

URBAN HARVEST: A CGIAR GLOBAL PROGRAM ON URBAN AND PERI-URBAN AGRICULTURE

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ABSTRACT

This Bulletin examines the challenges posed by urbanization and the way that agriculture in and around cities can confront those challenges, and also take advantage of opportunities offered by the urban economy. Drawing on case materials from Asia and other parts of the world, the paper shows how technical and policy research and development can contribute to improving the livelihoods of urban and peri-urban households. In particular, this paper discusses the CGIAR's System-wide Initiative on Urban and Peri-urban Agriculture, now known as Urban Harvest Program, which addresses problems and opportunities in agricultural systems that are intimately bound to urban economy and ecology. The Program was launched in recognition of global urbanization trends showing that half of the earth's population may already be living in the world's urban areas. With urbanization come such issues as over population, poverty, food security and other ecological, health and social problems. However, opportunities also exist and here, agriculture can best contribute, for instance by converting waste to productive nutrients for farming, providing fresh produce to urban dwellers, creating green spaces, etc. To reach its goals, the Urban Harvest research and development (R&D) framework has the following components: livelihoods and markets; urban ecosystem health; and stakeholders/policy analysis and dialogues.

Key words: CGIAR, Urban Harvest Program, urban and peri-urban agriculture

INTRODUCTION

After perhaps 30 years of determined research, increasingly sophisticated modeling and growing consensus among scientists, the “message” about climate change has finally struck home for millions of people and many national and provincial governments. Both public and private sectors are setting goals for reduction of greenhouse gases and increasing resources are being made available for research on alternative energy sources.

But another global trend with similarly massive implications for human life and the environment has so far received far less attention. Latest demographic figures suggest that half the earth's population is already urban. Almost all of recent urbanization is in the developing world and the majority of the new urbanites are poor. Cities and towns are increasingly becoming encircled by impoverished shanty towns and slum settlements where families often lack piped water or sanitation services and face severe environmental and health problems, food and nutrition

insecurity, and limited or no access to formal employment.

As with climate change, the scale of the problem posed by urbanization requires concerted action through a multi-faceted, multi-sectoral response. The major international response, thus far, by the United Nations Human Settlements Programme (HABITAT), addresses the crisis in terms of shelter and associated problems such as health risks, poor environmental care, insecurity, and weak urban governance. Until recently, there was no comparable international initiative addressing the urban crisis in food and nutrition security, nor the deterioration in urban natural resources, nor a possible response through agriculture. The United Nations Food and Agriculture Organization (FAO) established an Inter-Departmental Working Group on Food for the Cities in the 1990s, but despite some excellent work, urban issues have so far remained outside the formal FAO structure with very limited resources.

Other international organizations concerned with food production and food security, such as the

Consultative Group on International Agricultural Research (CGIAR)¹ have, like FAO, responded in the past to urban food security needs primarily through supporting technological improvements in rural agriculture. Urban planners have taken a similar approach, concentrating on improved transportation systems and more efficient markets. There is no doubt that improved rural food production and supply will continue to be important and necessary both for food security in cities and securing rural livelihoods. Indeed, a diversification and strengthening of rural livelihoods is one important strategy for limiting urban migration. However, it is increasingly clear that this response is not sufficient, given the scale of the urban crisis, the needs of poor urban households, and the characteristics of changing urban demand.

The need for a more direct agricultural response to urban poverty and food insecurity was recognized by the CGIAR in late 1999 when it established a CGIAR System-wide Initiative on Urban and Peri-urban Agriculture, now known as Urban Harvest. The Initiative was launched to focus the efforts and collective knowledge of the 15 International Agricultural Research Centers which CGIAR supports on issues relevant to urban and peri-urban agriculture. Hosted by the International Potato Center, the Initiative established a global Coordination Office in Lima, Peru, in 2000 and regional coordination capacity in Asia in 2001, in Africa in 2002 and in Latin America in 2004.

Urban Harvest seeks to enhance food and nutrition security, increase incomes, and improve environmental and health conditions among urban populations via agriculture. These three goals are closely related to the differences anticipated in the role of agriculture as one moves from rural, through peri-urban to urban conditions. Evidence of micronutrient deficiencies among poor urban children underlines the need for a sustainable means to increase the availability of micronutrient-rich foods for this group. The highly unstable employment conditions of developing world cities prioritize the need for flexible, alternative employment opportunities that can provide access to supplementary income. Thirdly, agriculture offers opportunities to make a positive impact on urban ecosystems under tremendous strain from high populations and poor infrastructure, through the provision of productive, aesthetically pleasing green

¹ The CGIAR is a unique global partnership of governments, multilateral organizations, and private foundations that work to promote food security, poverty eradication, and the sound management of natural resources throughout the developing world.

spaces, and the ability to absorb urban organic wastes through composting and use as animal feed. Agriculture in urban conditions can also have negative health and environmental repercussions through poorly managed use of agro-chemicals and through introduction into the food chain of the many biological and chemical contaminants present in the urban environment. Urban Harvest is concerned to help mitigate these risks and ensure the safe contribution of agriculture to urban food security.

Because agriculture in urban and peri-urban areas has both great potential and also certain risks, Urban Harvest recognizes a further goal – to integrate agriculture into urban systems as a safe, accepted component of sustainable cities through engagement with the policy and planning institutions of urban areas.

THE CHALLENGES OF URBANIZATION

Major population movements and changes in reproduction and mortality rates during the 20th century have dramatically transformed the way we live. Half the world's population is already urban and another 1.5 billion people will be living in cities by 2020 (Fig. 1). This explosive growth of urban settlements, which is occurring in developing countries, brings with it two critical challenges: the migration of peoples towards the urban world has brought with it a migration of poverty that cities are ill-equipped to deal with; and the problem that unplanned urban growth is accompanied by environmental pollution, health risks and a decline in the quality of life.

Migration of Poverty to Urban Areas

During the post-second world war “development decades”, economists have considered poverty to be a largely rural phenomenon, with city dwellers benefiting from an “urban bias” in the distribution of resources (Lipman 1977). However, population growth and migration over the past 30 years and structural adjustment policies introduced in the 1980s undermined whatever urban bias that had existed (Maxwell 1998).

Today, while a majority of developing country poor people continue to be rural, at least in absolute terms, this no longer holds true for Latin America, where the urban share of poverty has dramatically increased, from 37% in 1970 to 62% in 1997 (CEPAL 1999). Similar changes are occurring in Africa and in Asia (Fig. 2). In Africa, about 40% of the poor are now

Fig. 1. Percentage change in urban population, 1950-2030.

