

ICT Update

a current awareness bulletin for ACP agriculture

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Mapping the extent of
urban agriculture in
Dar es Salaam with GIS

Kigali and Rome's city
farmers to experiment
with e-procurement

Food preservation
techniques over radio for
Havana's organoponicos

Urban Agriculture



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ICT Update



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At some point over the course of 2005, notes urbanist Mike Davis in *Planet of Slums*, an investigation into the world's poorest cities, the world's population made the epochal shift from rural to predominantly urban. By 2015 there will be nine mega-cities, each with more than 20 million inhabitants. Eight of them will be in the developing world.

ICT Update, and indeed much of the agricultural policy community, has for the most part focused on rural agriculture, but as many as 800 million people – most of them in the developing world – are involved in urban farming – the growing of food crops or raising of animals in or around cities. Moreover, some 15–20% of the world's food is actually already produced by urban farmers. The poor in developing countries generally spend between 50% and 70% of their incomes on food. However, urban agriculture can produce significant reductions in household expenditures on food, and also open up opportunities for barter and selling surplus produce for cash. The practice thus should be a component of any strategy for poverty alleviation. Urban agriculture can also benefit the urban environment in profound ways. While agribusiness uses ten to 15 calories of petroleum energy to deliver one calorie of food energy, urban agriculture uses between one and three calories to do the same.

Until recently, few Southern authorities – municipal or national – recognized the importance of urban agriculture as a productive sector. As it is often associated with urban squatters and uncontrolled activity, governments too often have seen urban agriculture as a problem to be stamped out rather than encouraged.

Many cities are now reassessing this attitude as they can see benefits for the environment, food security and poverty reduction. Increasingly, Southern universities are including urban agriculture in their curricula, and at UN-HABITAT's World Urban Forum (WUF) in June 2006, it was a key agenda item for the second time. In this issue of *ICT Update*, we interview Marielle Dubbeling, the organizer of the WUF workshops on urban agriculture. Nonetheless, as far as we can

determine, no one anywhere has yet given an overview of the use of ICTs in urban agriculture. This is perhaps understandable, as it is largely performed by the urban poor and slum dwellers, and one might think that information technology is for the most part out of their reach, but this is not strictly true.

As Southern city councils begin to change their attitude to urban agriculture, they must take into account a number of health and planning concerns. How do they ensure that farmers use treated water that will not affect the quality of food? How do they minimize the human health risks associated with livestock keeping in densely populated areas? How do they manage agriculture on semi-public or private land occupied by squatters? Some Southern cities are using relatively inexpensive GIS, GPS and remote sensing and aerial imagery to map out the extent of current urban agriculture and room for its potential. Axel Drescher and Stefan Dongus, two experienced practitioners of GIS in urban agriculture give an overview of their work in Dar es Salaam.

Farmers themselves also need methods of sharing knowledge of urban agricultural techniques, and in different areas use a range of ICTs from traditional radio to e-education and streaming video to share agricultural knowledge. Vilda Figueroa and Jose Pepe Lama report from that Mecca of urban agriculture, Cuba, on their use of radio and online distance learning to inform the population on methods of food preservation and the prevention of post-harvest wastage.

Urban farmers, no different from their rural cousins, also need ways of receiving market information. In the future, we will see widespread use of mobile phones and the internet to connect urban farmers to their markets. In a few areas, this is already happening: In this issue we have a look a city-to-city 'glocalization' project between Kigali and Rome and their plans for something called 'e-procurement'.

Although ICTs have yet to figure prominently in discussions surrounding urban agriculture, this issue of *ICT Update* offers a taster of what is to come. ■



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As a way to influence decision-makers, one of the RUAF's partners has produced a five-minute video on the safe use of wastewater for vegetable production, in which farmers and market women describe improved practices in their daily lives.

In another example, women farmers in the Niayes region of Senegal have developed their vegetable gardens into enterprises by specializing in crops that are in demand in the capital Dakar and abroad. They use their mobile phones to gather market information – in order to know exactly where and when they should make their produce available.

Teamspeak. In between we have thematic Teamspeak meetings, to which we invite people who are working on a specific theme for discussions. With Teamspeak, transcripts of these discussions can also be printed out and distributed as a sort of minutes of what has been discussed.

There are few places where urban agriculture is on the curricula of schools and institutes of higher education. RUAF is currently developing a package of distance education courses based on training and workshops organized with Canada's International Development

Communicating, visualizing, campaigning ICTs in the urban agricultural context

We should not always assume that poor urban farmers do not have access to electronic information. Broadband internet access is ever more available in cities in the developing world, certainly in the capitals, and mobile phones are ubiquitous.

The International Network of Resource Centres on Urban Agriculture and Food Security (RUAF) is an alliance of support agencies, donor agencies, NGOs and farmers' associations. It is coordinated by ETC and seven regional partners. Within the RUAF network, we use a range of information technologies for communication purposes, while other technologies are used by municipalities in the South and the farmers themselves.

The initial aims of our organization, which started its activities in the late 1990s, were to find ways of putting urban agriculture on the international agenda, and to become a clearinghouse for information on the subject. We developed web-based information systems on publications, resource persons and donor agencies. Furthermore, via the magazine and through electronic conferences, we facilitate discussion and analysis between specialists and practitioners. We have now grown into a network of resource centres that promote and support urban agricultural development activities and policy making in 20 cities around the world.

Visualising urban agriculture techniques

Meanwhile, there is a large number of city farming projects in the North. How they were developed has been described online to some extent, with some practitioners having made short films or podcasts explaining the techniques they have used. Packaging these experiences in a way that is visually or aurally accessible is indispensable for effective knowledge sharing in the South. There is a real need to visually document with video, streaming video, CD-ROM or DVD the processes of urban agriculture – what's succeeded, what has failed, what techniques work and what don't. Such formats are also useful in campaigns that attempt to reach and influence decision makers, showing what is being done and how it relates to sustainable city development.

