



Sustainable urban and periurban food provision

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Thematic paper 3: Innovative experiences with multifunctional urban and peri-urban agriculture in city regions in the global South

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1. Background and introduction

The project SUPURBFOOD (“Towards sustainable modes of urban and peri-urban food provisioning”, www.supurbfood.eu) is a research project financed by the 7th Framework Programme for Research and Technological Development of the European Commission. Its aim is to improve the sustainability of agriculture and food delivery in city-regions in Europe as well as in the global South by developing together with SMEs innovative approaches to: a). water, nutrient and waste management and recycling; b). short food supply chain delivery; and c). multifunctionality of agricultural activities in city-regions.

This is mainly done in 7 city-regions across Europe (Rotterdam, The Netherlands; Rome, Italy; Ghent, Belgium; Vigo, Spain; Bristol, United Kingdom; Zürich, Switzerland; Riga, Latvia), but the project also explicitly aims to learn from experiences with urban & peri-urban agriculture (UPA) and urban food provisioning in countries of the global South. In the global South, in spite of sometimes considerably different contextual settings and driving forces, often very similar types of experiences with urban agriculture, waste and water reuse, and food provisioning exist. These frequently have developed in a strong way and may hold important lessons for the development of sustainable city-region food systems in Europe.

Within SUPURBFOOD the RUAF Foundation (International network of Resource Centres on Urban Agriculture and Food Security, www.ruaf.org) is the responsible project partner for the identification and analysis of relevant experiences from the global South within the three thematic areas of the project, in order to enrich South-North exchange and collaboration and draw lessons from these for the development of sustainable (peri-) urban food systems in the 7 European city-regions mentioned above.

This thematic report specifically focuses on relevant experiences from the global South within the thematic area of **multifunctional urban and (peri-) urban agriculture in city regions**, and aims to identify inspiring examples and define lessons for application elsewhere on the basis of these. The selected initiatives are drawn to a large extent from experiences of RUAF with urban agriculture and food provisioning

projects in the South in which short chain development and value chain creation already for several years have become an integrated part (for example see the RUAF programmes “Cities Farming for the Future” (2005-2008) and the project “The Edible Landscape: integrating urban agriculture into multifunctional land use planning” (2004-2006) and thematic publication such as a special issue of RUAF’s Urban Agriculture magazine on Multiple Functions of Urban Agriculture (No. 15, 2005). A survey of literature and web sources was implemented to identify complementary initiatives and an electronic “Dare to Share” fair was organised in order to mobilise involved researchers, local authorities, urban planners, SME’s, producer groups, NGOs, etc. in the global South in providing other relevant examples..

The entire inventory of sixteen cases (see Annex 1 of this report) demonstrates the variety of experiences with multifunctional urban and peri-urban agriculture (UPA) in city regions in developing countries. The inventory shows multifunctional (peri)urban agriculture involves a range of different social, ecological and economic functions including a.o. tourism, leisure, education, green space management, flood control, social integration and social cohesion. The described cases also represent a wide variety in terms of the products, services and (public) goods generated by the initiatives and show a diversity in engaged stakeholders from public administration, market and civil society as well as in the institutional arrangements that are put into place for the operation of the initiatives and to market articulation.

Part I of the report provides a more detailed analysis of 7 selected case studies. This analysis addresses the following questions:

- What **characterises** the multifunctional UPA initiative? What distinguishes it from other initiatives for urban agriculture and food provisioning? What are social and ecological benefits, that are relevant from the perspective of multifunctionality (e.g. landscape, biodiversity, natural resource management, leisure opportunities, health improvement, community building, social cohesion, etc)? Which actors are participating in the initiatives? What kind of financing modalities, institutional arrangements, and business models are applied? What roles are given to (peri-) urban producer groups, civil society groups and SME’s in this approach and what are the relationships among them and between these and other actors?
- What is the **economic, social and ecological performance** of the multifunctional UPA initiative? What positive impacts in terms of enhancing food

security and access to food, enhancing income level and continuity for the (peri-)urban farmers? How does the initiative contribute to multiple functions (social and or environmental) beyond food production and income/employment generation? What are main possibilities to enhance such benefits?

- Are there any specific social, economic and ecological problems (negative impacts) caused by this strategy/modality, and if so what are these?
- Which seem to have been the main factors that facilitate or hamper (socio-cultural, technical, economic and financial, political/legal and institutional) the further expansion of this type of multifunctional initiative? What are the main constraints encountered by the involved actors?
- Based on the above, (a) What is the **sustainability/viability** of this type of initiative and (b) What are important prerequisites for further expansion of this type of initiative? Changes in the approach needed, critical support required, etcetera?

Part III is a synthesis of lessons learned from these cases. The main opportunities and challenges with respect to developing and valorising the multifunctional character of urban and peri-urban agriculture are highlighted. These include aspects like: improving institutional arrangements for valorising the range of societal functions provided by multifunctional (peri-)urban agriculture, and increasing the sustainability (including economic viability) of such initiatives. Special attention is given to opportunities and challenges with respect to roles of government, NGOs and private sector parties, the types of business models applied and the type kind of support that is needed.

It should be noted that case description and analysis is based on secondary literature review and –where possible- on additional phone interviews. No ground verification has been done in the context of this project, nor have data been externally reviewed. The authors can therefore not ensure that data are fully correct, up-to date or complete.

2. Description and analysis of selected cases of multifunctional urban and (peri-) urban agriculture

2.1. Introduction

This part describes seven cases of multifunctional urban and peri-urban agriculture in more detail to get a thorough understanding of the activities implemented, challenges encountered, lessons learned, impacts, sustainability and viability. Each case is described using the following:

Case description

Short description covering what, where, who is involved, how the initiative came about, dynamics and scale covering the following questions:

- What are the key products and activities?
- What are the key resources needed/used?
- How does the business initiative contribute to multiple functions (social and or environmental) beyond food production and income/employment generation?
- Value proposition: what is the added value, in what way is it different from other chains/products?
- Which market segment is covered? What are the existing customer relations?
- Which actors are participating, what are their roles and relationships?
- What kind of financing modalities are applied? Cost structure?
- What kind of institutional arrangements are put in place?
- What sort of business model was adopted, any changes/modifications made over time?

Economic, social and ecological performance

Covers issues such as:

- Main positive benefits on food security and access to food; income; increased livelihood options, social and organisational innovation, etc.
- What are other social and ecological benefits that are relevant from the perspective of multifunctionality (e.g. landscape, biodiversity, natural resource management, leisure opportunities, health improvement, community building, social cohesion, etc.)? What are possibilities to further enhance these positive benefits?

- Are there negative outcomes/impacts caused by particular case (i.e. social, economic and ecological)?
- Cost/benefit analysis.
- Main factors that facilitated/hampered further expansion/up-scaling of this multifunctional urban agriculture initiative? (i.e. socio-cultural, technical, economic, financial, political/legal and institutional). What are the main constraints encountered by stakeholders involved?

Conclusions:

- Sustainability/viability of this multifunctional UPA initiative (financial, ecological, social, institutional).
- What are important prerequisites for further out-scaling/up-scaling of this type of initiative? What support/enabling environment is needed?
- Any changes needed in approach?

2.2. Multifunctional productive use of food plains in Antananarivo, Madagascar

Case description

The research project ADURAA¹ (2003-2007) was launched during the 2002 crisis in Madagascar, when contested electoral results plunged the country into months of political chaos. At that time, urban food production proved to be a valuable food source for the capital city, which was being isolated from other food supply for at least six months (Aubry et al. 2008, 33). The project brought together a team of researchers from INRA (France), CIRAD (France), Antananarivo University, the High School for Agronomical Sciences and the Center for Agronomical Research Applied to Development (FOFIFA) and partnered with local municipalities (Antananarivo and neighbouring towns), working closely with the Urban Planning Agency (BDA). The aim was to look at the sustainability of urban and peri-urban agriculture (UPA) in and around the Malagasy capital, putting the emphasis on the multiple functions that local agriculture fulfils for the city, such as food supply, valorising urban waste and wastewater, flood management. amongst others etc. In Antananarivo, situated in a mountainous area, human settlements occupied traditionally the hills, leaving the plains and lowlands to agriculture. Today, urban agriculture accounts for 43% of the city's total area of 425 km² (Aubry et al 2008, 24). The project identified several typologies of farms and farming systems and concentrated on rice, tomato, and watercress production, as three important elements of the Malagasy diet.

Rice is the main staple food in Madagascar. Rice production in and around Antananarivo is the third source of supply to the city and its share of the total urban consumption varies from 15 to 25% depending on the year (Aubry et al 2010), of which a fair share of is aimed at self-consumption (this concerns about 14% of the population). Rice in Antananarivo is grown mainly in peri-urban areas, more specifically in the northern plain and in the more industrial southern plain. Farmers also cultivate rice in the intra-urban low-lands, mainly for self-consumption.

In the northern plain, farmers alternate several kinds of productions throughout the year. On the same field, rice is grown from July/August (mid dry season) to December/January (mid rainy season); fishing and duck rearing takes place after rice harvest (end

¹ Analyse de la Durabilité de l'Agriculture dans l'Aglomération d'Antananarivo

of rainy season); and bricks production starts as soon as the fields are drained (beginning of dry season).

The rice fields have an important function as regulator of floods and storm water: rice is harvested before the hurricane season so that the empty fields serve as a retention basin. In the absence of functioning sanitation infrastructure, urban liquid waste flows to agriculture areas on lower land, benefiting crops with water and nutrients (rice is generally grown without use of chemical fertilisers), though also potentially negatively affecting yields, depending on pollution levels. Urban agriculture in the northern plain also contributes to landscape conservation: the rice fields became an important element of local identity and agro-tourism, rooting in the historic decision to settle the capital city there back in the 17th century. Given its high landscape value, the northern plain was turned into a protected agricultural area, where construction (through embankments) is prohibited. Furthermore, local authorities planned the creation of a “living museum” with walking paths winding through the paddy fields for visitors to discover the local fauna and flora.

Although it features similar topographic elements, urban agriculture in the southern plain is much less acknowledged and viable. In the southern plain, rice fields must compete with industries for land and labour. Industrial activities cause severe pollution of the runoff water that eventually ends up on the rice fields, damaging the crops and adding to the bad quality reputation of southern plain produce. Whereas farmers in the northern plain all work in farm or agriculture-related activities (selling, processing etc.), southern plain farmers are all employed in the industry sector, with rice cultivation as a complementary source of food and income by selling produce to factory workers.

As for vegetables, tomatoes are grown in peri-urban areas, on foothills of the paddy fields during rain seasons, but also increasingly in the intra-urban valleys all year round, on former rice fields, as farmers are diversifying their production and tomato is a quite profitable crop when grown within or close to the city. Antananarivo tomato production accounts for up to 90% of urban supply. It is quickly perishable and thus needs to be marketed soon after harvesting, the proximity of the city thus being a substantial asset. Tomato production in peri-urban or more remote areas is less cost-effective because the costs for transport are higher, as is the potential of product losses. A particularity in Antananarivo is that the distribution of vegetables from peri-

urban production generally involves as a lot of intermediaries (collectors, wholesalers ...) making peri-urban products more expensive than rural or intra-urban products, thus either less competitive on the market or less profitable for the producer.

In the intra-urban valleys, watercress has become a very profitable option. Urban watercress production covers almost entirely the urban consumption (yearly production is estimated to 20 – 40,000 tons in Antananarivo alone!). Watercress grows on land where building and infrastructure are not possible due to flooding risks. It also grows on former rice fields, where after a certain threshold of pollutants concentrated in the wastewater irrigating the fields, rice stopped producing grains and leading urban farmers to switch to leafy vegetables. The issues of quality and safety of leafy vegetables grown in urban areas were examined in the framework of the follow-up project QUALISANN (2008-2011). Even if the use of wastewater to irrigate and wash the produce raised health concerns, as did the high quantity of chemicals used for pest control, the findings showed that the level of pollution in the vegetables is rather low after being rinsed with clean water and cooked (Aubry et al 2010 b). Findings also showed that watercress production generates more pollution to soil and water resources than former rice production as a result of the use of chemical insecticides.

As far as UPA in Antananarivo is concerned, not only do the production systems differ, not only in their production characteristics and crops grown; but also in their (multiple) functions as indicated above. Depending on the proximity of the city, diversity is also found in the occupation of the producers themselves, who become more or less engaged in agricultural-related activities other than farming (direct selling, processing, borrowing material etc.) or unrelated activities living closer to the city. With the proximity of the city, off-farm activities become more important and farming specialises in short-cycle vegetables production, requiring little time and input such as watercress (Falinirina 2010). Frequent off-farm activities for urban & peri-urban farmers are:

- Direct selling of farm produce, livestock or bricks
- Employees (small businesses, services), factory workers
- Domestic workers
- Construction workers
- Local crafts (Aubry et al 2012).

For the farmers, brick-making represents an opportunity to earn additional income during the dry season, but also to change the use of land on a longer term. Making

bricks out of the clay soil layer damages the ground, and thus jeopardises the flood retaining capacity of the rice fields. After 4-5 years of continuous brick making on the same plot, the land becomes unsuitable for both agriculture and water absorption and will eventually be prepared for future building (Aubry et al 2012, 434).