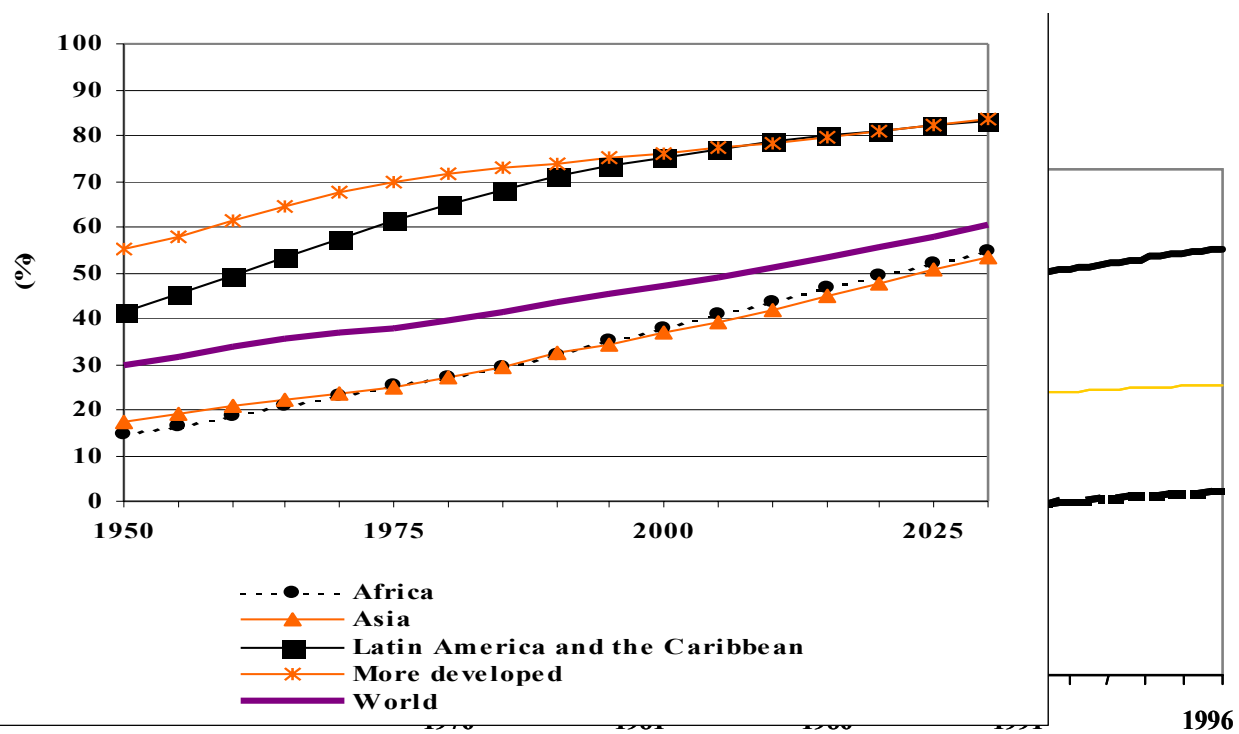


Fig. 2. Changes in urban share of poverty: selected Asian countries.

urban, though there is considerable variation among countries (UNCHS 2001). In Asia, rapid urbanization in populous countries such as Bangladesh has led to around 15 million poor people living in urban areas, about 24% of the total poor (World Bank 2002).

Despite the limited availability of poverty data disaggregated for urban populations² and the even fewer datasets that permit analysis of trends, it is still clear that urban poverty is growing steadily and significantly partly through continuing migration, but now more significantly through new generations of urban dwellers being unable to escape from poverty (Bouquier 2004). In a recent analysis of newly assembled data, IFPRI shows that in seven out of eight countries where longitudinal data exists, an increase in the share of poor people in urban areas is occurring. These countries represent two-thirds of developing world people (Haddad et al. 1999). The same study also analyzes a larger dataset on trends in the number of underweight children in urban and rural areas. Results showed the same trend of a worsening in both the absolute numbers of urban underweight children and a growth in the share of underweight children in urban areas.

Furthermore, many observers believe that even these dramatic trends understate the percentage of the urban poor because of the way national statistics on poverty are calculated, many of which fail to take into consideration the higher costs of non-food items such as transport, education, health care, water and sanitation.

The absolute and relative growth in urban poverty and undernutrition raises two important issues. First, there is a clear link with food insecurity among poor urban populations, illustrated by the growth in underweight children. This in turn is connected to the inability of families to purchase food. Second, there is evidence of a link between poverty and the instability in the urban labor market and its vulnerability to economic shocks (Amis 2002).

Environmental and Health Impacts of Urbanization

By 2020, 4.3 billion people will need shelter, food, and employment in urban areas. Already, the UN-Habitat calculates that a billion people are living in slums and shanty towns, and an increasing proportion of the additional urban population will be located in such

² Unfortunately, there is still limited disaggregated data on poverty; even the World Bank's World Development Report 2000/01 on poverty provided very little disaggregated data.

informal settlements. Water, sanitation and other local services, including the collection and removal of garbage are often unavailable in these settlements, leading to increased exposure to contaminants and the risk of disease (Hardoy and Satterthwaite 1989).

Furthermore, there is evidence that the urban poor and those living around cities are also exposed to a "double health burden", being subject both to the communicable diseases typical of rural areas and the non-communicable "lifestyle" diseases typical of the urban health transition (HABITAT 2001, Birley and Lock 1999). Of particular concern are the 15 out of 19 megacities in the South with populations exceeding 10 million. Congestion and overcrowding in these cities also contribute to problems associated with access to food, to poorer air quality and to worsening psycho-social health. Problems affecting many urban and peri-urban areas are thus not just about human health problems, but about the interconnections between individual human health, community health, and the health and sustainability of the environment.

OPPORTUNITIES FROM THE CITY

Despite the dimensions of the challenge posed by urbanization, the growth of cities also includes an enormous expansion in markets for agricultural products, especially for livestock products, high-value horticultural crops and processed products as well as cutflowers and ornamental plants. Producers and processors located close to cities have comparative advantages to supply these markets, because of the perishability of the products as well as the opportunity to develop short marketing channels with a range of different markets. These factors offer households the chance of a route out of poverty and offer cities a means of supplying fresh, high value food to urban populations.