For our work, specialists and practitioners need to meet, discuss and network. However, the organization of getting people together, whether in person or via telephone, is expensive, especially for our Southern partners. The RUAF partners only meet face-to-face once a year. To share experiences more often and improve on joint learning, we have moved over to voice over internet protocol (VOIP) telephony for conference calls, using Teamspeak, a free, internet-based teleconferencing application. We now have four or five RUAF partner meetings a year over

Research Centre (IDRC), in Latin America, Africa and the Middle East. We have established links with universities that can offer certification for those who have completed the courses.

Urban agriculture is often seen as only a low-tech affair performed largely by the poor, whom one would normally assume to have little or no access to advanced information technologies. What we find is that within the field, there are actually a range of ICTs that are not only being used but becoming essential. The challenge is to use the appropriate tools to reach different audiences. ■



ANNE CHEVE-GRANDET

After years of ignoring or circumscribing urban agriculture, some cities in developing countries have begun to embrace the phenomenon, as they now see its benefits for poverty reduction and for improving the urban environment.

Unfortunately, even in those cities that have changed their minds, and in spite of ongoing research, few systematic surveys have been carried

limited applications of geographical information systems (GIS) to map urban food production activities. In the Dominican Republic, for example, researchers from the University of Santiago have developed a GIS database covering Santiago de los Caballeros. In an EU-funded project in Ouagadougou, Burkina Faso, researchers have mapped urban and peri-urban agricultural areas using IKONOS satellite imagery. To a more limited extent, GIS has been used to map urban agricultural activities in the cities of Accra and Kumasi in Ghana.

Open-space survey

The city with the most comprehensive experience in the use of GIS is Dar es Salaam in Tanzania. In 1999, the German Agency for Technical Cooperation (GTZ), Dar es Salaam city

spaces was then assessed, totalling four per cent of the whole surveyed area in 1999. Furthermore, conclusions could be drawn regarding the dynamic development over a seven-year time span. This gave indications about the importance of this type of urban land use, mainly in terms of its viability in view of competing demands for land for housing, infrastructure, and so on.

The knowledge base can be used by town planners, city officials and policy makers for decision-making concerning the place of urban agriculture – especially vegetable production – in the city's development. The urban agriculture map also offers an entry point for support organizations to contact urban farmers. Further, the evidence created by this map can help raise public awareness and acceptance of urban vegetable production.

First things first

Mapping the extent of urban agriculture

Despite the amount of research on urban agriculture, very little is actually known about the extent of farming activities in many cities. Before municipalities can begin to develop institutional support for urban agriculture, they need to know exactly what is going on, and where. That's where GIS comes in.

out to explore the actual extent of agriculture in inner city areas. Very few data are available regarding the extent, the importance, the development and the output of urban agriculture, as well as its connection to small enterprise development. Basically, no one really knows very much about what goes on where.

Thus, before municipalities can begin to design better regulations that will facilitate urban agriculture and incorporate it into their planning, they need to produce maps of farming activities in their cities. Many questions remain unanswered. Where are urban agricultural activities concentrated, and why? What kinds of crops are being grown? In what types of soil? By which groups within the urban population? How available is water and what is its quality? How far is it from farm to market? Are there potential health and environmental risks?

Globally, there have been only very

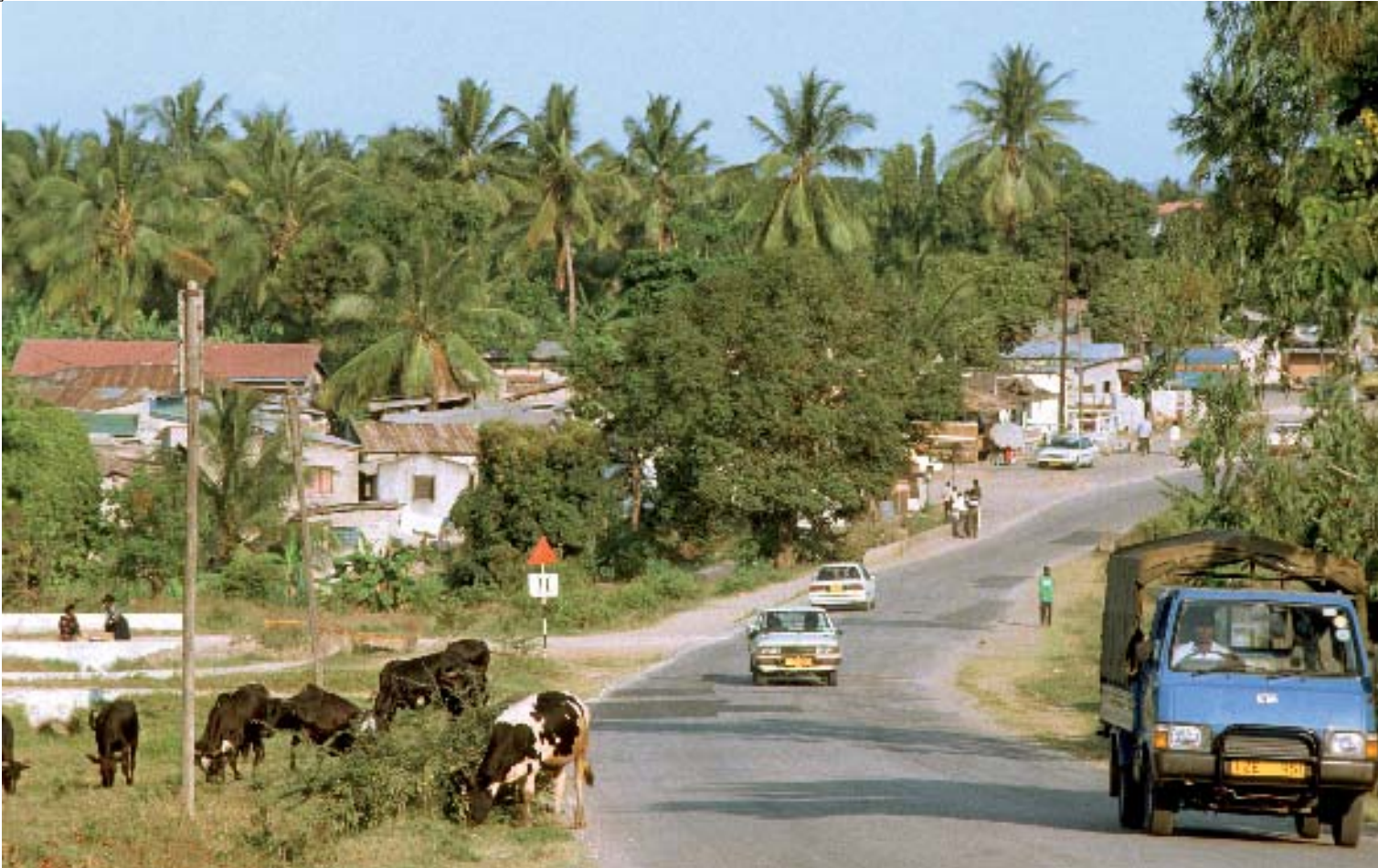
council and the Ministry of Agriculture and Cooperatives collaborated in a survey project that showed that one possible way to close the information gap is to map urban agricultural areas by combining analysis of aerial photographs with field work and GIS. The main motivation for the survey was to create an opportunity for urban farmers to receive additional support from various stakeholders concerning questions of land tenure, water supply, infrastructure, extension services and training. The methodology developed at the time has since been used as a model and adapted for similar projects elsewhere.

