

Impacts of urban agriculture

Highlights of Urban Harvest
research and development, 2003-2006



URBAN
HARVEST



Impacts of urban agriculture

Highlights of Urban Harvest
research and development, 2003-2006



Impacts of urban agriculture

Highlights of Urban Harvest research and development,
2003-2006

© International Potato Center (CIP), 2007

ISBN: 978-92-9060-329-0

The publications of Urban Harvest contribute important information for the public domain. Parts of this publication may be cited or reproduced for non-commercial use provided authors rights of Urban Harvest are respected and acknowledged, and you send us a copy of the publication citing or reproducing our material.

Published by the International Potato Center (CIP), convener for Urban Harvest. CIP contributes to the CGIAR mission through scientific research and related activities on potato, sweetpotato, and other root and tuber crops, and on the management of natural resources in the Andes and the other mountain areas. www.cipotato.org

**Produced by Communications and Public Awareness
Department**

Writing and editing: Cathy Barker, Gordon Prain, Maarten Warnars, Ximena Warnars, Lisa Wing, Freda Wolf

Production coordinator: Cecilia Lafosse

Design and layout: Elena Taipe, Nini Fernández-Concha

Printed in Peru by: Comercial Gráfica Sucre

Copies printed: 500
November 2007

Table of contents

| | |
|--|-----------|
| Introduction | 5 |
| Introduction to urban livelihoods and markets | 9 |
| Flower power in the Philippines: Strengthening the contribution of the jasmine industry to urban livelihoods | 10 |
| Meals on wheels add a new dynamic to pig raising in Hanoi | 13 |
| Identifying best bet marketing opportunities for Kampala farmers | 17 |
| What should I feed my child? Perceptions of foods for young children among Lima mothers | 19 |
| Introduction to Urban Ecosystem Health | 21 |
| Adopting Farmer Field Schools to urban realities in Lima, Peru | 22 |
| Research for a cleaner future: Heavy metal contamination in Kampala | 24 |
| Dirty secret treasures in Nairobi | 27 |
| Improving the quality of irrigation water in Lima | 30 |
| Introduction to Stakeholder and Policy Dialogue | 33 |
| Getting agriculture on the municipal agenda in Lima | 34 |
| An urban agricultural model in the making: Kampala, Uganda | 37 |
| Improving the integration of urban agriculture in national and local government in Kenya, through multi-stakeholder platforms | 40 |
| Networking | 43 |
| Local and global networking | |
| Networking and capacity building activities 2003-2006 | 45 |
| Publications | 52 |
| Networking partners | 56 |
| Investments partners | 59 |
| Urban Harvest researchers, students and interns 2003-2006 | 60 |
| Abbreviations and acronyms | 63 |

Introduction

The CGIAR¹ System-wide Initiative on Urban and Peri-urban Agriculture, now known as Urban Harvest, was formally launched in late 1999, to focus the efforts and relevant collective knowledge of the Alliance Centers towards collaborative development of innovations in urban and peri-urban agriculture. Since its inception, Urban Harvest has been hosted by the International Potato Center (CIP) and the global coordination office of the Initiative was established in CIP's Lima headquarters in early 2000. Between 2001 and 2002, regional coordination capacity was established on the ILRI Campus in Nairobi for Sub-Saharan Africa and in CIAT's facilities in Hanoi, Vietnam.

The broad goals of Urban Harvest which have guided the Initiative from its beginnings are to enhance, through local agriculture, the food, nutrition and income security of the urban and peri-urban poor, reduce negative urban environmental and health effects among urban populations and stimulate the integration of agriculture within urban management strategies.

These interdependent goals have been operationalized through a research framework which draws on the sustainable livelihoods framework and eco-systems health thinking. The framework distinguishes three

research and development themes relating to **urban livelihoods and markets; urban ecosystems health; and stakeholder and policy dialogue** (see Box). The framework underlines the different role and characteristics of agriculture as one moves from rural, through peri-urban to intra-urban conditions. The articles in this report, which highlight some of the program achievements between 2003 and 2006, also capture the particularities of the urban context. Food and nutrition insecurity are highly correlated with conditions in many rural areas of the developing world. Yet the high cost of food in cities, the restricted access to own food production, unhealthy living conditions suffered by low-income urban families combined with poor diets – including increasing consumption of refined foods – all create urban hot-spots of food and nutrition insecurity. The article on mothers' perceptions of animal source food for your children in Lima, where around 50% suffer anemia, is part of a broader effort to stimulate increased consumption of these iron-rich foods. Stimulating increased access to urban food production is supporting what local people already know: it is a path towards better nutrition and health.

Although many migrants move to cities in the expectation of more and better-paid jobs than in the

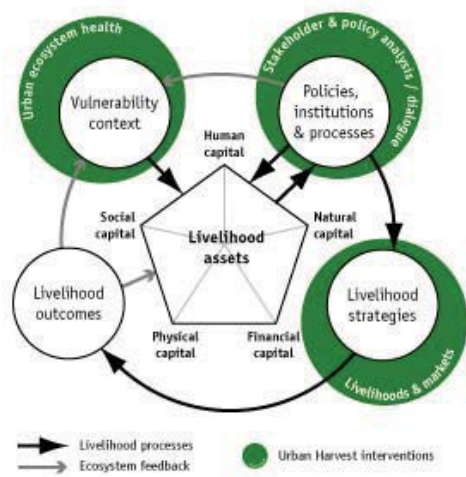
¹ The Consultative Group on International Agricultural Research is a strategic alliance of members, partners and international agricultural centers that mobilizes science to benefit the poor. It aims to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment

country-side, we know that many cities have as much as 90% informal employment, meaning occasional and precarious opportunities for earning income. Urban crop production and livestock-keeping have been shown to be complementary activities to casual non-farm work for many families and improving their income-generating potential can help them move out of poverty. Articles from the Philippines, Vietnam and Uganda show the special opportunities that urban and peri-urban producers have to access local input and produce markets.

Urban ecosystems have both health risks and economic and environmental benefits for producers and consumers. Agriculture is a key part of the eco-system, generating risks through use of toxic inputs in densely populated areas and vulnerable at the same time to becoming a pathway for biological and chemical contaminants in the ecosystem, directly via soil or water to producers and indirectly facilitating the passage of contaminants into urban food systems. The articles on biological contamination of irrigation water in Lima and heavy metal contamination in Kampala identify some of these problems and describe potential solutions. The organic wastes in the urban ecosystem carry nutrients which can be used at low or no cost by urban producers. The article on producer schools in Lima describes the way the

method has helped producers transform their agriculture towards more ecologically friendly production, using local organic wastes. The Nairobi article talks about the complicated flows of wastes entering and leaving and circulating within Nairobi, and the opportunities these provide for income.

Compared to rural settings, cities are more heavily regulated and experience more intensive competition among a wider range of stakeholders for resources. Urban agriculture has in the past been at best ignored and at worst restricted or prohibited by local governments in the developing world. As many cities such as Havana, Rosario, Vancouver, Cairo and Yunnan have already shown, agriculture can become an integral part of good environmental management of urban space. Cities and their inhabitants need green space to survive and an Urban Harvest supported study of urban heat islands in Manila has clearly shown the cooling effect of green spaces in the city. The three articles in the section on Stakeholder and policy dialogue present examples of how it is possible – not easy, but possible – to influence policy processes and organizational change to better integrate agriculture in urban planning and development and by so doing, making cities more sustainable places.



RESEARCH FRAMEWORK

The Urban Harvest research framework (see diagram) draws on earlier insights into sustainable livelihoods and urban eco-system health. In complex city ecosystems, which include informal economies and social networks, poor households depend on multiple income sources and a wide range of non-material assets to ensure their livelihood. Inadequate assets can leave households vulnerable to economic, environmental, health, and political stresses and shocks (the vulnerability context).

Five types of capital assets are distinguished. Natural capital includes the quantity and quality of accessible land and water as well as biodiversity. “Hidden” natural resources, such as vacant lots, unused water surfaces and nutrient-rich solid and liquid wastes are common in urban areas, but are often unrecognized by local governments. Physical capital refers to such assets as buildings, equipment, seeds, animals and own transport. Human capital includes family labor, knowledge and health status. Available income and savings comprise financial capital. Social capital includes the access to networks, groups, trust and support.

The deployment of assets in household strategies, the influences and impediments experienced through engagement with the institutional and policy fabric of the city (structures and processes), the outcomes achieved, are part of livelihood processes, which in turn exert positive and/or negative ecosystem feedback on the livelihood assets and on the vulnerability context.

Urban Harvest identifies three research themes: Stakeholder and policy analysis and dialogue seeks understanding of the actors, policies and institutions concerned in urban agricultural activities and develops methods for communication and consensus among actors and legitimacy for urban agriculture in policy and regulatory schemes. Livelihoods and markets targets production, processing, marketing and consumption systems along the rural-urban transect and identifies technology interventions to enhance income and food and nutrition security. Urban ecosystem health focuses attention on the feedback mechanisms between people’s actions and population, community and environmental health.

Introduction to urban livelihoods and markets

The **sustainable urban livelihoods framework** recognizes that increasingly in rural settings, and very much so in complex urban contexts, poor households depend on a diversity of strategies to ensure food security, income and well-being. These diverse strategies depend on a set of household assets or capitals: natural capital (such as land, water, pollutants); financial capital (money); physical capital (houses, equipment, vehicles, animals, seeds); human capital (labor power, ie. health, and capacity or skill); and social capital (networks of trust, exchange and mutual support, which all individuals and households maintain to a greater or lesser degree).

Deployment of assets in household livelihoods strategies also depends on the influences and impediments that household members experience when they deal with urban institutions, such as municipal regulation, or policies of local marketing practices. This constrained deployment of assets and the livelihood outcomes which they achieve are all part of the urban livelihood process. Inability to adequately

deploy assets can leave households vulnerable to economic, environmental, health, and political stresses and shocks, which are referred to as the “vulnerability context”: the level of susceptibility to poverty and the difficulty of moving out of poverty. Conversely, better access to social and material assets, improved capabilities and diversified activities to deploy these assets, combined with a more supportive institutional context, can move households out of poverty.

The participation of men and women in agriculture varies along the rural-to-urban transect, as do other aspects of farming systems, such as land area, tenancy, principal crops and animals production, food security and marketing strategies and health risks. Women play a dominant role in many types of urban agriculture systems, especially those involving small livestock and multiple food crops. The important role women play in “feeding cities” indicates the importance of working with them in action research interventions. Women’s frequent access to sources of social capital (women’s associations) provides scaling out opportunities.

Flower power in the Philippines: Strengthening the contribution of the jasmine industry to urban livelihoods

10



Sampaguita, the jasmine buds adopted by the Philippines as its national flower, is primarily used for the production of garlands, which in turn are used as ceremonial and decorative ornaments. As many as 120,000 low-income households in the Manila region—from sampaguita farmers to garland makers, to children selling garlands in Manila—depend on these garlands as an important source of income. An in-depth assessment study conducted by Urban Harvest partner institutions sought to improve the contribution of the sampaguita (jasmine) enterprise system to the economic and social well being of key players in the Manila metropolitan region by identifying the benefits and constraints of this thriving industry.

The University of the Philippines Los Baños and CIP-UPWARD carried out studies in the municipalities of San Pedro and Calamba, Laguna, and Manila in the Philippines (between 2001 and 2004) that highlighted the importance of the sampaguita livelihood system to households and to the community of San Pedro and to those involved in marketing in Metro Manila.

The entire system involves eight key players: the farmer (who produces sampaguita flowers and other raw materials, mostly men); the flower picker (who harvests daily the floral buds, mostly women and children); the supplier (who collects flowers from farmers and transports them to San Pedro, often times farmers' wives); the abaca fiber cleaner (who cleans abaca fibers, mostly old women and men); the vendor (who buys wholesale the raw materials from farmers and suppliers and retails them to contactors and garland-makers); the garland-making contractor (who buys raw materials from vendors and contracts garland-makers, mostly women); the garland maker (who strings together the flowers, mostly women and children); and the garland seller (who peddles the sampaguita garlands in Manila, mostly women and children).

The study identified the most pressing constraints of the sampaguita economic system and offered solutions to such limitations. Aside from asserting that this is a viable peri-urban industry, the study—which involved various surveys, secondary data, field visits, focus group discussions and interviews with key informants—stressed the importance of involving local and international organizations, policy makers, and government agencies in supporting this trade as an important contribution to livelihoods in the metropolitan region.

The sampaguita livelihood system in San Pedro, Laguna, a suburban town 29 kilometers south of Manila, is anchored primarily on the production of flowers and their preparation into garlands. The town serves as the point of convergence linking farming activity in rural areas to the marketing of garlands in urban centers. Flowers produced in rural farms are bought, traded and transformed into garlands in the municipality, with the garlands being subsequently

sold in adjacent Metro Manila. Data shows that up to 2.8 million flower buds are traded daily in San Pedro.

As the study points out, the various livelihood activities revolving around garland making in San Pedro provide numerous benefits to everyone involved. At the forefront of these benefits are employment and income generation, socio-cultural benefits (making the youth productive and empowering woman), and the promotion of loyalty, trust and a sense of tradition among those involved in the garland production chain.

However, as with any other agribusiness venture, the sampaguita enterprise is beset with problems.

Among the most pressing is the susceptibility of sampaguita to insect attack, which in turn leads to farmers' extensive use of pesticides. This not only harms the environment and raises production costs, but also affects the health of those who handle the flowers. All players along the chain, from growers to pickers to garland stringers, have complained of skin allergies and breathing difficulties and suspect it is due to pesticide residue in the flowers. Women and children are the most exposed to health risks because they are in charge of picking the flower's buds and therefore re-enter the farm less than 12 hours after spraying.

With this in mind, health risks resulting from pest management and pesticide use were a major focus of the study. Farmers are often oblivious to the negative health effects that can result from using either very toxic or unsafe pesticides, or simply using too much of it. Some sampaguita growers spray as much as four times a week to combat the whitefly and budborer and other insect pests and diseases.

The study also identified other major problems and constraints faced by key players in the garland production



chain, including competition with other sellers and suppliers, a lack of capital to increase business, non-payment of loans by customers, irregular price fluctuations of flowers and a lack of better methods of storing flowers. Rapid urbanization in the municipality is also a threat.

At the forefront of CIP-UPWARD's efforts to help find solutions to the main constraints affecting the sampaguita livelihood in the Philippines is the development of an Integrated Pest Management scheme to reduce the frequency of pesticide applications and encourage the selection of less-toxic ones. Non-pesticide based management was also introduced including the use of biological pest controls, better farm management practices that minimize pest infestations, and replacement of sick and old sampaguita plants.

At the policy level, CIP-UPWARD-Urban Harvest helped organize a multi-disciplinary and inter-institutional forum that discussed the problem of excessive pesticide use and lack of registered crop protection products for sampaguita. The Fertilizer and Pesticide Authority of the Philippines, representatives of crop protection companies, government research institutions and sampaguita farmers attended this forum. An Ad-hoc committee was formed in this meeting to discuss and study policy recommendations on pesticide use for sampaguita.

At post-production level, this study emphasized the importance of identifying better storage methods for sampaguita floral buds, which can only be preserved for 48 hours using the existing technology of packing them in Styrofoam containers with ice. This forces garland-makers and contractors to only buy what they can process in one day. The study points out that better storage

methods could allow them to manage their time more efficiently.

Another major concern identified in the study was the reduction in the yield and the perishability of sampaguita flowers. More information on the floral biology (i.e. flowering and pollination) of the sampaguita could be used, among other things, to breed new varieties that could have flowers of varied colors and that are more resistant to pests and diseases. Determining the nutrient requirements of sampaguita and even using organic manure as a nutrient source to enhance yield and quality was also suggested in the study.