In megacities such as Shanghai, technical innovation by farmers and institutional changes introduced by the municipal government has resulted in the inner zone of horticultural production – within a radius of 10 km from the point of sale – supplying 76% of the vegetable needs of the city. In Beijing, the figure is even higher (Yeung 1987). In sub-Saharan Africa, urban and peri-urban horticultural and livestock systems also supply large volumes of urban food needs. In Cameroon, for example, almost all the indigenous leafy vegetables consumed by poor urbanites in the capital Yaounde are grown in the inland valleys around the city. In Lima, over half

of vegetables are supplied from the three irrigated valleys within the metropolitan boundaries, with a single valley supplying 70% of some crops.

Horticulture is one of the fastest growing agricultural sectors, largely driven by the growing urban demand for a wide range of high value vegetables and fruits throughout the year. Global fruit and vegetable production increased by 50% during the 1990s, from .81 to 1.2 billion MT. Meanwhile, per capita availability grew 25%. Horticultural crops are also profitable, from 8 to 20 times more profitable than maize under Kenyan conditions, depending on the crop. They also have lower economies of scale and greater labor demand compared to field crops, making them especially appropriate for small producers. They create jobs for producer households – at twice the rate compared to cereals, per hectare of production. Women are major beneficiaries of horticulture, since they tend to play a more significant role in these systems, both during production and in post-production handling and processing enterprises.

Livestock is also experiencing major growth, to the extent that it has been characterized as “the livestock revolution” (Delgado et al. 1999). According to FAO data, per capita annual meat consumption increased from 10 kg to 26 kg in developing countries between the mid-1960s and the end of the 1990s, though clearly there continues to vast differences among different populations. Consumption of dairy products has also risen significantly, from 28 kg to 45 kg in the same time period. Urban and peri-urban producers are already taking advantage of this revolution. The vast majority of Kenya’s milk production is concentrated in small dairy operations in the peri-urban areas around Nairobi, the capital city. As much as 80% of poultry and eggs are supplied from urban and peri-urban producers in Kamala and other African cities.

Cities are not only concentrations of growing demand for agricultural commodities, they are also nutrient sinks and repositories of other untapped natural resources. Nutrients are found in the vast quantities of wastewater and organic residues generated in urban areas. Cities also contain underutilized land and water surfaces which can be put to productive use.

Urban natural resources and product markets have the potential to contribute to economic and social development of agricultural households located along the entire urban-rural transect. Despite the stereotype of rural agriculture and urban manufacturing, in practice the agricultural sector

crosscuts rural-urban boundaries, and manufacturing and services are commonly found in rural areas. This overlap of sectors is underscored by the agriculture-related flow of people, produce, inputs, financing and knowledge along the rural-urban transect. This suggests that their interdependence is of greater importance than their separation.

Analysis of rural-urban linkages can help us to understand where improvements in rural-to-urban food flows can best contribute to better food security among the urban poor and where opportunities exist for urban food production to make a complementary contribution – either directly or via income opportunities – to household food security.

According to UNDP estimates, as many as 800 million people worldwide are presently involved in agriculture in and around cities (Smit et al. 1996). Although this kind of farming is a time-honored strategy for feeding urban dwellers, the dramatic increase in the rate of urbanization and the size of cities gives it a new significance. Millions of people are now growing food crops, raising livestock and managing trees and flowers. In many cases they are also contributing to the environment by greening the city, absorbing wastes through composting and recycling and putting marginal and abandoned land to productive use (Deelstra and Girardet 2000). Although this kind of agriculture demands considerable technical skill, it receives little or no research attention and is frequently ignored and sometimes outlawed by municipal authorities. This has led local people to engage in agricultural systems operating well below their potential and frequently to use production practices that add to existing urban health and environmental problems.

Insufficient is known about the dimensions of current agricultural production in and around cities, the different types of systems that exist, their contribution to livelihood and the environmental and health risks and benefits they bring. Although cultivation or animal-raising can differ as between the high density ‘intra-urban’ compared with the lower density areas around cities referred to as peri-urban, nevertheless urbanization is a dynamic process. Population builds up in peri-urban areas and changes occur in land use. Low-density, contiguous rural areas become increasingly settled, linked in multiple ways to the city and thus “peri-urban”. The Urban Harvest Initiative addresses problems and opportunities in agricultural systems which are intimately bound up, day to day, with the urban economy and ecology.

RESEARCH FRAMEWORK

The goals of Urban Harvest are to contribute to: the increase in food security, improved nutrition and higher incomes of urban and peri-urban populations through agricultural production; reduce the negative environmental and health impacts of urban agriculture whilst enhancing its positive potential; and establish the acceptance of urban and peri-urban agriculture as a productive and essential component of sustainable cities. To address these goals, a research and development framework has been developed which draws on earlier insights into sustainable livelihoods and urban ecosystems health as well as urban planning and policy and consists of three elements: **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 research and development attention on feedback systems linking peoples' actions – especially related to agriculture - and the health of the urban ecosystem, including individual health, community health and environmental health. **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 and its integration in policy, planning and regulatory schemes. A fourth area, **knowledge networking and capacity development** facilitates the knowledge

sharing functions of collaborative partnerships and the enhancement of capabilities in order to make use of the results of public goods research.

Urban Harvest's objectives involve the dual task of strengthening the role of agriculture to help urban and peri-urban households move out of poverty whilst maintaining or improving environmental health and the sustainability of cities. To address these objectives, a research and development framework has been developed which draws on earlier insights into sustainable livelihoods and urban ecosystems health as well as urban planning and policy.

The **sustainable urban livelihoods framework** (Radoki and Lloyd-Jones 2002) 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 and water; financial capital; physical capital (houses, equipment, vehicles, animals, seed); human capital, both in terms of labor power and capacity or skill; and social capital, which refers to the networks of trust, exchange and mutual support which all individual and households maintain to a greater or lesser degree (Fig. 3). Deployment of assets in household livelihood strategies also depends on the influences and impediments which household members experience when they deal with urban institutions such as municipal regulations, or policies or local marketing practices. This constrained deployment of assets and the livelihood outcomes which they achieve are all part of urban livelihood

Fig. 3. Sustainable urban livelihoods framework.

processes. 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 assets combined with a more supportive institutional context can move households out of poverty.