Open spaces play an important role in cities and can provide a buffer against food insecurity in times of crisis. In Dar es Salaam the exact locations and areas of open spaces larger than 1000 m² were mapped and integrated into the city council's GIS database. The actual area used for vegetable production in the city's open

Why GIS?

The use of GIS technology offered several benefits, in particular the visualization of spatial data, particularly the distribution of open spaces in a city used for farming, with simple analytical functions to calculate the size of these areas. The technology also permitted data overlay in order to investigate relations between various relevant factors, such as designated land uses, irrigation water quality, and socio-economic variables. Researchers were also able to link vector data (digital data in the form of points, lines and polygons having geographical positions and shapes defined by a set of coordinates) in maps with attribute data such as the type of crop grown, sources of water or number of farmers.

In the future, projects will be able to update the digital maps and extend them to include a greater range of topics and layers. It is also possible to print out hard copies of maps showing any desired topics and areas, at any



Urban agriculture in Dar es Salaam

ROEL BURGLER

scale, for discussions with local stakeholders.

GIS is highly flexible. Depending on the local context and available data sources, a wide variety of spatial data can be integrated and combined, including satellite imagery, aerial photography (digital or analogue), topographic or thematic maps at all scales, cadastral maps, and global positioning system (GPS) measurements.

Methodology

Given that GIS and aerial photography, high-resolution satellite imagery and GPS receivers are now widely available, the methodology used for this project can be used in a similar way in cities anywhere in the world. In Dar es Salaam, an area of 165 km² was surveyed over a period of four months. First, the researchers analyzed analogue aerial photographs (stereo pairs), then carried out the fieldwork, and followed this up with the digitization, visualization and analysis of the results using the GIS.

The analysis of the aerial photographs was the essential step, making it possible to map a large area in a short time, and to produce very

precise information on actual land use. The analysis was based on the most up-to-date available set of aerial photographs of the Dar es Salaam region (black and white orthophotos, stereo pairs, at a scale of 1:12,500), taken in 1992. The photographs were analyzed with a stereoscope to identify all open spaces used for agricultural production. The borders of these areas were drawn onto the respective cadastral maps (scale 1:2500) of the Dar es Salaam region.

The high resolution of the aerial photographs and the large scale of the cadastral paper maps made it possible to indicate the position of the boundary lines with a high degree of accuracy. Field visits were then made to confirm the boundaries on the ground, and thus to avoid mistakes during this phase.

An alternative option would have been to use digital remotely sensed imagery with a resolution higher than one metre. However, such digital imagery was not available in Dar es Salaam at the time of the survey, and, even if it had been, it would have been less accurate than the analogue aerial photos.

Fieldwork – paper maps or GPS?

Project staff visited all of the areas identified as productive open spaces during the aerial photograph analysis on motorcycle. All sites were checked. However, some sites turned out to be inaccessible – for example, some areas were on land controlled by the army. The extent of farming at each site was compared to the situation in 1992. In almost all cases, this was possible simply by working with the cadastral maps and observation. In case of any changes, the new situation was marked in the maps. In a few cases, GPS measurements were taken to map the newly emerged open spaces, and to measure significant changes to areas inaccessible to farmers. If farmers were found at a site, the researchers asked them to participate in a short questionnaire survey regarding ownership of the site, access to water, and any general problems they had. The researchers then asked them for any further comments they might have. At the time of the survey in 1999, it was necessary to use differential GPS in order to obtain adequate accuracy (a margin of error less than 3 m). This required the simultaneous use of two GPS receivers, one stationary and the