Other opportunities discussed included the commercial feasibility of extracting essential oils from the sampaguita flower.

Meals on wheels add a new dynamic to pig raising in Hanoi



Vietnamese urban and peri-urban households commonly raise a few pigs for market in their backyards. This activity adds to their income, puts a little pork on their own table, especially for the Lunar New Year, and the manure can be used or sold as fertilizer. However, the villages of Cat Que commune near Hanoi have turned pig raising into the hub of a complex local cluster of agro-enterprises. The pig raising industry in Vietnam is very dynamic, like many things in Vietnam - it undergoes rapid changes in response to the introduction of new materials and knowledge.

Following the economic reforms of *Doi Moi* in the mid '80s, the government allowed the emergence of private markets. The resulting rising incomes increased the

demand for meat, especially in urban centers. In Cat Que commune on the outskirts of Hanoi, already heavily dependent on livestock raising due to limited agricultural land, households started to specialize in different stages of pig raising: piglet (called *giong*: "seed pig") supply and raising medium-sized pigs (*got*) to be sold for fattening for final marketing as meat. Cat Que farmers began to specialize in intensive production of the intermediate *got* stage of pig raising: purchasing weaned piglets from sow/piglet raisers at 5 or 6 kg to raise them to between 25 and 30 kg, to sell to meat pig raisers who then fatten them up to between 80 to 110 kg. Raising "growing pigs" (as *got* would be called in US hog raising terminology) was soon adopted by almost all of the 2,600 households in Cat Que. The system that was developed helped create an effective link between rural and peri-urban and urban households in "rural-urban enterprise clusters".

Cat Que enterprise clusters consist of piglet (*giong*) producers and traders, *got*-raisers, feed and medicine suppliers, veterinarians, *got*-collectors, pig fatteners and manure collectors. All the *got*-raisers agree that the biggest advantage of clustering together is the market they collectively create. It is common for a household to raise 500 to 1000 *got*, up to 5000 a year. Each cycle takes 45 to 60 days depending on the quality of the baby piglets and their growth potential, diet, health and management.

An Urban Harvest team including The International Potato Center (CIP), The International Center for Tropical Agriculture (CIAT) and national researchers from Hanoi Agricultural University and the National Institute for Animal Husbandry, have been analyzing the complex set of interrelated pig-raising issues to provide a basis for elaborating an enterprise plan. The intention would be to improve the system, identifying the actors and concerns of the different aspects of the pig production chain, participating in joint identification and discussion

of research needs. Figures from 2002 showed that 80% of the total income in Cat Que comes from pig-raising related activities, while the other 20% of income derives from agricultural products, mainly rice and fruit production, rice alcohol (which is highly related to pig production) and other sources of income, including selling alcohol and fruits, labor and construction, salary as local officials and small business. Most households are engaged in more than one type of *got*-centered enterprise. The relationships of these associated enterprises form the bases of complex enterprise strategies, which strive to maximize profit and sustainability of their livelihoods by balancing feed, market fluctuation, growth, disease control, labor, credit and marketing.

Growing pigs are fed a diet largely of agricultural products grown in the villages: rice, rice bran, rice liquor residue, sweet potato vine or water hyacinth or pistia (water lettuce). They are occasionally given a protein concentrate to speed up growth for seasons when *got* prices are high. Their feed standards are lowered when there is a glut in the market. Disease control is as much related to management as it is to marketing strategy and labor requirements. All *got* are sold together, which lowers profits and creates uneven labor requirements, but it is done for disease management reasons (for example, thoroughly cleansing the pig pens). Selling *got* on credit fosters relationships with the collectors but also creates a cash flow problem, which in turn is passed on to the feed suppliers who then must sell feed to *got* raisers on credit.

One research activity that Urban Harvest and its partners have completed is a trial on maize substitution for rice. The results showed significant improvement in growth rate, reduced feed cost and higher profit. The maize diet has the added advantage that the maize can be fermented rather than cooked, which saves the farmers a lot of time. The disease survey also identified the management areas that affect the frequencies of illnesses,

including pig-pen design and flooring, living space, cleanliness (bathing frequency and thorough disinfection of pig pens) and drinking water source.

The pig raising industry in Vietnam responds quickly to innovation and new business possibilities. Around 1999, some of the farmers of Cat Que have begun to use a nutrient-rich new source of pig feed, incorporating residues from restaurants and other institutions involved in the preparation of food in the city. While these residues were previously used to feed a few pigs in the confines of the city, it was with the new widespread use of the motorbike and the increasing number of restaurants that it became feasible to take quantities of commercial food residues, ingeniously balanced on these small motorbikes, 20 km out to peri-urban pigs. Pig “meals on wheels” opened up the possibility of fattening pigs on a larger scale, which by 2004 began to be seen as an alternative to *got* raising in Cat Que. Although more growing pigs can be raised at a time on locally grown food in the space available, the margin of profit is much higher in the fattening stage.

Therefore, fattening fewer pigs on food residues brought from the city is still more profitable than raising a larger number of *got* pigs on local agricultural products. A brief study by UH indicates between 50 and 100 households are fattening pigs using residues. There is some local conjecture that if the price of pork continues to rise, Cat Que could shift to specializing in pig fattening rather than *got*-raising, although the supply of restaurant and institutional residues could be a constraining factor. An interesting note is that these rural-urban enterprise clusters become more closely linked with the urban ecosystem.

Motorbikes and scooters have revolutionized transportation in Vietnam. Masses of them are to be found everywhere. There are even many motorbike

tours offered all over the country. In 2002, it was estimated that there were more than 1.3 million motorbikes in Hanoi (1 motorbike per 2 people on average) and by 2004 the estimate was up to 2 million motorbikes. They are used for family transportation, taxis and for cargo. For the trip to the Cat Que villages, the highly liquid institutional and restaurant food residues are carried in sealable blue plastic barrels, which hold about 70 kilos each. A motorbike can be loaded with three of these barrels: one on each side of the rear wheel, a third behind the driver and sometimes a small container is even placed between the legs of the driver on the bike frame. The larger the volume, the more the reduction in transport costs. Nevertheless, transportation logistics are complex, because even a slight, sudden swerve of the motorbike can set off the sloshing dynamics within the barrels that can cause the bike, rider and cargo to slew off the road.

The pigs in Cat Que villages grow fat on these gourmet wastes, which are used as the major feed source. For each of the two feedings a day they are boiled up in large cauldrons, added on top of local agricultural products to prevent sticking, for about 1.5 hours, over fires fueled by coal slurry. Rice bran is added a few minutes toward the end of the boiling time. One or two trips to the city per day are required, depending on the number of pigs. Though animal nutritionists say three feedings would be better, the constraints of time simply rule out this possibility. Sometimes the women's first trip into the city is at 1:00 or 2:00 a.m. to sell vegetables, returning at 5:00am, when the husbands leave to fetch the food residues for the pigs. Between two and five hours of labor time a day is required for transport. This tends to be men's work because of the heavy, unstable load.

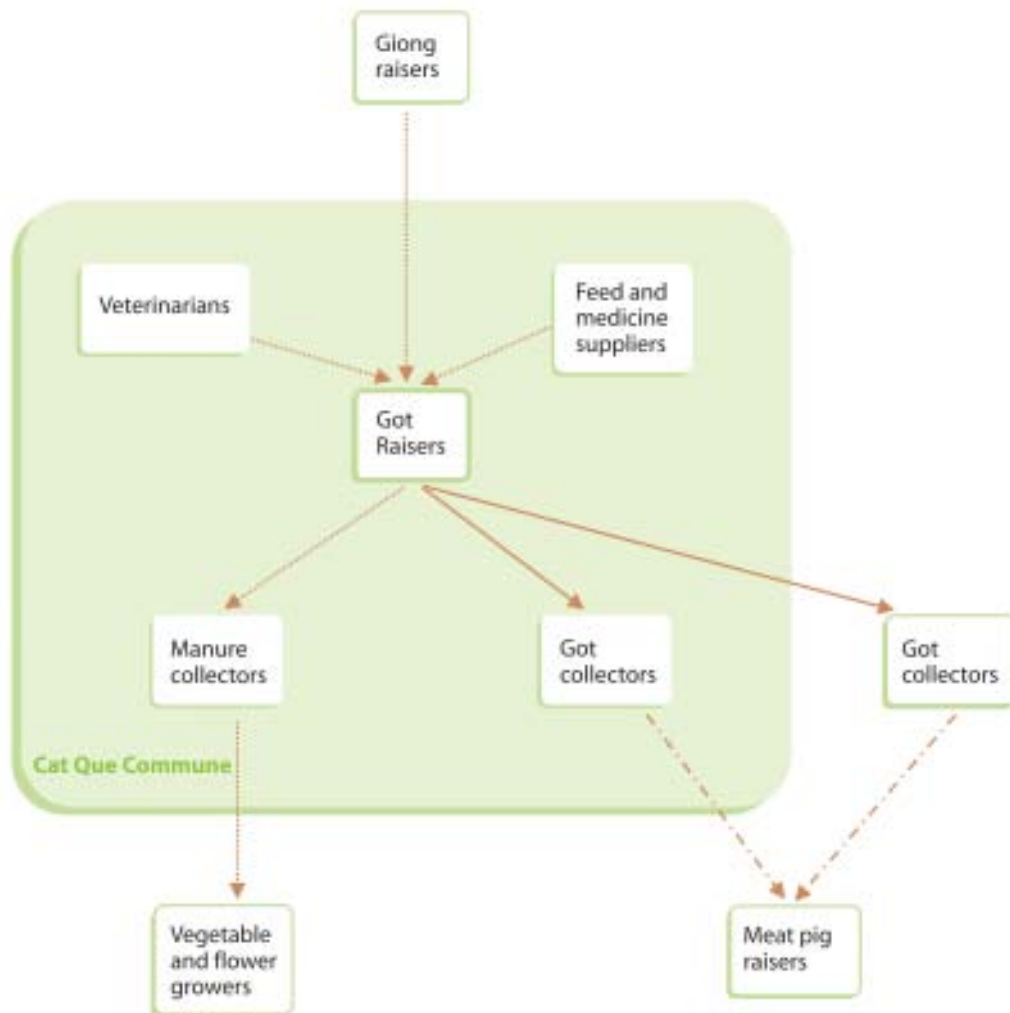
Although no nutritional analysis of the food wastes has been concluded yet, the residues from restaurants and

food preparing institutions are thought to be highly nutritious, although they have to be picked over because of small inorganic objects that get mixed in, such as small plastic bottles. Tofu residues can also be purchased from many small-scale tofu enterprises in Hanoi, but are more expensive and farmers generally agree restaurant waste is higher in nutrients and better for fattening pigs, even though the supply of tofu residues is more secure. Commercial supplements are used sparingly to stay within the narrow profit margin.

Even though the residents of Cat Que have significant economic advantage over traditional farming or livestock raising, they would like to explore the possibilities of further improving the profitability and resolving the problem of waste and environment. Ironically, while recycling restaurant residues from Hanoi partially alleviates one environmental hazard, the increased volume of resident pigs causes another in Cat Que. Measures to manage or eliminate the waste need to be identified. One possibility is to construct canals so the waste can be directed away from the commune into a holding tank for disposal. Pig manure is an excellent fertilizer. If the manure can be processed into a higher quality and value fertilizer, the market will also open up. It is, therefore, possible to experiment with small scale manure processing, but it would be better to adopt larger scale processing.

There are enough raw materials for fertilizer processing on a large scale. This would, however, require major investment that must be provided either by the government or private investors. To attract such an investment from either party, analysis must be performed to demonstrate the extent of the economic and environmental benefits.

Figure 1: Got-raising based enterprise clustered in Cat Que



Identifying best bet marketing opportunities for Kampala farmers

Direct, low-cost linkage to diverse urban markets is both an opportunity and a challenge for urban and peri-urban producers. Through its research theme of livelihoods and markets, Urban Harvest develops strategies to help producers better access the opportunities and confront the challenges.

Urban agriculture plays a key role within and around the rapidly growing city of Kampala, where agriculture activities contribute up to 40% of the total food consumed there. More than half of the land both within Kampala's municipal boundaries and peri-urban areas is used for agricultural purposes, with an estimated 30% of the households engaged in urban agriculture. Successful marketing of products thus has major livelihood implications for large numbers of urban farmers.

Beginning in 2002, an Urban Harvest team, led by the International Center for Tropical Agriculture, Colombia (CIAT) and the International Center for Tropical Agriculture, Nigeria (IITA) assessed the market opportunities for urban and peri-urban farmers in Kampala and helped them identify a portfolio of agricultural products with market demand whose production is technically and economically feasible.

Market surveys compared levels of demand for the products currently being produced by farmers there and identified a number of new fruits and vegetables with high potential.

The overall study involved: a rapid urban appraisal to characterize communities and identify agricultural commodities being produced by urban farmers for income generation; a study to capture opportunities for existing and potential products, and an evaluation of the most promising options for urban and peri-urban farmers.



Of the 38 products identified and evaluated, 8 were selected as high potential and their production and economic characteristics were further assessed. The evaluation criteria considered to select the short list of 8 products were: market demand (those in high demand and scarce supply), production feasibility in an urban setting, present production by urban and peri-urban farmers and government policies.

Meanwhile, the methodology used for the selection process was the rapid market assessment. This information-gathering method, which involves a series of carefully structured and documented in-depth interviews, provided a quick and effective way to discover and understand market needs and opportunities.

The rapid market assessment identified the following market opportunities: poultry products (broilers, eggs and local/indigenous chicken), vegetables (leafy vegetables, tomato, carrot, onion, cocoyam, mushroom, cauliflower and red pepper), fruits (avocado, mango,

pawpaw, pineapple, watermelon, jackfruit, tangerine, apple, pear, orange), meat (beef and pork) and fresh milk. Information on purchasing requirements—quality, packaging, minimum volumes, frequency of delivery, etc—was obtained for all these products.

The selected products were presented to farmers, who chose the most appropriate enterprises within their means. These were: mushrooms, poultry and pork. These were identified as high value products whose production is less risky than other alternatives that may provide a higher income, such as fruits and vegetables.

Market studies indicated, however, that the identified products had the potential to increase farmers' income only if they met the demands of traders in terms of quality, quantity, continuity and price. To fulfill these requirements, project participants concluded that they must either confine themselves to the local or niche markets that they can supply with their present production levels, or move toward collective action as a means of supplying greater volumes to those markets indicating growth possibilities.

Moreover, providing support services to farmers to overcome these initial "barriers to entry" (i.e. access to seeds, technical assistance, contacts with potential buyers, etc.) is key in helping farmers develop their crop production into a sustainable income-generating activity.

At present, services either do not exist or are oriented more toward production with little attention paid to marketing or enterprise organization.

The inter-institutional and multidisciplinary nature of this particular project is an attempt to bring together appropriate actors from both research and development to establish such services and work with the local community to develop more efficient enterprises.

The findings from this work are now being incorporated into a recently installed research and development project in Kampala, part of the International Development Research Centre (IDRC)-supported Focus City program.¹

¹ The Focus City Research Initiative (FCRI) selected eight cities around the world where multistakeholder City Teams are working in partnership over four years to research and test innovative solutions to alleviate poverty.

What should I feed my child?

Perceptions of foods for young children among Lima mothers

What types of food do people give their children?

Are choices made on the basis of custom, economy, education – or a combination of these? A study was conducted in a handful of communities on the outskirts of Lima to determine caregivers' perceptions and habits regarding child nutrition, specifically their use of animal-based products in the diet of young children between six and twenty four months old.

The study, carried out jointly in 2003 by Urban Harvest and Peru's Nutritional Research Institute (IIN), is set to help develop future programs and educational material aimed at combating infant malnutrition with an emphasis on incorporating animal-based products such as meats, milk and eggs into babies' meals.

