



Sustainable urban and periurban food provision

Work package 3 / Deliverable 3.5

Synthesis report: Innovative experiences with (peri-) urban agriculture and urban food provisioning – Lessons to be learned from the global South

Henk Renting and Marielle Dubbeling [RUAF Foundation]

November 2013

## Contents

<b>1. Background and introduction .....</b>	<b>4</b>
<b>2. General lessons to be drawn from experiences in the global South .....</b>	<b>9</b>
2.1. Recognition of the role of UPA and urban food provisioning in sustainable and resilient urban development.....	9
2.2. UPA as a means for poverty alleviation and realizing food security.....	10
2.3. Social, economic and ecological functions of UPA beyond food production .	13
2.4. Synergies as key mechanism for developing UPA and urban food provisioning systems .....	14
2.5. (Re-) building linkages and networks within the city-region food system.....	16
<b>3. Conclusions and lessons for multifunctional urban and peri-urban agriculture.....</b>	<b>19</b>
3.1. Range of social, ecological and economic functions .....	19
3.2. Contextual nature of multifunctional agriculture: differences between the global South and North.....	20
3.3. Multi-functionality, socio-economic development and value chain creation..	22
3.4. The role of policies and institutional arrangements in strengthening multifunctional (peri-) urban agriculture .....	25
<b>4. Conclusions and lessons for Short Food Supply Chains.....</b>	<b>28</b>
4.1. Short chains as mechanism to provide a socioeconomic basis and income streams supporting UPA.....	28
4.2. Appropriate business models for short food supply chains .....	30
4.3. (Re-) defining profitability and economic viability of Short Food Supply Chain initiatives .....	31
4.4. Support measures for Short Food Supply Chain initiatives.....	32
<b>5. Conclusions and lessons for waste and wastewater recycling and reuse ....</b>	<b>36</b>
5.1. Growing attention and experience with waste (water) recovery and reuse .....	36
5.2. Key role for policy support measures .....	38
5.3. Formulation of well-designed business models and combinations of (private, public, community) funding .....	39
5.4. Need for market analysis, information, training and larger-scale implementation .....	41
<b>6. Final remarks .....</b>	<b>43</b>

6.1. Introduction.....	43
6.2. Importance of balanced mix of (market, public and civic) governance mechanisms .....	44
6.3. Need to define clear exit strategy for policy and external support .....	45
6.4. Research gaps and recommendations .....	46
<b>References .....</b>	<b>48</b>

# 1. Background and introduction

The project SUPURBFOOD (“Towards sustainable modes of urban and peri-urban food provisioning”, [www.supurbfood.eu](http://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](http://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.

The results of this inventory and subsequent detailed analysis of 26 case studies have been documented in three previously published thematic reports (D3.2, 3.3 and 3.4). For the thematic area short food supply chain delivery an inventory of 21 experiences was made, while 8 cases were analysed in detail. For the thematic area of multifunctional (peri-) urban agriculture the inventory consisted of 16 experiences, while

7 in-depth case studies were documented. Finally, for the thematic area waste recovery and reuse an inventory was made of 30 experiences and 11 cases were subject to detailed case study analysis. Tables 1.1, 1.2 and 1.3 below give an overview and short characterisation of the in-depth case studies for the different thematic fields.

**Table 1.1. Case studies Short food supply chains**

<i>Case, city, country</i>	<i>Short description</i>
1. PROVE, Brasilia, Brazil	Federal programme on processing and marketing small-scale family production
2. Harvest of Hope / Abalimi Bezekhaya, Cape Town, South Africa	Vegetable box scheme with 20-25 gardens and 18 producer groups coordinated by social enterprise
3. Schaduf, Cairo, Egypt	Sale of vegetables from micro rooftop farms on local markets
4. Food security programme, Belo Horizonte, Brazil	Municipal programme stimulating food access to poor groups (markets, restaurants, urban and peri-urban agriculture)
5. Jinghe online farm, Beijing, China	Vegetable box scheme combined with online sale of a wide range of products from local cooperatives
6. Spring onions cooperative, Amman, Syria	Women's' cooperative marketing spring onions with distinctive quality label
7. Canastas comunitarias, Riobamba, Ecuador	Consumer-driven movement providing access to cheap and fresh products through box scheme
8. Urban Agricultural Programme (PAU), Rosario Argentina	Municipal programme stimulating urban and peri-urban agriculture, focus on direct selling (markets, boxes, processing plant)

More details in D3.3 Oudewater, N., De Vries, M., Renting, H. and Dubbeling, M. (2013) - Thematic paper 2: Innovative experiences with short food supply chains in (peri -) urban agriculture in the global South

**Table 1.2 Case studies Multifunctional (peri-) urban agriculture**

<i>Case, city, country</i>	<i>Short description</i>
1. Antananarivo, Madagascar	Multifunctional productive use of food plains
2. Urban Agriculture Programme (PAU), Rosario, Argentina	Productive green spaces, participatory design and social integration as part of municipal urban and peri-urban agriculture programme
3. Dar Bouazza, Casablanca, Morocco	Eco-Solidarity Gardens: an agroecological producers' network linking urban and rural spheres
4. Agri-tourism plan, Minhang district, Shanghai, China	Agro-tourism planning, combining infrastructural improvement with quality food production and recreational urban and peri-urban agriculture
5. Tianjin, Ji County, China	Xijingyu village tourism
6. Beijing, China	Beijing International Urban Agricultural Science & Technology Park: training and leisure combined with urban and peri-urban agriculture
7. Lagos, Nigeria	Social cohesion and maintenance of green space due to urban and peri-urban agriculture in a small urban community

More details in D3.4 Renting, H., Naneix, C., Dubbeling, M. and Jianming Cai (2013) Thematic paper 3: Innovative experiences with multifunctional (peri -) urban agriculture in city regions in the global South

**Table 1.3 Case studies Waste (water) recycling and reuse**

<i>Case, city, country</i>	<i>Short description</i>
1. Kolkata, Calcutta, India	Wastewater-fed agriculture
2. Yaoundé, Cameroon	Planted Sludge Dewatering Beds: Reuse of faecal sludge for forage production pilot
3. Kumasi, Ghana	Co-composting of faecal sludge and solid waste
4. Ouagadougou, Burkina Faso	ECOSAN: Reuse of urine as (liquid) fertiliser in agriculture
5. Sulabh International Social Services, India	Biogas generation at community and public toilet blocks
6. Waste Enterprisers, Kumasi, Ghana	Faecal sludge to energy (biodiesel)
7. Balangoda, Sri Lanka	Production of compost from household waste

8. DeCo!!, Tamale, Ghana	Decentralised composting for sustainable farming and development
9. Thai Biogas Energy Company, Rayong, Thailand	KIT Biogas project using cassava processing wastewater
10. Waste Concern, Dhaka, Bangladesh	Low-cost, labour-intensive method to convert solid waste into organic compost
11. Tamale, Ghana	Agricultural Land Application of Raw Faecal Sludge

More details in D3.2 Cofie, O., Jackson, L. and Van Veenhuizen, R. (2013) - Thematic paper 1: Innovative experiences with the reuse of organic wastes and wastewater in (peri -) urban agriculture in the global South

The entire inventory of 67 experiences and 26 in-depth case studies demonstrates the wide range of urban and peri-urban agriculture (UPA) and urban food provisioning systems that have developed in city regions in the global South. On the one hand, they make clear that UPA in the context of city regions in the global South is associated with a diversity of social, ecological and economic functions including social integration, poverty reduction, job creation, social cohesion, education, tourism, leisure, green space management and flood control. The contribution of UPA to the closing of nutrient loops and water cycles at local level by means of waste (water) recycling and reuse in this respect can be considered as a specific type of ecological multi-functionality which is particularly well developed in the global South.

Considering market and institutional arrangements the analysed initiatives also represent a meaningful diversity in terms of the products, services and (public) goods generated by the initiatives as well as the mix of stakeholders from public administration, market and civil society that are engaged in the governance of UPA and urban food provisioning initiatives. In this respect, the important development of short food supply chains in relation to urban food systems in city regions in the global South is an expression of the fact that urban and peri-urban agriculture are strongly and increasingly integrated in wider urban socio-economic systems.

In the following chapters of this synthesis report a further analysis of the characteristics and the lessons that may be drawn from experiences with (peri-) urban agriculture and urban food provisioning systems in the global South will be made. The main aim of this analysis is to confront and compare these southern experiences with similar experiences in the global North and to identify key factors for the successful design and operation of initiatives that might be applied and replicated elsewhere.

More specifically, the following questions have given guidance to this comparative analysis:

- What are the **specific characteristics** of (peri-) urban agriculture and urban food provisioning systems in the global South? What distinguishes them from similar other initiatives for urban agriculture and food provisioning in the global North?
- What main (combinations of) **social, economic and ecological functions** are generated by the initiatives in addition to food production?
- Which **actors from the private, public and civic sector** 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 known about the **economic, social and ecological performance** of initiatives? What types of positive impacts can be distinguished and what are main possibilities to increase such benefits? Are there specific negative impacts and risks associated to initiatives and how can these be mitigated and adequately managed?
- Which are the main (socio-cultural, technical, economic and financial, political/legal and institutional) **factors that facilitate or hamper** the initiation and development of the analysed initiatives? What are the main constraints encountered by the actors involved?
- What are the main options for **policy support** that emerge from the studied initiatives?
- Based on the above, what is the **sustainability/viability** of the initiatives and what are important prerequisites for the further expansion and dissemination of (peri-) urban agriculture and urban food provisioning initiatives?