Related resources

In Focus: Growing Better Cities – Urban Agriculture for Sustainable Development by Luc J.A. Mougeot

→ Book covering Canada's IDRC's two decades of experience with urban agriculture. Particular emphasis on the influence that research has had on government policies. Full text also available online. CD of IDRC urban agriculture website included with book. www.idrc.ca/en/ev-95297-201-1-DO_TOPIC.html

City Farmer – Canada's Office of Urban Agriculture

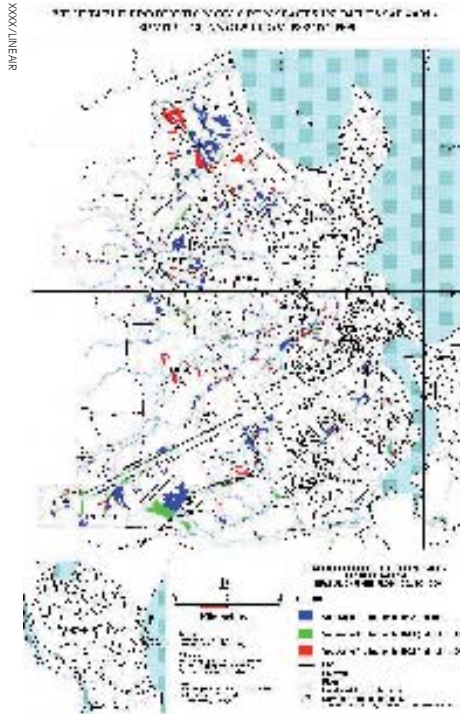
→ A cornucopia of documents and other information on urban agriculture around the world. One of the top urban agriculture resources on the internet. www.cityfarmer.org/

Integration of RS, GIS and AHP for Hanoi Peri-Urban Agriculture Planning

→ Project integrating remote sensing, GIS and analytic hierarchy process (AHP) for Hanoi peri-urban agriculture planning. www.gisdevelopment.net/application/agriculture/overview/ma04149abs.htm

Urban Harvest Listserv

→ Listserv set up to facilitate networking and information covering urban and peri-urban agriculture (UPA) and related issues, with some 200 participants from various research organizations, NGO's, and academic institutes all around the world. www.cipotato.org/urbanharvest/home/listserv.htm



other a mobile unit for use in the field. The geographical coordinates of the corner points of agricultural open spaces were recorded, saved in the receiver and later downloaded to a computer. Experience showed that it was much more efficient to work without the GPS receivers for the purpose of the study. In most cases, it was sufficient and even more accurate to observe the areas and mark the observations directly onto cadastral maps. An alternative option would have been to use enlarged copies or prints of the aerial pictures on which to mark the results of the field observations. With paper maps it was easy to show and explain the purpose of the work to community leaders and members, whereas the use of GPS equipment in the field was sometimes problematic as it caused suspicious reactions from city residents who were not familiar with this technology. Today, GPS as a technique has become much more accurate, and the receivers are a lot easier to use. However, the researchers recommend the use of paper maps or printed aerial pictures as a basis for field mapping, and the use of GPS only if orientation in the field is not possible otherwise.

Digitization

Finally, the results of the analysis of the aerial photographs and the fieldwork were digitized using

MapInfo, a software package that the Dar es Salaam city council was using as their standard GIS at the time of the survey. The borders of open spaces drawn onto the cadastral maps were digitized as polygons with a digitizing tablet. In cases where the areas were measured by GPS, the downloaded coordinates were read into the GIS software and connected manually to form polygons. A digital base map of Dar es Salaam (including the positions of roads, railway lines, rivers and the coastline) was already available. Attribute data collected in the questionnaire survey was then entered and linked to the respective polygons. The database that resulted from this work can be used by town planners for further analysis and planning purposes, and to make overlays with other relevant spatial data.

The developed methodology is entirely applicable to other cities and can be expanded to incorporate other topics of interest. Indeed, the methodology is currently being used as part of a research project on the use of wastewater in urban and peri-urban agriculture in India and Pakistan. The same methodology is also being used in a participatory mapping project to investigate malaria hazards in relation to Dar es Salaam's urban agriculture.

Urban agriculture in Dar es Salaam, as in many cities in the developing world, may well be manifestly apparent as a form of land use, but without a detailed mapping of the precise extent of such activities, municipal authorities cannot begin to develop institutional support for it. Integrated into local government planning processes, the GIS data can be used to help raise public awareness of the benefits of urban farming, to improve regular access to land, aid extension services, and can be used by town planners for further analysis and planning purposes. Participatory mapping is the first step on the road to the normalization and promotion of urban agriculture. ■

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For the record

In our story, 'Wine, workers and web applications' (July 2006, p4), due to editing errors, we inaccurately reported that the dop system was 'slowly disappearing', when it is truer to say it has all but disappeared. The photograph intended to illustrate this phenomenon, acquired from a photo agency with a caption stating that it was an image of workers being paid in money and wine, was in fact of a worker empowerment scheme. The final paragraph of the article suggests that conditions on many farms are the same or worse as existed prior to the advent of South African democracy. The author wishes to stress this is not his perspective nor that of the stakeholders of his organization (WIETA). The correct version of the article appears on the ICT Update website.

Havana preserve us!

Food preservation techniques on Cuban radio

Havana is a Mecca for urban agriculture, but a scarcity of refrigeration results in considerable wastage. One project is using that venerable old ICT - radio - to get out the food preservation message.

Cuba has some 380,000 small vegetable gardens throughout the island's cities and towns. In Havana allotments - or *organoponicos*, as Cubans call them - occupy 12% of the area of the city and provide its 2.5 million residents with over 90% of the fruit and vegetables they need.