A vital source of protein, vitamins, iron, zinc and calcium, animal-source foods are important for human growth and development, particularly during children's first years of life, when mental and physical development is most rapid and when the incorporation of foods complementary to breast milk is of utmost importance.

Access to meat and other animal-based products, however, is limited in rural and peri-urban areas such as the four shantytowns where the study was carried out, as these products are more difficult and more expensive to obtain than say, vegetable crops or processed goods.

In Peru, of the half million children under the age of five, one in four suffers from chronic malnutrition and one in every two has anemia—a disorder caused by a dietary iron or vitamin deficiency.

Through this and other projects, the International Potato Center (CIP) and partner institutions are committed to improving children's nutrition and overall health by encouraging mothers to adopt good feeding habits, disseminating information on the health benefits of consuming animal-based products, and providing



recommendations on the incorporation of such products into daily meals.

The methodology used in this particular study included in-depth one-on-one and group interviews with caregivers—including home animal breeders—as well as written surveys and questionnaires. During the initial information gathering process, project leaders applied the Pile Sort technique, which involves users grouping cards into piles according to specific topics. This simple and effective information sorting method helped structure the content of the study.

Study results brought to light, among other things, reasons why caregivers prefer one animal-based product over another: the availability of such products and the perception (and current use) of these products.

Caregivers in these communities generally prefer to feed their children chicken liver, chicken meat, milk and egg as their main source of animal-based goods. Fish, chicken meat, and yogurt are the products that they

(and their children) least favor and/or least consume. The study discovered that these preferences are closely tied to the caregiver's economic situation, access to these goods and cultural eating habits.

Urban Harvest aims to incorporate and promote animal-based products that are produced locally and/or are easily obtained into aid programs by providing caregivers with ideas on different meal preparations and presentations, while emphasizing the nutritional importance of such products.

Indeed, one of the main causes of infant malnutrition is caregivers' inadequate feeding practices which include, among other things, over-diluting infant's food, not feeding them enough food throughout the day, and not incorporate animal foods (meat, poultry, fish and eggs) into meals – or even totally excluding them.

This study considers the fact that not all children are the same: feeding practices differ from child to child

depending on their growth, development and age. What does remain a constant, however, is the fact that malnutrition affects an infant's health, growth and development, and therefore can lead to a lower quality of life as an adult.



Introduction to Urban ecosystems health

Understanding both positive and negative health effects on households and the urban ecosystem is essential for determining strategies that multiply benefits and mitigate risks. The **urban ecosystems health framework** provides a better lens for analyzing health issues related to urban agriculture. It is based on the interdependence of human health with the health of the natural, physical and social environments within which urban populations live. It focuses attention on six dimensions of urban health where urban and peri-urban agriculture (UPA) can have both a positive and negative impact. These dimensions include: *health of urban populations, communal health, quality of the built environment, quality of the physical environment, health and resilience of the biotic community and the health of the natural ecosystems.*

Many urban producer households are vulnerable to contaminants such as pesticide use, liquid and solid wastes. Heavy dependency and use of pesticides in densely populated urban areas create health problems for producers and the natural fertility of soils. Alternative Integrated Pest Management strategies are being

introduced, through farmer field schools, to mitigate these negative effects. Moreover, water contamination, derived from inadequate water treatment plants in developing countries, causes many health problems for urban dwellers. The use of either wastewater or contaminated river water as a source of irrigation causes many health issues for producers as well as consumers.

Access to natural and physical resources for agriculture and the potential impact of these resources on agriculture is important, although this is not enough. Natural and physical resources, of potentially great use to urban agriculture, go unrecognized by local officials or remain underutilized by poor urban households. Hence the concept of **urban resources recognition and use** is employed to address the high potential of urban agriculture to mobilize and add value to natural and physical resources, such as water, and, thus, strengthen and balance capital assets available to urban communities. Strongly linked to both the livelihoods and urban ecosystems health frameworks, this will form the basis of a third module with an emphasis on resource mapping, modeling and policy development.

Adopting Farmer Field Schools to urban realities in Lima, Peru



A participatory project on the outskirts of Lima is helping an organized group of farmers to improve their quality of life and care for the environment by strengthening the management of their crops and livestock production systems.

As metropolitan Lima continues to sprawl further into the Rimac river watershed and turn traditional agricultural lands into concrete, urban farmers in the communities of Carapongo and Huachipa continually have to deal with the health, legal and environmental problems that accompany urban growth. An estimated 20% of Lima households are involved in agriculture—backyard livestock raising or growing horticulture products—with many of these families depending on horticulture as their main source of income.

In an effort to curb the negative effects of urbanization, Urban Harvest designed and implemented a program that aims to adapt improved technologies to farmers' horticulture production, decrease their use of pesticides, and search for new market opportunities for their

products. Most producers in the area have limited know-how or money to improve the quality and efficiency of production and therefore have no option but to sell their products to local markets at a nominal price.

Implemented in 2004 and 2005, this Urban Harvest project utilized the Farmer Field Schools (FFS) approach, which involves intensive adult education and social learning techniques to stimulate agricultural education. This approach, which up until now had only been applied in rural settings, was adapted for the first time to an urban context. This meant factoring in, among other things, the participants' multiple livelihood activities, limited time availability, and competing priorities.

Aside from adapting the FFS approach to an urban coastal setting, specifically Lima's eastern river valley, the approach used in this project was innovative in the fact that it aimed to find integrated solutions to the management of vegetable crops and not merely for the specific problems of disease and pest control.

The main themes discussed during the FFS sessions and experiments were land use management, fertilization, management of insect pests, water management and irrigation techniques, planting techniques, and market access. This helped farmers become aware of the environmental and health problems, market indicators and crop production issues in their urban environment.

The prevalent theme, however, was land use and crop management. Study results highlighted the fact that there exists a lack of local knowledge of urban agro-ecologies and of pest and disease management among producers, which in turn leads to the widespread use of highly toxic pesticides to combat insect pests and diseases.



Pesticide-related health hazards are particularly relevant in an urban setting because spraying occurs close to homes and near green spaces used for children's play. Moreover, pesticide use leads to water contamination and thus to the marketing of contaminated crops.

With this in mind, participating farmers were introduced to integrated pest management and soil management techniques. Special attention was paid to "soil health" and the use of the different composts and manures (cow, chicken, and guinea pig droppings), emphasizing that plant health depends on soil health.

Also discussed were different water and irrigation systems, including drip irrigation and the use of treatment reservoirs with the opportunity for aquaculture and the production of clean irrigation water. Specifically, the project involved the construction of a backyard reservoir in Carapongo that aims to improve human health, the natural environment, and household income through the production of tilapia fish in the reservoir.

Although potato is not normally considered a high value crop in Peru, researchers and producers evaluated promising native and commercial potato varieties for the production of organically produced cocktail potatoes for a growing luxury market in Lima.

As a result of the social learning context of FFS, producers in the area have realized the importance of grouping together and have formed micro-enterprise associations to strengthen their access to existing markets and response to new commercial opportunities.

Organized farmers in Huachipa, for example, have joined forces and started selling their organic products to a local clinic and restaurants, where there is a growing demand for organic products, in an effort to access buyers directly and therefore obtain better prices for their ware. According to farmers, direct sales provide them with a consistent, nearby outlet for their products and at a competitive price. Meanwhile, in Carapongo, the main buyers are families in the area, which simplifies the commercialization process and provides immediate returns for the group.

Despite this, project participants have concluded that tapping larger, more profitable markets for their organic products is essential in order for their horticulture production to become a sustainable income generating activity. So far, both producer groups have linked up with the Empresa Ecológica Perú, which serves as an intermediary between producers and supermarkets and green fairs for the sale of organic products. Through this association, producers have completed their first batch of deliveries, which included 5 different products.

Project leaders attribute a big part of the success of this project to the close collaboration established between producers and the local government. In addition to forming strategic alliances with government institutions and other non-governmental entities, the project is working with different actors along the value chain to establish new market linkages.

Projects like these demonstrate the potentials of urban and peri-urban agriculture for poverty alleviation, micro-enterprise development, social inclusion, and enhancing food and nutritional security, among other things.

Research for a cleaner future: Heavy metal contamination in Kampala



The rapid growth (3.5% per year) of the city of Kampala in recent years makes heavy metal contamination of particular concern to urban and peri-urban agriculture. Urban ecosystem health is important because of the feedback mechanisms between human actions and population, community and environmental health. In cities in general, accumulations of toxic substances, particularly heavy metals, are a major concern in urban and peri-urban agriculture. Kampala, formerly the Buganda kings' hunting grounds, has only been a city since 1961, but there are forgotten former industrial or dumpsites dating from its first half century as a city that are potential sources of soil or water borne contaminants. Kampala City, located in the only urban district in Uganda, has a resident population of over 1.2 million (2002 census), but the daytime population is more than twice that size, which implies a heavy amount of daily traffic powered by unleaded gasoline moving along major roads, emitting air borne heavy metal particles. About 35% of the population of Kampala is engaged in farming, about three quarters of which are women, and an estimated 40% of

the food consumed in Kampala city is produced by urban and peri-urban agricultural production.

Since 2002 one of the main aspects of the work carried out by Urban Harvest and the Kampala Urban Food Security and Livestock Coordination Committee (KUFSAALCC), a non-governmental, inter-institutional organization, has been to study the health impacts of urban and peri-urban agriculture in Kampala. In 2004, a study on heavy metal contamination funded by an International Development Research Center (IDRC)-AGROPOLIS award was presented at the botany department of Makerere University. It is one of few such studies on heavy metal pollution from a developing country. The main objective of the study was to determine the heavy metal content of the air, soil and food crops grown in areas receiving particulate emissions from motor vehicles in Kampala City. The soils were analyzed for cadmium (Cd), lead (Pb) and zinc (Zn). Other soil parameters investigated included soil pH, soil organic matter content, texture and macro-element content (phosphorus and nitrogen).

After a preliminary study of the roadways to see which were the most heavily traveled and by what kinds of vehicles, the three with the heaviest traffic were selected. The University of Makerere research team studied soil samples and the food plants growing from some eleven sites, nine of them near the most heavily transited roads and two sites in areas with low traffic density to serve as control, taking samples from ten locations at each site at different distances from the road. As Grace Nabulo, who headed the team, points out: "We also tested to see what kinds of food plants were affected; whether the contamination was absorbed or could be reduced by preparation (washing or peeling); if absorbed, what parts of the plant—leaf, root, peel, fruit/seed—were affected." In addition, the placement of test sites allowed them to

test whether contamination was reduced when crops were protected from roadway pollution by a house standing between the road and the field. In order to measure airborne lead contamination, test wipes were taken from window glass to see how the lead content in the air compared with what was found on leafy vegetables—the window wipes provided a better measure than the plants of lead in the air.

The toxicity of lead, which has no known biological function in the human body, comes from its ability to mimic other biologically important metals, notably calcium, iron and zinc. Lead is able to bind to and interact with the same proteins and molecules as these metals, but the molecules thus formed fail to carry out the same functions, such as producing the enzymes necessary for certain biological processes. The symptoms of chronic lead poisoning include neurological problems, among a long list of other pernicious effects. The effects can be carried into the next generation: a woman exposed to lead in her childhood (even with no exposure after that) can pass the lead to her child as an unborn fetus or through her breast milk. The link between early exposure of children to lead and learning disability has been confirmed by multiple researchers and child advocacy groups. Very young children are particularly vulnerable to environmental soil Pb through hand to mouth behavior. The four major sources of Pb are: (1) the exhaust from vehicles that use leaded gasoline, (2) lead water pipes, (3) industrial emissions and (4) Pb in paint.

Cadmium (Cd) and some Cd compounds are listed by the International Agency for Research on Cancer as carcinogenic. Cadmium is bioaccumulative and persistent. It is a priority pollutant that should be eliminated, not just reduced. Zinc (Zn) has toxic effects on the environment. It is a component of tires, which is released as they wear down. Although Zn is an essential element for higher plants, it is considered phytotoxic in

elevated concentrations, directly affecting crop yields and soil fertility.

The study found the total lead in soils to be within acceptable concentrations for agricultural use with the exception of three sites, which were the sites ranked first, second and third in terms of traffic density of gasoline powered light vehicles, —heavy vehicles use diesel fuel, which does not contain lead. Total cadmium in soil was found at concentrations above the recommended maximum for agricultural soil at most of the sites. Total zinc in soil was found within recommended concentrations at all sites except one.

On the other hand, elevated concentrations of Pb, Cd and Zn were found in all crops and, in particular, leafy vegetables. Most of the heavy metal accumulation was in the leaves compared to the roots, fruits and tubers. Heavy metal accumulation in leafy vegetables was in the order of leaf > root > peel > fruit/seed. In root crops the order of accumulation was root > leaf > peel > tuber. The total heavy metal content of soils was observed to decrease rapidly with increasing distance from the roads. Accumulation of Pb in soils above background levels took place up to a distance of 30 m, after which it became constant.

Finally, this study found the dominant pathway for Pb contamination of leafy vegetables was from aerial deposition, while Pb in root crops appeared to originate from the soil. Likewise, Zn vegetable contamination stemmed mainly from aerial deposition. On the other hand, the major pathway of contamination by Cd was found to be uptake from the soil, possibly from an abandoned industrial site or dumpsite.

Findings and recommendations of the research study are: Roadside farming activities in the city are safest at a distance of more than 30 m from the edge of the road. Leafy vegetables should not be grown near roadsides,

regardless of traffic density. Crops where the edible part is protected from aerial deposition, such as corn, pulses like beans and peas, and some tubers such as sweetpotato and cassava, are safer for roadside farming, but the peel of tubers and the pod of beans and peas accumulate higher Pb contents and should not be used. Those vegetables that bioaccumulate heavy metals in their skins should be peeled. All vegetables should be washed thoroughly in plenty of clean water before consumption. Washing was found to reduce the Pb and Cd contents in many of the vegetables studied but had little effect on the zinc content. If possible, areas other than roadsides should be utilized for the growing of crops for consumption. The placement of gardens on the far side of houses could help to block some of the deposition of lead, cadmium and zinc. Sheltering crops could help

reduce the amount of heavy metals deposited from passing vehicles. Regulation of vehicle emissions and the introduction of unleaded fuel are recommended as part of the long-term solution to this problem. Allocation and monitoring of land usage within Kampala could help to reduce the use of hazardous areas for agricultural activities.

The heavy metal contamination study provided important information for two other Urban Harvest projects in Kampala. More knowledge and especially more detailed knowledge about heavy metal contamination early in the urbanization process can be used to build safeguards into the process and create options to mitigate or avoid dangerous impacts on environmental and human health.

Dirty secret treasures in Nairobi

Nairobi has passed through many changes since its founding a little more than a century ago. Today it is still a cosmopolitan city known variously as the “Green City in the Sun”, the “Safari Capital of the World” or the “Place of Cold Waters”, although many parts of it have increasingly become buried under mounds and heaps of garbage and a lot of the “cold waters” are contaminated by sewage. About 40% of the more than 1740 metric tonnes of solid waste generated every day by its approximately 3 million residents gets collected and disposed of. The rest continues to mount up in open spaces, along the roads, the railroad, the river, forming piles everywhere in most of the residential, industrial and commercial neighborhoods, even in the business district. Like other cities in developing countries, the municipal infrastructure has not been able to keep pace with the rapidly growing population. By the mid-1980s, private waste collectors serviced middle and high income residential neighborhoods, but lower income residents had to find other solutions to the sanitation problem. About 50% of Nairobi residents live below the poverty line and are concentrated in peri-urban slum areas characterized by limited amenities and unhygienic living conditions. By the early 1990s there were a few small-scale community-based composting groups, who utilize a small amount of the accumulation of manure from the many animals being raised for the local food market.