The above-mentioned examples of production systems provide –to a varying extent– different **multiple functions** fulfilled by UPA in Antananarivo. These can be clustered in 5 groups:

- 1- *Food supply* – a main function when considering the high percentage of urban consumption covered by urban and peri-urban production
- 2- *Regulating function/flood management* – UPA has proved to play a substantial role in terms of flood mitigation during rainy seasons. Agricultural buffer zones, both in the intra-urban valleys as in the peri-urban plains, are a very inexpensive solution to flood risks. In urban lowlands, farmers have built themselves a system of dykes to retain the water.
- 3- *Economic function* – UPA is contributing to income generation and job creation for the farmers in Antananarivo
- 4- *Land use* – Coupled with its flood and storm water retention capacity, agriculture is a very suitable use for municipal land reserve deemed non constructible due to flood risk
- 5- *Reuse of urban waste* – untreated urban wastewater flows onto agricultural land (urban/peri-urban), and is valorised by agricultural activities, provided the level of (industrial) pollution is sufficiently low. Other forms of urban waste such as composting of organic matters found on landfills have gained attention as it provides a cheaper source of input, as compared to more costly manure traditionally used.

For these reasons, the Urban Development Master Plan Horizon 2015 (PUDi, 2004) underlines the need for more structured and sustainable urban planning to conserve the city's cultural and natural habitat and improve living conditions in the city. It calls for protection of the agricultural and green zones, of both intra-urban agriculture as well as peri-urban agricultural zones (page 43, 45, 57, 74 and 99), because they play an important role in water management and protect the city from floods and heavy rain-fall and because they offer an important income source for lower-income families. The plan also calls for improved access to public water and sanitation points throughout the city as well as improved waste(water) management, including establishment of composting

units in each of the towns making of the Antananarivo agglomeration. Composting should reduce waste volumes, enhance the life of the landfill and serve as inputs to agriculture. In 2004, the Mayor of Antananarivo suspended construction licences in the northern rice plain, a decision that remains in force until today. The 2006 “Green Plan” (Plan Vert) was developed in order to operationalise parts of the urban development plan. It calls for the creation of a protected agricultural area of 2000 ha in the northern plain to maintain its role as a buffer zone protecting the city against catastrophic floods. Agriculture in the southern plain is however “sacrificed” to urbanisation. It also proposes the rehabilitation of the urban Marais Masay lake and surrounding areas, where fish are captured every day and intra-urban market gardening occupies the zones bordering the lake; and it outlines a proposal for the establishment of a natural/cultural “museum” to attract tourism, preserve the traditional rice-duck-fish systems and preserve plant variety (Plan Vert, 2006).

Economic, social and ecological performance

The dual concept of sustainability used by the ADURAA project gives interesting insights into environmental, economic and social benefits or downsides of the production systems. It considers, on the one hand, the **farm** or **internal sustainability**, which refers to the economic viability, social acceptability, and environmental performance of the farming system itself. On the other hand, the **territorial** or **external sustainability** informs on how a given farming system integrates within a city and its urban projects (roads, zoning, master plans etc.) and how it contributes to the sustainable development of the territory.

More concretely, the level of sustainability of the northern plain rice system was assessed as high, both internally and externally, and so was that of the intra-urban valleys watercress, due to its high productivity and environmental role as buffer zones. On the contrary, the southern plain rice system was deemed not sustainable, raising concerns about the future of farming and farmers in this area.

Considering the sustainability of UPA in Antananarivo as a whole, the following statements can be made:

+ *UPA is a profitable activity* - It supplies a great share of urban vegetable consumption and local rice production helps balance the market. However, further

research is needed to assess how peri-urban distribution chains could be shortened, in order to generate more profit for the farmers.

- + *Providing Food Security* – Most of urban and peri-urban rice production is mostly consumed by the farmer's extended family and neighbours (about 14% of the population).
- + *Valorising urban waste* – UPA reuses the nutrients contained in urban organic waste and wastewater, which is a great asset considering the poor sanitation infrastructure in Antananarivo.
- + *Multifunctional aspects of UPA* are gaining more and more recognition among local authorities and urban planners, especially with respect to the landscape function and recreational activities in the northern plain, and most importantly, to the flood management aspects provided by UPA.
- + *Contributing to urban resilience* – Beyond mitigating the flood risk, UPA proved capable of ensuring food security at times of political crisis.
- While it brings some considerable economic benefits to the farmers, the *environmental performance of brickmaking is disastrous* (jeopardizing both the flood retaining capacity and productivity of rice fields) and should be regulated more strictly (not least to avoid the eventual building on non-constructible areas, which have greater value and functions as agricultural land).
- *Pollution* through the use of chemical pesticides (watercress production) or through industrial activities causes great damages to soil and water, hampering the sustainability of agricultural practices.

As for socio-economic benefits, data on the situation of the farmers and their families are clearly lacking, such as farmer's income (depending on what activities), level of education of household members, distribution of roles and responsibilities. Data on support structures and interventions (training, extension, access to land) are also lacking. It might also be necessary to have a closer look on the situation of the southern plain farmers almost all employed in the industrial sector. Should industrial water pollution make food production totally unfeasible, how would this influence their food security?

In terms of constraints, the project highlighted the threat posed by urbanisation in spite of the excellent market opportunities for UPA products resulting from high urban demand. This shows the necessity/urgency of involving decision-takers and further

including UPA in local policies. For instance how can brick-making be regulated and how can urbanisation of the southern plain be done in such a way that it still maintains areas for food production and flood control?

Lessons learned

1. Off-farm activities increase together with proximity of the city – a chance (income diversification) and a challenge (less prone to engage in farming)
2. Location of production areas is important in terms of economic sustainability
3. To be fully sustainable, UPA needs to be both internally (farming system level) and externally (territory level) sustainable
4. Flood protection through UPA is inexpensive and has many other advantages in terms of sustainable urban planning
5. Even if it doesn't "feed the city" completely, UPA does contribute substantially to the resilience of the Magalasy capital in times of political/economic/environmental crisis and distorted food supply
6. Some products such as watercress can be called "product of urbanisation" (see Aubry et al 2012, 435) as its intra-urban production results from its capacity to be more resistant to water pollution than rice.
7. Agriculture can be an integrative part of a city's identity – as showed by the northern plain paddy fields - and valorised through landscape/recreational projects

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2.3. Participatory design of productive green space and social integration, Rosario, Argentina

Case description

In Rosario, the third largest metropolis in Argentina, urban agriculture has been supported since the early nineties through government policies that were introduced under the PAU (Programa de Agricultura Urbana/ Urban Agriculture Programme). This municipal Programme for Urban Agriculture was set up with the support of the local NGO CEPAR (Centro de Estudios de Producciones Agroecológicas (Centre for the Study of Agroecological Production)). More recently, urban agriculture activities largely increased as a result of the economic crisis in 2000 and government support to combat poverty and at the same time create more jobs.

This first phase (2002 – 2005) of the programme had the characteristics of emergency response, whereby the objectives were to create social networks amongst those similarly affected by the crisis, to increase income on short term and to provide healthy foods. Unemployed people could sign up with the municipality, work in the gardens for at least 4 hours per day and earn 150 pesos (US\$50) per month. The programme started with around 10.000 farmers / gardeners.

The second phase (2005 – 2008) was one of consolidation. A large number of people left the programme, as they found a job in the sectors that were again growing after the crisis (such as the construction business). Others that stayed consolidated their activities, which, in certain cases, they had first seen as a side activity when they had nothing better to do, but now became full time jobs providing for their families. The programme was left with around 200 active gardeners. Up to 2008 it was funded by the government and several donors.

From 2008 onwards, the focus was one of strengthening the activities. Commercialisation and sales channels were the key words. The programme grew from a focus on food cultivation for self-sufficiency to a focus on creating viable commercial channels for gardeners to make an adequate living. Nowadays there are 120 to 150 active gardeners, selling their produce directly to consumers in weekly market fairs; through a food box system and to processing industries.

Since its inception, the PAU has successfully undertaken activities aimed at consolidation of urban agriculture as a legitimate urban land use and strategy for social and local economic development through:

- Organisation and implementation of urban agriculture projects related to production, processing (agro-industries) and marketing
- Participatory mapping and design of vacant urban spaces that may be used for urban agriculture, with an emphasis on areas not suited for construction (e.g. flood plains, land under power lines)
- Optimising use of vacant land areas for agro-ecological farming
- Facilitating and formalising access to land for UA of both occupied and potentially useable plots
- Integration of urban agriculture in municipal spatial and land use planning
- Promotion of multi-functional urban and peri-urban agriculture that has recreational, educative and landscape management functions in addition to its productive function
- Donation of basic equipment and inputs to starting community garden groups (fencing, low cost irrigation facilities, tools, seed, and compost)
- Improvement of individual capacities and organisational strengthening of community groups by providing training and technical assistance
- Establishment of direct producer-consumer linkages through which better-off citizens can buy products from the community garden groups based on their social solidarity and/or an interest in healthy ecologically grown products
- Development and dissemination of appropriate technologies that make optimal use of available local resources, with support from research institutes and universities.

The main actors involved in the programme are:

- *Gardeners*; Overall these gardeners are relatively old, with a clear lack of young adults active in the sector and the majority are women. On 30th of August 2011 there were 160 gardeners active in the programme.
- *Municipality (local government)*; The municipality is involved through the PAU programme which falls under one of its Secretariats. It provides funding for the

programme and has a large role to play in the promotion of the activity nationally. Luckily Rosario maintained a social party in power for the duration of the programme, that strongly promotes these types of activities and gives it stability.

- *Promoters*; The municipality has employed 30 to 40 promoters. Most of them were gardeners in the past, and have been trained to support and build the capacity of the current gardeners.
- *Donors / NGOs*; PAU is a joint effort by the local government – bringing in money, logistic support, and infrastructure and NGOs such as CEPAR and Ñanderoga (two local NGOs). Technical support has been provided by the Schools of Engineering and Architecture at the University of Rosario. Financial support has been granted by international organizations such as UN Habitat, the Spanish NGO ASPA and the Italian NGO ICEI.

In recent years an important focus of attention has been on the development and consolidation of different marketing channels for the products. These commercial channels consist of the following:

- **Farmers markets (or fairs)**: in 2003, PAU created seven weekly markets in different parts of Rosario. The programme provides all the market infrastructure and coordinates its transportation from one location to the other if necessary. Gardeners are able to sell their products directly to the consumers. Most of the time, a younger member of the family is sent to the market while the adults work in the garden.
- **Delivery bags of vegetables (bolsones)**: These are brought directly to the consumers on a weekly or monthly basis depending on what the consumer has requested. The 'bolsones' programme is operated largely by the gardeners themselves. Profits from the 'bolsones' programme are shared entirely among the participating gardeners. Approximately 50 bags are delivered weekly, though this number fluctuates based on the weather and the season.
- **Agro industries**: as mentioned above two industries were developed, one for pre-packaged vegetables and the other for cosmetics. At first the gardeners were responsible for both the cultivation and the processing of vegetables but due to lack of time and skills, now the PAU has employs a group of women to work in the agro industry and pays them a salary. Pre-packaged vegetables are

sold at the community markets, the agro industry itself, two small shops, and directly to offices. An average of 40 to 50 food packages are sold each week, earning a profit of about 500 pesos. It is estimated that around 100 packages per person should be sold daily for the employees to receive a decent wage. The gardeners do not share in any of the profit from the pre-packaging unit.

- **Direct sales from the garden or in neighbouring communities:** this is not a commercial channel supported by the programme but has been developed by the gardeners themselves. Literature mentions that a substantial amount of their income comes from the channel, however hard data is not available. Such sales may also benefit the lower-income population that lives close to the gardens.
- **Commercial channels with supermarkets are being established from 2012 onwards** with local supermarkets selling organic garden vegetables and cosmetics.

The programme mainly focuses on middle and high income households interested in eating healthy organic food.

Besides support for capacity building on farming techniques and on the development of commercialisation channels, the PAU programme from its start has had a strong focus on developing and valorising the multiple functions of urban agriculture. First, the programme from its start has had a strong focus on social inclusion and creating income and employment opportunities for poorer population categories that were most severely hit by the economic crisis. Also after the Argentinian economy gradually recuperated the PAU programme has continued to preserve a strong focus on building a social economy in Rosario.

Secondly, the PAU programme has developed a successful approach in making often unused public spaces accessible for use for productive purposes in combination with a wide range of other social and ecological functions. This approach has turned the “agroecological production spaces” that were developed as part of the PAU programme into public spaces in the area that not only serve for production purposes but are also spaces of social encounter, leisure and that contribute to various ecological functions. Terrile (2009) indicates how the PAU programme intends to combine different functions in the sphere of economic objectives (economic viability, equity, sustainable margins,

circulation of local resources) with social functions (local and endogenous development, autonomy, food self-sufficiency) and objectives in the sphere of environment and ecology (biodiversity, stability, ecosystem services). Additionally spaces that are recuperated for urban agriculture are conceived as multifunctional spaces that simultaneously may have the function of didactical, productive, demonstration, and/or recreation space while also serving as spaces for family encounters, social dialogue, for social integration and promotion of associated entrepreneurial activity, and for improving and recuperating natural habitats.