## 2. General lessons to be drawn from experiences in the global South

On the basis of the analysis of case studies on urban agriculture and urban food provisioning initiatives in city region in the global South that were outlined above, the following general conclusions and lessons can be formulated:

### 2.1. Recognition of the role of UPA and urban food provisioning in sustainable and resilient urban development

The development of urban and peri-urban agriculture (UPA) and urban food provisioning systems are ***increasingly considered an important part of sustainable and resilient urban development*** by local governments in the global South. This trend is illustrated by cities like Rosario (Argentina), Lima (Peru), Belo Horizonte (Brazil), Kesbewa (Sri Lanka), Antananarivo (Madagascar), Casablanca (Morocco) and Bogota (Colombia). Policies and plans developed often integrate a range of different policy domains and objectives (including waste management, food security, poverty alleviation, climate change adaptation) and cover both the production, distribution and consumption aspects of the city region food system.

Some of the local food policy efforts already have a longer history, as is the case for Rosario and Belo Horizonte, which have well-developed policy frameworks for the development and promotion of UPA and urban food provisioning systems that date back to the 1990s. Also programmes like the former Urban Harvest programme (CIP-CGIAR), the Food for the Cities implemented by FAO and projects implemented by the RUAF Foundation such as Cities Farming for the Future (2005-2010) and From Seed to Table (2009-2011) have been instrumental in the development of policy frameworks for the development of urban agriculture and urban food distribution systems in a several cities in the global South.

The fore mentioned trend is also expressed by the 2013 Mayors Declaration that was adopted at the Resilient Cities Congress in Bonn (2 June 2013) of the International Association of Local Governments for Sustainability ICLEI. The Mayors Declaration (World Mayors Council on Climate Change, 2013) at several points makes explicit

reference to the key role of food systems within overall resilient city development when stating that:

*“We invite local governments to develop and implement a holistic ecosystems-based approach for developing city-region food systems that ensure food security, contribute to urban poverty eradication, protect and enhance local level biodiversity and that are integrated in development plans that strengthen urban resilience and adaptation.”*

and:

*“We urge that appropriate mechanisms be made available at all levels for capacity building and to ensure direct access and scaled-up financial support for the implementation of urban adaptation, including the development of resilient food systems (...).”*

## 2.2. UPA as a means for poverty alleviation and realizing food security

The fact that policy frameworks for UPA and urban food provisioning systems have developed relatively strongly, and in several cases earlier, than in cities in the global North is at least partly an expression of the **important role that urban and (peri-) urban agriculture** play in cities of the global South **as a means for poverty alleviation and realising food security at household and city level**. Urban and peri-urban agriculture has traditionally represented an essential livelihood strategy for poor urban family households, and this role in recent decades has only become more prominent in response to increasing urban poverty and food insecurity in many countries of the global South. Apart from urban agriculture and gardening for self-consumption within the family household, urban and peri-urban food production also to a growing extent has become a commercially interesting economic activity contributing to income and job creation and to food security at city region level.

From earlier studies, estimations are available on the relative importance of urban and peri-urban food production to food consumed in urban areas (Dubbeling et al. 2010). Figures differ per city and for the type of products; however, for perishable products

this may rise to 60% or more. Table 2.1 below summarises data from different studies and cities.

**Table 2.1 Share of urban food consumption provided by urban agriculture, various cities and years**

City	Percentage of urban demand met by urban agriculture						
	Leafy vegetables	All vegetables	Eggs	Poultry	Milk	Pork	Fruit
Havana, Cuba (Gonzalez Novo and Murphy, 2000)		58					39
La Paz, Bolivia (Kreinecker, 2000)		30					
Dakar, Senegal (Mbaye and Moustier, 2000)		70–80		65–70	60		
Dar Es Salaam, Tanzania (Jacobi et al., 2000)	90				60		
Addis Ababa, Ethiopia (Tegegne et al., 2000)		30			79		
Accra, Ghana (Cofie et al., 2003)		90					
Ibadan, Nigeria (Olajide-Taiwo et al., 2009)	80						
Brazzaville, Congo (Moustier, 1999)	80						
Nouakchott, Mauretania (Laurent, 1999)	90						
Antananarivo, Madagascar (Moustier, 1999)	90						
Jakarta, Indonesia (Purnomohadi, 2000)		10					16
Shanghai, China (Yi-Zhang and Zhangen, 2000)		60	90	50	90–100	50	
Hong Kong, China (Smit et al., 1996)		45		68			15
Singapore (Smit et al., 1996)		25					
Hanoi, Vietnam (GTZ, 2000; Phuong Anh et al., 2004)	80	0–75 seasonal variation	40	50			50
Vientiane, Laos (Kethongsa et al., 2004)	100	20–100 seasonal variation					

Source: Dubbeling et al (2010), compiled by RUAF Foundation from different sources

The contribution of UPA in cities in the global South to poverty alleviation and food security builds on a number of complementary mechanisms. First, it results to dietary improvement, especially by including more fresh vegetables and contributing to more diversified diets. Second, UPA practiced for personal use in some cases contributes significantly to food security at the level of the family household. The amount poor urban households produce (for) themselves differs widely between areas, some examples are e.g. East Jakarta: 18 %, Kampala: 50 % and Harare 60 %. However, food producing households in general are more resistant to economic crisis and increases in food prices than non-producing households.

Third, UPA can make a substantial contribution in terms of income generation when produce is sold at local markets. The cash savings that are realized by this for example are used for buying staple foods, thereby also contributing to improved food security. Table 2.2 below summarizes data on monthly net income generated from peri-urban

vegetable in different cities in Africa and Asia, indicating that - even when generated income in many cases may be insufficient to fully provide a living for the total household - important amounts of complementary family income are generated.

**Table 2.2 Income generated by urban agriculture, various cities**

<i>City</i>	<i>Typical net monthly income in US\$ per farm</i>	<i>Net income per capita in this country</i>
Accra, Ghana	40–57	27
Bamako, Mali	10–300	24
Bangui, Central African Republic	n.d-320	22
Banjul, Gambia	30-n.d.	26
Bissau, Guinea Bissau	24	12
Brazzaville, Congo	80–270	53
Cotonou, Benin	50–110	36
Dakar, Senegal	40–250	46
Dar es Salaam, Tanzania	60	24
Kumasi, Ghana (Eriksen-Hamel and Danso, 2009)	35–160	27
Lagos, Nigeria (Ezedinma and Chukuezi, 1999)	53–120	27
Lome, Togo	30–300	26
Nairobi, Kenya	10–163	33
Niamey, Niger	40	17
Ouagadougou, Burkina Faso	15–90	25
Yaoundé, Cameroon	34–67	53
Ho Chi Minh City, Vietnam (Jansen et al., 1996)	40–125	
Jakarta, Indonesia (Purnomohadi, 2000)	30–50	

*Source:* for data on West and East African countries: Drechsel et al, 2006

Source: Dubbeling et al (2010),

Finally, urban and peri-urban agriculture also plays a significant contribution to employment generation in urban areas in the global South. While figures are scarce and no comparable indicators are available, Table 2.3 below summarizes some of the available data on the contribution of urban agriculture to urban employment in various cities. The figures show that contributions of agricultural production to urban employment can be substantial, ranging from 15-20% of households involved in farming or gardening to upto 35-40% in some African and Chinese cities.