Urban Harvest conducted a study in partnership with International Livestock Research Institute (ILRI), World Agroforestry Center (WAC), both of which are centers of the Consultative Groups on International Agricultural Research (CGIAR), Kenya Agricultural Research Institute (KARI) and Kenya Green Towns Partnership Association (KGTPA), which is an NGO. The study illustrated gender involvement in management of municipal organic solid waste (MOSW) for urban and peri-urban agriculture as well as the different aspects of waste management as livelihood strategies. The data was compiled from a



survey conducted in 2003-2004 on management of organic waste and livestock manure for enhancing agricultural productivity in urban and peri-urban Nairobi. The objectives of the study were to make an inventory of community based organizations involved in organic waste management for urban and peri-urban agriculture (UPA), document the existing composting groups in Nairobi, analyze composting management techniques, model rural-urban nutrient movements and link stakeholders in UPA.

In January 2005 the final stakeholder workshop was held to discuss the results of the study of waste recycling in Nairobi, with a special focus on the use of manure and organic residues in agriculture. Attending the workshop were representatives of the implementation team listed above plus staff from the Nairobi City Council Departments, national government and civil society organizations who are involved in and concerned with the management of urban wastes. It was also a way of familiarizing them with the specific objectives of the original project, making them aware of the characterization of ecological exchanges of nutrients among different sectors and geographical areas of the city and the value chain involved in economic

exchanges of different kinds of wastes between rural and urban areas.

Waste is a relative term. Although it refers to something that is useless or worthless, it must be borne in mind that waste—like beauty—is in the eye of the beholder. Urban agriculture plays a significant role in urban environmental management through waste recycling. There are a lot of nutrients in urban organic waste (carbon, nitrogen, phosphorus and potassium). Only one percent of organic waste in Nairobi is used for production of compost for use as a bio-fertilizer, another use is for animal feed, particularly kiosk and restaurant waste for pigs and goats. Inorganic waste (plastics) can be used to make useful products: hats, bags and baskets, roof tiles, fence posts, cages for small farm animals and containers for compost. Cardboard and packaging can be used for building materials, oily milk containers and some cardboard are used for fuel. Clearly there is an opportunity here to increase income from both waste and more efficient farming and to contribute to a cleaner, healthier local community. This type of recycling helps solve an environmental problem while providing income for the urban poor.

Urban agriculture also plays a significant role in wastewater recycling through irrigation. This opportunity for urban waste recycling has not been exploited due to lack of space for waste recycling activities and absence of appropriate policy on waste management. Urban agriculture also helps put idle urban land into productive use.

Problems identified which inhibit successful recycling include: (1) insecure access to land for composting, poor group management leading to internal conflicts, which prevents taking advantages of economies of scale in waste handling and processing; (2) declining group membership due to the still underdeveloped compost market and the hard work involved in compost production, especially considering the only

transportation used is the wheelbarrow and (3) a tendency to resort to traditional composting techniques having rejected newly introduced techniques.

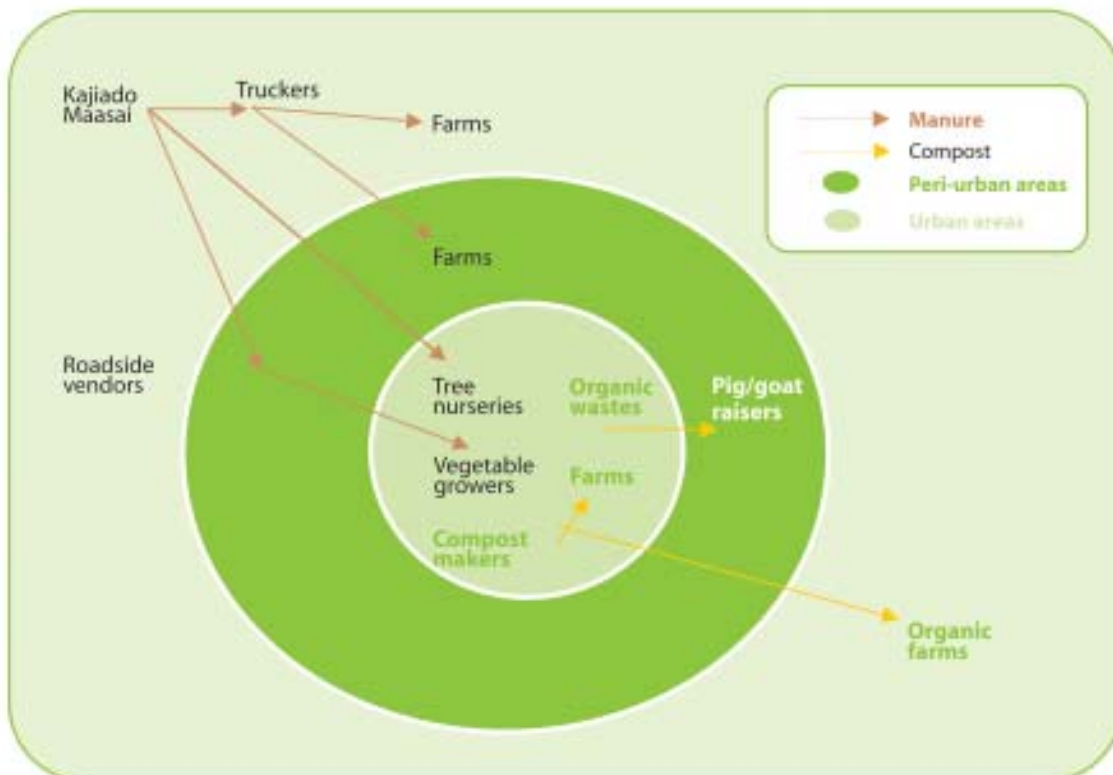
Research on the chemical composition of different compost sources being used in Nairobi indicated that the quality is generally high and there is potential for greatly increasing the quantity produced. Studies of residue markets described a complex network of nutrient flows linking rural and urban areas: some urban livestock producers export their surplus fodder to rural areas, while others use compost they have produced for their own crops. There is also co-composting of local materials (mixing of manure and vegetative residues), which is comparable to what is done in rural areas. Half of the livestock producers use their manure for crop production and some sell or give it away. However, a most disturbing finding was that up to 80% of manure is dumped or burned in public areas. This represents a large economic loss to agricultural producers and a high potential environmental and health cost to the city.

Intriguingly, while urban manure is mostly considered a nuisance, rural manure from Maasai cattle herders is part of a flourishing trade, some sold to peri-urban vegetable producers and urban nurseries, but mostly traded on through the city to rural producers in other parts of the region as far as 300 km away. Composting is not a common practice, which probably accounts for the high price of compost compared to manure. The study found that compost producers, who usually advertise and trade their product on site, are unfamiliar with marketing strategy and opportunities while potential customers are unaware of compost sources and its high quality. Better marketing skills and diffusion of knowledge could transform this “hidden resource” into a major source of income, earnings and savings for compost makers and growers alike.

The chaotic state of solid waste management services in Nairobi is attributed to insufficient funds, insufficient equipment and outgrown institutional and organizational arrangements. Increasing incomes and solving environmental problems through recycling and

composting can be components of a systematic, integrated approach to a healthier Nairobi basically by recognizing and utilizing the valuable resources that are quite literally at their doorstep.

Rural-urban manure and compost markets in and around Nairobi



Improving the quality of irrigation water in Lima

30



Using contaminated water for irrigation is just another fact of life for the majority of urban and peri-urban producers in Lima's Eastern Cone, which produces 35 percent of the fresh vegetables (lettuce, beets, turnips, cabbage, celery, sweet basil and herbs), as well as a large number of the small meat animals (chickens, ducks, guinea pigs and pigs) consumed daily in Lima. The mining industry straddles the upper watershed of the river that supplies most of the water for this desert valley, where this element is scarce and domestic waters are not treated before being emptied into the river and even directly into

the irrigation canals themselves. This can be a source of ill-health for urban consumers and acts as a disincentive to buy local produce. Urban Harvest, as part of its collaboration program with the municipalities in this zone, made a study of the level of contamination of irrigation waters, soils and vegetables, and has worked with local residents to help them find a low-cost solution to their problem.

The Rimac, like most of Peru's coastal rivers, begins at more than 5100 meters above sea level in the high Andes. Fed by glaciers and seasonal rains, it travels over 204 km to cover the 145 km from its source to the sea, passing through a large number of crystalline lakes and mining areas in the highlands before it drops down to cross the coastal desert. The dry season river level can be very low for as many as nine months of the year but the river turns into a raging torrent when there are heavy rains in the highlands. Human and environmental health risks have long been present from heavy metals leaking from tailings dams of operating and abandoned mines into the waters of the upper watershed, and in more recent years by the untreated sewage and refuse dumped into the river in increasing quantities by the fast-growing population as one gets closer to Lima. Cities located at the mouths of large rivers all over the world are confronted with over-enrichment of nutrients, contamination by pathogens and toxic chemical substances that adversely affect the ecosystem and public health. Lima is no exception.

In order to assess the health risks, two types of data were collected and analyzed: secondary data, which were collected over a seven-year period by two state agencies responsible respectively for water and health; and primary data, which came from extensive sampling and analysis of the waters at different locations along the river and irrigation canals, of the soils in the irrigated fields and of the vegetables

themselves, both recently harvested and after washing in the irrigation canals. The good news is that the heavy metals cadmium, lead and chrome are no longer much of a problem, due to increased control of mine tailings in the upper watershed. Available cadmium assimilated by plants comes from the parent soil and not from mining activity and can be bioaccumulated at risky levels of foliage plants. There is no evidence of bioaccumulation of lead and chrome in vegetables. Arsenic is found to be above permissible limits in some places. The highest concentration is in *huacatay*, an aromatic herb of the marigold family, used extensively in Peruvian cuisine, but in such small quantities that it is ultimately considered a low health risk.

The bad news, however, is the alarming amount of *Escherichia coli* bacteria and parasites present in the water, which is now considered the highest contamination risk for agricultural activity in the Rimac Valley. Sometimes the fecal coliform count was more than five thousand times the maximum permissible limits (MPL) for water used to irrigate garden vegetables. It was found that 30% of the garden vegetables in one neighborhood and 70% in two others are over the MPL, making them unfit for human consumption. More than 97% of the samples of irrigation canal water taken in these three sites exceed the MPL for watering vegetables. The irrigation canals often contain the highest degree of contamination and are used to wash clothes, for bathing and to wash vegetables for market. Of the vegetables that tested clean at harvest, 38% became contaminated when washed with water from irrigation canals. Latrines are sometimes installed right over irrigation ditches and the agricultural fields also serve as public latrines, adding a further source of contamination.

The long-term solution to this problem is the provision of sanitation systems for the settlements along the river, but shorter-term mitigation measures are urgently needed.



In response to the concerns of local producers, Urban Harvest coordinates an alliance with the PanAmerican Health Organization and the PanAmerican Center for Sanitary Engineering and Environmental Sciences (OPS-CEPIS), the Centro de Estudios de Solidaridad con America Latina (CESAL), the Rimac Irrigation Users' Board (JUR), the Municipality of Lurigancho-Chosica and producers from the zone with the financial support of the National Institute for Agricultural Research (INIA)-Spain, the Madrid Community and the International Development Research Centre (IDRC)-Canada, which has installed a small 185 ft³ pilot reservoir to treat irrigation water. Water enters the reservoir from the irrigation canal and is left standing for at least ten days, during which time the bacteria are eliminated through aerobic chemical processes and parasites are eliminated through sedimentation. As part of the pilot study, water from the treatment process was compared with untreated river water as sources of irrigation for vegetables.

The results showed that the reservoir has cleared 98 percent of bacteria and eliminated all parasites from the river water. When radish and lettuce were tested for contaminants, those planted in treated water had up to

97 percent less bacteria (well below permissible limits) while parasites were practically absent in both crops. To maintain this level of sanitary quality a reservoir of 700 m³ built on an area of about 1000 m² is required per hectare. If the reservoir is complemented with a technified irrigation system of multiple floodgates the amount of water required to irrigate fields can be reduced by 50%.

Apart from the cost of the land, the cost of a 700 m³ reservoir is about S/.4,5000 (US\$ 1,360), which goes up to S/.17,770 (US\$ 5,538), depending on the quality of the waterproofing geomembrane liningliner.

To explore alternative economic opportunities, fish (tilapia) production in the reservoir is being assessed.

Projections of potential net earnings from sale of fingerlings and mature fish are S/ 1750 (US\$ 555). In addition to this benefit, irrigation with reservoir water appears to have had a beneficial effect both on rate of emergence and growth and on the uniformity of the crop, with higher percentages of marketable products available sooner than with use of river water.

This difference is still being evaluated. The small reservoir has been shown to have multiple benefits, and is replicable in the area. Working with local producers, Urban Harvest is therefore in the process of implementing other reservoirs with the capacity of irrigating up to 70 hectares with clean water.

Introduction to stakeholder and policy dialogue

Unlike agriculture in rural areas, crop production or livestock raising in and around cities is enmeshed in a complex web of policies, regulations and competing stakeholder interests which can restrict, constrain and sometimes outlaw the practice. This adds further insecurity to households already often suffering food and income insecurity. Municipal recognition and support for safe urban and peri-urban agriculture is an essential pre-condition for its contribution to urban development. The inclusion of a research area on **stakeholder and policy dialogue** seeks to contribute to that goal.

A first step to good planning is to define the complex interaction between different urban systems and to involve all the interested stakeholders in a participatory process of consultation. Negative perceptions (justified and unjustified) about urban and peri-urban agriculture (UPA), held by the various players in the planning process, must be confronted through a combination of targeted education, demonstration and participation. Also to be discussed among local stakeholder groups and policy-makers are their perceptions of the city they live in, appropriate activities to take place within the city and how to address the real needs of community members.

To build understanding and collaboration through dialogue at municipal and national levels, Urban Harvest

has developed a stakeholder dialogue model involving a multi-agency committee on urban food security and agriculture with participation by municipal authorities to oversee research and development interventions and to facilitate policy change. Platforms for dialogue and joint activities for building awareness have been established, with the inclusion of irrigation committees and women's community kitchens in Lima, schools in Kampala, non-government organization (NGO) networks in Nairobi and Nakuru and flower trader groups in the Philippines. A good example of this work is in Kampala where the City Council of Kampala undertook a participatory consultation with stakeholders to make major revisions to city ordinances to legalize agricultural activities for the first time. City planning should incorporate an understanding of household food security and nutrition conditions, agricultural research and economic forces. The integration of UPA requires going beyond traditional planning approaches. In most of the developing world's cities, too little is known about the actual extent to which urban and peri-urban areas are used for agricultural purposes. Also, little is known about the spatial distribution of urban agriculture in the cities and the change in this distribution over time. Tools such as Geographical Information Systems (GIS) can increase our understanding of UPA in such areas.

Getting agriculture on the municipal agenda in Lima

34



Agriculture is widespread in Lurigancho-Chosica, one of the largest and less urbanised city districts on the eastern fringe of Lima. Despite the significant contribution that urban and peri-urban agriculture can make to generating income and food security, this was until recently a little known or understood sector of the district economy despite the numbers of local people involved. Farming was absent from municipal organization or planning and the voices of local producers were unheard.

Lurigancho-Chosica is home to around thirty thousand families with around 20% involved full-time or part-time in agriculture. Crop production is mainly located on the irrigated valley floor, which makes up nearly 45% of the district area. Producers there grow and supply about 25% of metropolitan Lima's vegetables, and also raise birds, guinea pigs, rabbits, pigs, cattle and goats. Almost 30% of landless families living on the poor hillside settlements in the heart of the district also keep small animals for occasional sales or home consumption. With almost a third of children under 6 affected by chronic malnutrition in Peru, this additional source of food and income is often vital for these families.