An important role in the development of this approach to the participatory development and design of multifunctional space for urban agriculture was played by the *action-oriented research project "Making the Edible Landscape"* from 2004-2006 coordinated by McGill University in Canada, the Urban Management Programme and the RUAF Foundation. The project 'Making the Edible Landscape' was an international project aimed at exploring possibilities to make productive urban growing an integral part of housing and neighbourhood design and for stimulating the role of urban agriculture as catalyst for neighbourhood upgrading and in managing public lands. It was implemented simultaneously in collaboration with three city partners in Rosario, Argentina; Colombo, Sri Lanka and Kampala, Uganda and financially supported by IDRC and the UN-HABITAT's Urban Management Programme.

In the specific context of Rosario the main goal of "Making the Edible Landscape" was to build collective strategies to facilitate the transition of traditional state-funded housing projects to "productive neighbourhoods" that integrate urban agriculture in urban design, upgrading and development, thus providing households with food-production and income-generating opportunities next to housing and basic services. For this aim an inter-institutional action research programme was set up with relevant public institutions such as amongst others the Service for Public Housing of the Municipality (SPV in Spanish), which is in charge of programs for neighbourhood upgrading and new residential construction. Collaboration between the SPV, the PAU and the National University of Rosario led to important synergies with the university providing knowledge and experience in research and design, the PAU contributing its vast experience in agricultural and participatory work, and the SPV contributing human and financial resources and knowledge related to upgrading and development.

The areas selected for this project were the Molino Blanco and La Lagunita settlements. Situated at the southern fringe of the city limit, Molino Blanco is a neighbourhood of 798 families (3,500 people), of whom almost 30% were to be relocated to a new settlement as their houses were built on flooding areas or over planned roads. The settlement would then be regularised, giving not only titles to residents, but also providing them with the basic municipal services such as potable water, sewage, drainage, gas, electricity, paved roads, and footpaths. The majority of the population aged 14 and over did not have a steady job, only 19.8% of those older than 24 have completed primary school and only 3% have finished high school.

La Lagunita (Lagoon in Spanish) is located in the west of Rosario. It owes its name to the fact that the area becomes flooded after heavy rain, mostly during the rainy season. The area was first occupied over twenty years ago by families coming from the Chaco province, who basically settled on private land. Over the years the original families brought their relatives from the provinces resulting in a very close-knit community. After 2001, a second wave of settlers (about 50 families) occupied state-owned land inside the settlement.

The Making the Edible Landscape project focused on the participatory design and implementation of the following types of spaces:

- *Garden parks*

The garden parks integrate different activities and users, minimising construction and maintenance costs and providing ecological services important to urban systems. The most innovative feature for the city is the incorporation of a productive dimension into the park design, which is based on previous urban agriculture experience. Urban landscape design blends with productive use while securing urban farmers user rights to the land. Educative and leisure activities were also planned and integrated into the design (such as a soccer field; a picnic area and green space for public encounters).



Figure 2.1. Vision of productive garden park “Molino Blanco”

- *Productive squares*

These are neighbourhood squares designed for recreational, productive and possibly commercial activities. Their structure and functioning responded to the community needs for playgrounds, social meeting places, urban greening and production.

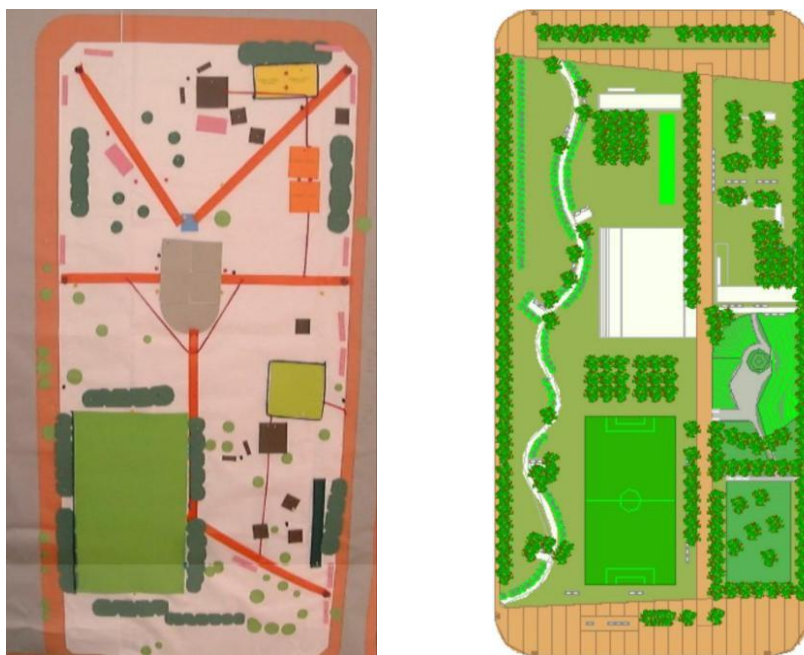


Figure 2.2. Neighbourhood design and final design for productive square “Lagunita”

- *Productive streets*

These streets will allow for farming on available roadsides. The design also considers spaces for food selling and bartering and growing of food trees and aromatic herbs. This will enhance the streets' potential as a space for social interaction, without

obstructing the normal traffic and pedestrian flow.



Figure 2.3. Vision of a productive street

- *Demonstration gardens*

Training is a key element for urban agriculture. A demonstration garden set up inside the neighbourhood will give visibility to urban agriculture and provide free access to a space specially designed for people to learn how to grow food. This aimed to improve use of other productive spaces in the neighbourhood, as mentioned above, and make the project more sustainable.

Economic, social and ecological performance

Some of the results of the Urban Agriculture programme in Rosario can be summarised as follows:

- 85 community gardens have been established with a total productive area of 20 ha, creating employment and income for more than 200 producers.
- Five demonstration and training sites (one in each municipal district) have been set up.
- Five farmers' markets have been established at strategic public places in the city, with weekly sales of locally produced products.
- A network has been established of committed consumers who weekly receive a box with a variety of ecologically grown vegetables produced by the community garden groups.
- Two processing units have been established: one for the processing of

aromatic plants to produce natural cosmetic products and another to package vegetables.

- Five multi-functional community gardens, with areas between 2 and 4 ha, have been established in a civic park (“Parque Huerta /Garden Parks”). The community gardeners, in return for being allocated part of the park to grow food, play a role in the maintenance of the park, thereby lowering related costs for the Municipality.
- A network of urban horticultural producers has been established.

In economic and social terms the main beneficiaries of the PAU have been the gardeners in the following ways:

- Improved social position: the majority of urban farmers come from the lower social classes in Rosario. Many live in the slum areas and lived on social welfare subsidies. Now they are able to provide for themselves, receive an education and interact with policy makers and high-class customers their self-esteem and social position has improved.
- Improved land ownership: the majority of farmers farmed on land that was not officially assigned to them. In certain cases large landowners rented out the land and as soon as investments were made by the gardens (land improvements), the landowner would take back the land. Through a land survey the PAU was able to identify large amounts of land suitable for long term cultivation. With support from the municipality it was able to negotiate user-right contracts of about ten years. This gives farmers much more stability and encourages greater investment.
- Income and job creation: there is increase in the demand for products over time during the programme’s implementation period. Growth of sales on both the farmers markets, in the garden itself (generating 33% of income on sales) as well as in number of delivery bags: fifty registered clients in 2008 compared to 650 in 2011. This resulted in some gardeners making high profits (up to 500-600 Euro/month) and now having a full time job in gardening. Gardeners have also started other than gardening enterprises such as nurseries; sale of ornamental plants and compost that diversity their income sources. A group of youth has started recently started a business in selling ready-made planting boxes to middle and high-class income families for placing on their roofs or balconies.

In terms of ecological benefits, the following benefits can be identified:

- The programme provided solutions for illegal land occupation and urban farmers working the land were able to clear the abandoned pieces of land and the urban parks allocated of weed and debris. Waste areas, where drug-trafficking and crimes were often sighted, were turned into clean well-managed and aesthetically pleasing landscapes. In addition this motivated the community to clean up other neighbourhood spaces and thus had a positive effect on overall health and hygiene conditions.
- The programme has had a positive effect on the spreading and development of ecological production methods. It collects green waste from markets and green spaces (grass cuttings, tree clipping, leaves) for composting, thus contributing to reducing waste.
- The garden parks are located in poorer neighbourhoods of Rosario where people generally lack access to green spaces. As the gardens are publically accessible, they enhanced access to such green spaces for the general population that often does not have the economic possibilities to visit Rosario's green and recreation zones located in the better -off neighbourhoods and city centre. Such green zones also have a positive impact on the micro-climate and reducing urban temperatures in these areas.
- Several of the garden-parks are located in flood zones. By enhancing rainfall infiltration and reducing the risk of illegal housing/construction (that suffered from regular flood damages), flood risks are reduced.
- Results of the participatory design processes included increased social acceptance and responsibility of the designed areas. The community is responsible for the installation and maintenance of the gardens and other uses. This helped strengthening the relations of the community with their own surroundings and providing it their own identity. On its turn it stimulates inhabitants to feel proud of their own environment.

More specifically the mapping and identification of vacant lands and the "Making the Edible Landscape" approach for participatory design of urban agriculture spaces have been a key factor in the development of the PAU programme. Together they enabled

the development of a green infrastructure of agro-ecological productive spaces in the municipality which in 2011 included:

- 67 hectares restored and preserved as multifunctional land.
- 45 hectares protected as new green areas
- 22 hectares in production.
- 400 family vegetable gardens.

Key to these results were a number of specific municipal actions that have been developed over time, including:

- The creation of municipal bylaws and regulations that facilitate land management and development of different initiatives connected with urban and peri-urban agriculture.
- Setting up a municipal land bank for the development of urban agriculture initiatives.
- Incorporating urban and peri-urban agriculture in the Metropolitan Strategic Plan through the Rosario Green Belt Project.

While the process of establishing agro-ecological production spaces through a participatory process therefore has been generally successful, also a number of problems and complications occurred from which important lessons can be learned. First of all, the experience showed that the participatory design process required an intense dynamic of training and community workshops, as part of which landscape architects and designers had to learn to trust and work with the community and pay attention to community dynamics in order to ensure equal participation of various groups. This also meant that although a general methodology was followed in both settlements, the process had to be adapted to the specific characteristics of each situation.

In La Lagunita for example, where community members had no prior experience to urban agriculture, much more time had to be spent on explaining the concept and visiting existing urban agriculture areas than in Molino Blanco Sur. Also, in Molino Blanco a community gardening organisation already existed that allowed them to define common problems and seek solutions that bring improvements to all and to better organise themselves for participation in the design workshops. In La Lagunita no such community organisation or platform existed and still had to be constructed.

Potential conflict situations on desired uses did occur, and new values of open and green areas had to be promoted.

It is also proved important throughout the process to come to early and clear agreements on the financing, implementation and management of the areas. Responsibilities of the municipality, the private sector and the community were clarified and agreed upon. This also included for example the follow up needed in form of training for urban agriculturalists, specifically on the use of organic production technologies (thus minimising health and environmental risks).

Conclusion

The experience of the PAU programme demonstrates the potential of urban and peri-urban agriculture to transform social and economic realities through local municipal policies of which spatial and physical design and planning make an important part. The application of a multi-stakeholder process that brings together the expertise and resources of various organisations and institutions is crucial for the success of the programme.

Neighbourhood upgrading and housing development schemes are common measures taken by city councils and provide a good vehicle to incorporate urban agriculture into design and planning. New visions on sustainable urban development and urban greening should promote the planning and preservation of open spaces for natural habitats, active recreation and multifunctional agriculture. Cities like Rosario illustrate the benefits of integrating food production in design and management of urban open spaces to improve food security and reduce malnutrition in cities, reduce poverty by enabling income generation and improve the urban environment by making cities more habitable, while also providing for cultural, educational and leisure activities.

The two participatory design experiences in La Lagunita and Molina Blanco Sur have served as examples and “laboratories” for the city of Rosario and other cities in the region. On 20 hectares of public land bordering the ring-way around Rosario additional garden-parks have been installed afterwards. Involving the Rosario architects and applying a similar participatory design process, a productive square has also been designed in Villa Maria del Triunfo-Lima, Peru, integrating productive and recreational functions, but also a small wastewater plant for treatment and irrigation. Another

garden-park has been planned in Belo Horizonte-Brazil, inspired by the Rosario experience.

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2.4. Eco-Solidarity Gardens: an agroecological producers' network linking urban and rural spheres, Dar Bouazza, Casablanca, Morocco

Case description

Within the framework of the action-research project Urban Agriculture Casablanca (UAC) the Technical University of Berlin (TU) established a partnership with the association Terre & Humanisme Maroc² (THM) back in 2008. Inspired by the French movement Terre & Humanisme - revolving around the environmentalist Pierre Rahbi, THM is an association advocating for agro-ecology in Morocco. Located about 15 km from Casablanca, Dar Bouazza is a small seaside resort, in which hinterland industry and agriculture compete for land and resources.