**Table 2.3 Contribution of urban agriculture to urban employment, various cities**

<i>City</i>	<i>Urban producers</i>
<b>Accra, Ghana</b> (Sonou, 2001; Maxwell and Armar-Klemesu, 1998)	13.6% of all households in 16 city areas are involved in farming, among them 700 market farmers (1997)
<b>Dakar, Senegal</b> (Mbaye and Moustier, 2000)	3,000 family vegetable farms (14,000 jobs) of which 1,250 fully commercial (9,000 jobs); 250 poultry units (1996)
<b>Dar es Salaam, Tanzania</b> (Sawio, 1993)	15–20% of all families in 2 city areas have a home garden; urban agriculture forms at least 60% of the informal sector and was the second largest urban employer (20%) in 1997
<b>Kumasi, Ghana</b> (Drechsel et al., 2000; AQ 2006 in Ref Poynter and Fielding, 2000)	1,470 registered farms and 30,000 unregistered farmers; 500 cattle owners; 100 registered poultry farms (+ 200 unregistered)
<b>Kampala, Uganda</b> (International Potato Center, 2007)	35% of households are engaged in urban agriculture
<b>Nairobi, Kenya</b> (Foeken and Mwangi, 2000)	150,000 households (30% of population); agriculture provided (in 1993) the highest self-employment earnings among small-scale enterprises
<b>Cienfuegos, Cuba</b> (Socorro, 2003)	17,000 jobs were generated between 1995 and 2003; 1.17% of city GDP
<b>Governador Valadares, Brazil</b> (Lovo and Pereira Costa, 2006)	45% of population practices some form of urban agriculture
<b>Habana, Cuba</b> (Gonzalez and Murphy, 2000)	117,000 direct and 26,000 indirect jobs in urban agriculture
<b>Lima, Peru</b> (IPC, 2007)	20% of the population of Lurigancho-Chosica District of Lima is involved full-time or part-time in agriculture
<b>Shanghai, China</b> (Yi-Zhang and Zhangen, 2000)	2.7 million farmers (31.8% of all workers) 2% of city GDP
<b>Beijing, China</b> (Liu et al., 2003)	Peri-urban agriculture is absorbing high amounts of migrant labour (between 500,000 and 1 million people)
<b>Manila, Philippines</b> (IPC, 2007)	120,000 low-income households in the Manila region depend economically on local jasmine production (including jasmine farmers, garland makers, garland sellers)

Source: Dubbeling et al (2010), compiled by RUAF foundation from different sources

Although the production levels and turnover of individual urban producers in many cases will be small, the high number of urban producers in each city makes their overall contribution to the urban economy highly significant, generating employment for many poor urban households.

## 2.3. Social, economic and ecological functions of UPA beyond food production

The case studies also clearly indicate that, in addition to its contributions to food security and poverty alleviation outlined above, **urban and peri-urban agriculture results in a considerable range of complementary social, ecological and economic benefits for city regions**. These multiple benefits, on their turn, are important factors for the further development and valorisation of urban agriculture and urban food provisioning systems within the city region and provide an important basis for their social and economic viability.

Examples of multiple functions of urban agriculture and urban food provisioning systems that were encountered in the cases and consulted literature include the following:

- Providing leisure, education and training opportunities.
- Management of green infrastructures at lower cost and more efficient compared to open green space.
- Strengthening of social cohesion, safety and neighbourhood improvement.
- Employment generation, enterprise development and regional economic spin-off effects.
- Reduction of energy consumption related to urban food consumption: less transport, less cooled storage, less packaging.
- Productive and safe reuse of urban wastewater enabling food production close to consumers and reducing pressure on fresh water resources.
- Reduction of impact of floods and landslides by keeping flood plains free from construction, facilitating water filtration and storage, and reducing erosion.
- Reuse of nutrients in waste, resulting in less environmental pollution and reduced energy demand for collection and disposal of waste.
- Contribution to climate change adaptation and mitigation.

The **key role of multi-functionality in the development of (peri-) urban agriculture and urban food provisioning systems** will be analysed in more detail in chapter 3 of this report.

## 2.4. Synergies as key mechanism for developing UPA and urban food provisioning systems

The case study examples demonstrate that there are important and strongly developed synergies between the different thematic areas of urban agriculture and urban food provisioning in the global South. The **development of synergies between these areas (short food chains; waste and water recycling and multifunctional agriculture) therefore appears to be an important mechanism for the development of UPA and regionalized urban food systems.**

Synergies can be identified between all of the three thematic fields of study. Linkages between multifunctional (peri-) urban agriculture and short food supply chains appear to be the strongest. With respect to the cases studied for the thematic area multifunctional (peri-) urban agriculture, in 5 out of 7 cases (71%) a combination is established with short chain provisioning of food products (Rosario, Antananarivo, Casablanca, Minhang agri-tourism and Xijingyu village tourism), with short food chains either being the driver for other multiple functions (building on direct linkages between producers and consumers to also involve consumers in other activities like recreation or education) or multiple functions being expanded also with the provisioning of food. Examples are multifunctional activities in the area of agri-tourism (China cases) or education (for example Casablanca) which offer specific possibilities to develop short chain marketing. Or on the other hand, short food supply chain cases marketing organic or agro-ecologically produced food while at the same time providing other multiple functions such as flood zone management and city greening (e.g. in Rosario).

In concordance, the studied experiences for the thematic area short food supply chains in a considerable number of cases are characterised by multifunctional forms of production. Actually, in various cases the multifunctional nature of urban agricultural production systems, and their contribution social and ecological benefits beyond food production, appears to be an important factor in differentiating product quality and attracting consumer demand.

The thematic area of waste and wastewater recycling also has important synergies with the other thematic areas. On the one hand, waste and waste water recycling when combined with agriculture in itself can be considered a specific form of multifunctional (peri-) urban agriculture since it is a form of closing nutrient and water cycles at local level contributing to ecological sustainability. On their turn, short food supply chains promoting organic and agro-ecological production offer large opportunities to integrate a waste recycling component, as these rely on non-chemical forms of nutrient management (organic waste, compost).

An important question that emerges with respect to the issue of synergies between the thematic areas is at what scale/level these are exactly found and constructed. This can be done at the level of the project, such as is the case with combining education, ecological production and short chain marketing in the example of Casablanca. There



are other cases where synergies rather occur, and appear to be most effectively constructed at the level of the city or city region as a whole. This is illustrated by the cases of Belo Horizonte or Rosario where combinations between distinctive, agro-ecological production and short chain distribution are constructed through institutional arrangements at larger, city regional, scale. This difference also poses important questions about what are the most appropriate governance levels and forms of policy support to facilitate the construction of synergies.

## 2.5. (Re-) building linkages and networks within the city-region food system

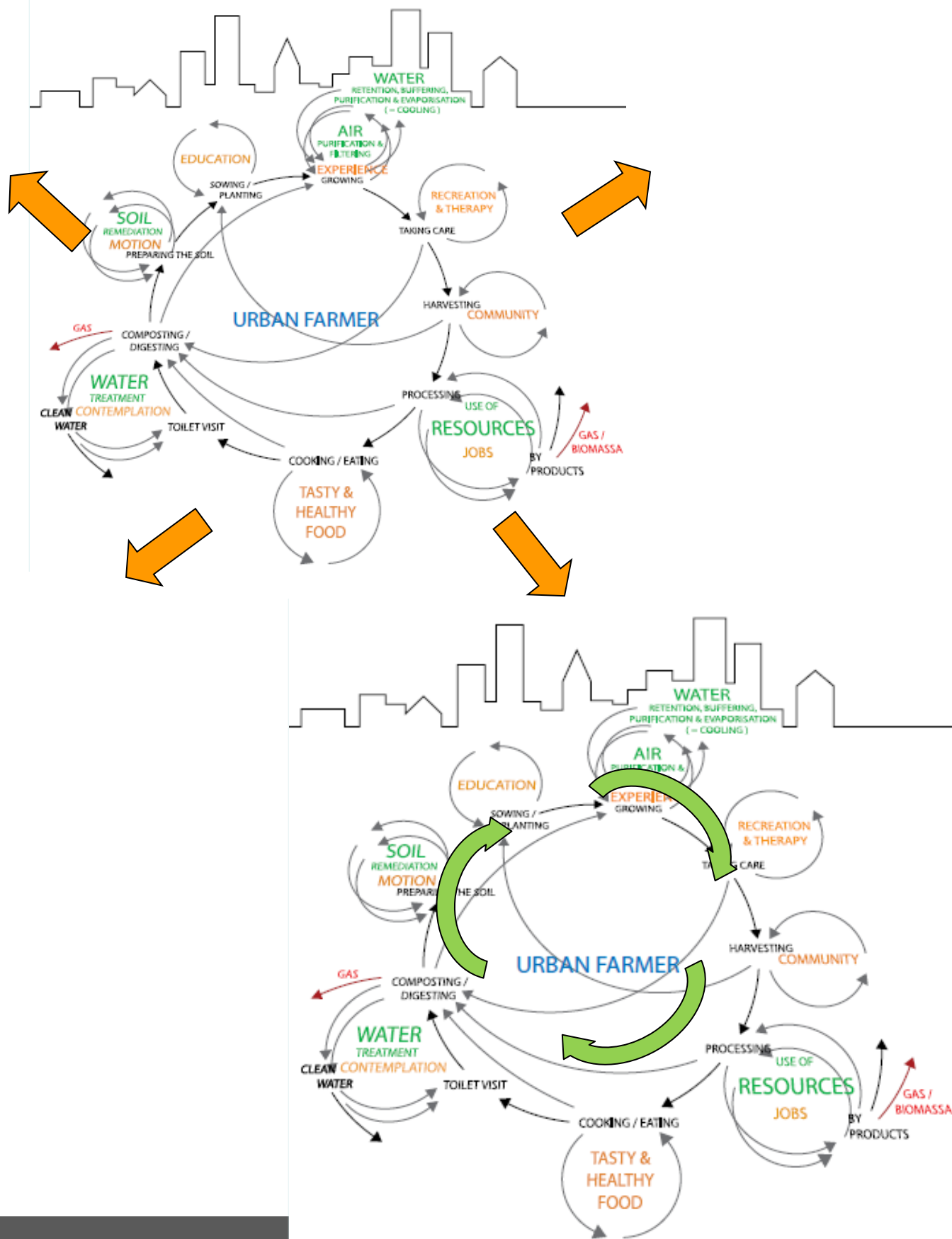
The case studies, apart from underlining the importance of multi-functionality and synergies between the three thematic fields, suggests that the development of urban agriculture and urban food provisioning systems to a large extent ***builds upon the (re-) creation and strengthening of networks and linkages at city-regional level***, many of which have previously been broken in earlier processes of economic globalisation and specialisation.