In 2003, as part of its research themes on **urban livelihoods and markets and stakeholder and policy dialogue**, Urban Harvest conducted diagnostic research on the contribution of agriculture to household livelihoods in the district and on the other, sought to generate better understanding among decision-makers about the significance of local food production with the aim eventually of incorporating the phenomenon of urban agriculture into local government organization and planning.

Working with local producers and municipal managers and decision-makers, Urban Harvest facilitated workshops, co-ordinated information-sharing and organised public events, such as fairs and visits to model farms where ecological urban agriculture is practiced. The first of three international workshop meetings was held in October 2003. Invited representatives, including those from Havana (Cuba) and Cuenca (Ecuador), made presentations to local administrators about how the incorporation of urban agriculture within policy-making in their countries had encouraged the development of greater food security, income and a greener urban environment for local people living there.

The result of this first international workshop was that decision-makers were given solid evidence for the potential of urban agriculture to enhance the livelihoods of local people. As a consequence, the mayors of metropolitan Lima publicly declared their support for the development of urban agriculture. This led to a decision by the local district administration in 2004 to create an Urban Agriculture Unit (*Sub-Gerencia de Agricultura Urbana*) within the Department of Economic Development.

A second international workshop was held in December 2004. Representatives from the cities of Rosario (Argentina) and Azcapotzalco (Mexico), were

invited to attend this public presentation of the working plan of the Unit. The Unit functions as a neighbourhood service centre for agricultural producers and local people. It promotes better links and understanding between producers and consumers by offering training, information new marketing opportunities and mediation with the municipal authorities. With some co-financing from Urban Harvest, the municipality managed to put together a budget of US\$100,000 with the aim of promoting activities that support the Unit's objectives:

(1) To encourage producers to farm in a sustainable, economically viable way using fewer chemicals; (2) To intervene in local planning, including promoting legislation for the productive use of vacant lots; (3) To promote improved practices and diversification of agricultural activities that contributes to higher income. Included in its action plan is the acknowledgement of the need to develop ways of integrating urban agriculture into planning and encouraging social integration, including analysis of the roles of men and women. During these two years, the local Urban Agriculture Unit has worked directly with more than 700 local producers, helping them with training courses and market opportunities and applying the technical skills developed by the collaborative efforts of producer innovators and the Urban Harvest research team through the Urban Field Schools (see article page 20 and list of publications).

To facilitate the exchange of ideas and experiences between districts of Lima and with other Latin American cities where urban agriculture has become prominent and an integrated aspect of urban governance, a third international meeting was held in August 2006. The meeting included presentations by participants from Bogota (Colombia), Mexico city (Mexico), Rosario (Argentina) and Havana (Cuba), as well as by two district mayors from the city of Lima with pioneer urban

agriculture programs. These experiences were used to develop proposals for a comprehensive urban agriculture program relevant at the level of metropolitan Lima.

A key activity within its research theme on stakeholder and policy dialogue has been Urban Harvest's cooperation with the local Urban Agriculture Unit to explore forms of engagement with the policy making process. Drawing on local networking linkages (see article, page 41 and list of publications), unit managers were trained by staff of the Institute for the Promotion of Sustainable Development (IPES), a partner organization specializing in policy-related aspects of urban agriculture. Training complemented officers' existing practical experience of municipal administration, by adding strategic planning and policy formulation aspects of urban agriculture. As a result, Unit staff recognized the need to strengthen local agriculture through a participatory process that includes integrating all municipal actors, including producers, consumers, public managers and NGOs, among others. In this way, the municipality has been able to adapt its structure according to the needs of its people.

The Unit has generated a workplan to support those involved in urban agriculture. The plan includes steering through the local legislative process a series of ordinances defining good agricultural practices – a useful addition to the by-laws since up to now, agriculture has lacked specific regulation in metropolitan Lima. The workplan also focuses on issues such as access to land, land tenure, access to and quality of water, access to finance (micro-credits), strengthened marketing and processing channels, environmental conservation, organic waste treatment and the quality and safety of agricultural products. All of these issues affect most of those involved in local agriculture, who live in the area and who consume products from the area.

As a result of efforts made to demonstrate and showcase the viability of local food production, there is a wide consensus among producers and decision makers that “productive green spaces” is a persuasive land use concept and that the existence of these spaces should be actively supported and maintained. The stakeholder and policy dialogue model calls for continuing open discussions to respond to the real needs of the population. Other municipal departments, such as Urban Development, Economic Development, Rents, Social Welfare and Parks and Gardens, have been made aware of the impact of local agriculture. There is now a municipal decree regarding inclusion of agricultural production in the micro-finance program, and an agreement with the Local Environment Commission to present the Good Urban Agriculture Practices Regulation for approval.

An important part of supporting urban agriculture’s contribution to increased income, greater food security and a more liveable environment involves addressing various institutional challenges:

- To overcome the challenge of illegitimacy of the practice, urban agriculture has been recently included as a municipal productive activity which gives it license, passing from an illegitimate status to a legitimate one.
- To overcome divergent perceptions of agricultural practices among different stakeholders, an institutionalised agriculture plan needs to be developed that promotes constant communication amongst producers and continued awareness-raising and information dissemination amongst decision-makers.
- To overcome inevitable changes in levels of political



support, it is necessary to strengthen urban farmers’ organisational, managerial, technical and networking skills and to help create consolidated and produce organisations that can speak clearly and in unison with local authorities.

The urban environment is socially, economically and politically dynamic and nothing can guarantee the viability of urban agriculture. Competing land uses and labour needs will always be key factors in its sustainability. Nevertheless, these lessons from Lima suggest that the sustainability of urban agriculture can be strongly enhanced through dialogue among stakeholders, through incorporation of the practice into local government organization and through enhancement of policies and regulations which ensure fair treatment of producers, but also regulate the quality and safety of their products.

An urban agricultural model in the making: Kampala, Uganda

In the last decade, the recognition among various sectors of the population and among national and local government agencies in Uganda, as to the benefits of attending, protecting and promoting urban and peri-urban agriculture, has served as an example for human development efforts and strategies worldwide. The recent legislative changes in Kampala, the role of the various civil societies' organisations, including international organisations, not to mention the efforts of the urban farmers themselves, have jointly begun the establishment of a healthier, more sustainable and environmentally friendlier urban agricultural model, as well as a more comprehensive approach to agricultural development.

Urban Agriculture, as defined by the United Nations Development Program (UNDP) (1998)¹, has always been a part of Kampala's economy. Urban and peri-urban agriculture and livestock (UPA &L) is widely practised as an intense livelihood strategy in Kampala. This is due to a number of factors, including the rapid economic decline in the early 1970's, rural-urban migration, and the city's growth that engulfs large agricultural farmlands. According to the 2002 Population and Housing Census, Kampala's population growth of 3.9% derives mostly from rural-urban migration. There is an unemployment rate of 42.5%, and over 80% of the population are in the low-income bracket while 38.9% live in absolute poverty. Approximately 35% households with backyard gardens of less than an acre practise UPA&L as their livelihood strategy.

However, in Kampala, as in most African countries, the benefits of UPA&L have been largely shadowed by its risks. Agriculture in Uganda has been, until recently, promoted only in rural areas through national policies that sought to develop strategic plans to eradicate



poverty. Under the "Town and Country Planning Act. 1964" and the "Public Health Act. 1964", urban agriculture

¹ United Nations Development Program 1988. "Potential, problems, and policy implications for urban agriculture in developing countries" Agriculture and Human Values Vol.20, No.1

was widely seen as an illegal activity even though it was not per se prohibited. Concerns about urban agriculture were based on perceived public health issues, including the dangers of creating environments for breeding mosquitoes, harbouring vermin, pollution from poorly disposed livestock wastes and general nuisance from poorly managed livestock. Even though UPA&L activity continues to grow, it is perceived to be neither consistent with a modern productive city environment nor an activity that can make a significant economic contribution.

In the early 1990's both formal and informal initiatives to recognize UPA&L started, for example, the "cow bank" project of the National Assembly for the Kampala district and also similar projects implemented by the civil society organisation, Environment Alert. The country's decentralisation process has allowed for local initiatives such as the district agricultural extension officer working under the Kampala City Council (KCC) to build capacity for urban harvest work in collaboration with non-government organizations (NGOs) as well as awareness building for local politicians. UPA&L initiatives like these have consequently brought about other challenges, such as clashes between district and central government officials and the city officials whenever UPA&L related laws were enforced, or such as UPA&L related promises and bribery with small livestock for votes during local elections.

However, public and political awareness and greater understanding of the dynamics of UPA&L are part of the change process that has, since then, led to important structural policy changes in favour of UPA&L. The awareness creation and sensitisation can be seen as a product of the greater amount of information, detailed diagnostics and research carried out on the issues of UPA&L by various actors.

The creation of Urban Harvest as a Strategic Initiative on Urban and Peri-Urban Agriculture meant more systematic

and coordinated international research on issues of urban agriculture, which in turn led to a series of initiatives of international and regional meetings and workshops up to the early 2000s. In these meetings and workshops, Uganda's research community, NGOs, technical officers and politicians had the opportunity to interact, learn, share and be exposed to experiences in other countries as well as gain an understanding of urban agriculture.

In 2002, a coalition of research actors, Makerere Department of Agriculture Extension, International Institute of Tropical Agriculture, (IITA) -Foodnet, National Agricultural Research Organisation (NARO), KCC and two NGOs started to work on the project "Strengthening Urban Agriculture in Kampala, Uganda" which in general consisted of generating information to assist local authorities, policy makers, NGOs and researchers. Another collaborative project also started that year that intended to understand the health risks and benefits of UPA&L and options for enhancing the benefits and minimizing the risks. The coalition of this project included the Makerere University, KCC, Environmental Alert, International Livestock Research Institute (ILRI) and funded by Canadian International Development Agency (CIDA), International Development Research Centre (IDRC) and Urban Harvest.

Links were made between these projects and a core group of local organisations developed, at first as informal linkages, later formally, as the Health Coordinating Committee (HCC). The committee, whose members include Makerere University, KCC and Urban Harvest among others, provided direct links between research and development activities and political awareness of the issues at a high level and thus played a major role in the policy change process. The committee later developed into an independent organisation under the name of Kampala Urban Food

Security, Agriculture and Livestock Coordinating Committee (KUFSAALCC).

In 2003, a series of stakeholder consultative workshops in Kampala were held - five Divisional Forums and one District Forum. These workshops intended to raise stakeholder awareness and established the foundations for the stimulating process of developing the new ordinances. After the District Forum, the group of interested organisations (mainly HCC members) used the outputs of the meeting to rework the draft Ordinances. Urban Harvest had an important part in coordinating the team of actors to support the process of revising the draft ordinances. After a participatory revision process, the harmonising of the stakeholders culminated in the incorporation of the various concerns and perspectives in the draft Ordinance. The Ordinance was finally approved by the Mayor of Kampala city in May 2005 - a victory for urban agriculture.

Urban Harvest, though specialising in research, also incorporates into its work the vital aspect of partnering and lobbying. In Kampala, the interests and perspectives of the various stakeholders varied a great deal. While on the one hand, the municipality and business community were concerned with the health and nuisance issues, community-based organisations and NGOs focused more on the issues of food security and livelihoods. Urban Harvest's program established a process where they had to "... find ways through impasses held by different stakeholders. The process started with the organisation of a dozen neighbourhood consultations and workshops where local people could comment on existing rules and make suggestions for reforms," comments Diana Lee Smith, Urban Harvest Regional Coordinator in Nairobi.

Creating awareness and sensitisation about UPA&L is an important aspect in achieving structural and policy changes. These changes contribute to the continuous

promotion of its positive aspects, such as income creation and food security, but also the changes need to focus on minimizing its negative aspects, such as environmental contamination and health risks. The establishment of stakeholder partnerships and lobbying at the various government levels is crucial for such structural changes, as well as creating the institutional space that allows for a policy change to occur.

In addition, the supportive attitudes of responsive city government officials such as Winnie Mkumba and Margaret Azumba in Kampala, is just as essential to establish the environment for institutional political reforms. This government role is further evidenced by the commitment and initiative of the city Mayor who added to the new ordinances the right, by law, for urban residents to grow food and raise livestock within the city limits for individual and commercial purposes in May 2005.

Considering that until recently UPA&L was seen as an illegal activity, this achievement is a breakthrough. UPA&L has real potential for improving food security, income generation and employment and contributing to poverty reduction and women's empowerment. These benefits should outweigh any negative impacts and drive Kampala onward. The efforts of the various stakeholders, base organisations and the responsive city government, point to a true reversal of attitudes and policies leading to a working UPA&L model.

The recent achievement of policy change and UPA&L benefit recognition in the city of Kampala is but one step forward in the process for a change in national policies on UPA&L that will enable development of national strategies and laws promoting and regulating Urban and Peri-urban Agriculture & Livestock.

Improving the integration of urban agriculture in national and local government in Kenya, through multi-stakeholder platforms

40



Multi-stakeholder initiatives facilitated by local and international organizations in Nairobi and other Kenyan cities are leading to changes in the political climate and clearing the way for legislation and policy initiatives that will provide greater tolerance and legitimacy for urban and peri-urban agriculture and livestock (UPA&L) production.

Urban farming is a semi-legal activity in Kenya and is a common livelihood option for poor households such as those living in Kibera, Nairobi's largest slum. About 50% of Nairobi's poor are thought to be involved in crop and/or livestock production. Escalating demand for food, services and infrastructure, as well as increasing environmental burdens accompany the increase in the urban population. Food production on vacant lots, along riverbanks and adjacent to railway lines has intensified in response to growing food insecurity, unemployment and poverty associated with this unplanned urban growth. A concern with the precariousness of this livelihood strategy, tied to a need to understand the dynamics of UPA&L, have led to various joint initiatives and interventions by local, national and international actors.

Early initiatives included the co-organization of regional workshops by Urban Harvest, Food and Agriculture

Organization of the United Nations (FAO) and UN-Habitat to sensitize local governments in the region to the importance of urban food security issues and urban food production as a strategy to achieve it, encourage sharing of experiences around these issues and to support the signing of joint declarations by Kenya and other countries of the region. The Addis Ababa Declaration on Feeding Cities in the Horn of Africa followed a workshop on this theme, held in Addis in May 2002. In the same year Urban Harvest co-organized, with UN-Habitat and FAO, a Nairobi meeting of city mayors from the region to discuss "Urban Policy Implications for Enhancing Food Security in African Cities". The sharing of experiences during that meeting resulted in new initiatives and policy processes in several countries, especially Uganda. The Harare Declaration on Urban and Peri-Urban Agriculture (UPA) in East and Southern Africa was linked to a workshop held in Zimbabwe in 2003, which was supported by RUA-F-MDP and Harare Municipal Council.

Platform-building at local level demonstrates the importance of joint action as a driving force for change in Kenya. Multi-stakeholder workshops held in 2003 were direct products of research carried out in 2002 by a local Nairobi-based NGO, the Mazingira Institute, into livestock keeping in Nairobi and environs. The DFID-funded study analyzed the different forms of livestock keeping in the city and revealed the divergent perspectives of the different stakeholders on this practice. It highlighted the need to convene these stakeholders in order to promote joint action by producers towards establishing safe and sustainable livestock keeping. In 2004 Urban Harvest, the International Livestock Research Institute (ILRI) and the Kenyan Agricultural Research Institute (KARI), through their study on waste management for urban agriculture in Nairobi, initiated a multi-stakeholder policy dialogue through organizing a workshop at

KARI in July 2004. One of the recommendations that came out was for KARI and the Ministry of Agriculture to spearhead an urban and peri-urban agriculture review process. Thus KARI, in conjunction with the Ministry of Agriculture through the Provincial Agriculture office in Nairobi, assumed a leading role in urban agriculture in Kenya. They later organised a series of workshops in collaboration with Mazingira Institute and Urban Harvest with the aim of providing an enabling environment for UPA&L. Information was exchanged, policies were debated and evaluated, different perspectives were considered and it was determined who should take on the responsibility to carry the policy process forward. Although KARI took a role in organizing the workshop, one of the results was the recognition that the Ministry of Agriculture is the most appropriate institution to promote a national policy change. It was agreed that this role should be built upon extensive research and analysis, the creation of a forum for dialogue among government, private and the community sectors, and crucially, the establishment of farmers' network to ensure a voice for the producers in the policy change process. Mazingira Institute and Urban Harvest have continued to support this "sectoral mix and cooperation model", as well as supporting risk assessment, participatory approaches to policy review and legislative reform.