An Educational Farm has been set up on a 0.7 ha land plot about 3 km from Dar Bouazza, situated between two semi-rural villages where farming is still an important source of income for the population. The initial objectives of the farm were twofold: on the one hand, to train local farmers in agro-ecological production, and on the other hand, to sensitise the urban consumers as well as local peri-urban population to the multidimensional benefits of a healthy nutrition. Since 2008, the activities at the Educational Farm have targeted and reached a variety of audiences: children, women and farmers from the neighbouring villages, urban families, schools, universities and administrations have participated in information sessions, open days and other events, trainings and workshops on organic farming, healthy food production and consumption.

Half a dozen of local farmers trained in agro-ecological production methods at the Educational Farm joined forces and formed an organic producers' network. Under the name *Jardins Eco-Solidaires de Dar Bouazza* (JESDB - Dar Bouazza Eco-Solidary Gardens), they set up a box scheme with the financial and organisational support of THM. Following the French AMAP principle (Association for the Preservation of Peasant Farming), it is based on the weekly delivery of food baskets to a collection point in Casablanca. In 2010, after a full year of operation, the producers became independent financially. This success brought more local peasants to seek training at

² Terre & Humanisme Maroc (THM): association of about 100 members across Morocco, provides organizational support to the PPAC, agroecological training, advising, communicate about the JESDB, handles subscriptions and monitors orders and deliveries. Its main objective is to spread across the country agroecological concepts and techniques by training trainers.

the farm and a second batch of newly trained organic farmers joined the JESDB network, now producing on over a little more than 6.5 ha with 14 gardens.

The consumers are middle- to upper-class urban households from Casablanca, who are very sensible to the solidarity and environmental aspect of the project and are seeking healthy and quality food for their children. There are currently about 60 subscribing families, and other 10-20 on the waiting list. The scheme offers full-, half- and quarter-size baskets costing respectively 200, 120 and 70 Dirhams (approx. 18, 10 and 6 EUR) (as of Sept. 2012). The full basket contains 12 to 17 kg of fresh vegetables, herbs and fruits, and its composition varies according to seasonal availability. Eggs and poultry are available on demand and to be paid extra. The Dar Bouazza producers benefit from almost no competition, since the offer of organic vegetables is very limited in Morocco and the demand is growing.

By signing the Eco-Solidary charter that seals the subscription, both producers and *consum'actors* – as they are called in the agreement – commit to more than just producing and buying food. They engage in an initiative that directly links farmers to their urban customers, providing more opportunities to meet, learn, taste, and earn additional income than a box scheme *stricto sensu* would imply. Box scheme clients enjoy regular farm visits on the weekends, some of them even helping out on “packing” day or designing communication tools such as flyers and blogs. Events take place regularly at the Educational Farm, which has become a multifunctional platform for the dissemination of healthy food and agro-ecology, by bringing together stakeholders from both the rural and the urban sphere and mixing modern with traditional approaches, recipes and technologies. The Eco-Solidary Gardeners have become ambassadors of the project and its approach and appear regularly on national television and in the press. Some of them now participate in the various agro-ecological trainings as trainers themselves.

Despite the social and economic benefits, the lack of flexibility of the basket scheme is perceived as a restricting factor for the JESDB producers, who have thus been looking for alternative distribution channels in Casablanca. They started selling their seasonal surplus production to a couple of organic shops in Casablanca (Domaines Agricoles), and for some time the food baskets were available on one of the first e-shopping sites *greenstore.ma*: the 10 subscriptions were sold out within 3 days. In addition, produce is

regularly sold at the Educational Farm during open days and other events at agricultural and food fairs across the country. Furthermore a special label for agro-ecological food produced around Casablanca is currently under study, aiming at marketing more broadly and especially reaching professionals (restaurants, school canteens etc.). Named “Bessaha” which literally means “with health” and is generally used for wishing a good appetite, the label is meant to advocate for a safer and healthier nutrition. As organic certification is too costly and not accessible to small farmers, a Participatory Guarantee Systems (PGS) is now being discussed with other urban and peri-urban producers in Morocco.

The educational farm and the Eco-Solidary gardens address healthy food at all stage of the food system: from the organic production of food items to its marketing, as shown previously, but also through conservation projects for local and traditional seeds, food processing trainings, and cooking workshops for the village’s women, who are now taking care of the catering at every events at the Educational Farm.

Economic, social and ecological performance

The benefits of the Eco-Solidary Gardens model seem to result mainly from two important features: on one hand, the agro-ecological production, and on the other hand, from the multifunctional aspect of the activities, which beyond the productive function promote the social, economic, environmental, spatial, recreational functions of urban agriculture:

- *Clear economic benefits for the farmer and their families:* The project has brought about a rapid increase in the farmers’ income. Given the immediate success of the baskets, the producers initially supported financially by PPAC have become independent after one year only. The demand is high and so is the added value of organic produce. Farmers’ families enjoy better nutrition, some of them having described health improvement.
- *Agro-ecology and the Ripple effect:* agro-ecological agriculture being very profitable due to the efficiency of agro-ecology and the under-supplied urban market for organic vegetables, other farmers have been quickly convinced and joined the ranks of the Eco-solidary Gardens
- *Social/Societal Revaluating of farming activities:* Farmers received training, improved their skills, gained social acknowledgement as they are now amongst the well-to-do

in the village. They are considered the pioneers of a new type of farming in Morocco, appear in the media, speak on conferences and make school visits. This recognition has greatly improved their self-confidence. It has also become a distinctive feature of the villages, now known as “organic villages”.

- Consum’actors have access to healthy, organic food and can enjoy the educational and recreational offer of the Eco-Solidary gardens
- *High environmental performance*: agro-ecological farming systems are proven to be resource-efficient (drip irrigation, mulching, composting) and land-efficient (multi-cropping, high yields on little land). Furthermore, it helps sequester Co₂, promotes/protects eco-systems and biodiversity, and produce little Green House Gas Emissions (according to the project’s own Life Cycle Analysis-study)
- *Viable farming valorises agricultural land*: it favours open-space conservation and hinders land speculation
- *Educational/Recreational aspects*: the Eco-Solidary gardens are not solely agricultural spaces but also places where visitors are shown the different production techniques and vegetable varieties, where kids can see where their food comes from.

In terms of constraints, the most important hampering factors to the basket systems are internal and primarily based on relational conflicts: personal grievance, competition and tensions hinder the coordination of the network and cause fatigue amongst the farmers, some of them wishing to withdraw and start selling on their own. It also leads to the current incapability to open up the Eco-Solidary Gardens to new farmers and further develop the network, although the demand has been steadily growing on the consumer side. Other constraints specific to these kinds of vegetable box systems and the JEDSB in particular are:

- Production costs including manpower are relatively high, thus produce is affordable only by middle to upper class customers.
- Lack of flexibility for the producers (have to comply with a group production plan)
- Lack of flexibility for the customers (cannot suspend the subscription when on vacation...)
- The distribution/transport/delivery are a heavy load on the farmers’ shoulders who would rather have THM take care of it.

- Missing sense of security for the farmers: some newly trained organic farmers are reluctant to engage because of the lack of outlets. Indeed, the lack of market infrastructure for organic food makes it difficult to meet the consumers' demand.

The major external threat comes from the real estate market: given high speculation, access to land becomes more and more difficult, if not impossible for small farmers. Like in other big cities, it has become more profitable to sell one's land than to cultivate it. The land around the PPAC is highly coveted for other non-farming activities (industry, tourism, infrastructure, social housing).

Conclusion

The JESDB-model so far has proven to be financially viable. Unfortunately, it has currently reached its limits with regards to increasing production or covering growing demand.

Environmentally, Eco-Solidary Gardens seem to be one of the most sustainable systems for food provision as agro-ecological production is based on resource- and land efficient technologies/methods and almost no packaging (plastic or renewables) is being used. The main impact it has on environment and climate is through transportation of the food baskets to the collection point, as well as the consumers' rides from their homes to the collection point and back.

The initial intention of the pilot project within which the Eco-Solidary Garden fall was to test the ability of short food chains to:

- "Feed the city" (= to meet the needs of the urban population)
- Be a valuable livelihood strategy (=generate enough revenue to support the household) for urban/peri-urban population.

Concerning the first question, further research is needed to test the up-scalability of the model. In the current situation, the food baskets are available only to a handful of privileged middle-class families, due to the relatively high price of the subscription. What about the poorer segments of the population? Is farming on one's balcony, rooftop or private garden the only way to have access to healthy/organic food for such poorer families? Would there be a basket system that could be affordable to economically and socially disadvantaged people? What would it take to lower production cost?

In terms of livelihoods, agro-ecological farming has proven to be an excellent source of income, at least as far as the Eco-Solidary Gardens are concerned. The farmers have seen their revenues increase very rapidly and are now among the better-offs of the village.

If one considers the viability of the Eco-Solidary Gardens as an urban agriculture model, one cannot but highlight, again, the significance of the multifunctional aspects and of engaging in various markets and activities.

Lessons Learned:

- *Growing organic food* is an excellent livelihood option for Casablanca's peri-urban farmers
- *Multifunctionality* – in terms of multifunctional use of space and multiple role of the farmers - both are a prerequisite for the gardens' success as well as an enrichment for the farmers and their communities.
- Activities target local community as much as urban families: both (re)discover healthy food habits and regional gastronomy as well as environmentally-friendly food production and lifestyles
- Consum'actors: enjoy not only fresh food but also farm visits
- Farmers enjoy increase of revenue and self-esteem, valorised as ambassadors of agro-ecology (schools, media...)
- The experience suggests that diversification of market outlets (vegetable boxes, organic shops, farmers markets etc) is an important strategy to make initiatives more viable and generate different income sources. In this respect, also diversification of activities, combining food production and sales with offering visits and training services constitutes an important strategy for enhancing economic profitability.

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2.5. Agricultural Tourism Plan of Minhang in Minhang district, Shanghai, China

Case description

The Agricultural Tourism Plan of Minhang district in Shanghai has been elaborated by the Agriculture Committee of Minhang District. The main aim of the plan lies in effectively enhancing the overall development of agri-tourism in Minhang district. Agri-tourism in Minhang District is an important activity in suburbs of Shanghai.

Minhang District is located in the southwest of Shanghai. The region has abundant agri-tourism resources and has a long history in the set up and operation of agri-tourism enterprises. Although the agri-tourism development of Minhang District has reached a certain scale, its development has been rather disorganised and erratic. This situation is not considered conducive to the sustainable development of agri-tourism in this area. Therefore, the analysis and documentation of the development model and of experiences of agri-tourism and clear definition of future development directions played an important role in the further development of agri-tourism both in Minhang District and Shanghai. The resulting Agricultural Tourism Plan of Minhang District in Shanghai is a comprehensive tourism development project for agro-tourism in Minhang District that is led by the government, researched and compiled by scientific research institutions, and in which corporations, farmers and other stakeholders have participated.

Urban agriculture is assigned an important role in the development of multifunctional land uses in Minhang, especially from the perspective that urban agriculture has an important potential to develop its multiple functions, improve its environmental roles and re-integrate agriculture into rural and urban development. As part of the Minhang Master Plan on Urban Agriculture Development for 2010-2020, agro-recreational parks have been installed, which have as overall aim to facilitate urban agriculture development by more efficient organisation, improving infrastructure and facilities and supporting technology development, strongly focussing on ecological/high-quality production and recreational agriculture. The areas in the Minhang Master Plan on Urban Agriculture Development are designated either as agro-industrial or as recreational agriculture parks. In total there are 7 agro-parks, of which 3 are classified as recreational agriculture zones.

The initiative of Agricultural Tourism Plan of Minhang can be characterised as follows:

- *Key activities*

Under the coordination of the Agriculture Committee of Minhang District, experts and scholars obtained the required information through collecting data, investigating the actual development environment for agri-tourism, interviewing relevant stakeholders such as government officials, entrepreneurs, farmers, citizens and tourists, and finally put forward the future development plan for agri-tourism in Minhang District. The document builds on a systematic analysis of the development conditions for agri-tourism, its spatial organisation and distribution, the arrangement of touristic routes, the design of agri-tourism products, and recommendations and suggestions for policy measures.

- *Participants and their roles and relationships*

The participants of the planning process included government officials, experts and scholars, entrepreneurs, farmers, citizens and tourists. The government played a coordinating and leading role and is ultimately responsible for the implementation of the plan. Experts and scholars are responsible for collecting data, investigating actual development trends, interviewing government officials, entrepreneurs, farmers, citizens and tourists and finally for compiling the plan. Entrepreneurs, farmers, citizens and tourists are participants in as well as end-users of the plan, and their needs and demands are an important basis for the elaboration of the plan.

- *Market segments and consumers*

The project targets the citizens in Shanghai and its surrounding areas. Compared with other famous tourist attractions, the agri-tourism sector in Minhang District has little outstanding attractions to attract outside visitors. Therefore, especially tourists from the nearby urban areas will be targeted by the agri-tourism offer in Minhang District.

- *Revenue of government*

The main revenue sources for the governments involved in the project will be income tax and land use tax for businesses. However, in order to encourage and support the development of tourism enterprises, the government will reduce or exempt part of the demanded tax revenues for specific and temporary situations.