To complement the household level focus of the capitals and their deployment in strategies, the urban ecosystems health perspective (Hancock 2000) emphasizes the ecosystem feedback effects of the livelihoods outcomes of households as well as the effects of policies and institutional processes and the positive or negative effects these have on the environment – affecting the vulnerability context of households or directly affecting household capitals, 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 UPA can have both a positive and negative impact (see feedback processes in Fig. 3).

Because of the range and complexity of stakeholder involvement in urban agriculture, the number and types of institutions and political and economic processes with which urban households must deal and the importance of municipal recognition of UPA as a valid tool for urban development, Urban Harvest’s research framework also includes **stakeholder and**

policy analysis and dialogue. This helps provide mechanisms for local uptake of technical and policy analysis and innovation, and a systematic capacity to monitor and assess implementation of action research. It also provides the basis for establishing “platforms” to facilitate consensus building, joint decision-making and knowledge networking (Stren 2001). Policy analysis and policy development will of course be an important part of the content of the other components, but those research outputs will feed into the dialogue. These three components of the research framework can be closely related to three major components of the livelihoods framework (Fig. 4).

LIVELIHOODS AND MARKETS

What is the role of agriculture in urban livelihoods and how can households be helped to better secure their healthy food needs and to leverage greater returns from market opportunities? Research with a wide range of partners in Africa, Asia and Latin America has identified several pathways for enhancing socioeconomic benefits.

Though there are many classifications of types of urban and peri-urban farming systems, a tentative synthesis of classifications across the major developing regions suggests four main types (Table 1). Women play a dominant or key role in at least the first three. Women tend to manage small livestock and small-scale multiple cropping systems, often

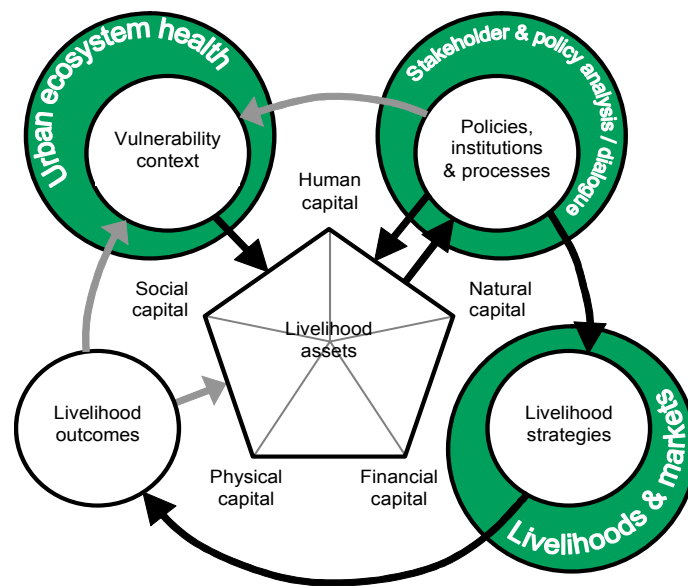


Fig. 4. Urban Harvest research areas.

Table 1. Major types of urban agriculture

Systems	Common locations	Livelihood aspects
Survival/food security	Urban/peri-urban, roadsides, abandoned lnds, wastelands	Urban natural resource use major source of livelihood
Food supplement	Urban, homegardens, rooftops, container gardening, small animal production	Adaptation of physical/natural resources for secondary food source
Mixed food security/commercial	Peri-urban, rainfed, hillsides, zero-grazing, crop-livestock systems	Main or secondary livelihood contribution, with non-farm work
Commercial	Peri-urban and urban, wetland valleys, irrigated lands poultry/pig farms, dairy	Main livelihood contribution

grown in containers or in patches of land adjacent to the house (Prain, in press). Most commonly these systems have dual food security-income supplement production objectives, even if the income supplement comes from cash savings due to home produced vegetables. Women have less access to managing agro-enterprises, such as intensive vegetable areas, nurseries or agro-processing, though they often play a key role in marketing crops and animals. 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 opportunities for wider access to resources and knowledge and for scaling out innovations.

The participation of men and women in agriculture also varies along the rural-to-urban transect, as do other aspects of the farming systems, such as land area, tenancy, principle crops and animals produced, food security and marketing strategies, and health risks. Insecurity of tenure was identified as a serious problem for households producing closer to urban centers. Direct and indirect policy interventions are addressing this issue.

Producer and other households along the rural-urban transect have forged important interdependencies within and across production chains of crops and animals. These include the flow of seeds (rural-to-urban biodiversity), nutrients (rural manure, urban compost), livestock elements (young rural animals for fattening, urban feed) and the primary and secondary marketing of fresh and processed products. Several types of interventions are being implemented which address technical, institutional

and policy constraints within these rural-urban marketing networks. Opportunities for adding value to the production chain are being prioritized. The following cases illustrate the kinds of food security and marketing systems that exist in urban agriculture, and how research and development specialists can engage with local people to strengthen them.

Pig-raising Systems in Hanoi, Vietnam (Peters et al. 2002)

Almost all rural households and many urban households in Vietnam raise pigs. Pork is a preferred meat and is especially associated with the Vietnam New Year. Traditionally, the numbers are kept within two to six pigs due to limited feed, labor, and market. Those households which raise pigs for home consumption would typically fatten the pigs over the year using agricultural by-products and household organic wastes and slaughter them for the New Year celebrations. Larger scale, cooperative production units also exist to supply meat to urban consumers without access to their own production.

With the economic reforms introduced in the late 1980s, known as Doi Moi, Hanoi began to prosper and increase its meat consumption. At the same time the Government allowed the emergence of private markets. In response to this economic liberalization and growing urban demand, commercial pig meat supply chains began to appear in the peri-urban areas. Instead of individual households maintaining sows to produce piglets which are then fattened and sold, some households have begun to specialize in different stages of the production of pig meat, while