The platform established by the 2003 workshop was named the Nairobi and Environs Food Security, Agriculture and Livestock Forum (NEFSALF). The forum serves as a space for the exchange of ideas about different positions, priorities and activities on UPA&L. In January of 2004, the Mazingira Institute, funded by the National Resources Institute (NRI) of the United Kingdom, organised the NEFSALF "Community Sector Meeting" aimed at facilitating group organization and building networks at the community level. The outcome of this meeting was the establishment of the Farmers Network in mid 2004, which already has 105 members,

some of these members being groups with their respective members.

Another development of the Forum has been to improve the access of farmers to the Ministry of Agriculture and municipal services through the establishment of jointly agreed upon strategies. As a result, farmers identified the need for training as a priority. Two training courses have already taken place. The Forum represents an ideal space for the governmental institutions to become sensitive to farmers needs and recognize and promote the benefits of UPA&L in Kenya.

The work of the forum, as well as from research results generated by Urban Harvest and other local and international organizations have increased knowledge about and understanding of UPA&L issues. This has led to an improvement in the institutional environment in Nairobi and to the possibility of national government making policy changes in favour of UPA&L. One example has been land reform policy. The task force working on a new national land policy invited Urban Harvest to participate in the drafting of the new policy and to co-author, with the Ministry of Agriculture, a paper on urban agriculture in Kenya to inform the policy process. The draft policy now includes urban land specifically destined for agriculture as well as urban land set aside for waste recycling, yielding compost for use in local agricultural production.

Multi-stakeholder initiatives linked to urban agriculture and livestock have also been launched in Nakuru, the provincial capital of Kenya's Rift Valley. Following research carried out in 2004 by Urban Harvest and Kenya Green Towns Partnership Association, a Kenyan NGO active in urban development and urban agriculture issues, it was apparent that despite support by the city council on the ground, by-laws in Nakuru were unclear and in some ways unfriendly towards urban farming and

needed to undergo reform. Modelled on its support for Urban Harvest and local actors in Kampala (Uganda) towards effecting policy change, DFID provided financial support in Nakuru to enable Urban Harvest, Green Towns and the local Council to organize a series of multi stakeholder workshops to analyze the by-laws in relation to safe and sustainable UPA&L, propose revisions and formulate new by-laws. Another town in Kenya (Kitale in

Rift Valley Province) is interested in adopting the by-laws and has invited Urban Harvest to go and initiate the process with the administrators. The experience in Nakuru once more indicates the strategic importance of different international, national and local agencies establishing mechanisms for working together for policy change.

Networking

Local and global networking

From its base in Lima, Peru, Urban Harvest's research and development program engages with partners and stakeholders in local and regional settings in Asia, Africa and Latin America through multi-sectoral platforms at city level, through regional networks of cities and through regionally focused international organizations and partnerships. Urban Harvest also participates in global initiatives and alliances to facilitate cross-learning among developing regions and between North and South.

At the **local level** Urban Harvest's stakeholder and policy dialogue platform (SPDP), described from the research point of view in previous sections, also facilitates communication, information sharing and learning among and by local stakeholders in "anchor cities" – urban and peri-urban locations where diagnostic studies, technical interventions and policy analysis and development are undertaken with partners. The high level of complexity of urban ecosystems and the great diversity of stakeholders and their needs puts an especially high premium on this communication and sharing and the formation of alliances. The involvement of municipal authorities in these local platforms is particularly important, both to tap into their expertise in planning and policy, as well as to provide learning opportunities to them about integration of agriculture in urban governance.

Local level networking also provides a means for formal capacity development opportunities involving links with local universities and training organizations.

At the **regional level**, through networking with regional organizations and linking agencies in anchor cities and "contact" cities – urban and peri-urban areas involved in training and knowledge exchange creating learning partnerships and build capacity. Thematic and knowledge sharing workshops have been co-organized with regional partners (for example, UN-HABITAT and

the RUAF Foundation in Sub-Saharan Africa and RED AGUILAR in Latin America) that have brought together political and technical representatives from different cities in each region. Cross-visits have also been organized between anchor cities and between anchor and contact cities, for example the sharing of gender-mainstreaming experiences in Kenya with Ugandan partners, or the exposure of researchers and local government officials in Western Kenya to policy processes in Nairobi and Nakuru.

In Africa, with funding from IDRC, Urban Harvest linked up in 2003 and 2004 with several CGIAR Centers (CIP, ILRI, IWMI, World Agroforestry Center), internationally and regionally based organizations (RUAF Foundation, Municipal Development Program, Mazengira Institute) and national partners to implement a regional training course for multi-disciplinary and multi-sectoral teams from seven cities from East, Southern and Central Africa. After the course, these city teams later formed a virtual network as they sought to implement proposals and utilize methods developed and presented as part of the course. As a way of drawing out the lessons and learning objectives of the real world course for more general use, the materials of the course were later developed into a distance learning tool in the form of an interactive CD-ROM.

In Latin America, Urban Harvest has been involved in training and interaction among other CGIAR centers about the use of Geographical Information Systems (GIS), especially with regard to its application to issues of water quality monitoring and land use changes. In an effort to build a region-wide platform on urban agriculture technology and policy support several networks have sought to harmonize their activities, and Urban Harvest has multiple representation on Advisory committees of these initiatives.

Regional pages on the Urban Harvest website and a regional listserv in SSA further enhance the spread of regional networking and information exchange.

The main effort at the **global level** is to seek cross-fertilization of ideas and approaches between developing regions and between North and South and to engage the attention and interest of actual and potential donors. Although these efforts were at one time formalized in the global Support Group on Urban Agriculture and Forestry (SGUA), an alliance of international, regional and national organizations and donors, the deactivation of this network has led to more informal and ad hoc actions. These have included thematic workshops, such as a workshop on gender mainstreaming organized by the RUAF Foundation and Urban Harvest with CGIAR and external donor funding in 2004, and global initiatives such as that focused on a better understanding of urban agricultural

producer organizations, led by FAO with Urban Harvest, RUAF and other organizations on the Advisory Board.

Global knowledge networking also has also utilized conventional publications and electronic media to achieve its goals. A Working Paper Series provides a publication outlet and opportunities for feedback for research outputs and a series of Annotated Bibliographies of Anchor Sites offers a resource to other researchers and development specialists working in those locations. The website (www.cipotato.org/urbanharvest/home.htm), electronic and hardcopy news updates and the listserv (urbanharvest-l@lists.cgiar.org) offer means to share information across the network, keep people in contact and strengthen the urban agriculture agenda.

Networking and capacity building activities, 2003 - 2006

AFRICA

| Activity | Location | Date | Participants |
|---|-------------------|--------------|---|
| 2003 | | | |
| Kampala Health and UPA coordinating Committee | Kampala, Uganda | January | UH-regional, local staff, local partners |
| Workshop on urban livestock keepers in Sub-Saharan Africa | Nairobi | March | UH staff and partners in Nairobi and Kampala, |
| Waste-net meetings | Nairobi | Through year | UH Nairobi staff |
| Livestock Week, FAO | Rome | March | UH-SSA coordinator |
| UH Steering Committee meeting | Nairobi | April | UH-Global Coordinator, UH-SSA Coordinator, Committee |
| Global UPA Stakeholder meeting (SGUA) | Nairobi | April | UH-Global Coordinator, UH-SSA Coordinator, Committee |
| First planning workshop, International UPA training for Anglophone Africa | Nairobi | May | UH-Global Coordinator, UH-SSA Coordinator, Nairobi staff and partners |
| Interim meeting, International UPA training for Anglophone Africa | Nairobi | June | UH-Global Coordinator, UH-SSA Coordinator, Nairobi staff and partners |
| Second planning workshop International UPA training for Anglophone Africa | Nairobi | November | UH-SSA Coordinator and staff, partners |
| 2004 | | | |
| Final workshop and exhibition, urban agriculture in Yaounde | Yaounde, Cameroon | February | UH-SSA Coordinator, IITA and local partners (30) |

| | | | |
|---|----------------------|-----------|---|
| Regional Workshop on Development of Sustainable Urban Solid Waste Management Strategies by Wastenet-ITDG-EA and UNDP | Nairobi, Kenya | February | UH-SSA Coordinator UH-Staff |
| Final workshop on Strengthening UPA in Kampala | Kampala, Uganda | March | UH-SSA Coordinator, CIAT and local partners (15) |
| Anglophone Africa Regional Training Course on UPA | Nairobi, Kenya | March | UH-SSA Coordinator and staff, CIP, IWMI, ILR, international and local partners (32) |
| African Network for Soil Biology and Fertility Network (AfNet) | Yaounde Cameroon | May | UH-Staff |
| Regional Workshop on Risk Analysis and Gender in Urban Agriculture | Elementaita, Kenya | May | UH-SSA Coordinator |
| National stakeholder workshop on urban and peri-urban agriculture policy | Nairobi | July | KARI, UA-SSA staff, ILRI, local partners (65) |
| National Land Policy Formulation Process | Nairobi, Kenya | August | UH-Staff |
| UPA Methodology workshop by ILRI with IDRC support | IITA Ibadan, Nigeria | September | UH-Staff |
| Women Feeding Cities: Gender Mainstreaming in Urban Agriculture and Food Security, Workshop organized by Urban Harvest and RUAF | Accra Ghana | September | UH-SSA Coordinator UH Staff |

2005

| | | | |
|---|---------|---------|--------------------------|
| "Think tank" on agriculture-health linkages | USA | January | SSS Regional Coordinator |
| Comprehensive assessment of water management in agriculture program, IWMI | Nairobi | January | UH Staff |

| | | | |
|--|-------------------------|-------------------|--|
| Final Stakeholder Workshop on Issues emerging from the research Project: Management of organic waste and livestock manure for enhancing agricultural productivity in urban and Peri-urban Nairobi | ILRI campus, Nairobi | January | UH SSA Regional Coordinator UH Staff Partners |
| Kenyan National Land Policy Formulation Process | Nairobi | Jan - May | US Staff |
| Study tour of urban agriculture sites and urban settlements | Nairobi | February | UH Staff (UN-HABITAT), 40 members of Royal Swedish Academy of Agriculture and Forestry |
| Sub-Sahara Africa Regional Workshop of the Global Horticulture Assessment. (GHA) Meeting ISHS | Arusha Tanzania | February | UH-SSA Regional Coordinator |
| Sub-Sahara Africa Regional Workshop of the Global Horticulture Assessment. (GHA) Meeting ISHS | Arusha, Tanzania | February | UH Staff |
| Training Assessing year-round strategies in mixed crop-livestock systems: Incorporating sweet potatoes into animal feed Nairobi, Kenya. Organized by CIP, ILRI and System-wide Livestock Programme SLP | ILRI campus, Nairobi | February-March | Uh Staff |
| Asia and Middle East Workshop Global Horticulture Assessment (GHA) | Cairo, Egypt | April | UH Global Coordinator |
| Annual Gender and Diversity Associates workshop organized by G&D CGIAR system wide programme | CIFOR, Bogor, Indonesia | June | UH-Staff |
| Gender mainstreaming in urban agriculture | Electronic conference | August - December | Global Coordinator |

| | | | |
|--|-----------------------|----------|---------------------|
| Advisory Committee membership, FAO/IDRC project on producer organizations in urban agriculture | Rome, Italy | October | Global Coordinator |
| HABITAT Jam | Electronic conference | November | Information Officer |

2006

| | | | |
|---|-----------------------|-------|--|
| Rural-urban linkages Conference (Global Mountain Program) | Addis Ababa, Ethiopia | April | UH SSA Regional Coordinator |
| World Urban Forum III | Vancouver Canada | June | UH Global Coordinator UH SSA Regional Coordinator |

LATIN AMERICA

| Activities | Location | Date | Participants |
|--|---------------------|----------|-----------------------------|
| 2003 | | | |
| La integración de la agricultura urbana en el desarrollo sostenible de las municipalidades | Lima, Peru | November | UH Staff Partners |
| Formación en Fundraising y Marketing para la Investigación-Acción en la Agricultura Urbana en América Latina y el Caribe | Lima-Peru | November | UH Staff |
| Encuentro de Agricultura Urbana y Periurbana en México | Azcapotzalco-Mexico | November | UH LAC Regional Coordinator |
| 2004 | | | |
| El rol de la selvicultura y agricultura urbana en el desarrollo sostenible de las ciudades | Lima - Peru | January | UH Staff |
| Caracterización de resultados e impactos en los proyectos desarrollados por FONTAGRO | San José-Costa Rica | August | UH Staff |
| La integración de la Agricultura urbana y Periurbana en el Desarrollo Sostenible de las Municipalidades (Segunda Reunión Interinstitucional) | Lima, Peru | December | UH Staff Partners |
| 2005 | | | |
| Workshop on sensibilization | Lima-Peru | January | UH Staff |
| Prácticas de campo de los alumnos del módulo de Sistemas de Producción de la Maestría en producción animal | Lima-Peru | June | Producer Partner |

| | | | |
|---|-----------------------|-------------|------------------|
| Capacitación de Facilitación Atinchik de Procesos Participativos para el Desarrollo | Lima Peru | June | UH Staff |
| Workshop: Hydrologyc Spatial Modeling Workshop- GeoSFM hydrologycal modeling tool | Nairobi-Kenya | June - July | UH Staff |
| Taller: Diseño e implementación Multi-actoral de políticas y acciones estratégicas en la agricultura urbana | Lima-Peru | August | UH Staff Partner |
| Taller: Diseño e implementación Multi-actoral de políticas y acciones estratégicas en la agricultura urbana | Lima-Peru | September | UH Staff Partner |
| Curso Taller: Enfoque Ecosistémico en salud Humana: Evaluación y Administración de la Contaminación Ambiental | Rio de Janeiro-Brasil | October | UH Staff |
| Training: Manejo de semillas de hortalizas en la producción orgánica | Lima-Peru | October | Partner Producer |
| Curso: "Cuenca y Espacio Local: Gestión Ambiental y Ordenamiento Territorial" | Lima-Peru | October | UH Staff |

2006

| | | | |
|---|----------------------------|-------|--------------------|
| Planificación de proyectos de desarrollo local | Lima-Peru | March | Partner UH Staff |
| Curso: Gestión de Recursos Hídricos y Tecnologías de Riego | Ica-Peru | March | UH Staff |
| VI Encuentro de Agricultura Orgánica y Sostenible de ACTAF | La Habana-Cuba | May | UH LAC Coordinator |
| Urban/Peri-Urban Agriculture in the Asian and Pacific Region, | Tagaytay City, Philippines | May | UH Staff |

| | | | |
|--|-----------|------------|-------------------|
| Foro Electoral Políticas y Compromisos para el Desarrollo de la Agricultura Ecológica Sostenible | Lima-Peru | May | UH Staff |
| Curso: Metodologías Participativas de Capacitación en planes de Negocios | Lima-Peru | May | UH Staff |
| Curso: Manejo de Suelos y Nutrición Vegetal en la Producción de Cultivos en Costa | Lima-Peru | May - Jun | UH Staff |
| Foro: Gestión Ambiental de las Ciudades y Construcción Sostenible | Lima-Peru | June | UH Staff |
| Prácticas de campo de los alumnos del módulo de Sistemas de Producción de la Maestría en producción animal | Lima-Peru | June | Producer Partner |
| Curso: Aplicación de geodatabase en cuencas hídricas con ARC-GIS | Lima-Peru | Aug - Sept | UH Staff |
| Agricultura Urbana y Peri-urbana en Lima Metropolitana: una estrategia de lucha contra la pobreza y la inseguridad alimentaria | Lima-Peru | August | UH Staff Partners |
| 10mo Encuentro Nacional de Agricultura Ecológica | Lima-Peru | September | Producer UH Staff |
| III Seminario Nacional de Control Biológico | Lima-Peru | November | UH Staff |
| Curso: Mitologías participativas e Inter. – aprendizaje para el desarrollo rural | Lima-Peru | November | UH Staff |