- *Cost structure*

The project is funded by the Agriculture Committee of Minhang District. The fund is mainly used for field research, personnel organisation, the acquisition and analysis of data, text editing, and involvement of scientific research institutions.

- *Institutional arrangements*

Effective institutional arrangements are an important success factor for the accomplishment of the plan. The structure of the institutional arrangements of the project is as follows: government officials are required to accompany experts and scholars to investigate the actual development environment. Entrepreneurs, farmers and other stakeholders meet regularly to talk with government officials and experts. Relevant organisations and individuals are invited to participate in evaluating the content of the plan and submit their constructive amendments to the draft resolutions. Finally the government is in charge of the implementation of the plan.

- *Marketing channels*

For the promotion of agricultural tourism of Minhang District, various types of agricultural festivals are held in order to attract more tourists. Government agencies also promote agri-tourism through official promotion channels. Tourism enterprises promote their tourism products through advertising.

Economic, social and ecological performance

In the case of Minhang district, urban agriculture plays an important role in recreational activities and increasing the quality of living in Shanghai. A popular Chinese activity is to visit parks and gardens. Every spring in Shanghai, hundreds of thousands of citizens visit agricultural areas for sightseeing purposes. In the case of Minhang, the multifunctional planning did not result (yet) in large changes in production methods, but some entrepreneurs are considering building agricultural holiday resorts in the suburbs of Shanghai. Apart from individual sightseeing, several festivals are organised like the Peach Flower and the Osmanthus Flower Festivals. The function of these festivals is to advertise the farm products, to promote trade and to provide leisure to urban citizens. There is also attention for direct marketing and quality production, and there are specific activities aimed at quality improvement and labelling schemes.

Additionally there are synergies with improvement of green infrastructure and associated leisure opportunities. Shanghai has limited green areas and covers only 40 parks. The total available green space per person is 1.15 m², which is far below the Chinese average of 4 m², not to mention the world average of 50 m². To address and improve this situation, among other things the structure of the agricultural land is being adjusted without affecting its nature. Urban agriculture together with open green space management is therefore included in the overall city development plan.

More specifically for the Agricultural Tourism Plan of Minhang district due to its relative short implementation period, its actual positive and negative benefits of the project cannot yet be clearly assessed. Therefore, the benefits mentioned below refer to the expected benefits as described in the plan.

- *Economic performance*

Through the development of tourism infrastructure, the number of tourists attracted by agri-tourism in Minhang District is expected to increase. By increasing the diversity of the agri-tourism industry and the design of new tourism products, direct income from tourism is likely to increase as will related consumption demand. The project will provide thereby additional employment for local farmers and increase farmers' income. Based on the overall agri-tourism development of Minhang District, the tax revenues for governments will accordingly also increase.

- *Social performance*

The agri-tourism development in suburban areas proposed by the plan will create more leisure opportunities for citizens in Shanghai. As such the needs and demands of citizens to enjoy nature and green space can be better provided for. Increasing numbers of citizens are participating in agri-tourism, which positively impacts the well-being and overall physical health of people. The communication between citizens and farmers will be promoted, which is beneficial for farmers in order to better link up to urban culture and urban-based networks, supports citizens in acquiring more knowledge of agriculture production and will open possibilities for direct marketing of quality products with a distinctive label and price.

- *Ecological performance*

Through the protection of the natural environment and the construction of new natural agricultural landscapes, the green infrastructure of Minhang District and the availability of green space per citizen will increase. This will contribute to improvement of biological diversity and the overall environmental quality will be enhanced. The plan will maintain agricultural natural landscapes and improve environmental qualities of the country by creating new agricultural landscape sites.

- *Possible negative benefits*

In the process of the implementation of the agricultural tourism planning, a negative phenomenon that may occur concerns the illegal occupation of land and the building of illegal constructions on these. As a consequence, the pressure on scarce cultivated lands in Shanghai would further increase.

Conclusion

The Agricultural Tourism Plan is a comprehensive agri-tourism development project in Minhang District that is led by the government, supported by knowledge and research institutions, and developed with the participation of corporations, farmers and other stakeholders. Compared to previous agricultural tourism plans in China, the particularity of this project lies in the fact that it pays more attention to the ideas and needs of the entrepreneurs, farmers, citizens and tourists retained through in-depth interviews and surveys. As a result of this the plan will comply better with public opinions and demands and the implementation and development of the plan is expected to be more effective.

In order to maintain the sustainability of the plan, comprehensive monitoring and evaluation will be regularly performed. When needed the original plan will be adjusted in accordance to the evaluation. An important prerequisite to guarantee the sustainability of the plan is the long-term support by the government in form of policies and corresponding financial support.

In the process of setting up the Agricultural Tourism Plan, the Agriculture Committee of Minhang District has played a leading role as government partner. The initiatives of stakeholders including entrepreneurs, farmers, citizens and tourists should not only have informed the original plan, but be continuously monitored to be able to adapt the

plan over time to their changing wishes, demands and activities. For this, a long-term communication structure needs still to be established.

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2.6. Xijingyu village tourism, Tianjin, Ji County, China

Case description

Ji county is the only mountainous areas of Tianjin, and because of this unique advantage, the area is attracting large numbers of tourists. In 2012, the number of agro-tourists in Ji county reached up to 1,536,000 generating an income of 190,000,000 yuan. This rural tourism involved 1260 households, 4,800 mu picking fruit fields, 50 fishing parks and 40,000 direct and indirect farmer jobs. Rural tourism has become an important strategy to coordinate urban-rural development, and an important way to solve rural problems of unemployment, poverty and urban migration.

Xijingyu is an ancient village located in the north end of Ji county of Tianjin, surrounded by mountains, with distinctive features. It is also known as "stone village" with stone built houses, stone walls and a stone road, and located in the Middle Upper Proterozoic geological Nature Reserve. Because of this, the village has become a well-known photography and filming base. The village gives home to over 100 households, more than half of them living in stone houses, the history of which can be related back to the Republic of China. Until this date, the building styles and layout of village are still well preserved. In 2010, Xijingyu was chosen as the **first Chinese historical and cultural village** in Tianjin.

- *Key products, activities and resources*

Agro- tourism products/opportunities offered include:

- **Farmhouses:** providing catering and accommodation. Tourists can stay with the farm households, where nutritious meals are provided at affordable prices (around 80 yuan/day). The meals are prepared using products from local farmers, and all raw materials are guaranteed green and organic.
- **Fruit picking:** The whole village has 2300 mu of fruit trees, apricot, peach and pear where tourists may go to pick fruits for themselves.
- **Folk show activities:** the village has kept the traditional language and customs, and folk festivals. Some villagers still retain shadow play, hand-weaving and other traditional arts, with distinctive local characteristics.
- **Traditional buildings as the Historical and cultural village.** The "Stone Alley", "stone wall", "stone mill", "stone house" are important features.

- *Actors involved*

- **Farmers/households** : The village has about 130 households (about 600 villagers), and 1/3 of them participate in the tourism activities, the others are engaged in agricultural production or other work.
- **Local government (The village committee)**: The local government plays a facilitating role in coordination and solving conflicts between the different interest groups.
- **Foreign investors** : with urban migration, some houses were left vacant and were rented to foreign investors.
- **Visitors**: Tourists generate revenue that can enhance local economic development and improving people's living standards. However the local community was also disrupted by the arrival of a large number of tourists, which affected the local residents' living habits.

- *Current situation of industry*

There are currently 40 households engaged in rural tourism, each running a family business. In each farmhouse there are generally two people full-time involved, even in busy times rarely hiring other staff. The peak tourism period is usually from May to October each year, and the off-season is from November to April.

Scale: on average there are 6-10 rooms in each farmhouse, the prices generally range between 50-100 yuan. The rooms are simple including toilet and solar water heaters. In winter, it is very cold, and because the room has no heating facilities, there are rarely visitors in winter.

The common practice for the farm households is advertising their facilities, offering either or both online or telephone reservation. The biggest advantages for tourists are the cheap price and unique landscapes of the village.

Households suffer from strong price competition, leading in turn to declining service quality for tourists and directly affecting the region's reputation. Online to some extent alleviates this phenomenon, but still does not fully solve the problem.

Economic, social and ecological performance

Rural tourism seems to score well in terms of economic, social and ecological performance. The benefits are as follows:

- Increased income: According to statistics, the village receives 50,000-60,000 tourists every year, and the net income of the household reaches up to 30,000 yuan.
- Farmhouses promote sales of local agro-products, reducing the cost of sales, and enhancing the value of the products.
- Rural tourism has also encouraged the farmers to invest and venture. The households mainly used existing facilities to carry out tourist activities and investments were relatively small. Some farmers have ornamented or rebuild their houses to accommodate the visitors.
- Agro-tourism provides a platform for urban and rural interaction with the farmers and citizens learning from each other.
- Increased employment opportunities for the rural surplus labour force. rural tourism is a highly labour-intensive service industry and requires a set of services and facilities, not only including guides, managers and waiters, but also accommodation, catering, shopping, transportation and cultural industries. Rural tourism development can effectively promote development of the rural areas.
- The infrastructure in the rural areas was improved, including roads, electricity, telecommunications, water, garbage and sewage treatment, television networks and other public infrastructure, narrowing the urban-rural wealth gap.

Unfortunately there are also some negative impacts:

- Forced departures: in order to boost tourism development, some owners of traditional houses were asked/forced to leave and their houses taken over by investors.
- Farmhouse tourism is the main activity in Xijingyu, but the connection with the agricultural industry is still not really developed (farm picking; food festivals), which results in waste of opportunities and resources.
- With the rapid development of rural tourism and influx of large numbers of tourists, amounts of garbage and sewage increased without sufficient treatment because of lack of sewage treatment facilities, causing environment pollution and increasing the pressure on the environment.
- Architectural features are being gradually lost. With the development of rural tourism, the building industry of Xijingyu has also gradually developed, with new buildings not following locally cultural and architectural standards. Xijingyu has hundreds of years of history, but these are not maintained in new building infrastructure.

- Leisure and recreational activities are relatively simple. Farmhouses mainly provide catering and accommodation, recreational activities are mainly concentrated on playing cards, city sightseeing, climbing and picking fruit. Farming culture and resources are not being fully explored to meet the multiple interests of tourists, which has reduced the attractiveness of the area compared to other areas.

Conclusion

1. It is confirmed that rural tourism offers an opportunity to promote economic development and farmer income growth. For this, the local governments need to draw up a series of measures in support of development of the industry, which includes improving the service quality of managers, increasing infrastructure investment, preventing product convergence, amongst others.
2. With rapid urban expansion and industrial development, a large number of villagers moved into cities, resulting in the collapse of agricultural production and rural lifestyle. Agro-tourism may ensure more sustainable development of rural areas and offer job opportunities for younger people otherwise leaving the village.
3. Farmhouse tourism revenue is obviously subject to seasonal differences. Therefore, measures should be adopted to improve heating conditions, farmers' organisation and training, off-season activities to encourage visitors in the off-season as well.
4. Preservation of traditional heritage and housing should be ensured, with new real estate building following strict regulations.

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2.7. Beijing International Urban Agricultural Science & Technology Park: Training and leisure combined with (peri-) urban agriculture in China

Case description

The Beijing International Urban Agricultural Science & Technology Park was founded in October, 2008 and started building in early 2009. The park is designed with over 13.3 hectares of demonstration area for cultivation of vegetables, flowers and fruits such as grape and cherry. It started with 31 tunnel greenhouses (400 m²); a double plastic film multi-span greenhouse (2000 m²), 4 high standard energy-saving solar greenhouses (480m²), 200 m² storage facilities and over 400 m² of buildings for office, training and living purposes.

The park has been nominated as “The urban producers’ field school of the International Urban Agriculture Fund of China” and the “Centre of Youth Employment of the Communist Youth League in Beijing”. In August 2011, another 13.3 ha greenhouses were built including 32 solar greenhouses and 186 tunnel greenhouses.

The core area of the park covers 73 ha including infrastructure, agricultural science & technology demonstration areas, protected fruit & vegetables cultivation, organic and citizen farms. Covering an area of 230 mu (15.3 ha.), the agriculture science & technology demonstration area is mainly used for demonstrating protected agriculture (110 mu or 7.3 ha.) and new fruit varieties and efficient culture techniques (120 mu or 8 ha.). Protected fruit & vegetables are grown in the north of the park with an area of 210 mu (14 ha.). New varieties, new techniques, new facilities and new equipment are demonstrated, amongst others in 32 standard solar greenhouses and 178 plastic film arching sheds.

A research and development area of 390 mu (26 ha.) in the northwest of the park, is mainly used for water science & technology, tissue culture pilot research, testing of new machinery and management of the park. The construction includes 90 mu (6 ha.) of management & operation service centres, 60 mu (4 ha.) of water science & technology, 120 mu (8 ha.) of a seedling tissue culture pilot testing centre and 120 mu (8 ha.) of vegetable machinery testing.

The organic farm includes 2688 m² glass multi-span greenhouse serving also as a field supermarket, 14 high standard solar greenhouse (80X8m), 20 arching sheds(50X8m) and one multi-span double plastic film greenhouse.