The relevant networks and linkages that are involved in this process of re-localisation and reconnection are various. Amongst others they include linkages and networks between food producers and consumers, (re-) localised processing and distribution systems, (food) waste recovery and reuse, productive activities and ecological sustenance mechanisms, but also between market and non-market functions of (peri-) urban agriculture and food provisioning activities.

Following the analysis of P. de Graaf (2011) , the envisioning of a city regional food system which considers different elements of the food production and consumption system as an integral part of wider city region development, requires another conceptualisation of how we look at food systems. While food systems are generally conceived as a linear sequence of different stages from production through distribution and consumption to waste, an integrated vision rather demands a ***circular vision of different aspects of the food system*** which are repeated in time and are (potentially) interconnected with different types of feedback loops, interaction and recovery and reuse cycles. Following this conceptualisation Figure 2.1 below visualises the process of rebuilding of linkages and networks within the city region food system, which is currently occurring in many different contexts, both in North and South.



**Figure 2.1 Top: current situation and bottom: (Re-)building linkages and networks within the city region food system**



The upper section of the figure shows the situation in which urban food production and provisioning systems are entirely integrated in external, often globalised, networks and economic structures. Different production activities and services that form part of the food system are provided and/or marketed outside the direct locality and there is little integration of the different parts and functions of the food production and consumption system. Potential care functions of agriculture and food are not valorised, but rather provided and substituted by external health and medical services. Similarly, inputs for production or distribution are generally imported or provided by external economic linkages. Also waste (water) generated by the city region food system is transported outside the locality for external treatment and processing.

The lower part of the figure rather represents the perspective of (re) localisation and strengthening of local networks and linkages. Possible feedback loops and synergies between different sections of the food system are strengthened, resulting in a stronger integration and resilience of the city region food system. The hypothesis that is further under examination in this study, and in the SUPURBFOOD project more generally, is that such more (re) localised system also provide a basis for more economic, social and ecologically sustainable development.

## 3. Conclusions and lessons for multifunctional urban and peri-urban agriculture

### 3.1. Range of social, ecological and economic functions

As indicated earlier, in the cases studied within the thematic area multifunctional (peri-) urban agriculture as well as in the other two thematic areas short food supply chains and waste (water) recovery and reuse, a ***wide range of combinations of UPA with societal functions*** are found and explored that go beyond food production and income generation.

These functions can be classified into social, ecological and economic functions. Examples of social functions that are covered by the researched cases are social integration, neighbourhood improvement, care, leisure and education. Ecological functions that were encountered include for example green space management, flood control, water management and climate change mitigation. Economic functions that are provided by the studied cases include employment generation, enterprise development, and regional economic spin-off effects.

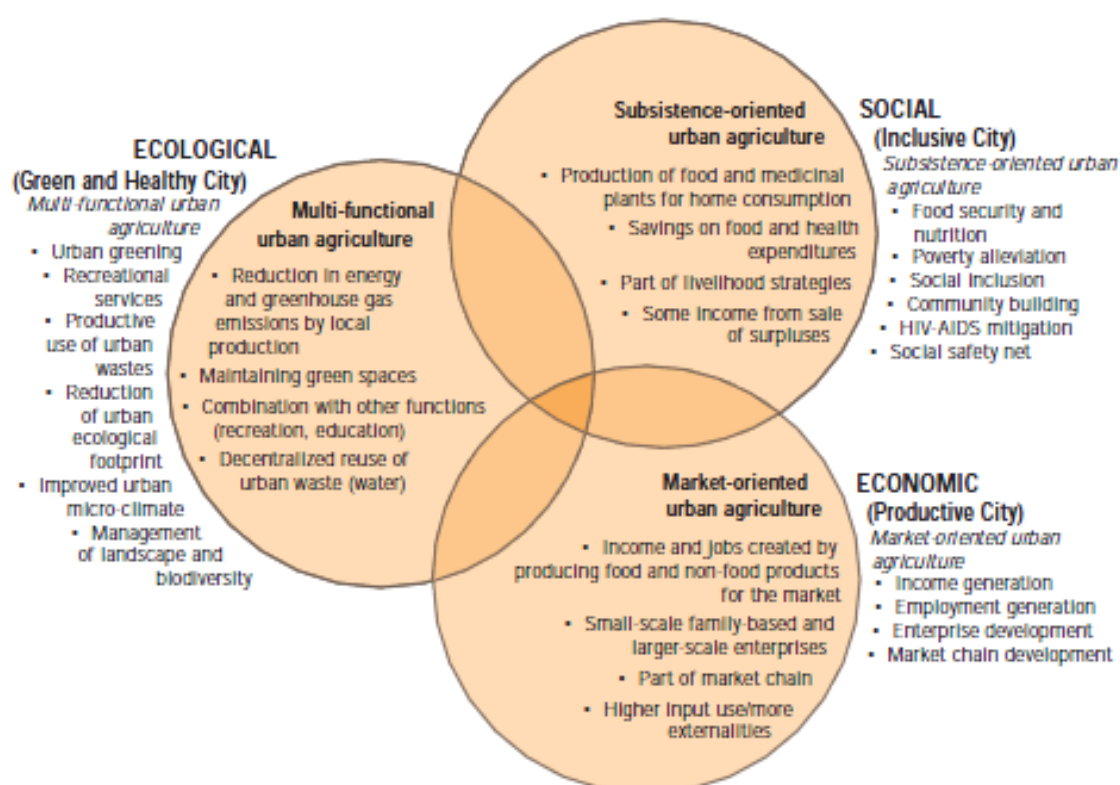
The range of social, ecological and economic functions that are provided by UPA, depending on its specific context and expression, in more general terms can be summarised in a graphical manner as per Figure 3.1 below. The different categories of functions of UPA in this figure are visualised as three overlapping domains. These ***three spheres or domains of multi-functionality*** 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:

- The ***social dimension***, when well developed, results in an 'inclusive' city region, in which social inclusion, poverty alleviation and community building are paramount;
- The ***economic dimension***, contributes to the development of a 'productive' city-region, in which income and employment generation and enterprise development are key parameters; and
- 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, climate change adaptation, urban greening and/or waste management are of large importance.

The three types of 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.

**Figure 3.1 Different dimension of multifunctional (peri-) urban agriculture cases**



(Source: Veenhuizen et al., 2006)

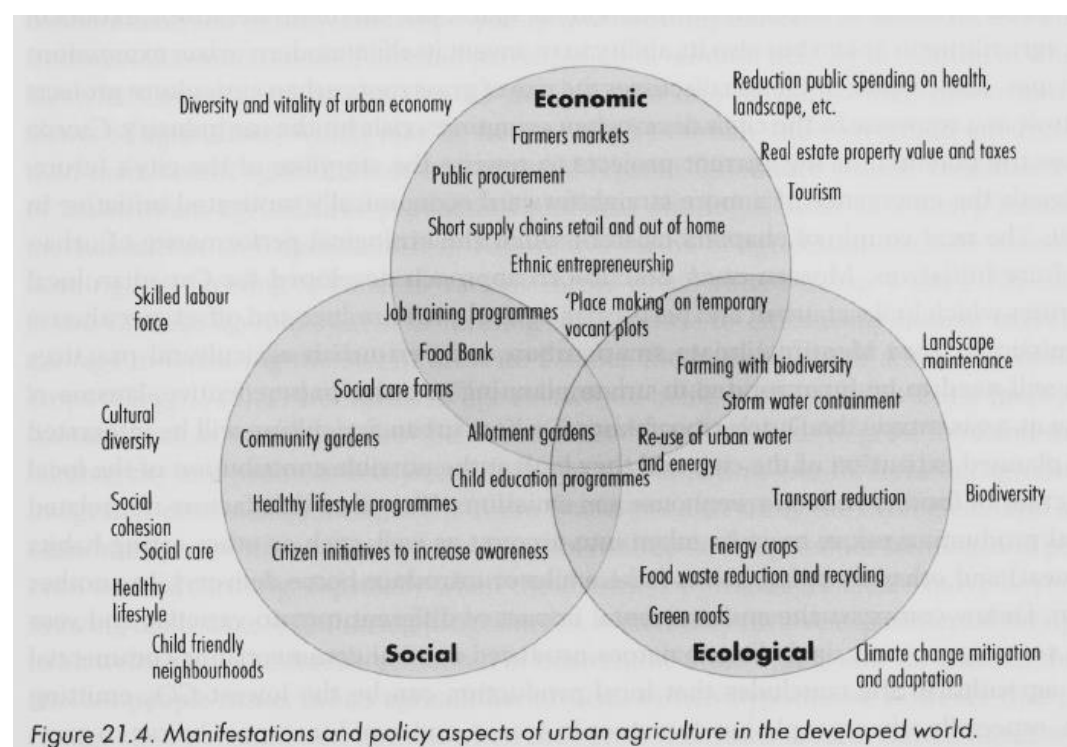
### 3.2. Contextual nature of multifunctional agriculture: differences between the global South and North

**The types of function combinations** that are generally encountered in the context of (peri-) urban agriculture in the global South to a certain degree appear to be **different from those encountered in the context of the global North**. This is a reflection of the differences in historical development of and driving forces behind UPA in different socio-economic and cultural settings. Contrary to the global North, the existence of functional agri-food ties in city-regions in developing countries has been a self-evident

reality for many decades (Van Veenhuizen 2006). Lack of (proper) sanitation systems, the need to apply lower cost nutrient and water sources in agriculture, but also different policy regulations that may easier allow for applying more ecological solutions to waste(water) management have for example resulted in larger application and business models of waste (water) recovery and reuse in urban and peri-urban agriculture in the global South compared to the global North. These differences all influence the particular mix of multiple functions that can be encountered in both specific contexts.