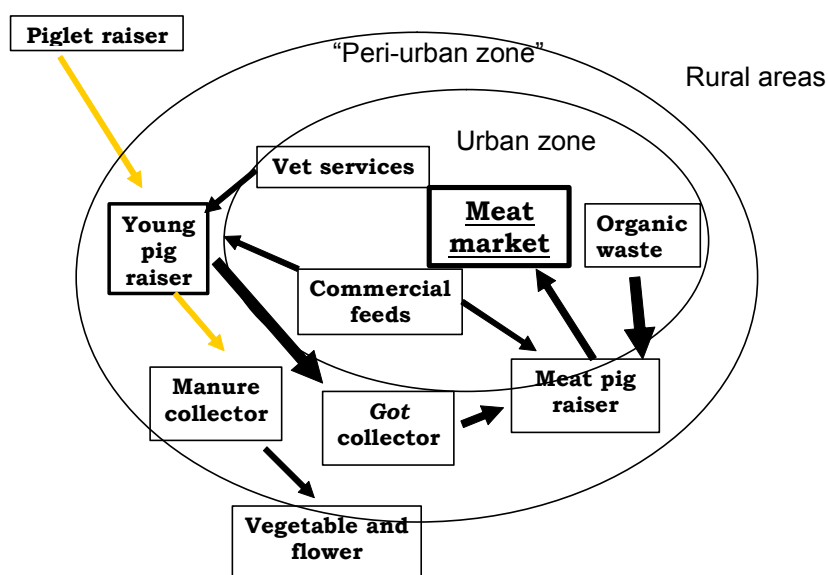


Fig. 5. Household-based pig-raising agro-enterprises in Hanoi: rural-urban market chain and "cluster"

other households have become specialized in service functions, such as piglet trading, manure collection, feed supply and so on (Fig. 5)

There are two types of piglets in the production chain: newborn to 6/7 kg piglets (*giong* or "seed") and 6/7-27 kg piglets, referred to as *got*. *Giong* production is especially associated with the rural areas and a livelihood strategy which combines piglet raising with agriculture. Households have one to three sows and sell the young piglets to the *got* raisers in the peri-urban areas. The *got* producers assume the technically more demanding management requirements of this age of piglet, but have the chance to obtain higher profits, because of the rapidly growing demand for fattening pigs. This is the least risky and lowest investment part of the chain, with correspondingly lower profit margins. The households involved in fattening tend to concentrate in the peri-urban and urban areas, where they are in close contact with the meat market.

The transformation of the pig-raising system along the rural urban transect in Hanoi is an example of the geographic concentration of small enterprises (clusters) which can be associated with high rates of innovation and dynamic growth, due to the synergies to be gained from "collective efficiency" (Schmitz 1998) through, for example, networks of suppliers and buyers in close proximity and gains from joint action. "Dynamic clusters" (Santee 1998) feature linkages to non-local, growth markets through traders and agents, and thus have incentives to invest in new

technologies and to cooperate (e.g. to fill orders, to access new technologies, to enter new markets).

One particular peri-urban village, Cat Que, has proved to be a case of an innovative, dynamic cluster in the way it responded to the market demand for the 25-30 kg *got* piglets in the late 1980s and 1990s, and began to fill the niche of *got* production. In other words, Cat Que farmers buy *giong* from sow/piglet raisers in rural areas at 5 or 6 kg and raise them as *got* until they reach approximately 25-27 kg and sell them to fattening pig raisers. Each cycle takes 45-60 days depending on the quality of *giong* and growth potential, diet, health, and management. Feed regimes are of particular importance. Rice, rice bran, rice alcohol residue, and sweetpotato vines constitute the bulk of the *got* feed for almost all the raisers, but in varying proportions among the raisers, which is reflected in different rates of weight gain and length of cycle. Commercial feed is fed sparingly and strategically in order to maintain the thin profit margin. Most households are engaged in more than one type of *got*-centered enterprise. For example, a *got*-raising household can also draw minor income from manure collection, or the feed suppliers in Cat Que also raise *got* or meat pigs or collect *got*. In less than 20 years, *got* and associated enterprises have come to define Cat Que's household economy and become the central theme of their livelihood. The relationships of these associated enterprises form the bases of the complex enterprise strategies, which strive to balance feed, growth, disease control, labor, and market fluctuation to maximize profit.

Urban Harvest has worked with the Hanoi Agricultural University, the National Institute for Animal Husbandry, and local households to explore ways to reduce disease problems through better knowledge of symptoms and treatment, and to improve the feed regimes within this system by increasing use of locally available energy and protein sources, so as to reduce costs and increase weight gain.

A more recent phenomenon, occurring in the same village and throughout the peri-urban areas of Hanoi, is the increasing use of urban organic wastes as pigfeed. Use of household food wastes as pigfeed is of course an ancient practice in many societies. The difference in the case of Hanoi is the transformation and increased profitability of pig-fattening through accessing large quantities of restaurant and other institutional sources of food waste via motorcycle. The motorcycle slowly became available in Vietnam during the 1990s, with the opening up of markets, imports and the accumulation of individual wealth. From fewer than 500,000 bikes in 1990, there are now around 10 million and they have become an essential part of the physical capital of many farming families. A rapid assessment of the system indicated that as much as 420 kg per day is transported per day in one or two trips to city supply sources, with between US\$.50 and US\$1.3 paid to suppliers per 100 kg (Urban Harvest Newsletter 2005). Urban organic wastes now account for around 80% of the feed source for fattening pigs in the peri-urban areas studied. The rest is made up with forage, primarily sweetpotato vines.

The experience in Vietnam alerts us to the fact that local urban producers live in a constantly changing world in which new opportunities present themselves all the time. The role of research and development agencies is to facilitate this innovation, while at the same time helping to ensure that the innovation will not undermine future use of urban natural resources for agriculture. This is the concern of the urban ecosystem health component of Urban Harvest's research framework.

URBAN ECOSYSTEMS HEALTH

Agriculture is not only an important livelihood option for urban and peri-urban families, in terms of food and nutrition security, income and social benefits, but it is also a management system for urban natural resources with the potential for both good and harm. Understanding the positive and negative health effects on producers, consumers and on the urban

ecosystem is essential for determining strategies that multiply benefits and mitigate risks.

A major cause of both health benefits and risks is the way urban ecosystems act as sinks for different kinds of wastes. Producers in hilly African cities like Kampala and Yaounde in Sub-Saharan Africa take advantage of the nutrients in the wastes that drain into city wetlands and inland valleys to fertilize horticultural crops. Wastewater is important for irrigation in many urban and peri-urban locations where access to treated water is limited by competition with other water users (domestic, industrial) or by price. It is also a useful source of nutrients, and in some cases may eliminate the need for fertilizer. Urban Harvest-supported pot and field trials in Hanoi, with the Institute of Ecology and Biological Resources and members of the local commune of Duong Lieu (Peters and Ngai 2004) evaluated the use of wastewater coming from agro-industrial and animal production areas of Hanoi in the cultivation of rice, kangkong and sweetpotato. The results indicated that in the case of rice, yields in treatments using wastewater were not significantly different than the use of ordinary irrigation water plus normal farmer applications of fertilizers. Carefully managed, wastewater can be turned from a nuisance – especially to those downstream of the waste producers – into an economic benefit and a means to conserve increasingly threatened urban water resources (Drechsel et al. 2005).