The Cuban people embraced urban agriculture in the wake of the collapse of the Soviet Union, which until the early 1990s had been purchasing the island's sugar at five times the market price and up to 95% of its citrus fruit production. In return, some 63% of Cuba's food was imported from Russia, along with 90% of its petroleum. When the petrol tap was turned off, however, the country had no way to fill the tanks of its tens of thousands of tractors or to produce the chemical fertilizers and artificial pesticides that it needed to maintain food production.

In response, Cuba turned to urban agriculture in a way no other country has done. Without fertilizers or pesticides, farmers on the island shifted by necessity to natural pesticides and compost. The army of tractors was replaced by droves of oxen. And without oil to power the movement of produce from the countryside to the city, the government marshalled almost every scrap of spare land in urban areas - between blocks of flats, on rooftops, and on land set aside for new buildings - and many of its citizens - for a grand experiment in urban agriculture as a way of reducing the need for transportation.

Educating Cuba's citizens in the various techniques involved in urban agriculture has required a range of creative methods of knowledge dissemination. As one example, the Colectivo del Proyecto Comunitario de Conservación de Alimentos de Cuba (Community Food Conservation Project of Cuba) launched a successful series of radio broadcasts but are now moving into the internet age in order to train city-dwellers in the techniques of food preservation. The scarcity of refrigeration, the seasonal nature of harvests and the lack of funds for developing the necessary infrastructure and industrial base for preserving food all contribute to considerable wastage

of harvested crops. The sub-tropical climate and the fragility of public food supplies require wide awareness of food preservation techniques. As effective as urban agriculture has been, the absence of any tradition of food preservation among the population means that wastage remains a problem.

Initially, the project produced brochures and folders, and later books, describing food preservation technologies in popular language. These activities were relatively limited, however, due to the high cost of printing and the lack of facilities for high-volume copying.

To broaden our reach, we began to employ radio, television and the press. We also at this point began disseminating the programmes in different formats such as audio-cassettes, CD-ROMs and videos, for broadcast by audio and video teams in communities, training centres and other public places.

About four years ago, we at the Project began a weekly 15-minute programme, 'Con Sabor' on Cuban national TV, discussing the conservation and preparation of food, together with messages on healthy eating. Now that we have many years' experience of organizing and producing our own media, we are branching out to digital versions of our videos and printed books, as well as producing TV programmes in digital formats (video compact disc and DVD). We are also currently in the process of developing online distance learning courses.

The use of different methods of communication has been achieved with a minimum of resources. After ten years' work, beginning from nothing in a district of Havana with 2000 inhabitants, we are now reaching 15,000 people throughout the country directly, and over 1.5 million indirectly by using mass communication methods. A recent survey of 1000 families in Havana showed that 55% of them had incorporated into their household some of the publicized food preservation techniques.

Food conservation has spread throughout the island with a commensurate improvement in food



MARK VAN DER ZOUW/HH

security and eating habits, all from the use of one of the simplest and earliest forms of information and communication technology - the radio - but we are very excited about the possibilities that more advanced ICTs are now giving us. ■

Vilda Figueroa

(conserva@cenai.inf.cu) is a chemist and animal nutritionist. She and her partner, José Pepe Lama, are coordinators of the Community Food Conservation Project.

Related resources

Feeding Cities in Anglophone Africa

→ Online urban agriculture course targeted at Anglophone Africa from Peru's Centro Internacional de la Papa www.cipotato.org/urbanharvest/news_events/global/online_course.htm

Television Trust for the Environment: Phnom Penh Sewage Farmers - urban aquaculture

→ Documentary on 'sewage farmers', who live on a Phnom Penh lakeshore, cultivating aquatic vegetables. www.handsontv.info/series7/04_taking_it_personally_reports/report6.html

Urban agriculture techniques podcast

→ Podcast on urban agriculture techniques from Michael Abelman, director of the Center for Urban Agriculture in California. www.suesupriano.com/article.php?&tid=89



Kigali's experiment in e-diplomacy, e-procurement and urban agriculture

A Rome-Kigali urban agriculture project aims to be a showcase for 'glocalization' e-strategies

Glocalization. 'Glocalization'? Is that a typo? Don't we mean 'globalization'?

Well, no. Glocalization, a portmanteau of 'globalization' and 'localization', is a form of decentralized cooperation and a new concept within development circles. Instead of *government-to-government* international relations, the proponents of glocalization aim to advance development through direct *city-to-city* collaboration. Glocalization works through bringing global alliances together to work at the local level.

The Glocal Forum is an international alliance of mayors, private sector partners such as Oracle and Microsoft, and the World Bank and other international organizations. It and FAO's Decentralized Cooperation Programme (FAO DCP) are the leading coordinators of experiments in glocalization. Tackling poverty alleviation and food insecurity are among their primary objectives. In

May 2004, the Glocal Forum and FAO signed a memorandum of understanding to collaborate on the development of city-to-city urban and peri-urban agricultural projects. The Rome-Kigali Urban and Peri-urban Agriculture Project (PAPUK) was the first FAO DCP project to become operational.

In Rwanda, one of the continent's most densely populated countries, small-scale urban agriculture makes a lot of sense. The 'glocalizing' aspect of PAPUK is that it shares urban agricultural knowledge and experience directly between the cities of Rome and Kigali.

Local actors in both cities take the lead role, with the FAO implementing the project and the Glocal Forum acting as facilitator and catalyst. The project aims to establish at least 40 micro-gardens; 96 animal breeder associations and 26 forest worker associations. In addition, rainwater harvesting and water management will

provide communities with access to clean water during the dry season.

eCities Network Programme

As part of the Glocal Forum's new eCities Network Programme, PAPUK has also become the 'baseline study' of the cost-effectiveness and potential value of city-to-city cooperation (C2C), comparing glocalization to existing approaches to international cooperation.