A possibly interesting learning exercise to better understand and analyse differences between the various functions of UPA in the global North and South, and lessons that could be drawn from one experience for the other, would be to return again to the initial analysis and definition of different types of functions as illustrated in Figure 3.1 and compare this with a similar visualisation of relevant functions in the European situation as made by Van der Schans and Wiskerke (2012) as part of their analysis of urban agriculture in developed economies (see Figure 3.2).

**Figure 3.2 Manifestations of urban agriculture in developed economies**



(Source: Van der Schans and Wiskerke (2012))

As stated earlier, the driving forces for the development of UPA in the global South have been different from those in the North and have been more clearly associated to food insecurity and poverty reduction, although the latter are also becoming more relevant in the global North as a result of the economic crisis. By contrast, in the global North considerations such as environmental goods provisioning, biodiversity, leisure and/or the search for fresh and healthy local food frequently appear to have been important driving forces, although these are now also receiving more emphasis in different countries and in larger metropolitan areas in the global South. Examples are 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. However, also in other settings such as Rosario in Argentina, UPA plays an important role in securing multifunctional public spaces for productive agricultural functions which at the same time have an important function for offering leisure opportunities and improving the neighbourhood's quality of life. in both specific contexts.

In the context of the global South, ecological functions associated with other policy dimensions such as climate change mitigation and adaptation, water management, flood control or waste management are receiving more and more attention, as climate change impacts are becoming more visible and cities generally have less opportunities to invest in more expensive infrastructure protection.

On the other hand, in the global South there appears to be less attention for issues related **to food quality and gastronomy** as evident in the Global North (Slow Food Movement for example). An exception is perhaps again China and some other countries in Southeast Asia (e.g. Vietnam) where food safety and access to healthy and safe food appear to be an important driver for the development of (peri-) urban agriculture and localised urban food distribution systems.

### **3.3. Multi-functionality, socio-economic development and value chain creation**

A key issue in addressing multi-functionality within the context of regional food systems is to **better understand how multiple functions provided by UPA interact with socio-economic development and value chains**. Urban and peri-urban agriculture

does not only contribute to generating jobs and revenues, but also to preventing costs by using people, land and resources productively, to generating social and ecological benefits (which are often not priced or only to a limited degree remunerated by public administrations), or to developing capital assets which indirectly may enhance future possibilities for their valorisation within socio-economic development.

In general, we see that multiple functions of UPA are ***both an outcome and a resource*** for the further development and strengthening of UPA. However, the exact interaction and mutual reinforcement between the multiple functions and UPA is still a blurred area due to complications like the fact we are dealing with public goods, incomplete markets and information asymmetry. Creating economic revenues is key to long term success of the multifunctional nature of UPA.

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 positive externalities (such as landscape management for example), in the global South examples of multifunctional (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 these countries is a much less common phenomenon.

From the case studies in this project it appears that a first step in triggering the creation of business opportunities is often the recognition of the multifunctional nature of UPA by policy institutions and civil society initiatives. The cases in the South have shown that business opportunities for UPA may arise from:

- Marketing of products & services, such as leisure, tourism, or education, which can be marketed on private markets and may contribute to revenue generation and portfolio diversification (e.g. various forms of agri-tourism and rural tourism in China; educational activities in Casablanca, Morocco);
- Cost savings and/or cost recovery for public goods or services compared to state provisioning, such as waste disposal, or green space management. Multifunctional UPA in this case functions 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).

- Cost avoidance by means of health improvement, flood control, climate change mitigation, etc. (e.g. Antananarivo, Kesbewa).
- Multifunctional UPA as a source for creating social innovation and new territorial networks which indirectly can be valorised by selling food products on new markets, creation of distinctive product quality or reputation, or creation of a 'basket' of products & services (e.g. Rosario, Casablanca, Amman).

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 only partly consist of additional economic revenues, but are rather also 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.

Urban and peri-urban agriculture does not only contribute to generating jobs and revenues, but also to preventing costs by using people, land and resources productively. Calculating such net savings will help inform better policy making. Estimating the value that people attach (or not) to particular urban agriculture land uses and functions, can be done by Valuing Public Appreciation, Willingness to Pay and Willingness to Accept. These methods have yet only been applied to a very limited extent in urban agriculture and merit broader application and testing.

Also it is clear that while the business opportunities for multifunctional UPA are apparent, they are often difficult to turn into secure and sustainable revenues in the longer run. A central question that therefore still needs to be further explored and answered remains: *“How to translate social benefits or cost savings into economic opportunities for producers and SMEs by means of revenues from public funding or access to resources resulting in cost reductions?”*

Another relevant question in relation to the economic viability of UPA is to what extent different goal-specific types of urban agriculture (self-sufficient, market-oriented and multifunctional, as in the three circles in Figure 3.1) should be seen as separate types or that rather different types potentially support or presuppose each other. In other



words relevant questions are to what extent self-provisioning and market-oriented UPA really can be sustained in cities without themselves having to turn increasingly multifunctional, or without having to also create some public good for the city. If this is the case it implies that multi-functionality should be an essential characteristic of urban agriculture and that UPA cannot be sustained if it does not become increasingly multifunctional.

### 3.4. The role of policies and institutional arrangements in strengthening multifunctional (peri-) urban agriculture

The role of policy in relation to multifunctional (peri-) urban agriculture appears to be ambivalent in the analysed cases; policy ***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 a context of strong urbanisation pressures 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***. As was already mentioned in the previous point, a first step in triggering the creation of business opportunities is often the recognition of the multifunctional nature of UPA by policy institutions and civil society initiatives. Clear examples of such supportive positive policy frameworks for the development of multifunctional (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 (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.

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 characterised by a balanced mix of involvement of public administration, civil society and market parties 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 Beijing International Urban Agricultural Science & Technology Park can best be characterised as a public-private partnership which again has an important implication of research and training institutes. The case of Eco-solidarity gardens in Dar Bouazza, Casablanca especially appears to be driven by the civil society organisation Terre & Humanisme Maroc and there are only few linkages with local public administrations and market parties which can partly explain the limited reach of the initiative. Also in Casablanca there is a clear involvement of a research institution in the form of the Urban Agriculture Casablanca (UAC) project of the Technical University of Berlin. In the cases of Lagos, Nigeria and Antananarivo, Madagascar, there is a less clear involvement of the local public administration and from the cases this also appears to be an important limitation and recommendation for improvement.

The role of research organisations specifically appears to be important to further develop and operationalise concepts of (multifunctional) urban agriculture, especially in a context where this concept is not yet generally accepted or still needs to find its place in urban spatial design and planning. The involvement of international research partners, as is the case in the Urban Agriculture Casablanca project, can also have a role in obtaining a more prominent position for urban agriculture projects on local policy agendas and in establishing linkages with stimulating best practices elsewhere. Lastly, research and training institute can have a positive role in providing knowledge support in the education and formation of stakeholders within (multifunctional) urban agriculture (as is the case for China) .

Perhaps the most developed case in terms of balanced institutional arrangements and governance mechanisms are 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 (risking programme break-down in case of changes in government). In spite of this limitation, the case demonstrates how the putting in place of a clear and well-developed stimulating policy framework combined with the active involvement of local communities and producer organisations can result in a strong and positive impetus on the development of multifunctional (peri-) urban agriculture at city-region level.

## 4. Conclusions and lessons for Short Food Supply Chains

### 4.1. Short chains as mechanism to provide a socioeconomic basis and income streams supporting UPA

From the short food chain cases analysed it can in general be concluded that Short Food Supply chains (SFSCs) are a ***promising approach to generate socio-economic ‘tissue’ – social cohesion, social capital and beneficial social networks – as well as income streams for UPA producers***. They thereby are an important institutional mechanism for building regionalised urban food systems. Especially, in early stages of the initiatives SFSCs are often crucial in developing markets for local and organic food where these did not exist yet. Furthermore, SFSCs also play an important role in generating better price margins by excluding intermediaries in value chains or by valorising distinctive product qualities (local, healthy, organic etcetera). An additional positive outcome of short food supply chains is that consumer control over the products has increased, often resulting in increased quality and availability of more healthy food available for urban consumers.