Cities are also abundant sources of solid organic wastes containing nutrients for soils and for animals. At present only a tiny percentage of urban organic wastes – which in most developing world cities accounts for the majority of total residue – is recycled. In Nairobi, Kenya, where Urban Harvest has worked with international research organizations, local NGOs and local associations of waste recyclers, only about 1% is being recycled, and yet there is an unmet demand from organic producers in and around the city for compost.

As already described in the case of Hanoi, urban food residues are an important source of animal feed in many urban settings. We plan to follow up the preliminary study in Hanoi with a more in-depth analysis of the system. In Lima, Urban Harvest is also examining similar systems of organic waste supply to pig raisers and in Kampala, a project has recently started to examine the potential for use of food wastes, in a situation where this is still a very small-scale, backyard practice. The aim is to identify, together with local pig raisers, opportunities for innovation in these systems, to enhance efficiencies, and to ensure that health risks are removed.

But these wastes also contain contaminants. As studies by Urban Harvest supported projects have shown, wastewater, including rivers that receive high levels of industrial and domestic effluent, and wastes used for composting, especially when mined from dumpsites, have the risk of carrying heavy metals and pathogens (Lee-Smith and Prain 2006). Air pollution is another contaminant pathway for heavy metals. An IDRC-supported study in Kampala, conducted as part of an umbrella project led by Urban Harvest, has examined the extent of contamination of different crops planted at different distances from roads in the Ugandan capital (Nabulo 2004). A correlation was confirmed between traffic density and heavy metal content in roadside soils, water, vegetables and air in sites around the city. Elevated concentrations of lead, cadmium and zinc were found in all crops and in particular, leafy vegetables. Accumulation of most of the heavy metals occurred in the leaves compared to the roots, fruits and tubers of the plant (i.e. leaf to root ratio was greater than 1), making the cultivation of leafy vegetables in areas with heavy traffic a potential health risk. On the other hand in the two rootcrops, tested, coco yams (taro) and sweetpotato, heavy metal accumulation took place in their root systems and in their leaves, but least accumulation occurred in the edible corms or storage roots. Sweetpotato showed the least accumulation of heavy metals. This suggests that urban producers are better off planting root and tuber crops in areas with heavy traffic concentrations.

Another aspect of urban agriculture practice which carries higher risks than in rural conditions is the use of pesticide by vegetable and flower producers in Asia and Latin America. In surveys carried out in Vietnam and Peru, farmers were found to receive most of their knowledge and information about pest management from the local suppliers of agrochemicals. Perhaps not surprisingly these same farmers reported regular use of highly toxic pesticides which were not always related to pest type or pest pressure. In urban conditions the geographical closeness of production areas with population centers and the short time it takes for products to move through the marketing chain increases health risks. Pesticides are prepared and used and equipment cleaned in places with other human uses, even by children. Late spraying means that pesticides quickly travel along the marketing chain. For example, heavy applications on jasmine flowers have been found to produce skin problems in garland makers and traders in the Philippines (de Guzman et al 2005).

Both the experiences with contamination from pathogens and heavy metals and the risks from

pesticide use indicate a clear need to help urban producers acquire alternative Integrated crop management strategies which emphasize the opportunities for safe use of urban nutrients and alternative ways of management pests. One approach being explored in work in Philippines and in Latin America is the adaptation to urban conditions of the farmer field school (FFS) approach.

EXPLORING URBAN FARMER FIELD SCHOOLS FOR INTEGRATED CROP MANAGEMENT

The Farmer Field School (FFS) method uses adult education techniques for agricultural learning and change. Adult education has become more important as the accelerating pace of technological change means that the tools one acquires in formal education become quickly obsolete in adult life (Minnick 1989). FFS was developed initially to facilitate farmer's understanding and application of integrated pest management principles in rice farming, for which conventional technology transfer training approaches were found to be inadequate (Röling and van de Fliert 1998).

Since then there has been considerable adaptation of the original production-side, crop constraint focus, with more attention to soils, markets, local learning and organization and farmer empowerment (Röling 2003, Züger 2005). In particular, it is possible to see how FFS is becoming more closely aligned with a livelihoods perspective, and less strongly tied to crop protection. FFS is "a form of agricultural education that develops *human and social capital* while conserving *natural capital*" (Röling 2003). This evolution of FFS seemed to align it very well with the livelihoods framework which is being increasingly used in urban agriculture research (Urban Harvest 2004).

The basic principles of the Farmer Field School, distilled from 10 years of Asian and other experience are listed in Box 1 (adapted from Pretty 1995).

FFSs provide the setting and the materials for farmers to explore and discover for themselves new knowledge about agricultural production on the presumption that knowledge actively and repeatedly obtained in this way will be more easily internalized, retained and applied after completion of the training. Repetition is important for retention, which is one reason why FFSs are repeated, usually on a weekly or fortnightly basis, with the same structure, throughout the growing season.

Until recently the application of this method to urban conditions was largely untested (Prain 2001). Yet it appears to offer the possibility of mitigating the

Box 1 Basic principles of a FFS.

- Learner decides and discovers what is relevant and meaningful.
- Teaching is a facilitating process that helps people explore and discover.
- Learning is a consequence of experience ("learning by doing").
- Cooperative approaches are enabling. They can strengthen learning (social learning, farmer-to-farmer learning).
- Learning is an evolutionary process and is characterized by free and open communications, confrontation, acceptance, respect and the right to make mistakes.
- Each person's experience is unique. Self-awareness about learning and problem solving leads to refined individual learning and action.

negative consequences of urban agricultural intensification through safely and sustainably increasing the use of organic wastes for soil conditioning and plant nutrition and improving the management of pests and diseases through integrated approaches, leading to improved crop quality and food safety which are increasingly contentious issues in urban agriculture. It also offers the means to relate crop production to the broader socioeconomic, institutional and policy arenas. Nevertheless, some aspects of FFS need special consideration in urban conditions. For example, the approach requires a major time commitment by FFS participants which can be problematic in urban conditions where agriculture may be only one of several livelihoods activities.

