sanitation and urban environmental management. In Accra, producers, water users, researchers, trainers, NGOs and policy makers regularly meet and work together in a Multi-Stakeholder Platforms or Learning Alliance, to formulate joint vision, strategies, action plans and projects that integrate water, food and environmental sanitation in the context of sustainable city development . These platforms (or this platform) is supported by RUAF and SWITCH.

This issue is a collaborative effort of RUAF (www.ruaf.org), SWITCH (www.switchurbanwater.eu) and SuSANa (www.sustainable-sanitation-alliance.org). SWITCH (Sustainable Water Management Improves Tomorrow's Cities' Health) is an EU-funded consortium of 33 partner organisations from 15 countries that are working on innovative scientific, technological and socio-economic options for sustainable water management in the "City of the Future". SuSANa, the Sustainable Sanitation Alliance, is an open global competence network of more than 50 organisations active in the field of sustainable sanitation and developing joint initiatives in support of the UN International Year of Sanitation (2008), and to contribute to the achievement of the MDGs.

We are interested to receive your article with well documented experiences regarding sustainable water use in urban and periurban agriculture, especially:

Continued on page 63 ▶

In the last issue of the UA-Magazine (no. 18: Building Communities), a questionnaire was included. The main question in this survey was whether you would like to continue receiving the free hardcopy of the UA-Magazine. We need this information to clear up our subscriber database: so if you have not done so already, please answer the questions on the form and send this back to us, or use the form on our website http://www.ruaf.org/renew.html. We would very much appreciate it if you would find some time to also fill out the full questionnaire, which can also be done at our website at http://www.ruaf.org/sitesurvey.html
Many thanks, we very much appreciate your contribution.
The Editor

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STRENGTHENING URBAN PRODUCER ORGANISATIONS

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• ***English-speaking West Africa:*** International Water Management Institute, IWMI-Ghana; email: o.cofie@cgiar.org
Website: www.iwmi.cgiar.org/africa/west_africa/projects/RUAFII-CFF.htm
• ***East and Southern Africa:*** MDP Municipal Development Partnership (MDP); email: tmubvami@mdpafrica.org.zw ; website: www.mdpafrica.org.zw/urban_agriculture.html
• ***South and South East Asia:*** International Water Management Institute, IWMI-India; email: r.simmons@cgiar.org
Website: www.iwmi.cgiar.org/southasia/index.aspnc=9106&msid=119
• ***North Africa and Middle East:*** American University of Beirut, email: zm13@aub.edu.lb; Magazine in Arabic: www.ecosystems.org/urbanagriculture
• ***China:*** IGSNRR Institute of Geographical Sciences and Natural Resource Research of the Chinese Academy of Sciences; email: caijm@igsnrr.ac.cn; Magazine in Chinese: www.cnruaf.com.cn
• ***Coordination and Support:*** ETC Foundation; email: ruaf@etcnl.nl; Magazine in English: www.ruaf.org

Editors, No. 19
This issue was compiled by René van Veenhuizen (Responsible Editor), together with Will Critchley, Ann Waters Bayer and Chesha Wettasinha of PROLINNOVA, and Gordon Prain of CIP - Urban Harvest.

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