The eCities Network Programme exploits the internet to develop interconnectivity between cities for knowledge sharing, joint municipal procurement, and trade at a much reduced cost. With the eCities Network Programme, we will first set up a best practices database for PAPUK, and later on other initiatives focusing on urban planning and urban sanitation.

The second component, the Kigali eCities portal, allows the city to present the successes, failures and challenges of their programmes. Through this

portal, Rome and Kigali will build capacity by having joint online training workshops, and interact with each other to promote PAPUK and other projects, with the aim of cutting the cost of providing capacity building exercises.

Finally, there is the eMarketplace, which allows cities to source municipal goods and services jointly, thus cutting the cost of procurement. Developed cities can increase the critical purchasing capacity of the marketplace, bringing down the average price of goods as a result of economies of scale, shaving off a good percentage of the cost of procuring items by buying together.

Farmer-to-farmer knowledge sharing, business-to-business trade

Rome and Kigali are the first pair of cities that have signed up to the eCities Network Programme. The PAPUK memorandum of understanding between the two cities led to the signing of an agreement for a proof of concept of the aggregated procurement scheme. In this way, the e-procurement deal is a continuation of the urban agriculture project.

We hope to replicate the PAPUK project model and scale it up and diversify to other local actors,

We want to advance development through direct city-to-city collaboration

including private sector companies in Rome and Kigali. Thus eCities is not a single-point project, as is the case with traditional nation-to-nation activities, but is a multi-point project. We hope that Roman small and medium-sized businesses involved in urban agricultural activities (production, marketing, distribution and sales) will use the portal to share agricultural knowledge with urban agriculturalists in Kigali directly, from business to business. Currently, such exchanges only occur on a government-to-government basis, but the business-to-business, local-to-local relationship is our ultimate aim.

The PAPUK project is the very firm basis for everything else that will be done through the portal. We are setting up within the portal various thematic sectors. Urban agriculture will be one of these, with PAPUK as a model to see how much we can reduce overhead costs by going online.

The eMarketplace is powered by the software from Tejari, a company of the

government of Dubai. The eMarketplace offers a reserved section where municipal officials can interact, with video conferencing tools for mayors and other city officials, or whiteboards for brainstorming. We call this reserved electronic interaction between cities 'e-diplomacy'.

Essentially, the 'top' layer of the eMarketplace allows government-to-business e-procurement, and the 'bottom' layer allows businesses to connect and trade with each other. It's a long process, but eventually urban and peri-urban farmers themselves will be able to market and sell their produce via the eMarketplace as well. In theory, a buyer in Rome – a restaurant, hotel or wholesaler, for example – will be able to link up with an urban agricultural supplier in Kigali directly.

Ahead of all this, cities such as Kigali need to modernize their financial systems. This is because cities can hardly buy online if the financial management systems are not up to the task. So the Forum has a preparatory phase to the eCities scheme, which works with Kigali, and subsequently other cities, to upgrade their financial systems and procurement processes so that they can more easily integrate the eMarketplace.

The project will begin implementation in late 2006, at which

point the Glocal Forum studies in PAPUK will be linked into the eCities programme. A complete roll-out in Kigali, which translates into actual community 'ownership' of the system, should start in mid-2007.

Rome and Kigali were the first pair of cities involved in each of the Glocal Forum projects. For the urban agriculture project, they were the first; for proof of concept for e-procurement, they were the first. The two cities already had a long-standing offline working relationship, so establishing an online relationship has been far easier and faster than it may be elsewhere.

Thus as much as eCities is about exploiting the opportunities of advanced technology, at the end of the day, glocalization – city-to-city networks – is actually about old-fashioned human relationships. ■

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Related resources

FAO Committee on Agriculture (COAG) statement on Urban and Peri-urban Agriculture

→ Food and Agriculture Organisation of the United Nations document on urban agriculture.

www.fao.org/unfao/bodies/COAG/COAG15/X0076e.htm

El Agora online best practices documentary – urban agriculture in Rosario, Argentina

→ Short online documentary illustrating urban agriculture best practices via the example of urban agriculture programmes in Rosario, Argentina. El Agora is an Argentine development NGO. (In Spanish with English subtitles) c. 5 min.

www.elagora.org.ar/site/English/Agriculturevideo.html

FAO Livestock, Environment and Development (LEAD) Livestock Online Toolbox

→ FAO's Livestock, Environment and Development (LEAD) initiative online toolbox helps planners evaluate impact of livestock on the environment. The toolbox features an easy-to-use matrix covering a variety of production systems, from grazing on communal grasslands to large-scale peri-urban dairy units.

<http://lead.virtualcenter.org/en/dec/toolbox/homepage.htm>

Tomdispatch Interview: Mike Davis, Green Zones and Slum Cities

→ Interview with Mike Davis, author of Planet of Slums, investigating urbanization of humanity. Tomdispatch is a blog of the progressive US think-tank, the Nation Institute.

www.tomdispatch.com/index.mhtml?pid=82790

Mushworld report: Use of internet to market mushrooms by growers in urban Zimbabwe

→ Mushworld website report on growth of the mushroom industry in Zimbabwe. Cultivation has been more noticeable in urban areas. No marketing is being done on TV or radio although some growers advertise their wares on the internet.

www.mushworld.com/oversea/view.asp?cline=0&cata_id=5650&vid=5563 (requires free registration)



ROEL BURCLER

The processes of economic liberalization have hit the poor of Senegal especially hard. In Dakar, unemployment of 25% has forced many city-dwellers to engage in small-scale farming to feed their families. Some 60% of the city's vegetable production now comes from urban agriculture.

wastewater. Key to this multidisciplinary investigation has been the use of a geographical information system (GIS) to map the extent of the use of untreated wastewater on urban farms and to cross-reference it with the incidence of negative health and environmental impacts.