For the past 18 months, groups of producers and researchers in Peru have been adapting FFS to the urban horticulture of Lima, the capital city. Preliminary results show that time is more of a constraint in urban settings and commitment is perhaps more closely linked to commercial opportunities offered by participation in the school. FFS also places strong emphasis on social interaction and learning, involving group activities. This can present difficulties in urban contexts where limited trust and social capital exist among urban cultivators (Arce et al. 2004). This led to changes in the method at the beginning of the FFS process, involving a longer period of sensitization and dialogue and joint determination of FFS goals, which focused on capacity strengthening for agro-ecosystem analysis, participatory evaluation of crop management innovations and capacity strengthening in social and agro-enterprise organization to improve marketing and profitability.

Thus, the process itself provides the means to establish and strengthen social and communal ties within cities, which are found to be one of the weak elements in urban agriculture.

Other learning points from the experience so far with two FFS focused on beetroot and lettuce as the target crops are as follows:

- As part of the sensitization process and the group dynamics of different sessions, a wide range of innovative learning tools and approaches were adapted to the urban characteristics of the FFS group. Tools such as "social drama", which enacted the relationship between "the farmer and the soil", helped to strengthen links to urban natural resources and their conservation and to strengthen the resolve of local producers to maintain their land for agricultural production rather than selling it for conversion to residential or industrial use.
- Field data obtained from trials undertaken as part of the FFS suggest that integrated practices, especially double-digging, resulted in yield increases of 15% for lettuce and 22% for beetroot.
- Applications of chemical insecticides were reduced from two to three applications per crop in the "farmer practice" treatment to zero applications in the ICM treatments, although herbicides continued to be applied in the latter treatment.
- Preliminary results demonstrated the potential to reduce reliance on chemical insecticides while increasing yield
- A complementary study which compared the perception of time and other variables among participants in rural and urban FFSs (Warnaars and Pradel, in press) yielded the following main findings:
 - Urban participants were found to be more "time constrained" than their rural counterparts, mainly because of a larger number of demands on their attention and commitment. This confirms the need for a more elaborate sensitization and consultation period in preparing the FFS and agreeing the ground rules.
 - Rural participants more highly valued the FFS itself than did the urban participants.

This seems to reflect their much greater involvement in agriculture as their major – and often only – livelihood activity.

- Both urban and rural participants highly valued the FFS as an organizational tool and a means to secure social cohesion, though this may be more marked among the urban participants.
- Both sets of participants highly valued education for their children and did not see their children staying in agriculture. This reflects the cultural devaluation of agriculture as an occupation in Peru and the technical and economic constraints faced by most farmers. It highlights the need for revaluing agriculture as a complementary livelihood activity and seeking increased profitability from technical innovation, alternative crops or animal products and the identification of new market opportunities.
- The positive impact of the FFS was demonstrated by the significantly increased knowledge of ICM principles demonstrated by participants and the adoption of ICM practices in their own farms
- The positive impact of the FFS was also demonstrated in the increased social capital of participants and their empowerment to seek institutional change. Both FFS groups have formed themselves into agro-enterprise associations to market ecological products.
- Whereas in rural areas the location of the communal activities of the FFS in an individual's private land has not been found problematic, this was an issue in the urban field schools. Participant producers expressed interest in accessing a neutral space for continued experimentation and learning. Municipal land was assigned for use as a "School for Urban Farmers". This "school without walls" provides a stable location for ongoing evaluations of alternative technologies by the FFS graduates themselves, showcases alternative production practices for the benefit of other producers and is a visible recognition of the necessary integration of agriculture within municipal policy and practice
- The School for Urban Farmers has the potential to offer multifunctional possibilities for the local population. These can include income, food security and therapeutic options for vulnerable groups such as unemployed youth,

pensioners and the sick. It is also an excellent site for environmental education for local schools.

STAKEHOLDER AND POLICY ANALYSIS AND DIALOGUE

Urban households involved in agriculture cannot avoid being caught up in a complex institutional and policy environment of laws, regulations, norms and urban planning schemes which influence how farming is carried out. Because of the population densities and multiple activities going on in cities, urban space is both more intensively legislated and more contested than rural space. Urban planning often seeks sectoral separation between rural agriculture and urban manufacturing and services, thus outlawing or restricting urban agriculture and adding to the insecurity among households practicing it. Or local authorities may favor conversion of agricultural land to "urban land" and tax it at higher rates, making agriculture nonviable.

The multiple activities of the city also entails the presence of a wide range of stakeholders, often with competing interests, but sometimes with the potential for synergy, as we saw in the case of the agro-enterprise clusters around Hanoi.

For urban agriculture to be sustainable, it is not enough to strengthen its food security, income generation or employment creation functions, or to enhance its positive environmental effects. It is essential that interested stakeholders come together to discuss potential conflicts and possible mutual interests, review current policy as it affects crop and animal production and the use of urban natural resources and identify new policies, strategies and planning approaches to ensure agricultural viability and the conservation of the natural resource base. To achieve this, Urban Harvest has been developing a model of stakeholder and policy analysis and dialogue which involves the characterization of stakeholders and their interests and the policy and planning environment and the establishment of "dialogue platforms" to build understanding and consensus among stakeholders, facilitate review and restructuring of approaches to agriculture and NRM.

The central actors in the dialogue platform are the local government – most often the architect of regulations and norms – and the producers. Other important actors include local and national research institutes and universities, special regulatory authorities, (water, wetlands for example), civil

society organizations, and international organizations as technical support and for facilitation.

In projects in the Philippines and in Lima, geographical information systems (GIS) have been used to understand the policy relevant distribution of land use types and changes in land use over recent years. The study in the Philippines is looking at the reasons behind urban sprawl – documenting this through GIS – and then trying to identify ways to avoid it and ways to build in productive agricultural spaces into urban development. In Lima, documenting changes in urban land use and the fate of natural resources under environmentally unplanned urban development is one element of an effort to integrate agriculture and natural resources management in urban development.

Dialogue platforms to change policy: urban agriculture in Kampala

The activities undertaken by the City Council of Kampala, Uganda, Kampala's Makerere University, national government agencies and local NGOs, with facilitation support from Urban Harvest, demonstrate most clearly how the dialogue platform can really change policy.

Like many other Sub-Saharan Africa cities, Kampala carries the weight of its colonial past. Part of that weight has been the very extensive set of rules and regulations relating to the raising of crops and animals and the use that is made of their products. The origins of these rules and regulations had more to do with trying to ensure that the city remained primarily a residential area for colonial institutions and families and Africans working for them than as measures to ensure the safety of the local population (Tibajuka 2004).