Publications

- Alegre, J., D. Escudero, O. Tesdell** 2007. Agricultural Business Associations in Urban and Periurban Areas in Lima, Peru. RUAF Urban Agriculture magazine. No. 17. RUAF: Leusden, The Netherlands.
- Arce, B., Valencia, C., Warnaars, M., Prain, G., Valle, R.** 2006. The farmer field school (FFS) method in an urban setting: A case study in Lima, Peru. En: Veenhuizen, R. van (ed). Cities farming for the future, urban agriculture for green and productive cities. Leusden (Netherlands). ETC- Urban Agriculture. pp.299-303. <http://www.ruaf.org/node/975>
- Arce, B., J. Alegre, D. Escudero, G. Prain, J. Saenz,** 2006. Estudio da Caso Lima (Perú): Crianza de cerdos en zonas urbanas: Diagnostico y Propuesta Municipal de Sistema de Manejo en el Distrito de Lurigancho Chosica. RUAF Urban Agriculture Magazine. Leusden. The Netherlands: RUAF.
- Arce, B., G. Prain y M. Salvo.** 2006. En busca de la integración de la agricultura urbana (AU) en las agendas municipales: una experiencia en el distrito de Lurigancho-Chosica, Lima-Perú. Integration of Urban Agriculture in Municipal Agendas: Experiences from Lima, Peru. RUAF Urban Agriculture Magazine Leusden. The Netherlands: RUAF.
- Arce, B., C. Valencia, M. Warnaars, G. Prain, R. Valle** 2006. The Farmer Field School (FFS) method in an urban setting: a case study in Lima Peru. in: van Veenhuizen, René (ed), Cities Farming for the Future - Urban Agriculture for Green and Productive Cities. Leusden. The Netherlands: RUAF.
- Arce, B. y G. Prain,** 2005. La Agricultura Urbana Como un Componente Económico Familiar y Su Inserción en la Gestión Municipal: La Experiencia del Proyecto: "Agricultores en la Ciudad", Lima, Perú. Presented at the IV General Assembly of Red Aguila seminar: Construyendo ciudades sustentables con Agricultura Urbana y Peri-urbana. 28 al 30 de abril, 2005, México.
- Arce, B., G. Prain and L. Maldonado.** 2004. Urban Agriculture and Gender in Latin America: A case study of Carapongo, Lima, Peru. Paper presented at the workshop, "Woman Feeding Cities: Gender mainstreaming in urban food production and food security" 20th -23rd September, 2004, Accra, Ghana. RUAF/Urban Harvest. http://www.ruaf.org/files/gender_arce_et_al_peru.pdf
- Arce, B., G. Prain, R. Valle and N. Gonzalez.** (Pre-edition). 2006. Vegetable Production Systems as Livelihood Strategies in Lima-Peru: Opportunities and Risks for Households and Local Governments. Acta Horticulture. International Society for Horticultural Science. 2006. <http://www.actahort.org>
- Atukunda, G., F. Baseke, S. David, J. Jagwe, M. Kalyebara, M. Kaweesa, R. Miiro, G. Musoke, G. Nabulo, A. Namagembe, C. Niringiye, R. Nyapendi, B. Odongo, C. Owor, M. Azuba-Ssemwanga, and S. Tumwegamire,** 2003. Participatory appraisal of urban and peri-urban agriculture in Kampala, Uganda. CIAT Africa-Urban Harvest Working Document. CIAT Africa Occasional Publications Series, No. 42. Kampala, Uganda: CIAT..
- Ayaga, G.; Kibata, G.; Diana Lee-Smith, Mary Njenga and Racheal Rege** 2005. Policy prospects for urban and peri urban agriculture in Kenya. UH Policy Brief Series no2. Lima, Peru: Urban Harvest - CIP.
- Burgos, G. y M. Carrasco** 2004 Características de la alimentación e ingesta de nutrientes de los niños entre 6 a 24 meses de una comunidad urbano marginal de Lima. UH Working Paper Series 2. Lima, Peru: CIP.
- Cofie, O.O.P.** 2003. UAM urbanization, poverty and urban food security UA-Magazine no.16. Leusden, The Netherlands: RUAF.
- Creed-Kanashiro, H., N. Espinola y G. Prain.** 2007. Fortaleciendo la nutrición infantil en Perú: Desarrollo de una papilla a base de camote. Lima, Peru: CIP.

- Dubbling M., G. Prain, M. Warnars, T. Zschoke** ed. 2005 Feeding Cities in Anglophone Africa with Urban Agriculture: 'Concepts, tools and case studies for practitioners, planners and policy makers' CD_rom. Lima, Peru: Urban Harvest- CIP.
- Escudero, D., B. Arce, M. Salvo** 2006. "La Investigación Participativa en los Procesos de Desarrollo, el caso del cultivo de Mucuna (Stizolobium deeringianum) en la agricultura urbana de la ciudad de Lima, Perú". Conference Proceedings: X Congreso Internacional de Ingeniería de Proyectos Valencia.
- Farm Concern** and Urban Harvest 2006. Viable market opportunities and investigative research on market threats for urban and peri-urban farmers; based on action market research. Draft project report. Farm Concern, Urban Harvest- CIP.
- Gallentes, J.** 2006. Manual on the IPM practices for Sampaguita (jasmine) production. Manila, Philippines: CIP-UPWARD.
- Gathuru, K., Nancy Karanja and Mary Njenga** (2007) Wastewater irrigation empowers Kenya's urban farmers. New Agriculturalist. <http://www.new-agri.co.uk/07/02/focuson/focuson6.php>
- Guzman, C. de, C. M. Bajet, and M. P. Navarro.** 2003. Assessing Pest Management Issues in the Sampaguita Flower Production and Garland-making Livelihood System in Peri-urban Metro Manila. Manila, Philippines: CIP-UPWARD.
- Guzman, C. de, Cristina M. Bajet, and Mariafe P. Navarro.** 2003 Sampaguita Livelihoods of Peri-urban Metro Manila, Philippines: Key Actors, Activities, Benefits and Constraints. Manila, Philippines: CIP-UPWARD.
- Guzman, C. de** 2005. Farming in the City: an Annotated Bibliography of Urban and Peri-urban Agriculture in the Philippines with emphasis on Metro Manila. Lima, Peru: Urban Harvest- CIP.
- Guzman, Constancio C.** 2003 Sampaguita Livelihoods of Peri-urban Metro Manila, Philippines: Key Actors, Activities, Benefits and Constraints. Manila, Philippines: CIP-UPWARD <http://www.cipotato.org/urbanharvest/documents/pdf/sampaguita-livelihoods.pdf>
- Hooton, N., Lee-Smith, D., Nasinyama, G. and Romney, D.,** - in collaboration with Azuba, M., Kaweeza, M., Muwanga, J., Lubowa, A. Atukunda, G., Njenga, M. and Young, J. 2007. Championing Urban Farmers in Kampala, Influences on Local Policy Change in Uganda. ILRI Research Report No. 2.
- Juárez, H., J. Moscoso, T. Alfaro** 2006. Contaminación del Río Rímac por patógenos y metales pesados y evaluación de riesgos para la agricultura en el Cono Este de Lima. II Congreso Nacional, I Congreso Iberoamericano de Riego y Drenaje. Universidad Nacional Agraria La Molina, Lima Peru.
- King'ori, Peter** 2004. Assessment of urban and peri-urban agriculture research in the CGIAR Centres in Sub-Saharan Africa. Urban Harvest Working Paper no. 1 Lima, Peru: Urban Harvest- CIP.
- Kimeze, S.** 2005. Farming in the City: an Annotated Bibliography of Urban and Peri-urban Agriculture in Uganda. Lima, Peru: Urban Harvest- CIP.
- Karanja, N., M. Njenga, and G. Kironchi** 2006. Wastewater utilization and policy framework for agriculture in urban and peri-urban areas of Kenya: Workshop Report organized by UH, JKUAT, UON and funded by IDRC held at Jakaranda Hotel, Nairobi, Kenya, February 02, 2006. UH-CIP.
- Karanja, N., M. Njenga, K. Gathuru, E. Kang'ethe, A. Karanja, M. Odumbe, S. Kiarie, I. Kimani, S. Wokabi, C. Getanda, P. Kingori, P. Mugo, A. Njenga, and F. Kirima** 2006. Local participatory research and development on urban agriculture and livestock keeping in Nakuru; project report UH_CIP.

- Lee-Smith, D.** and G. Prain 2006. Urban Agriculture and Health. Brief 13 in Hawkes, C. and M.T. Ruel eds. Understanding the Links between Agriculture and Health. 2020 Focus No.13, IFPRI. May 2006. Washington, USA: IFPRI.
- Lee-Smith, D.** 2004. Women Feeding Cities: Refocusing the Research Agenda in Women Feeding Cities Proceedings of the Gender Mainstreaming in Urban Food Production and Food Security Workshop, ed. G. Prain, H. De Zeeuw. Jointly organized by ETC-RUAF and CGIAR-Urban Harvest in collaboration with IWMI-Ghana. <http://www.cipotato.org/urbanharvest/documents/pdf/women-feeding-cities.pdf>
- Mwangi S.,** Mumbi K., Kamore M., Karanja N. & Njenga M. 2007. Creating Market Opportunities for Poor Women Farmers in Kenya. Urban Agriculture Magazine. Vol 17. Leusden, The Netherlands: ETC-Urban Agriculture.
- Nguyen T.,** M. Warnaars, T.T.B. Duyen, T.T.B. Ngoc 2007 Farming in the City: an Annotated Bibliography of Urban and Peri-urban Agriculture in Hanoi. Lima, Peru: Urban Harvest- CIP.
- Njenga, Mary** and Nancy Karanja (2005) Turing Urban Waste into Resource for Agriculture NEFSALF Bulletin No. 2. Nairboi, Kenya: Mazingira Institute.
- Njenga, Mary & Rose Thuo.** 2005. Urban Agriculture. Paper prepared for the urban land use, environment and informal sector thematic group in the Kenya national land policy formulation process. Kenya National Land Policy Pp. 27. Kenya, Nairobi: Kenya National Land Policy Secretariat Resource Centre.
- Njenga, M.,** K. Gathuru and N. Karanja 2004. Analysis of Gender Roles in Resource Recovery for Urban Agriculture in Nairobi, Kenya in Women Feeding Cities Proceedings of the Gender Mainstreaming in Urban Food Production and Food Security Workshop, ed. G. Prain, H. De Zeeuw. Jointly organized by ETC-RUAF and CGIAR-Urban Harvest in collaboration with IWMI-Ghana. <http://www.cipotato.org/urbanharvest/documents/pdf/women-feeding-cities.pdf>
- Nazarea, V.P.,** M.C. Piniero and R.P. Mula. 2003. Urban Gardens: Persistence and Change. Manila, Philippines: Urban Harvest- CIP-UPWARD.
- Njenga, M.,** K. Gathuru, S. Kimani, W. Frost, S. Carsan, D. Lee-Smith, D. Romney and N. Karanja 2004. Management of Organic Waste and Livestock Manure for Enhancing Agricultural Productivity in Urban and Peri-Urban Nairobi. Project report by UH, ILRI, ICRAF, KARI & UON.
- Njenga M.** and Nancy Karanja 2006. Community-Based Compost Production for Urban Agriculture in Nairobi in O. Cofie and A. Bradford Chapter 8. Organic Waste Reuse for Urban Agriculture in Cities Farming in the Future, ed. René van Veenhuizen. Leusden, The Netherlands: ETC-Urban Agriculture. http://www.idrc.ca/en/ev-103817-201-1-DO_TOPIC.html also available in print form. p 238-242.
- Njenga Mary,** S. Kimani, D. Romney and N. Karanja. Nutrient Recovery from Solid Waste and Linkage to Urban and Peri Urban Agriculture in Nairobi, Kenya (2007). In Bationo A., B.S. Waswa, J. Kihara and J. Kimetu eds Springer, Van Godewijckstraat 30, The Netherlands. pp 487-491.
- Njenga, M.,** E. Kang'ethe, N. Karanja, C. Kabiru, P. Munyao, G. Kironchi, K. Gathuru, and G. Prain, in collaboration with C. Githuku, P. Kanyari, C. Muneri, M. Githongo, J. Githigia, P. Gildemacher, and P. Kinyae 2007. Mainstreaming Gender Analysis in the Research Process in International Potato Centre (CIP) Project Report. UH, CIP, KARI and Funded by PRGA.

- Peters, D., Ngai, DO Duc** 2004 Agro Processing Waste Assessment and Management in Peri-Urban Hanoi, Vietnam. Journal of Sustainable Agriculture. USA : Food Products Press.
- Prain, G.** 2001. Farmer Field Schools: an ideal method for urban agriculture? Urban Agriculture Magazine No. 5. Leusden, The Netherlands: RUAF.
- Prain, G.** 2006. Integrated Urban Management of Local Agricultural Development: The policy arena in Cuba. In Cities Farming in the Future ed. René van Veenhuizen. Leusden, The Netherlands: ETC-Urban Agriculture http://www.idrc.ca/en/ev-103817-201-1-DO_TOPIC.html also available in print form.
- Prain, G.** 2006 Situation Analysis and Health Risk Assessment: Cattle and poultry raising in Kampala in Gordon Parin Chapter 10. Participatory Technology Development for Sustainable Intensification of Urban Agriculture in Cities Farming in the Future, ed. René van Veenhuizen. Leusden, The Netherlands: ETC-Urban Agriculture. http://www.idrc.ca/en/ev-103817-201-1-DO_TOPIC.html also available in print form.
- Prain, G.** 2006. Participatory Technology Development for Sustainable Intensification of Urban Agriculture. In Cities Farming in the Future ed. Rene van Veenhuizen. Leusden, The Netherlands: ETC-Urban Agriculture http://www.idrc.ca/en/ev-103817-201-1-DO_TOPIC.html also available in print form.
- Prain, G., Arce, B., and Karanja, N.** (Pre-edition). 2006. Horticulture in Urban eco-systems: some socioeconomic and environmental lessons from studies in three developing regions. Acta Horticulture. International Society for Horticultural Science. 2006. <http://www.actahort.org>
- Prain, G.** 2006. Participatory Technology Development for Sustainable Intensification of Urban Agriculture. En: Veenhuizen, R. van (ed). Cities farming for the future, urban agriculture for green and productive cities. Leusden (Netherlands). ETC- Urban Agriculture. ISBN 1-930261-14-4. pp.299-303. <http://www.ruaf.org/node/975>
- Prain, G.** 2006. Urban Harvest: A CGIAR Global Program on Urban and Peri-urban Agriculture. Extension Bulletin 575. FFTC . Lima, Peru.
- Raymundo R., C. Bussink, G. Prain** 2007. La Dinámica de la Agricultura en Lima 1972-2002, Una recopilación y análisis de estadística provinciales y regionales. Working Paper Series 3. Lima, Peru: CIP.
- Salvo, M., B. Arce, and I. De los Ríos** 2007. Integración de las entidades locales en la promoción del desarrollo rural-local consideraciones para Latinoamérica desde la experiencia del Cono Este de Lima (Perú) Conference Proceedings: X Congreso Internacional de Ingeniería de Proyectos Valencia.
- Urban Harvest** 2004. Memoria y Declaración: "La Integración de la agricultura urbana en el desarrollo sostenible de las municipalidades" 26 de Noviembre, 2003. UH Policy Brief Series. Lima, Peru: CIP.
- Urban Harvest** 2006. Memoria y Declaración: "La Integración de la agricultura urbana en el desarrollo sostenible de las municipalidades" 14 de Diciembre, 2004. UH Policy Brief Series. Lima, Peru: CIP.
- Warnaars, M. y W. Pradel.** 2007 A Comparative Study of the Perceptions of Urban and Rural Farmer Field School Participants in Peru. UH Working Paper Series 4. Lima, Peru: CIP.