Murky, murky waters

GIS, untreated wastewater and Dakar's market gardens

Sadly, not only work, but water too is scarce. Most urban farmers cannot afford water from the potable distribution network of the water company, Senegalese des Eaux. Worse still, given the proximity of Dakar to the coast, water from wells is highly saline. Farmers thus have no choice but to break into the sewage mains and access untreated domestic wastewater. Just 6% of the city's wastewater collected is treated before discharge.

Naturally, this raises a host of health and environmental concerns. In areas of Dakar where untreated wastewater constitutes for some farmers an important source of water, many among them are infected with intestinal parasites.

Since 1998, Canada's International Development Research Centre (IDRC) has funded the Institut Fondamental d'Afrique Noire, at Cheikh Anta Diop University, to lead a group of researchers from the University of Dakar, the Institut Sénégalais de Recherche Agricole and the Senegalese NGO Environnement et développement du tiers-monde (ENDA-TM). The research group has investigated the risks of using this untreated wastewater in urban farming and ameliorate its worst aspects, with the aim of identifying adaptable, long-lasting solutions to enable the healthy use of

Vital to this process was the development of a user-friendly GIS in which the user interface was optimized for the multiple actors involved in urban agriculture, from city planners to the market gardeners themselves. The system had to be durable and applicable to a wide variety of environmental problems.

The research group has developed a powerful tool that permits researchers not only to define the different components of wastewater usage, to localize and predict pollution risks and the people likely to be affected. It also allows decision-makers to integrate urban agriculture into urban planning, and the producers themselves to become more aware of the risks. Subsequently, the investigation focused on identifying and producing a map showing the typical locations of women vegetable vendors throughout the markets of Dakar. The GIS gave a clear indication of the size of the populations concerned and a representation of the commercialization of vegetable produce from market gardens.

In addition to untreated wastewater, Dakar's farmers also employ considerable amounts of fertilizer and pesticide. Researchers from the Centre d'Analyse Minérale at the University of Lausanne, Switzerland, thus suspected

that the soils would be contaminated with heavy metals, nitrates, organochloride and organophosphorus pesticides, as well as bacteria and pathogenic parasites. The CAM researchers collaborated in the work that was already being done, now with additional funds from the Swiss National Science Foundation.

For the geographical representation of the data on water pollution, the researchers employed software from Delphi and ArcView* to integrate, organize and spatialize the existing data and the new data collected in order to develop scenarios for simulation.

In this way, the GIS permitted the creation of a register of producers by census, then by an attribution of a code related to the plots of land, which were localized by GPS. The plots were digitized from geo-referenced aerial photographs. For each of these plots, the type of water used for irrigation (from shallow wells, deep wells or wastewater) was indexed. Additionally,

the agricultural practices, such as the use of different types and quantities of fertilizer and pesticide were indexed based on a representative sample of the plots. We created a soil map layer within the system, as well as a database containing the results of chemical and microbiological analyses of the groundwater and soil samples.

The data collected was then visualized on digitized geo-referenced maps. They showed that the producers didn't take into account the different types of soil in their dosages of fertilizer, resulting in both economic losses for the farmer and contamination of the groundwater.

It is a complex, costly and time-consuming process, but we hope through these investigations, we can minimize the risks of using untreated wastewater in urban agriculture – a practice that whatever its hazards, greatly improves the food security of the people of Dakar. ■

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Decision Maker's Guide to Compost Production

This guide takes decision makers step-by-step through the process of planning and designing a sustainable and economically viable composting system.

As seen in this issue's article on the use of wastewater in Dakar, waste disposal in cities in developing countries presents both a problem for urban hygiene and at the same time an opportunity for farmers in terms of irrigation or fertilization of urban farms. As cities grow, so grows the amount of waste they generate. Often disposed of in illegal landfills or left on river banks or roadsides, untreated organic waste presents considerable

health and environmental problems for municipal authorities. However, if organic waste is safely processed into compost, urban farmers benefit from improved harvests, and the city benefits from an improvement in waste management. The excess compost can also be sold, providing an additional source of income for farmers or waste collectors.

The Decision Maker's Guide to Compost Production is a simple piece of decision support software for compost planning aimed at users in the South, developed by the German Agency for Technical Cooperation (GTZ) and the private consulting and engineering firm Gesellschaft für Infrastruktur und Umwelt (GFI Umwelt). The guide is an aid to decision-making for municipal organic waste collection and processing, making it easy for those responsible to construct a sustainable and economically viable composting system. It takes the user through the process of planning and designing a composting system, and the stages of recording, collecting, treating and processing organic waste, taking into account local conditions.

For long-term treatment of soils, only quality compost can ensure that plant production is not retarded and the environment is not damaged. Therefore, for organic waste to be recycled for agricultural uses, it must be carefully separated prior to collection. Such a system of separation and collection requires careful planning, dealing with a range of technical, organizational, administrative, legal and financial questions. This is impossible without a clear waste management strategy. Furthermore, for a composting system to be sustainable, it must also be financially viable. In the planning phase, the user receives information concerning the operating costs of composting per year and per tonne of compost, whether there will be gains or



ROEL BURGIER

losses, the distribution of costs, and areas where financial savings may be made. The software then determines the best possible method of technical implementation related to the user's cost constraints. The guide queries the user about local conditions. It then divides the processes of organic waste collection and composting into distinct sub-processes, and the user then chooses the best method and receives a report on the expected costs and revenues immediately. The user may then vary the parameters to optimize the result.