While SFSCs in urban areas have demonstrated considerable impacts and potentials, there are also limitations and several areas in ***which further improvements are possible***. Many SFSCs still mainly concern fresh foods (vegetables, fruits, eggs, and exceptionally dairy) and often focus on a limited number of products. One of the main questions cities deal with is: How to expand this niche to an urban food retail system with more diversified product offer, including transformed, prepared, and conserved products, a market that is increasingly dominated by large transnational processing companies and retail chains?

In tackling this issue, the ***development of logistical infrastructures (such as ‘food hubs’) are of key importance***. Product aggregation of products from different producers that leads to a diversified ‘basket’, and synergies between different SFSC channels and outlets have proven to be a success factor in a number of cases (e.g. Rosario; Belo Horizonte and Jinghe farm in China).

Access of local food initiatives to mainstream food trading and distribution systems in many cases are restricted due to scale and quality requirements. Consumers pose quality requirements as do supermarkets (demanding a certain quality, quantity, timely delivery) and public administrations (hygiene regulations, etc.). It can be argued that there is a double problem of scale: on the one hand both input supply (favouring buying of bulk and large volumes of inputs) and supermarket logistics (in terms of volume of produce needed) are generally restrictive and integration in globalised commercial logistic structures (e.g. bar-codes) is often not accessible to local individual and groups of producers. At the same time, the scale of production/supply of short chain initiatives is often still too small, in such a way that they do not reach economies of scale and/or do not have sufficient resources to make larger up-front investments. Innovative solutions have however been developed by the Brazilian PROVE programme (agro industries supply counter where inputs can be bought in small quantities and specifically serving the needs of small agro-enterprises; setting up of producers kiosks for joint sale at supermarkets; creation of a joint logo) that can serve as inspiration to other new initiatives. Another innovative example is the Jinghe farm in China that pools producers and consumers together (cooperatives) and so links demand and supply at larger scales.

Reaching scale through market-diversification also seems an important success factor. Marketing channels may vary from farmer markets; institutional arrangements; consumer food boxes and supermarket sales. Stable linkages to consumer groups (the green consumers association in Rosario; the consumer cooperatives in China) also play an important role in sustaining the business.

The different cases indicate that in general there is a considerable demand for the food products produced in urban and peri-urban settings and that often demand is exceeding production. Urban consumers appear to be increasingly interested in urban, locally produced and healthy food. The case experiences indicate that there are different types of market demand for short chain urban food producing initiatives. Several of the initiatives specifically aim to reach middle and higher-class consumers in view of their economic buying power (Rosario, Cape Town). On the other hand, there are initiatives which mainly focus on marketing to poorer groups often in combination with social aims of improving food security (e.g Belo Horizonte, Canastas Comunitarias

in Ecuador). The question remains to which extent these different strategies influence business profitability for individual farmers or enterprises.

Especially for ensuring (stable) consumer demand it is important that the product quality is guaranteed and standardised and that attention is paid to the presentation of products (branding, packaging, barcode, etc.). In several cases product logos (Amman, Rosario, PROVE) played an important role in creating customer confidence. Government accreditation (Rosario, Brasilia), participatory guarantee schemes (Cape Town) or rather proximity and the building of strong community networks and direct contacts between producers and consumers are instrumental for the articulation of market demand and consumer control over production (for example Canastas Comunitarias, Riobamba). Also the possibility of making farm visits, or to buy directly from the farm, may strengthen the bond between producers and consumers and effectively increase sales volumes and prices (for example Rosario; Jinghe online farm, China).

Customer convenience plays another important role in generating demand. Jinghe serves as an example of new and innovative forms of online marketing, often targeting more well-off consumers with internet access and in combination with office or home delivery.

#### 4.2. Appropriate business models for short food supply chains

The development of short food chains and socio-economic networks surrounding these are to a different degree driven by the initiatives of market parties (including producers), government agencies and civil society. Generally initiatives which build on a well-balanced and **complementary mix of governance (public, market and civic) mechanisms** by means of public-private partnerships, multi-stakeholder platforms and an **increased role for Small & Medium Enterprises (SMEs)** appear to be relatively successful and more resilient on longer term. Such SMEs can be private initiatives but also social enterprises or government-led agro-industries or marketing organisations.

Examples of different types of enterprises and corresponding business models that can be distinguished include the following:

- SMEs or producer groups that take up short-chain marketing initiatives themselves (for example Amman, Jordan).
- Intermediary SMEs which assist farmers in marketing and training activities (for example Harvest of Hope, S-Africa).
- Intermediary SMEs which roll-out franchise type of production and marketing concepts (for example Schaduf, Cairo).
- Principally government-driven food delivery chains (e.g. Rosario, Argentina and Belo Horizonte, Brazil).

Despite the variety of models, each model is suited for specific cases and cannot be generally applied or copied to other cities. Evidence suggests that the suitability of models amongst others depends on the types of producers involved; e.g. low levels of education or skills may require an intermediary organisation for more specialist marketing or planning functions (like Harvest of Hope), and food access for the poorest may require government support and price settings (like Belo Horizonte). Also objectives of such different business models are different ranging from revenue generation or profit maximisation, to social enterprises with wider objectives aiming at recovery of organisational costs and job and income creation for the involved beneficiaries.

#### **4.3. (Re-) defining profitability and economic viability of Short Food Supply Chain initiatives**

When analysing traditional business activities, often profitability is considered as the main objective – implying that a surplus of revenues after deduction of costs and investments is generated to be paid out to the owner or shareholders of the involved business enterprise. However, in the practice of short-chain related initiatives it turns out that there are other forms of business that not necessary make a profit, but still can be economically viable. An example are social enterprises which have a social goal, and therefore do not necessarily need to make a profit, but rather aim to cover their own costs and break even. Potential surplus is reserved for future investments, and not retained as profit. Another example are government support programmes where public investment is made in order to create jobs for socially excluded or vulnerable groups of the population.

Most of the cases analysed in this study are not (yet) profitable in the traditional business sense, with maybe the exception of Jinghe farm. This is certainly the case for younger initiatives, but also for initiatives which are already in a more mature stage. In some of these cases, rather than profitability in a traditional business sense, cost recovery can be considered as the financial business objective (current example of Harvest of Hope). However at the level of individual enterprises (for example individual agro-industries in PROVE), or even at group level (creating financial reserves for the future; expanding to new business opportunities like is being done in Amman), activities are profitable and carried on –also when external support ended.

Further identification and analysis of short food chain enterprises in the Global South would be necessary to be able to make statements on the real potential of short food chains to be economically profitable over time (in the traditional ‘business’ sense of the word). It may well be that short food chains are still a recent development in the Global South and so-far have mainly been geared by more social, societal and developmental aims, which may include functions such as providing employment for producers/farmers or selling clean/healthy vegetables to urban consumers, thereby enhancing food security or increasing social cohesion.

This is also visible in the fact that very few quantitative data can be found on costs and profits made or on the economic margins realised by initiatives. This can be both for a real lack of data available, while in other cases the information is available but restricted because it is considered market-sensitive information. In addition, many cases and business analysis do not take all costs into consideration. Often repair costs, maintenance, transport and funding for growth; insurance or risks are not included in the financial plans. In either case, this constitutes an important research gap and bottleneck for the further analysis and development of business models for urban agriculture-based short chain enterprises.

#### **4.4. Support measures for Short Food Supply Chain initiatives**

In the context of mixed institutional arrangements and governance models, different parties from public administration, civil society and market actors all have their specific role to play in the support of Short Food Supply Chain initiatives. For example in the case of PROVE (Brazil) the government supported the initiative by adapting legal



frameworks that made it easier for small entrepreneurs to run their business. At the same time market parties (banks) played their part by providing specific and accessible loans to get these entrepreneurs started with the processing facilities they needed. The civil society played an important role in setting up a support NGO that aimed to provide training and assistance to the entrepreneurs over time.

Government support measures especially seem key in the start-up phase of the initiative (e.g. in the Chinese Jinghe farm case where initial website development was financed by the government) and in cases where social support to poorer/vulnerable groups is a main objective. A good example of this is the PROVE case in Brazil where public investment in food distribution channels seems to be a cost-effective means of employment generation in comparison to investments in other urban sectors.

Specific support activities for which often a role for governments appears to be required as incubator and facilitator in the setting-up of urban agriculture and food provisioning initiatives with a focus on social needs include the following:

- Support to disadvantaged groups to get them involved and started on a business or other livelihood enhancing activities.
- Legislation on hygiene and quality of products; other policy regulations in favour of small enterprises and short food supply chains.
- Secure access to land or infrastructure.
- Creating awareness about healthy food (mobilising consumer demand).
- Facilitating credit mechanisms and financial support.
- Using public demand by means of procurement mechanisms to develop markets for local or organic produce.
- Bringing together involved stakeholders (different government departments; producers, civil society, research and private sector)
- Temporarily taking over specific (market) functions. With respect to active government involvement in the actual operation of supply chain activities, rather an approach to increasing (institutional) capacity of market parties to take up these activities would be more sustainable on the long run than taking over market functions themselves.