The citizen farm in the southwest area of 217 mu (14.5 ha.), serves as a new type of agriculture experience park for hands-on gardening experience, tourism and education.

- *Main Products*

Fine fresh agriculture products, seeds & seedlings, facility & equipment;
Advanced agricultural technologies, brands & concepts;
Agriculture tourism products, innovative agricultural products.

- *Functions*

Science & technology demonstration, testing & promotion, training & practice, conferences & exhibitions, seedling propagation, recreation & tourism, international cooperation.

- *Profit models*

Through setting up an integrated platform for “production , study and research ” and the promotion of transfer of agricultural science & technology, the park will promote agricultural technology innovation of Lucheng town while serving the development of urban modern agriculture, make contributions to the development of agricultural science and technology. The economic benefits will mainly come from technologies, services, patents and products..

The project profit generation plan includes the following aspects:

- Promotion of agricultural science and technology incubation
- Paid services from science and technology intermediaries;
- Income from scientific and technological achievements (intellectual property patents, etc.);
- Farmers’ (or personnel from agricultural enterprises) training;
- Income from demonstration sites and shows;
- Conferences and professional meetings, promotion of agricultural products;
- Revenue from internships of college students and graduates, summer camps;
- Sales of horticultural products and membership cards;
- Entry ticket income.

- *Cooperation partners*

Agricultural Institutions and universities such as the China Agricultural University, Beijing Forestry University, Beijing University of Agriculture, Beijing Vocational College of Agriculture, Chinese Academy of Agricultural Sciences, Chinese Academy of Agricultural Mechanization Sciences, Chinese Academy of Forestry Sciences, Beijing Academy of Agricultural and Forestry Sciences.

Enterprises including Shanghai Huawei Water-saving Irrigation Co., Ltd., Beijing Zhouji Resource Science & Technology Co., Ltd., Beijing Jingyi Renewable Energy Engineering Co., Ltd., etc.

- *Business model*

Park development and management is based on inter-institutional cooperation among many parties. Getting profit from delivering services to science & education institutions, governments, enterprises, the park plays a role as research and development platform, science & technology communication, science & technology demonstration & promotion, trading, incubation and investment & financing, etc.

The park introduces advanced production systems, techniques, equipment and concepts and tries to promote the domestication of foreign crop varieties. Bringing together programs of agricultural universities and research institutions, the park is a great platform for agricultural science & technology development. Agricultural sales companies also join in the management of the park for display and sales of techniques, equipment, services, patents and agricultural products.

Moreover, with the concept of “One hundred equipments, technologies, products, organisations, and forums”, the park is driving the development of agricultural science and technology resources:

- One hundred equipments: clusters showing advanced agricultural facilities and equipment from China and abroad;
- One hundred technologies: introduction of high-tech agricultural technologies from China and abroad and promotion of agricultural science and technology;
- One hundred products: introduction and optimisation of products;
- One hundred organisations: aggregation of agricultural colleges & universities and science & research centres, full usage of the advantages of science &

technology, information and talents in Beijing to build the agricultural science and technology engineering centre;

- One hundred forums: organisation of one hundred agricultural forums to attract domestic and foreign agricultural experts from various fields to carry out lectures and live demonstration trials and to spread modern agricultural scientific knowledge through online video, pictures or CD.

- *Management mechanism*

According to the operational concept of “Government promoting, Enterprise Leading, Universities Joining, Internationals collaborating, Market operating”, both government and enterprises are tasked with distinct management rights and liabilities.

Economic, Social and Ecological Performance

Relying on Beijing’s advantages relating to its central location, advanced science and technology, abundant talents and information, the park sets the aim of being an “Aggregating professionals & building platform”. By integrating and aggregating advanced resources for modern agriculture science and technology from China and abroad, it contributes to balanced urban and rural development, optimisation and upgrading of industrial structures, promotes farmers’ employment and increases their income. In addition, it will innovate the developing models for urban modern agriculture, and support expansion to the rest of China.

1. Enhanced level of science and technology to promote industrial upgrading

The advanced agricultural technologies and industrialised operational modes are beneficial to promoting local agricultural science and technology innovation, enhance the further optimisation and upgrading of local agriculture, and improve and upgrade the industrial structures in the agricultural region. It will also boost the development of the agricultural science and technology in the area.

2. Improve the integration of urban and rural areas

Confronted with the rapid development of modern international city in Tongzhou District, the park provides services including healthy food production and agricultural leisure, which enhance the interaction between urban and rural areas.

3. Promote farmers' employment and increase their income

The park showcases new production systems and techniques, which –when applied– will help promote farmers' employment and increase their income. In addition, the development of the park also directly drives the development of neighbouring industries, creates more job opportunities, and increases the average annual growth rate of per capita net income.

Conclusion

According to field investigation and a feasibility study of the park, the following conclusions can be drawn:

1. This project is aligned with industrial policies, and specifically the agricultural industry structure adjustment and development plan in China.
2. This project meets the needs of science and technology in developing a modern urban agricultural city of Beijing, while fully using the advantages of available local natural resources and central location.
3. The investments made are reasonable, economical and practical, with profound social and ecological benefits. It has a spin-off effect by increasing farmers' income by advanced agricultural science and technology.

Sources of information

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2.8. Multifunctional role of urban agriculture in a small urban community in Lagos, Nigeria

Case description

In the past fifty years of Nigerian National Agricultural Development Planning, urban agriculture has not been promoted as a feasible urban land use or activity. Its contribution to urban food security and employment has for long not been acknowledged because food production is often perceived as a rural-based activity.

However, with increasing population growth, as a result of natural increase and accelerated rural-urban migration, coupled to associated food insecurity, high cost of housing, traffic congestions and delays and high unemployment rates, informal land use allocation for urban agriculture has become a common feature since the 1980s, such that there are now conflicts over land use changes and multifunctional land uses in informal urban agricultural in Lagos. This case investigates the functional linkages in land use types in urban agricultural and the implication for urban food production.

The case study area is named Alapere farm, which is an agriculture enclave covering 66,45 hectares on the mainland of Lagos metropolis. It is one of the three cells within the Kosofe agricultural block, which is one of the ten agricultural blocks delineated by the Lagos State Agricultural Development Authority. Alapere farm encompasses a small farming community, where farmers share a common interest but cultivate and take decisions individually. This site was purposely selected because it constitutes one of the vibrant commercial vegetable production areas in Lagos metropolis and it is typical of other agricultural areas in the study area.

The land was formally owned by the state government but has been sold to private individuals and organisations. Various types of land use activities take place at the agricultural enclave of Alapere farm. Analysis with Arc view GIS to map the enclave was used to make a classification of the different types of landuse. Agricultural land use constitutes 43.56 hectares (65.56%) of the total area of the Alapere farm enclave. This is followed by housing which covers 8.07 hectares (12.23%), recreation on 4.47 hectares (6.72%), commercial activities occupying 3.07 hectares (4.62%), a refuse dump site 2.57 hectares (3.87%), and transportation on 2.57 hectares (3.87%). Religious activities (both Muslim and Christian) occupy 2.14 hectares (3.22%). The

most common crops include both exotic (lettuce, spring onion, parsley, Dandelion, radish and India spinach) and local (Water leaf, Amaranth spp, Ewedu C. Ofiferus, Bitter leaf, Fluted pumpkin, Tomatoes and Okra) vegetables.

A questionnaire survey, informal discussions and observation methods were used to collect socio-economic data as well as other information on land use systems in the enclave. The study revealed that large numbers of farmers are male and earn about US \$53.50 a month with little or no formal education. Women and children provide labour and marketing support to their husbands and fathers, and over half of the farmers belong to the Hausa-Fulani ethnic group, which migrated from the northern parts of Nigeria for dry season farming. There are farm owners who only coordinate farming activities, farm labourers and farmers who coordinate and who also perform cultivation activities.

Prior to the present developments, land use in Alapere was mainly for informal agriculture and landfill, but with the transfer of ownership to private individuals and organisations, land development for residential housing, religious activities, recreation and commercial activities has increased rapidly; and this has affected land use for food and food production related activities. For instance, the area of cultivated land within the Alapere farm enclave decreased from about 63 hectares in the 1970s to 43,6 hectares in 2004. Based on these changes, it can be concluded that multifunctional land use at least partly due to lack of proper urban planning, poor implementation and inefficient monitoring of the urban activities. In the ongoing process of urbanisation, agricultural land use in urban areas is confronted with pressure from other uses and often in a weak position to defend itself against more dynamic and economically more powerful interests.

Other drivers for a multifunctional land use system (steering away from agriculture) include the poor socioeconomic status of the farmers, the perceived low cost of informal agricultural land, traffic delays and congestion that are common in Lagos, as well as the constant attention needed for cultivating vegetables. For these reasons farmers choose to construct and live in wood and corrugated sheet buildings close to their crops or occupy uncompleted buildings that dot the farming landscape.

The findings also revealed that farmsteads act as centres where farmers socialise, entertain visitors and meet for discussions and deliberations on issues that enhance the social and economic development of the farming community.

The enclave also acts as a location where food vendors, sachet water vendors, seed and fertiliser hawkers, as well as buyers of farm products can meet and trade.

Additionally, Islamic religious groups among farmers have common prayer areas, where other Alapere community members also worship. The farm enclave also serves as a domestic landfill for residents and farmers within the community.

Economic, social and ecological performance

This multifunctional use of the land in the Alapere farming community has both positive and negative effects. In terms of positive functions that urban agriculture contributes apart from its contribution to food security and sustaining economic livelihoods in the area, the following can be mentioned:

- Agricultural use contributes to social cohesion in the region, which is especially important in an area characterised by cultural and religious differences. Living and farming in the same environment enhances sustainable socialisation and the community togetherness necessary for peaceful coexistence in a multi-ethnic society such as Lagos.
- Agriculture use furthermore contributes to a sense of safety in the area and common interests against certain external threats contribute to social community networks in the area. E.g there is a close attention and collaboration required to tend vegetable crops, reduce crop theft and also to react promptly to pest and insect infestations.
- Multifunctional land use within an urban farm environment saves time that would otherwise be wasted due to traffic congestion and delays that are common in Lagos, thereby increasing productivity, raising income, improving nutrition and health and alleviating poverty. This is particularly true now that the Lagos government has intensified its efforts to ensure food security and to increase the socio-economic statuses of the urban poor. Multifunctional land use allows poor urban households access to cheap and affordable land for accommodation, which makes living in the city affordable and possible for them (Oyeleye, 2001).
- The urban agricultural land use contributes to safeguarding the agricultural landscape and green spaces within the city region or at least counteracts and forms

a social buffer against the deterioration of urban space. Nevertheless, this also requires strong(er) support from clear urban planning regulations which give priority and defend urban agricultural land use.

There are also a number of negative aspects and problems in the area. Because Alapere farm lies within the unplanned areas, it (like other farming enclaves) lacks sanitation and sewage facilities and waste is dumped on farming sites. This combined with the use of pesticides and other chemicals, can present risks to those living in this environment (Birley et al 1999; Zeeuw, 2000). Women and children are particularly exposed to health and environmental threats as children play in the contaminated areas unprotected. The negative impact of the situation could undermine efforts by the urban poor to increase the food supply for the growing Lagos population. Thus official support, acknowledgment, proper planning and services, amongst other measures, are necessary to improve the agricultural system in the study area.

The waste issue does not only constitute a threat and health risk for urban agriculture land-use, but could also offer an opportunity for closing nutrient cycles at the local level and providing nutrient inputs for agriculture when done in a safe and well-managed way (Adedayo 2013). The activities of waste and nutrient recycling need to be monitored and regulated for urban agriculture. This could be done by adopting small scale, simple, easy to manage and maintain technologies at household, community and state levels. According to Redwood (2004) the benefit of using cured organic waste as animal waste is ratio five to one meaning that every dollar spent on treatment systems returns five dollar made from agricultural yields.

Developing treatment systems at the local and state levels would create more livelihood opportunities for the urban unemployed and under-employed and also improve urban local economic development through backward and forward linkages. This should be linked to land accessibility because waste treatment and composting is land driven. Making land available and accessible through less stringent measures would reduce the threat the present state exhibits.

Conclusion

Cities in most developing nations including Lagos are not just putting pressure on urban food demand and employment but also on redistribution of formal and informal

land use for housing, recreation, markets and for religious purposes. Consequently, urban land use systems for transportation, commercial, industrial, residential and agriculture are metamorphosing into a multifunctional land-use system with their uncountable social, economic and environmental implications.

The pressure on urban land demand coupled with limited supply for various uses in Lagos has resulted in unprecedented rise in the cost of land. This has facilitated the multi-functional use of limited land spaces for urban agriculture. The experience derived from Alapere farming community with 66.45 hectares of farm land shows that the limited land space for farming vigorously compete with other uses such as recreational, commercial, residential and religious activities. At the same time agricultural land-use in the area forms an important contribution to the social and ecological stability of the area and positively contributes to functions such as social cohesion, peaceful coexistence in a multi-ethnic society, management of green spaces and keeping the land clean.