The software does not require any specialist knowledge. It uses Microsoft Excel as its system platform and operates without need of a keyboard. It can be completely controlled by a mouse and run on any PC with a Pentium processor and Microsoft Office 97 and above.

The software comes with a source book containing instructions on how to construct various composting systems, as well as tips on how to solve common problems. The source book contains six training modules with step-by-step explanations, covering the treatment of organic waste for compost, marketing and distribution, and economic and legal aspects. The final module includes a series of case studies from Benin, Burkina Faso, Germany, Indonesia, Poland and Tunisia. ■

The source book and software can be ordered for €30 from GFI Umwelt (www.gfi-umwelt.de)

Related resources

For more information, visit <http://unil.ch/Jahia/site/cam/op/edit/pid33305>

Malaria & Water Management – IWMI Project

→ System Wide Initiative on Malaria and Agriculture investigation of impact of urban agriculture on malaria transmission in West Africa, employing remote sensing and GIS.

www.iwmi.cgiar.org/health/malaria/projects.htm#urban

RUAF Electronic Conference on agricultural use of untreated urban wastewater in low income countries

→ PDF overview of 2002 electronic conference on strategies applied to reduce health risks from use of untreated, partially treated or diluted wastewater in agriculture.

www.ruaf.org/node/271

GIS as tool for water management – Lima

→ Workshop organised by Urban Harvest at the Rimac River Users Committee (JUR) to show how to incorporate GIS in planning and management of irrigation water in the eastern zone of Lima.

www.cipotato.org/urbanharvest/news_events/latin-america/gis-jur.htm



Marielle Dubbeling (m.dubbeling@etcnl.nl) is senior advisor to ETC Foundation International, a Dutch development consultancy, and Resource centres on Urban Agriculture and Food security (RUAF) partner. Ms Dubbeling talked to *ICT Update* about her experiences at the UN-HABITAT World Urban Forum (WUF) in Vancouver in June 2006 and the future of ICTs in urban agriculture

we organized the HABITAT Jam – a larger internet session where the WUF participants discussed issues related to urban development. The second most important issue of importance mentioned by these participants was urban agriculture and food security in cities.

Were there differences in the ways participatory GIS was used in the three cities?

→ Cienfuegos already had a good GIS-based municipal land map that was the most advanced, and most up to date of the three. This made it easier to incorporate urban agriculture as a land use category.

The World Urban Forum and urban agriculture

What is the World Urban Forum (WUF) and what did you do there?

→ The WUF is a biannual event organized by UN-HABITAT to discuss issues related to urban development. It brings together practitioners, local and national government officials, NGOs, academics, and international agencies interested in urban development. This year, ETC, Canada's International Development Research Centre (IDRC) and other RUAF partners organized three networking sessions on urban agriculture: One with representatives and mayors of four cities to discuss how they had developed their municipal programmes on urban agriculture; another with urban planners and designers, on the integration of urban agriculture into city planning; and a third on multi-stakeholder development and processes for action planning and policy design.

There has been an increase in interest in urban agriculture since the last WUF in Barcelona in 2004, which attracted fewer than 80 participants. This year we had over 150 participants at each session and even more people wanting to get in. For UN HABITAT and other international donor organisations, these sessions as well as other events on urban agriculture provided some important directions to consider regarding the role of urban agriculture in the context of achieving the Millennium Development Goal of halving poverty by 2015. Further lobbying however has to take place so that international agencies do more to support programmes and activities that promote development of safe and sustainable urban agriculture systems and integration of these in urban planning systems.

So interest in urban agriculture at the WUF and elsewhere at the international level is growing?

→ The demand from cities for urban agricultural support is often larger than we can respond to. Just ahead of the Forum,

What is the future for ICTs in urban agriculture?

→ Well, monitoring the impacts of urban agriculture will become more and more important. What does urban agriculture actually provide in terms of food security, incomes and environmental benefits? This monitoring will require the setting up of participatory evaluation systems, and the information and technology systems that can capture these data will be very important for this.

Elsewhere, we would like to see expanded use of participatory video, so that urban producers and other actors can describe how they practise urban agriculture, and answer technical questions such as: How do I grow something in a confined area? How do I grow mushrooms? How do I keep chickens while minimizing the health risks? Participatory video is useful for sharing this kind of information with other producers.

You've mentioned participatory video, but could you also talk about your experiences with participatory GIS?

→ Participatory GIS is mainly used for mapping areas of vacant land that could be used for urban agriculture, but also of land already in production, in order to incorporate urban agriculture in the municipal cadastral and land use plans. We've run participatory GIS projects in Rosario in Argentina, Governador Valadares in Brazil and Cienfuegos in Cuba, and are now applying it in 12 other cities around the world in the context of the RUAF network.

We used GIS in a participatory way by involving community members in checking the data. Since their knowledge of the uses of land is often more accurate than the information provided by earlier satellite images or aerial photographs, we defined in concert with the communities those units of land that needed to be incorporated into the GIS database.

Meanwhile, in Rosario, some municipal departments felt very 'protective' of the database, so we had to lobby to use it and upgrade it for the focus of the project. We found more or less the same thing in Governador Valadares. A bigger problem is that the databases are often outdated. Some municipalities, for example, may have used aerial photographs taken several years ago, or may not even have a GIS-referenced system.

What do you see for the future of urban agriculture?

→ I want to see improved technical and organizational capacities at the local and regional levels to develop urban agriculture. Urban producer organizations also need to be strengthened so that they can play a greater role in decision making and in giving shape to these programmes. I also hope that urban agriculture will not only be acknowledged and recognized as a legitimate use of land, but also integrated into urban planning and design. And there we still have quite some work to do. ■



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