Another classification of government roles could be the following:

- advocate (for example urge another level of government or corporation to follow a policy that advances UPA and short food supply production and marketing)
- coordinate (for example provide city facilities, such as meeting rooms, to help different stakeholders to organise around UPA and short food supply chains)
- support (for example pay for staff or resources to support local production or buy part of the produce for schools, hospitals or public restaurants)
- innovate (for example preserve flood-zones and other public areas for urban farming in areas short on public green space)
- facilitate (for example, modify applications to establish agro-enterprises or farmers markets to reduce the time, demoralisation and frustration associated with present-day restrictive policies) .

However, there is not always a clear-cut line where government support ends and what it should entail. In the case of Rosario and PROVE the government for example played/plays role in the logistics of getting products to the market. In Belo Horizonte on the other hand, transport seems to be organised and paid for by the producers, even though the programme has similar social aims as the former two programmes mentioned. In the Belo Horizonte case the government rather takes on a role in indirectly facilitating market initiatives by providing good market locations, publicity, guaranteeing product qualities, and setting price levels for certain products, but it does not take on actual transaction and business activities themselves. The question remains to what extent such functions could be best taken on by private actors (including the farmers themselves) or as in the case of Shaduf by the intermediary enterprise or as in China by a logistic company and to what extent this influences the sustainability of the system.

The situation can also be reversed where an NGO or a market party takes on responsibilities that otherwise could be organised by public authorities. For example in the case of Harvest of Hope (South Africa) the NGO initiative provides agricultural extension services to the producers that are working with them, while it might be argued that the government (Ministry of Agriculture) could take on this role more permanently (requiring that urban producers are recognised as “farmers” and that extension systems/technologies are adapted to their circumstances). In cases where a temporary project takes over certain market functions, initiatives may well collapse when the project (funding) is withdrawn. When government services would take up this

activity, this could at the same time bring down the costs for HoH and make it easier for the initiative to financially break even. For this purpose, multi-stakeholder networks can be mobilised and created to ensure that tasks are distributed through institutional arrangements with both government and market parties, thus improving the sustainability and viability of the project.

While the exact role of public, private and civic organisations therefore will depend on the specific local situation, on the basis of the studied cases it may be said that in general SFSC business models require policy, financial and technical support for:

- Improving (market) infrastructure, capacity strengthening (technical, management, business and financial skills) and extension (see the examples of Rosario, Belo Horizonte, Schaduf).
- Strengthening producer organisations and networking among producer organisations to take over some coordination and lobbying role after the producers are no longer supported by NGOs or governments (as done in Amman, Rosario, PROVE).
- Promoting value-chain development in urban agriculture and providing or broadening market opportunities (such as direct producer-consumer marketing, localising food hubs, public procurement as for example done by PROVE and in Belo Horizonte).
- Increasing producers' access to financing, including taking the lead in or guaranteeing investments in processing/marketing facilities that are too risky for individual or collective initiatives of entrepreneurs (for example cases PROVE, Brasilia, Harvest of Hope, Shaduf).
- Provide access to public land (for example Rosario) or generate funds and/or credits to obtaining more secure access to land.
- Transportation of products to markets.
- Innovating production and processing, extending to new products (Rosario, PROVE)
- Expanding multiple functions and additional revenue streams (as in China through farm visits).

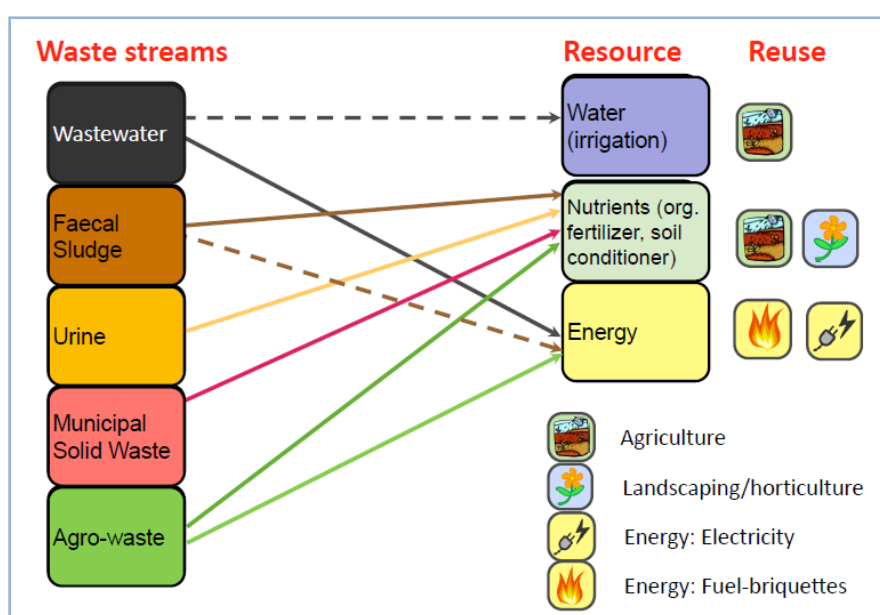
## 5. Conclusions and lessons for waste and wastewater recycling and reuse

From the cases dealing with waste and wastewater recycling and reuse it is clear that this is a well-developed activity area in city regions in the global South. This is especially the case when compared to cities in the global North. Several factors explain the relatively strong development of this thematic field of activity; amongst other as waste management is a growing problem in cities in the global South (see e.g. cases of Nawalapitiya Urban Council, Sri Lanka and Nakuru, Kenya described in the respective thematic report).

### 5.1. Growing attention and experience with waste (water) recovery and reuse

There is a large diversity with projects that recover and reuse water and components of waste such as nutrients, organic matter and energy from domestic and agro-industrial waste streams. Figure 5.1 and Table 5.2 below give an overview of the **different types of waste streams and resources** that are used and the cluster the analysed case studies according to specific waste streams.

**Figure 5.1 Different categories of waste streams & recuperated resources**



**Table 5.2. Case studies according to waste streams & recuperated resources**

Waste stream	Recuperated resource		
	Water	Nutrients	Energy
Waste water	1. <i>Kolkata, Calcutta, India:</i> Wastewater-fed agriculture		
Faecal sludge		2. <i>Yaoundé, Cameroon:</i> Planted sludge dewatering beds for forage production pilot 3. <i>Kumasi, Ghana:</i> Co-composting faecal sludge and solid waste 11. <i>Tamale, Ghana:</i> Agricultural Land Application of Raw Faecal Sludge	5. <i>Sulabh, India:</i> Biogas generation at community and public toilet blocks 6. <i>Kumasi, Ghana:</i> Waste Enterprisers - Faecal sludge to energy (biodiesel)
Urine		4. <i>Ouagadougou, Burkina Faso:</i> ECOSAN Reuse of urine as fertilizer in agriculture	5. <i>Sulabh, India:</i> Biogas generation at community and public toilet blocks
Municipal solid waste		3. <i>Kumasi, Ghana:</i> Co-composting faecal sludge and solid waste 7. <i>Balangoda, Sri Lanka:</i> Production of compost from household waste 8. <i>Tamale, Ghana:</i> DeCo!! Decentralised composting for sustainable farming 10. <i>Dhaka, Bangladesh:</i> Waste Concern solid waste to organic compost	
Agro waste		8. <i>Tamale, Ghana:</i> DeCo!! Decentralised composting for sustainable farming	9. <i>Rayong, Thailand:</i> KIT Biogas project using cassava processing wastewater

Waste streams that are recovered and revalorised thus include: waste water, faecal sludge, urine, municipal solid waste and agro-waste. Various cases combine different types of waste streams, such as is the case with Sulabh (India) combining faecal sludge and urine for biogas generation, co-composting of faecal sludge and solid waste in Tamale (Ghana) and decentralised composting of municipal waste and agro-waste in the case of DeCo in Tamale (Ghana).

The set of case studies illustrate the role of different entities developing businesses around revalorisation of waste streams, including public sector and private sector, either with commercial objectives or as social enterprises. However, larger-scale applications of such systems (at city-region level) are still difficult to find. One of the main reasons is a ***lack of market analysis of demand for products***.

An important challenge for the area of waste recovery and reuse is ***to still further create linkages between waste recycling and agricultural productive reuse***. Also finding synergies with other sectors and multiple use of waste (water) for energy and fertiliser may generate creative solutions (e.g. Sulabh, India). There are certainly technical and safe options for doing so (both for water and nutrient reuse) but waste treatment and agriculture too often still continue to be different, unconnected policy sectors and the reuse of recycled waste and water is still surrounded with a lot of taboos and (relevant) health concerns. To overcome these bottlenecks adequate information supply and gaining political support for exploring possible linkages is of key importance as is awareness and training on safe use to farmers and consumers.