Networking partners, 2003-2006

| Partner | Strategic role/complementary advantage |
|---|---|
| AVRDC | Urban horticultural systems, indigenous African vegetables |
| Bioversity | Research on urban banana production |
| CIAT | Agro-enterprise innovation |
| CIP | Sweetpotato varieties, seed technology. Farmer field school skills, GIS and modeling, agriculture and health |
| IITA | Rural-urban food systems, urban agriculture and livelihoods |
| ILRI | Diagnostic and action livestock research, utilization of manures, risk assessment and decision-support modeling |
| IWMI | Wastewater use for vegetables, flooding control |
| World Agroforestry Center | Use of tree legumes for fodder, tree nurseries, urban/peri-urban agro-forestry systems |
| GMP | Rural-urban linkages in mountain environments |
| PRGA | Gender mainstreaming |
| UPWARD | Rural-urban agro-enterprises, livelihoods and marketing studies |
| CIRAD | Urban horticulture |
| Ryerson University, Toronto, Canada | Food and nutrition security analysis in urban context |
| RUAF Foundation, Netherlands | Urban policies, training materials, gender mainstreaming |
| University of Georgia, USA | Cultural and biological diversity of urban horticulture |
| University of Guelph, Canada | Gender mainstreaming in urban agriculture |
| Universidad Politécnica de Madrid, Spain | Territorial planning and policy for urban areas |
| University of Toronto, Dept. of Public Health, Canada | Health risk assessment in urban agriculture, health related policies |
| Urban Poverty and Environment Program, IDRC, Canada | Urban environment issues, project implementation methods |
| University of the Philippines, Los Baños | Horticultural research, urban planning, GIS |

| | |
|--|---|
| University of the Philippines, Diliman | GIS, Multi-agent systems (MAS) |
| IEBR, Hanoi, Vietnam National Institute of Animal Husbandry, Vietnam | Waste water, parasitology |
| Hanoi Agricultural University | Animal nutrition |
| Kenya Agricultural Research Institute | Animal health |
| University of Nairobi | IPM, policy analysis, technology transfer |
| Jomo Kenyatta University | Soil studies, health risks |
| Ministry of Agriculture and Fisheries, Kenya | Waste water studies |
| Farm Concern International (CSO) | Livestock development, water and irrigation |
| Greentowns, Kenya (CSO) | Market chain analyses, product development |
| Mazingira Institute/NEFSALF (CSO/CO) | Community mobilization, participatory technology testing, local govt. facilitation |
| Nakuru City Council, Kenya | Building a model for organization of urban farmers |
| Edgerton University, Kenya | Urban environmental management, regulatory framework for urban agriculture |
| Makerere University, Uganda | Human nutrition |
| Kampala City Council, Uganda | Urban planning, public health issues, human nutrition |
| Environmental Alert, Uganda (CSO) | Land use policies, urban planning, regulatory frameworks, public consultations, convener role |
| KUFSALCC (CSO) | Community organizing, advocacy |
| Ministry of Agriculture, Animal Industries and Fisheries (MAAIF), Uganda | Dialogue platform, facilitation |
| | Agricultural and food policy analysis |

| | |
|--|--|
| National Agricultural Research Organization (NARO), Uganda | Horticultural crops, livestock research |
| IRAD, Cameroon | Livestock-crop interactions, agro-forestry |
| INCC, Cameroon | Urban systems and institutions |
| CESAL | Sanitation |
| District Municipality of Huachipa | Urban management policies, land use planning, convener role |
| District Municipality of Lurigancho-Chosica, Lima, Peru | Urban management policies, land use planning, convener role |
| Ecológica Peru | Organic product marketing |
| EMBRAPA, Brasil | Horticultural production, new horticultural species |
| Instituto de Investigación Nutricional (IIN), Perú | Child nutrition research |
| INIA | Small animal production systems (guinea pigs) |
| IPDA | Marketing systems |
| Metropolitan Municipality | Urban management policies, land use planning, linking producers to of Lima, Peru consumers |
| Ministerio de Vivienda, Peru | Urban agriculture national coordination |
| National Agrarian University, La Molina, Peru | Vegetable and livestock production modules, environmental health |
| Pan-American Health Organization, Center for Sanitation and Environmental Sciences (CEPIS) | Solid waste management |
| Promoción de Desarrollo Sostenible (IPES) (CSO) | Municipal policy análisis, urban planning |
| RED AGUILA | Networking urban agriculture experiences |
| Rímac River Water Users' Association (JUR), Peru | Irrigation water management, farmer representative |

Investment partners

Bundensministerium für Wirtschaftliche Zusammenarbeit und Entwicklung (BMZ), Germany

Canadian International Development Agency (CIDA), Gatineau, Québec, Canada

United Kingdom Government Department for International Development (DFID), London, United Kingdom

Food and Agriculture Organization of the United Nations (FAO), Rome, Italy

International Development Research Centre (IDRC), Ottawa, Ontario, Canada

Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA), Madrid, Spain

The World Bank Group, Washington, DC, U.S.A.

Madrid City Government

Provincial Government of Madrid

Kilimo Trust

ACIAR

Urban Harvest researchers, students and interns 2003-2006

URBAN HARVEST RESEARCHERS

Africa

Lubowa Abdelrahman - Nutritionist, Research Assistant, Urban Harvest - Kampala

Nancy Karanja - Soil Scientist, SSA Coordinator, Urban Harvest - Kenya

Peter Kingori - Nutritionist, Training Assistant, Urban Harvest - Nairobi¹

Julius Kyaligonza - Livestock Specialist, Research Assistant, Urban Harvest - Kampala¹

Diana Lee-Smith - Urban Sociologist, SSA Coordinator, Urban Harvest - Nairobi²

Shuaib Lwasa - Geographer, Project Leader, Urban Harvest Kampala Sustainable Neighborhoods in Focus

Mary Njenga - Ecologist, Research Assistant, Urban Harvest - Nairobi

Asia

CPC-NCPC-UPLB Team

Susan Bacud - University Researcher

Constancio de Guzman - Horticulturalist, UPLB (Project Leader)

Mario Navasero - University Researcher

Marcela Navasero - University Researcher

UPWARD Team

Arma Bertuso, Network Affiliate

Raul Boncodin - Agronomist, Program Associate, CIP-UPWARD³

Jaime Gallentes - Agronomist, Research Fellow for Information Services

Dindo M. Campilan - Sociologist, UPWARD Coordinator, Philippines

Hanoi

Dai Peters - Sociologist, Post-Doctoral Researcher, Hanoi, Vietnam⁴

Ngyuyen Thi Tinh - Animal Nutritionist, Hanoi Coordinator²

Latin America

Anamika Amani - Sociologist, Information Officer³

Jessica Alegre - Animal Production Specialist, Research Assistant

Tomás Alfaro - Water Engineer, Research Assistant

Blanca Arce - Livestock Systems Specialist, Latin America Regional Coordinator

Miluska Carrasco - Nutritionist, Research Assistant

Dennis Escudero - Livestock Specialist, Research Assistant

Nieves Gonzáles - Agronomist, Research Assistant

Henry Juárez - Environmental Scientist, Research Assistant

Luis Maldonado - Economist, Research Assistant²

Julio Moscoso - Water Engineer

Ana Luisa Muñoz - Administrative Assistant

Gordon Prain - Anthropologist, Global Coordinator

Miguel Salvo - Rural Planning Specialist

Maarten Warnaars - Sociologist, Information Officer / Research Assistant

STUDENTS AND INTERNS

Lima

Tomás Alfaro Abanto - Ms thesis, Water Resources, Universidad Nacional Agraria La Molina
 Malena Castro Manrique - Ms thesis, Environmental Sciences, Universidad Nacional Agraria La Molina
 Juan Francisco Chávez, Intern, Anthropology, Pontificia Universidad Católica del Perú
 Margot Díaz - Bs thesis, Nutritionist, Universidad nacional Agraria La Molina
 Carmen Eccoña - Bs thesis, Agriculture Engineering, Universidad Nacional Agraria La Molina
 Liliana Flores - Intern, Agronomy Engineering, Universidad Nacional Agraria La Molina
 Juan Andrés Gómez - Bs thesis, Anthropology, Universidad Nacional Agraria La Molina
 Ursula Ingar - Professional title, Agronomy, Universidad Nacional Agraria La Molina
 Henry Juárez - Ms thesis, Agronomy Engineering, Universidad Católica de Santa María, Arequipa
 Carlos César Llanos Lucas - Bs thesis, Entomology, Universidad Nacional Agraria La Molina
 Celika Patricia Nakamura Rivera - Bs thesis, Environmental Engineering, Universidad Nacional del Callao
 Rubí Raymundo - Ms thesis, Plant Pathology, Universidad nacional Agraria La Molina
 Jorge Luis Saenz Rabanal - Ms thesis, Animal Sciences, Universidad Nacional Agraria La Molina
 Susana Tapia - Intern, Anthropology, Universidad Nacional Mayor de San Marcos
 Omar Tesdell - Intern, Geography, Iowa State University, USA
 Ricardo Alberto Valle Niebuhr - Ms thesis, Agronomy, Universidad Nacional Agraria La Molina

Sub-Saharan Africa

Kenya

Natasha Anderson - MSc, Medical Anthropology, University of Toronto
 John Ferguson - MSc, Animal Nutrition, Reading University
 Wanjiku Gachie - BSc Agriculture, University of Nairobi
 Miriam W. Githongo - MSc, Soil Science, University of Nairobi and University of Florida
 Catherine R. Githuku - MSc, Environmental Engineering and Management, Jomo Kenyatta University of Agriculture and Technology - Kenya
 Dr. Caroline Kabiru - PhD Public Health, Independent
 Anthony Karanja - MSc Veterinary Medicine student, University of Nairobi
 Ben Keraite - PhD Public Health, University of Copenhagen, Denmark (Based in IWMI Ghana)
 Priscilla K. Kinyari - MSc, Environmental Engineering and Management, Jomo Kenyatta University of Agriculture and Technology - Kenya
 Kendra Lafflephe - BSc, Human Geography, University of Alberta, Canada
 Ruth Lavergne - BSc, Anthropology, University of Toronto
 Tony Loupin - UN-Habitat, MSc Economic Science, University of Louvain-La-Neuve – Belgium
 Samwel Mbugua - MSc, Human Nutrition, Egerton University- Kenya
 Caroline Muneri - MSc, Veterinary Pathology, University of Nairobi-Kenya
 Patrick Munyao - BSc Agricultural Engineering, Independent
 Florence Mutua - MSc Veterinary Medicine student, University of Nairobi

Dr. Cameline Mwai - BSc Veterinary Medicine, Independent
Michael O. Odumbe - MSc Agriculture Economics student, University of Nairobi
Mary Ogumbi - MSc, Human Nutrition, Kenyatta University
Esther Wamuhu Wambui - BSc Human Nutrition, Independent

Uganda

Kareem Buyana - MA (MUK)
Frank Mwiine - MSc (MUK)
Grace Nabulo - PhD (MUK)
Ritah Nakanwagi - MSc (MUK)
Renee Sebastian - MS University of Toronto (UoT), Canada
Collins Sewanyana - PhD Makerere University (MUK)
Shelby Yamamoto - MS University of Toronto (UoT)

South East Asia

Rehan Abeyratne (Sri Lankan) - Brown University (BSc.)
Caroline Cordier (French) - Wageningen University (MSc.)

Abbreviations and acronyms

| | |
|------------------|--|
| CEPIS | Centro Panamericano de Ingeniería Sanitaria y Ciencias (Pan American Center for Sanitary Engineering and Environmental Sciences) |
| CESAL | Centro de Estudios de Solidaridad con America Latina |
| CGIAR | Consultative Group on International Agricultural Research |
| CIAT | Centro Internacional de Agricultura Tropical, Colombia |
| CIDA | Canadian International Development Agency |
| CIP | Centro Internacional de la Papa (International Potato Center), Peru |
| DFID | Department for International Development, UK |
| FAO | Food and Agriculture Organization of the United Nations |
| FCRI | Focus City Research Initiative |
| FFS | Farmer Field Schools |
| GIS | Geographic Information Systems |
| HCC | Health Coordinating Committee |
| IDRC | International Development Research Centre, Canada |
| IIN | Instituto de Investigación Nutricional |
| IITA | International Institute of Tropical Agriculture, Nigeria |
| ILRI | International Livestock Research Institute, Kenya |
| INIA | National Institute for Agricultural Research |
| IPES | Institute for the Promotion of Sustainable Development |
| KARI | Kenya Agricultural Research Institute |
| KGTPA | Kenya Green Towns Partnership Association |
| KUFSALCC | Kampala Urban Food Security and Livestock Coordination Committee |
| KCC | Kampala City Council |
| MOSW | Municipal Organic Solid Waste |
| MPL | Maximum Permissible Limits |
| NARO | National Agricultural Research Organization |
| NEFSALF | Nairobi and Environs Food Security, Agriculture and Livestock Forum |
| NGO | Non-Government Organization |
| NRI | National Resources Institute, UK |
| OPS | Organización Panamericana de la Salud (PanAmerican Health Organization) |
| RUAF | Resource Centre on Urban Agriculture and Food Security |
| UH | Urban Harvest |
| UNDP | United Nations Development Program |
| UPA | Urban and Peri-urban Agriculture |
| UPA&L | Urban and Peri-urban Agriculture and Livestock |
| WAC | World Agroforestry Center |

Contact: Gordon Prain, PhD Global Coordinator
CIP, Apartado 1558 Lima 12, Peru
Av. La Molina 1895, La Molina, Lima-Peru
Tel. 51-1-3496017, Ext 2040/3042
Web page: www.cipotato.org/urbanharvest
email: urbanharvest@cgjar.org

Urban Harvest is the CGIAR system wide initiative in urban and peri-urban agriculture, which aims to contribute to the food security of poor urban families, and to increase the value of agricultural production in urban and peri-urban areas, while ensuring the sustainable management of the urban environment. Urban Harvest is hosted and convened by the International Potato Center.

www.cipotato.org/urbanharvest

CIP's Mission

The International Potato Center (CIP) seeks to reduce poverty and achieve food security on a sustained basis in developing countries through scientific research and related activities on potato, sweetpotato, and other root and tuber crops, and on the improved management of natural resources in potato and sweetpotato-based systems.

The CIP Vision

The International Potato Center (CIP) will contribute to reducing poverty and hunger; improving human health; developing resilient, sustainable rural and urban livelihood systems; and improving access to the benefits of new and appropriate knowledge and technologies. CIP will address these challenges by convening and conducting research and supporting partnerships on root and tuber crops and on natural resources management in mountain systems and other less-favored areas where CIP can contribute to the achievement of healthy and sustainable human development.

www.cipotato.org

The Consultative Group on International Agricultural Research is a strategic alliance of members, partners and international agricultural centers that mobilizes science to benefit the poor. It aims to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment.