The following recommendations for policy and research can be made for Alapere, Lagos:

- Policy attention should be geared towards preserving urban land used for cultivation as it has been shown that agricultural activities enhance the livelihood status of the urban poor.
- A plan for urban agricultural land use should be developed to boost sustainable urban agriculture in the cities.
- Urban agricultural activities should be integrated into government programmes aimed at reducing poverty, creating income and employment opportunities and improving local economic development.
- Public awareness campaigns should be initiated on the relevance of urban agriculture for urban food security, employment and income generating activities.
- Farmers should be educated on the health-related problems associated with farming activities to increase needed precautionary measures.
- In order to alleviate waste problems in the area and valorise opportunities to close nutrient cycles at local level the following policy interventions are relevant for examination (Adedayo 2013): a. Increase in community's knowledge and support for waste recycling; b. Public education aimed at more balanced and objective assessment of potential benefits of waste recycling in relation to urban agricultural

practices; c. Building the capacity of community members and understanding of nutrient recycling for urban agriculture; d. Training on treatment systems (safe transportation, sorting, grinding, storage, packaging, etc.). e. Setting up a special line of credit for urban farming entrepreneurs and preserving existing agricultural credit quota for them.

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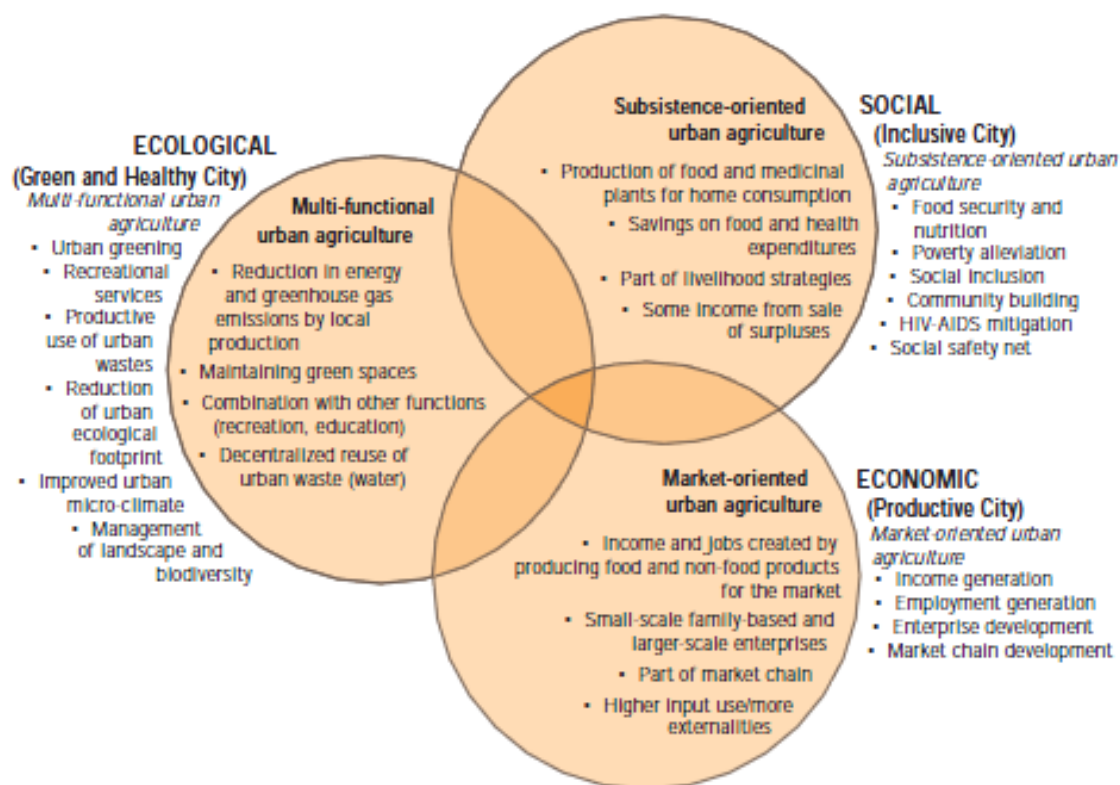
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3. Synthesis of lessons learned from the cases

1. The different cases analysed in the previous chapter clearly demonstrate that there is a **wide range of societal functions beyond food production and income generation associated with urban and peri-urban agriculture** in city regions in the global South. These functions can be classified into social functions, ecological functions and economic functions. The range of functions and examples of these is summarised in figure 2.1 below.

Figure 2.1 Different dimension of multifunctional (peri-) urban agriculture cases



(Source: Veenhuizen et al., 2006)

These three spheres or dimensions of multifunctionality can also be associated with particular ideal types of city-region food systems and the specific role of (peri-) urban agricultural production systems in these:

- a. The **social dimension**, when well developed, results in an 'inclusive' city region, in which social inclusion, poverty alleviation and community building are paramount;
- b. The **economic dimension**, contributes to the development of a 'productive' city-region, in which income and employment generation and enterprise development are key; and
- c. The **ecological dimension**, when well developed, is associated with the development of a 'healthy and green' city region in which landscape and biodiversity management, recreation, urban greening and/or waste management are important features.

The three city-regions - inclusive, productive and healthy and green - are to be understood as ideal types. In reality, city-regions will combine aspects of these dimensions, although they may differ in the emphasis put on a particular dimension.

2. The type of function combinations that are generally encountered in the context of urban and peri-urban agriculture in the global South to a certain degree appear to be different from those encountered in the global North. In the cases that were analysed for the Global South (possibly with the exception of China) first of all there appears to be a focus on **social functions** of poverty reduction, food security and the generation of secure livelihoods. This is different from the European context where the attention in debates on the multi-functionality of agriculture especially centres on public goods such as landscape values or biodiversity for their intrinsic value or as policy aim.

In the Global South functions in the sphere of **ecological functions** are also important, but are more frequently associated with other policy dimensions such as climate change mitigation and adaptation, water management, flood control or waste management. An exception in this respect is China, where in a context of exceptionally high population pressures urban and peri-urban agriculture serves as a means to create accessible green spaces which offer leisure opportunities for growing urban populations.

Also **educational and social integration functions** of (peri-)urban agriculture are frequently encountered in cases analysed as is for example demonstrated by the cases of Casablanca, Rosario and Beijing. On the other hand, there appears to be

less attention for issues related **to food quality and gastronomy**. An exception is again China and some other countries in Southeast Asia (e.g. Vietnam) where food safety and access to healthy and safe food appears to be an important driver for the development of urban and peri-urban agriculture and localised urban food distribution systems.

3. While in the context of Europe, debates on the **economic aspects of multifunctional agriculture** are mainly centred on the issue of public goods and the need to correct market failures by means of institutional arrangements that enhance market transparency or by generating income flows from public funds for the remuneration of such positive externalities, in the Global South examples of multifunctional urban and peri-urban agriculture appear to represent a wider range of economic expressions. This is perhaps a consequence of the fact that public compensations for the provisioning of public goods in the context of these countries is a much less common phenomenon.

Examples of such economic models that are encountered in the Global South include the following:

- The supply of services which can be valorised on private markets (for example cases of agri-tourism in China).
- Multifunctional urban agriculture as a means to co-finance and/or recover costs for the generation of not yet existing public services (for example creation of green infrastructures in China and Rosario, also examples of waste recycling and recovery).
- Multifunctional urban agriculture to avoid certain costs related to flood incidences and waste disposal.
- Multifunctional urban agriculture as a source for creating social innovation and new economic networks which indirectly can be valorised by selling food products on new markets and/or for higher prices due to a perceived distinctive product quality (for example cases of Rosario and Casablanca).

In strict, quantitative financial terms the available information on economic benefits generated by multifunctional forms of (peri-) urban agriculture is very limited. In most cases it is clear that economic benefits do not consist of additional economic revenues, but rather are to be understood in terms of cost savings, access to resources (e.g. land or favourable policy arrangements) or improvements in market

networks or price levels. The question remains what are the best modalities to finance these contributions and functions (such as the buffer and flood retention function of the rice plains in Madagascar or the potential for organic waste recycling in urban and peri-urban agriculture and related reduction of costs for sanitation). Government may have to play an important role in this regard.

4. The **role of policy in relation to multifunctional (peri-)urban agriculture** from the analysed cases appears to be ambivalent; it can both be a driver of multi-functionality in a positive and a negative sense. The case of Lagos (Nigeria) is a good example of how a lack of appropriate policies in the context of strong pressures of urbanisation and urban sprawl may indirectly serve as a driver of multifunctional land-use when competing claims on urban space are insufficiently counteracted.

On the other hand, there are also various examples that make clear the policy can be an important driver of multifunctional (peri-)urban agriculture by providing incentives and stimulating policy measures for the development of (certain types of) multi-functionality. Clear examples of such positive policy frameworks for the development of multifunctional urban and peri-urban agriculture are the PAU programme in Rosario, Argentina, and the Agricultural Tourism Plan of Minhang district in Shanghai, China.

These positive and stimulating policy frameworks have in common that they explicitly recognise and address the multifunctional role of urban and peri-urban agriculture and take specific measures for regulating and stimulating these. Recurrent areas of policy support and regulation include: spatial planning, access to land, training and extension, facilitation of credit and funding arrangements, and specification of quality criteria for products and services.

5. With respect to **institutional arrangements and governance mechanisms** that are most appropriate for stimulating multifunctional (peri-)urban agriculture, the empirical material suggests that especially cases in which there is a balanced mix of involvement of public administration, civil society and market parties these appear to be relatively successful in developing and valorising multiple functions of UPA. Examples of such cases are the PAU programme in Rosario and the Agricultural

Tourism Plan of Minhang district, but also the Xijingyu village tourism case in Tianjin. What is striking is that in the first two cases research and training institutions play an important role in the partnerships that are underlying the initiatives.

In other cases the governance mechanisms which have been developed appear to be less balanced and this is clearly a factor that helps to explain the fragility or limited range of some of the studied initiatives. The case of Eco-solidarity gardens in Dar Bouazza, Casablanca especially appears to be driven by the civil society organisation Terre & Humanisme Maroc (THM) and there are only few linkages with local public administrations and market parties which can partly explain the still limited reach of the initiative. In the cases of Lagos, Nigeria and Antananarivo, Madagascar, there is a less clear involvement of local public administration and this also appears to be an important limitation and recommendation for improvement.

Perhaps the most developed case in terms of balanced institutional arrangements and governance mechanisms is the PAU programme in Rosario, Argentina, although one could argue that in this case the role of local government institutions is perhaps in some respects too dominant. In spite of this limitation, the Rosario case demonstrates how the putting in place of a clear and well-developed stimulating policy framework combined with the active involvement of research and local communities and producer organisations can result in a strong and positive impetus for the development of multifunctional (peri-) urban agriculture at city-region level.

Annex 1 Inventory of cases of multifunctional urban and peri-urban agriculture in the Global South

Location	Type of Multi-functionality	Short characterisation
Agro-recreational parks (agro-tourism, recreational use, education)		
1. Minhang, Shanghai, China	Agro-recreational parks	Aim of the project is to develop the multiple functions of agriculture to improve its environmental roles, enhance the quality of the products and re-integrate agriculture into rural and urban development. The agro-recreational parks have been installed as part of the Minhang Master Plan on Urban Agriculture (UA) Development 2010-2020, which has as overall aim to facilitate UA development by more efficient organisation, improving infrastructure and facilities and supporting technology development and has a strong focus on ecological / high-quality products, and recreational agriculture. The areas that are part of this plan are designated as agro-industrial and recreational agriculture zones. In total there are 7 agro-parks, of which 3 are classified as recreational agriculture zone.
2. Beijing, China	Agro-tourism and City Region Development	Agro-tourism in Beijing emerged in the late 1980s and has been booming in recent years. By 2002, there were 2,246 agro-tourism sites in Beijing that attracted 36.2 million tourists and grossed an annual income of nearly 2.3 billion Yuan (equivalent to about US\$285 million), which represents 12.1 times the number of tourists and 7.1 times the amount of income reported in 1996. There are currently 285 large-scale agro-tourism parks in Beijing, including fruit-picking plantations, forest parks, meadow or pasture parks, fishery

		<p>parks, recreation farms, eco-agriculture holiday resorts, renting plantations, education farms, and modern agriculture demonstration gardens. Agro-tourism models in Beijing can be divided into four types based on the sites' leading activities, i.e. 1: sightseeing, 2. leisure and vacation, 3. participation and experience, and 4. exhibition and demonstration. Agro-tourism is an official part of planning at municipal and district level. A “Beijing agro-tourism development plan” was elaborated and administrative management regulations were stipulated.</p>
3. Nanjing, China	Promoting recreational and organic urban agriculture	<p>To meet urban residents’ new demands for recreational services, healthy food and an attractive peri-urban landscape, Nanjing municipal government launched two programmes in 2002: ‘Greening Nanjing’ and ‘Developing Multifunctional Agriculture’. The first programme aims to ‘green’ the city by stimulating forestation activities in farmlands, around lakes and rivers and along major roads in the coming eight years (over 56,000 ha were planted in the period 2003-2007). The second programme is actively promoting the development of multi-functional agriculture in peri-urban Nanjing with emphasis on recreational agriculture and production and marketing of healthy, organic food products. Organic food production and marketing are stimulated, among other ways, by providing technical advice and other support related to production, certification, branding and marketing e.g. through specific outlets in the urban centre. A series of agro-product festivals and exhibitions have also been organised, such as the plum festival, grape festival, watermelon festival, crab festival and even forest festival.</p>
4. Chengdu, China	farm/based leisure agro-	<p>Urban agriculture in Chengdu is known for its diversity in high-quality products because</p>