This ideological and policy separation between the residential town and the agricultural countryside carried over into the post-independence period. The regulations stayed on the statute books and until the early part of the 21st century agriculture was technically illegal. Furthermore, this situation was endorsed by senior managers in the Ugandan agricultural research system, who responded quite negatively to the idea of urban agriculture, during meetings with Urban Harvest in 2000. In the City Council, too, there was tacit or explicit support for the prohibition on many types of agriculture, even though paradoxically the City had its agriculture office and an agricultural officer who worked energetically with women home gardeners in the city.

The stakeholder dialogue began with the participation of representatives from different

Ugandan organizations and international organizations working in Uganda (CIAT, ILRI) in a regional stakeholder meeting convened by Urban Harvest in 2000 (Fig. 6). This meeting provoked a major change of mind in some Kamala participants and strengthened the determination of others.

These changes were followed up by team formation in Kampala and the initiation of an Urban Harvest-funded project involving baseline production, livelihoods and marketing studies. They were strengthened with the award of external funds to Urban Harvest, the University of Toronto and local organizations to study the health impacts of urban agriculture in the city. It included components on health risk analysis related to contaminants in soils and in the air, a nutrition component and a study of the risks and benefits of livestock production. To implement the project, the partners formed a Coordination Committee, chaired by a public health specialist from the University and including a senior member of the City Council, the City's agricultural officer, a supporter of urban agriculture within the Ministry of Agriculture and Fisheries, an urban-oriented NGO and Urban Harvest. This committee oversaw the implementation of the different components of the project.

During the technical implementation, it became clear that for urban agriculture to fulfill its potential contribution to urban livelihoods without posing health risks to either practitioners or consumers, it was essential to address the policy aspects. Kampala City Council, possibly influenced by the regional stakeholders meeting in 2000, began the process of reviewing the six ordinances pertaining to agriculture and related topics in the city in 2001, and came up with a set of draft revised ordinances. Meanwhile, through the interactions within the coordinating committee, the experiences of conducting participatory research with agricultural households and the influence of other meetings and networking in the region, it became clear that those most involved in urban agriculture should participate directly in the ordinance review. The Coordinating Committee, with its existing space for stakeholder dialogue, especially between technical and political perspectives, was thus transformed into a broader based organization, the Kamala Food Security, Agriculture and Livestock Coordinating Committee (KUFSAALCC), was registered as an NGO and obtained additional funds for undertaking such a participatory review. This review, involving parish, district and city wide consultations with the local population, yielded detailed recommendations for shortening, simplifying and rationalizing the more than 60 pages of

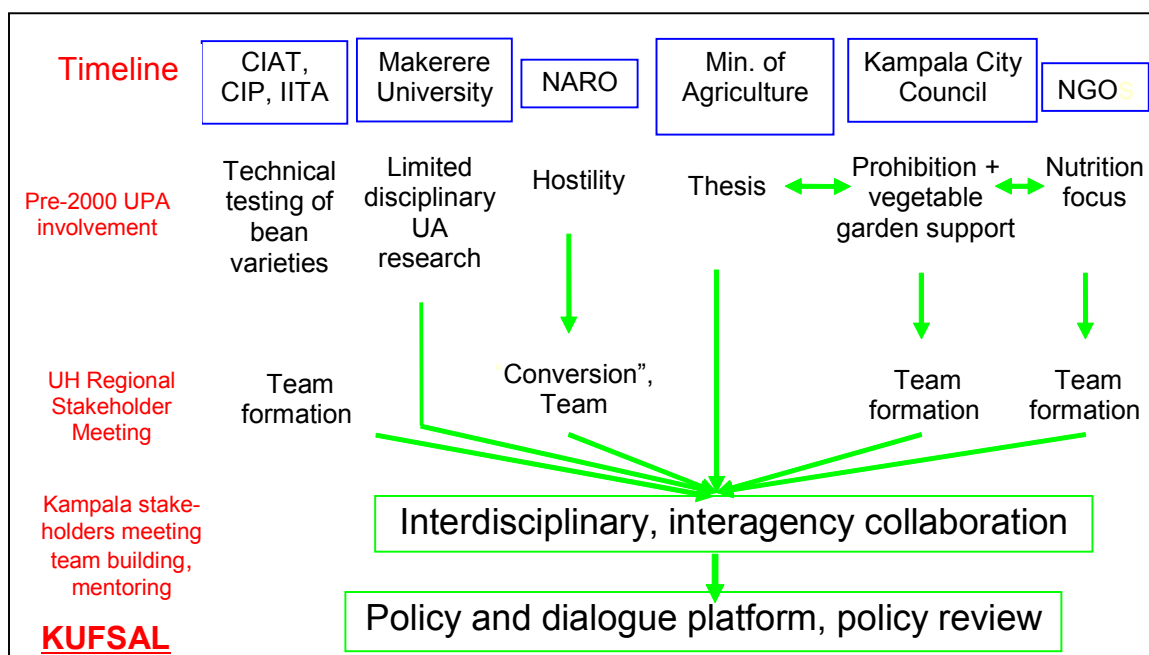


Fig. 6. Stakeholder dialogue and policy process, Kampala

ordinances. The revised ordinances were ratified by the Council and endorsed by the Mayor and KUFSAALCC undertook to test the new guidelines on urban agriculture with selected communities in Kampala.

LOOKING TO THE FUTURE

The urbanization trends and the increasing concentration of poverty in and around cities appear irreversible, though improved livelihood options in rural areas certainly need to be greatly increased in order to slow migration and maintain national food production capacity. Given this irreversible scenario, there is continuing need to address urban food security issues and to strengthen the role of agriculture in diverse urban livelihood strategies. As cities face ever greater population pressures with inadequate infrastructure, the role of agriculture in urban environmental management will also become increasingly important. Parks and gardens are options for maintaining green spaces and avoiding ‘heat islands’ where local government has the funds to provide them. In many cases, it is far more practical for the green spaces to be productive spaces managed by the private sector – that is, local producing households.

At the same time, urban trends can lead to potential health problems in urban agriculture, either through the transmission of contaminants into the food chain

or through the unsustainable intensification of urban horticulture to capture growing markets. The growing sophistication of urban consumers will increase the need for food safety and quality controls and these will require that health risks are identified and mitigated. This also highlights the key role of urban policy and planning in agriculture. We need to work with policy makers in order to ensure that agriculture is incorporated within urban governance, that it is empowered and facilitated and that it is recognized as an integral part of sustainable cities.

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