	<p>tourism</p>	<p>of its favourable climate for agriculture. Chengdu is one of the pioneering cities in China in the development of agro- tourism. Agro-tourism is locally known as Nongjiale; where tourists from urban areas in Chengdu go to a farmers’ house and stay over the weekend, eating country food and enjoy the nature. Nongjiale provides opportunities for urban tourists to enjoy nature, but it has also significantly increased local rural households’ annual income, thereby improving the overall quality of Chengdu’s rural environment. Some farmers combine this with selling flowers. Nongjiale accommodates some 15 million tourists every year and created more than 290,000 jobs.</p> <p>'Five Golden Flowers' are the highlight of the municipal efforts to promote urban-rural comprehensive development and the integration of urban and rural areas. Several major scenic spots have been developed including Farmer's Residence in the Sea of Flowers, Happy Meilin, Chrysanthemum Garden by the Eastern Fence, Lotus Pool under Moonlight and Plot Garden of Jiang Family, of which the development of agri-tourist locations has been an integral part.</p>
<p>UPA and climate change adaptation and water management in cities</p>		
<p>5. Amman, Jordan</p>	<p>Urban and peri-urban agriculture as components of a climate change programme</p>	<p>In the city of Amman urban agriculture and forestry is included as one of the five central components of the Amman CDM Strategy to meet Kyoto climate change aims. The strategy identifies vacant open spaces suitable for urban agriculture and creates a land bank to facilitate cont(r)acts between land owners and potential users. It also encourages value adding and sustainable agriculture methods such as organic farming and promotes water-harvesting harvesting techniques and more efficient water use in (peri-)urban</p>

		<p>agriculture. Additionally it promotes the use of (productive) green roofs as well as of urban and peri-urban forestation with productive trees.</p>
<p>6. Rosario, Argentina</p>	<p>Productive multifunctional spaces for urban agriculture</p>	<p>The municipal urban agriculture programme in Rosario (PAU) is one of the most developed local policy frameworks for the facilitation of urban and peri-urban agriculture as integrated part of wider city region development. The PAU programme from the start has been conceived as a multifunctional policy, with first of all a central focus on social integration and poverty alleviation in the time when Argentina was struck by a profound economic crisis. Also after economic recuperation, the PAU programme preserved an explicit orientation on the development of a social economy and further developed the concept of urban agriculture as a multifunctional activity. This also includes the use of spaces for urban agriculture as multifunctional spaces which one the one hand have a productive function but at the same time provide didactical, demonstration, and recreation functions and serve as spaces for family encounters, social dialogue, social integration and for improving and recuperating habitats.</p>
<p>7. Antananarivo, Madagascar</p>	<p>Productive use of flood plains and green space management</p>	<p>Antananarivo is an example in which different types of food production are closely integrated with the local landscape and where urban and peri-urban agriculture provides a range of social and ecological functions. This became especially apparent during the 2002 crisis in Madagascar, when contested electoral results plunged the country into months of political chaos. At that time, urban food production proved to be a valuable source of food supply for the capital city, which was being isolated from other sources food supply for at least six months. Apart from this function as a buffer and source of food</p>

		<p>security urban and peri-urban agriculture in Antananarivo is integrated with various ecological functions such as water management, flood control and waste management. This is especially the case of agricultural production systems such as rice and water cress cultivation which take place in the flood plains surrounding the city.</p>
8. Freetown, Sierra Leone	Urban and peri-urban agriculture as part of climate smart land use zoning	<p>In Freetown, Sierra Leone the Ministry of Land Country Planning and Environment, Ministry of Agriculture, Forestry and Food Security, Freetown City Council and Western Area Rural District Council signed an agreement to map and protect valley bottoms and wetlands and allocate low lying lands for (peri-)urban agriculture and forestry. The aim of such land use allocation is to prevent construction in flood plains, enhance storm water infiltration, reduce flooding and to enhance urban food security and create alternative income opportunities.</p>
9. Kesbewa, Sri Lanka	Climate change adaptation and flood control	<p>Located at 20 km from Colombo, Kesbewa Urban Council (KUC) with 152,700 inhabitants is rapidly being developed and urbanised. Next to that, projected increase in average rainfall as well as heavy rainfall events resulted in increased flooding risk. Rapid conversion of agricultural and paddy lands in low-lying areas into residential and commercial lands have significantly altered the natural water flow and drainage in the area. This has resulted in recurrent flooding affecting tourism facilities, surrounding roads and residential areas. Local authorities are developing various urban and peri-urban agriculture models to counter these trends. A first model is integrated rice-vegetable production in flood zones and wetlands to create a buffer zone reducing the effects of floods and enhancing storm water storage and infiltration. This is achieved through</p>

		rehabilitation of paddy fields with 50 farming households cultivating vegetables on raised expanded bunds mixed with saline-resistant paddy. The second model includes support to 150 home-garden units, designed in such a way that they make most efficient use of space and can serve as models for a future denser city. Their location will also allow for future integration and connection of the home-garden zones to other green and agricultural spaces in the city, creating a green city mosaic.
Biodiversity and landscape management		
10. Casablanca, Morocco	Multifunctional landscapes, tourism	The Urban Agriculture in Casablanca (UAC) project is a German-Moroccan research project funded by the German Federal Ministry of Education and Research (BMBF) which investigates the role of urban and peri-urban agriculture in the development of megacities. The project aims to analyse and examine to what extent urban agriculture can make a relevant contribution to climate-optimised and sustainable urban development as an integrative factor in urban growth centres. Urban agriculture is understood as every form of formal or informal agricultural production within a city, whereby in the context of urban growth centres “city” equates to the urban region. The approach of the project gives due attention to the multifunctional role of urban agriculture and has studied different functions that go beyond strict food production including multifunctional landscape, healthy food production, peri-urban tourism and industrial biogas production.
11. Jerusalem, Israel	Biodiversity management	As part of its urban biodiversity management strategy, the City of Jerusalem has developed a plan for the comprehensive management of local urban nature sites, in

		<p>cooperation with the Society for the Protection of Nature, and other local stakeholders. The City of Jerusalem has recently designated an urban nature park to be preserved as a local model of sustainable development which serves to strengthen the surrounding urban development. The City of Jerusalem has also declared the Gazelle Valley Park development programme its legacy project and will lead efforts to protect and restore the site's unique biodiversity. The city of Jerusalem has also advanced the detailed planning for designating a valley nature reserve. The city aims to establish sustainable planning guidelines for the valley in order to begin the restoration process of the city's distinctive urban ecosystem and assure the protection of its ancient biodiversity assets. Traditional forms of agriculture have played an important role in the creation and preservation of biodiversity in the City of Jerusalem and the biodiversity management plan foresees, in cooperation with agriculture producers, in sustainable forms of agriculture and agro-ecotourism as a means to encourage sustainable development. Also the plan foresees in the promotion of green roofs and community gardens as tools for biodiversity awareness and communication.</p>
<p>12. Cape Town, South Africa</p>	<p>Green infrastructure, biodiversity conservation</p>	<p>The City of Cape Town encompasses unique wildlife and is a biodiversity hotspot without parallel. The city is located within the Cape Floral Kingdom, the smallest of only six floral kingdoms in the world. The Cape Floristic Region has a high proportion of unique and endangered species, and as a result is considered a global biodiversity hotspot. Currently there is an intensifying biodiversity conservation crisis in the Cape Town. The city coincides with an extremely high concentration of unique biodiversity, making it almost</p>

		<p>impossible to completely avoid negative impacts of urban development. High immigration rates to Cape Town, particularly during the past two decades, and inappropriate development in the form of urban sprawl, constitute the greatest threats to remaining biodiversity in the city.</p> <p>Urbanisation causes fragmentation of natural habitats, exposing flora and fauna to greater impacts of invasive alien species, pollution and other disturbances. Pressure from developers adds to the threat of biodiversity loss in the remaining natural areas. In turn, these impacts lead to declines in populations and increased extinction risks.</p> <p>The City of Cape Town's Biodiversity Management Branch is working to fight the pressures of urbanisation by ensuring that an understanding and appreciation of biodiversity and nature is mainstreamed into everyday life, which includes delivering tangible benefits to all communities. More specifically, the branch is responsible for conservation planning, biodiversity management and alien species eradication. In this context urban agriculture is explored as a tool for biodiversity conservation in a number of possible ways. On the one hand, certain forms of urban agriculture may contribute to strengthening green infrastructure and provide ecological habitats. On the other hand, in a context of strong poverty and lack of awareness on biodiversity urban agriculture may provide a means to build bridges for communication about conservation issues in low-income communities.</p>
<p>Social inclusion and green care</p>		
<p>13. Hanoi, Vietnam</p>	<p>Social and labour market</p>	<p>In and around Hanoi, a relatively higher proportion of city land is used for agriculture</p>

	<p>integration of immigrant labour</p>	<p>compared to other cities in Asia, such as Manila (Ali and Porciuncula, 2001). The key to this success, apart from Hanoi's impressive natural resources and productive labour force, is a strong network of public institutions that support agriculture. Urban and peri-urban agriculture in Hanoi is estimated to provide about 44% of Hanoi's food requirements and provides an important share of urban employment. It contributes to a range of social and ecological functions, including the preservation of scenic and landscape values, agricultural biodiversity protection and the preserving the cultural heritage of traditional villages around city temples. However, urban agriculture in Hanoi is particularly important for the role it has in providing employment to migrant agricultural labourers, especially when they cannot find other jobs in their early stage of migration.</p>
<p>14. Monrovia, Liberia</p>	<p>Social integration, conflict resolution</p>	<p>The urban population in Liberia is growing quickly as the economy slowly recovers from the disastrous effects of the 15 years of war. The capital, Monrovia, is host to an estimated 45 percent of the more than one hundred thousand rebel fighters who were demobilised in Liberia and a huge population of war-affected people including internally displaced people, repatriates and rural families who migrated to Monrovia in order to escape poverty. Many of these migrants were farmers before coming to Monrovia, but lack the basic skills necessary to secure employment in other sectors. The education gap experienced by most Liberian youths has also created a significant dearth of skilled workers in most sectors. Young adults are not attracted to the low income generated in agriculture, which cannot compete with unskilled labour wages offered, for example, in mining. Their marginal status and lack of prospects also undermine social cohesion,</p>

		<p>stability and economic growth, especially in already fragile situations as experienced in Liberia. In this setting urban agriculture and related business services (processing, marketing, veterinary services), which is estimated to be practiced by ca. 5000 households in greater Monrovia provides an important strategy to help reduce urban poverty, improve food security and enhance social integration and cohesion amongst urban populations.</p>
<p>15. Lagos, Nigeria</p>	<p>Social cohesion, peaceful coexistence in a multi-ethnic society</p>	<p>In the past fifty years of Nigerian National Agricultural Development Planning, urban agriculture has not been promoted as a feasible urban land use or activity. Its contribution to urban food security and employment for long has not been acknowledged because food production is often perceived as a rural-based activity. However, with increasing population growth, as a result of natural increase and accelerated rural-urban migration coupled with it associated food insecurity, high cost of housing, traffic congestions and delays and high unemployment rate, informal land use allocation for urban agriculture has become a common feature since the 1980s, such that there are now conflicting land use changes and multifunctional land uses in informal urban agricultural land in Lagos. The case study area, named Alapere farm, which is an agriculture enclave covering 66,45 hectares on the mainland portion of Lagos metropolis, shows that the limited land space for farming vigorously competes with other uses such as recreational, commercial, residential and religious activities. At the same time agricultural land use in the area forms an important contribution to the social and ecological stability of the area and positively contributes to functions such as social cohesion, peaceful coexistence in a</p>

		multi-ethnic society, management of green spaces and keeping the land clean.
16. Community gardens, Africa	Social integration of HIV /Aids patients	<p>Over the last decade, urban agriculture has played a steadily increasing role in improving the quality of life for people affected by HIV/Aids. There is a range of examples of successful projects in countries such as South-Africa, Botswana, DR Congo, Kenya, Mozambique, Namibia, Swaziland, Uganda, Zambia and Zimbabwe. An important rationale for stimulating household or community food gardens in urban areas and schools is to provide an alternative source of food for people who engage in high-risk sexual behaviour in order to obtain food or a small amount of money with which to purchase food. This approach based on income generation and micro-farming equally applies to homeless children, particularly street children and orphans who may face higher social vulnerability due to extreme poverty and harsher urban living conditions. Such children can be mobilised to join community-based urban gardening groups, A second rationale for stimulating household or community food gardens is to help improve the quality of life for people already living with HIV/Aids. Many of the potential benefits of urban agriculture become even more paramount for people suffering from suppressed immune systems or requiring nutritious diets to accompany what can be aggressive anti-retroviral drug therapies. The direct benefits of engaging in urban agriculture are plentiful and can be physiological, nutritional, psychological or economic.</p>