## 5.2. Key role for policy support measures

Public government support is key in all models of waste (water) recycling and re-use and often one of the most important challenges. ***The need for increased public awareness and policy support*** is often a prerequisite to deliver new sanitation systems in urban areas. This includes buy-in from appropriate government ministries and departments such as public health, environment, planning, food and agriculture.

Table 5.3 below shows the different types of public support for various reuse strategies. In some cases, support comes in terms of multi stakeholder involvement, joint policy analysis and adjustments, such as shown by the Indian Sulabh case. In other cases, support is given through provision of regulatory measures for safe reuse, including the application and management of systems for risks within policy and public administration (e.g. Waste Concern, Bangladesh).

**Table 5.3: Examples of public support for selected reuse cases**

Types of support Measures	Kolkata, India	Urine in Ouagadougou, Burkina Faso	Sulabh, India	Co-composting, Kumasi, Ghana
Creating awareness and /or market development				
Infrastructure development				
Access to land or arrangements				
Support related to licences or sanitary regulations				
Waste collection and presorting				

Source: Cofie, O., Jackson, L. and Van Veenhuizen, R. (2013)

Other key areas for support and multi-stakeholder partnership include: logistics (transport from waste disposal to processing site) and location of and support to facilities for processing.

### 5.3. Formulation of well-designed business models and combinations of (private, public, community) funding

The formulation and implementation of well-designed business models that generate value and allow cost recovery or profits could result in an important up-scaling of waste (water) recovery and reuse efforts. Recovery and reuse business models are any practices that utilise the resource value in waste in such a way that the use of the resource generates value that can be used to support the sanitation service chain, safe disposal, and where possible productive reuse. In this respect, **relevant differences in economic business model objectives**, ranging from cost recovery for sanitation services (i.e. generally cost savings for public administration) to revenue generation/profit maximisation and social enterprise development should be taken into account.

Funding is crucial to any potential business model, and it is important to develop funding mechanisms which go beyond temporary project funding. Government funding is well-justified as sanitation is a public health concern.

External financial incentives can however be critical components in the take-off stage of programmes and to enable initial investments. An example is the Indian NPBD program offering an additional capital subsidy for combining cattle dung-based biogas plants with a sanitary toilet. Under the same initiative up to 70 percent of the capital cost was received as subsidy to construct a small biogas plant, two toilets, and a water storage tank in schools (Aggarwal, 2003).

Most waste (water) recycling and re-use activities are funded by external donor funding or government support. Because sanitation, including urban solid waste management, is still predominantly financed by the public sector, business models that contribute to partial or full cost recovery are generally well-received and can attract support. However, where cost recovery and savings (also health and environmental gains of improved waste management) are easily shown and demonstrated; revenue generation is more difficult to achieve.

This is amongst others due to the limited market for some reuse products. For example, a case study effectuated in Kumasi, Ghana showed that only 17% of the city's organic waste can be reused in entire urban and peri-urban farming. This means that revenue generation is difficult to achieve due in such a limited market; creative business models may solve the issue and attract policy support in return. The answer may lie in multiple use of waste (water) resources for both energy and fertiliser, as for example in the Indian Sulabh case, or in expanding fertiliser markets to green areas and rural agriculture.

One of the ways to finance further research and development of business models is the use of credits/loans and combinations of funding sources. This is an under-researched option, and not frequently implemented, as many of these projects are too big for micro credits and too small for regular finance.

Use of personal finances can sometimes also be a funding option, as is demonstrated by the Kolkata case of sewage fed aquaculture, which independent of any outside funding sources was able to pay labourers' salaries and rent for land leased with revenue from fish sales. Another example is the Indian Sulabh case which makes a creative combination of funding sources to finance the operation and maintenance of community toilet and biogas facilities. Municipalities that want to implement Sulabh's



improved systems are required to provide the land and 20% of the construction costs. Sulabh, in return agrees to maintain the facility for free for 30 years following the 'pay & use' system for the community toilet. Community involvement is another important source of "funding" through the 50,000 volunteers that help to manage Sulabh's model enterprise.

#### **5.4. Need for market analysis, information, training and larger-scale implementation**

In summary, large-scale applications of systems at the city level are still difficult to find. An important reason that so few examples exist is a lack of market analysis of demand for recycled products. The main challenge is to further develop linkages between waste recycling and safe, productive use of end products. Finding synergies with other sectors (water-energy-food nexus) and multiple use of waste and wastewater may generate creative solutions. There are technically safe options for water and nutrient reuse, but water, sanitation, solid waste management and agriculture are, too often, still unconnected policy sectors.

Policy support for recovery & reuse is key in all success models. This may concern support for:

- creating awareness and/or a market for products and services;
- development of infrastructure;
- access to land;
- arrangements regarding licenses or sanitary regulations;
- waste collection and pre-sorting.

Re-use of waste and wastewater is a key element for enhanced resource efficiency in urban and peri-urban agriculture. Because of (perceived) health risks, there is generally a common hesitation to take advantage of great potential of wastewater re-use in (peri) urban agriculture. Low-cost technologies for decentralised wastewater treatment and reuse in urban and peri-urban agriculture are available (including amongst others natural infiltration and oxidation ponds or reed bed systems), but their further development and larger-scale implementation is needed. Especially research on and further implementation of medium and small-scale wastewater treatment allowing keeping a maximum of nutrients and eliminating pathogens is an area that needs

further attention. Such systems need to be developed for or adapted to local contexts. This would be beneficial not only for urban agriculture, but also limit the need for or, at least, deferring investments in building new, costly wastewater carrying and treatment infrastructure. Research supporting development of low-cost rainwater harvesting and safe storage (preventing water-borne diseases propagation) options for the purpose of urban agriculture may be a complementary but no less essential area.

In cities where only partial or no wastewater treatment is available, health risks of productive reuse of waste water can be reduced through complementary health risk reduction measures as explained in the WHO guidelines for safe use of excreta and wastewater. These new guidelines assist decision-makers to plan how to achieve the required levels of pathogen reduction by choosing and combining a number of different health risk reduction measures and entry points for action along the “farm to fork” pathway, depending on what is feasible locally. As the new WHO guidelines allow for incremental and adaptive change (in contrast to the earlier strict water quality thresholds), they are a cost-effective and realistic approach for reducing health and environmental risks in low-income countries. The dissemination of such information and training on potential risk reduction measures to urban and peri-urban agriculture producers is however lagging behind and limits wider application.

Similarly, farm and household level waste recycling are quite well covered by past research on manure reuse, backyard composting or Ecosan (see amongst others the International Water Management Institute –IWMI and FAO research, but also the Sustainable Sanitation Alliance SuSanA: <http://www.susana.org/>). However more and better (business) models for district-level waste recycling and resource recovery for urban agriculture and energy still need to be developed. The focus should turn to be on centres of waste accumulation to have a high probability of economics of scale. Following a range of analyses, IWMI and other partners suggested that the fundamental factor that could result in the scaling-up of resource recovery and reuse (RRR) efforts is the formulation and implementation of business models that generate value and allow cost (partial to full) recovery or profits if well designed.

## 6. Final remarks

### 6.1. Introduction

This synthesis done on the basis of 67 experiences and 26 in-depth case studies with UPA and urban food provisioning systems in the areas of multifunctional agriculture, short food supply chains and waste recovery/re-use demonstrates clearly that there are many interesting, localised, though often small-scale, experiences to learn from in the global South. The general, overall challenge that emerges from this study is how to upscale and apply these at the level of the city-region and how to expand and disseminate existing, promising experiences to localities elsewhere.

A key element that emerges in all thematic areas is the importance to better understand and define business opportunities and business models. A considerable range of business opportunities can be identified in all of the thematic areas, even though it is not always clear yet to what extent this implies an economic viability in traditional business terms. Clear business models as well as entrepreneurial skills and capacities appear from the analysis to be important success factors. A better insight in options to create value or reduce costs is needed in all respects. However, it is also clear that SMEs cannot create successful business models alone; network creation is essential.

The cases have shown a variety of business models and types: intermediate SMEs, producer-led SMEs, cooperative initiatives, franchise models, government-led businesses, etc. Cutting across these business types are different business aims: cost saving, cost recovery, revenue generation, profit maximisation, portfolio diversification, social enterprises, etc. These examples have shown that clear business models are important, but that they should always be attuned to the specific contextual setting and historical conditions which determine the success or failure of a case.

In all of the analysed cases, the important role of opportunities for support measures by local and regional public administrations for the development of UPA and re-localised urban food provisioning systems is highlighted. Most of the cases see an important role for the public authorities and policy makers in the facilitation of SME development in short food supply chains, multifunctional agriculture and waste recycling. Clearly, in

some situations policy plays a more prominent role than in others; this is also related to the phase of development and life cycle stage of cases. However there is a general agreement on the pivotal role of policy makers with respect to aspects such as:

- awareness raising and capacity building capacity on the potential societal benefits of urban and peri-urban agriculture amongst citizens, policy makers, consumers, etc.;
- enhancing information on, and access to, critical resources such as land, knowledge, etc.;
- better legal recognition of and support to UPA activities and practices;
- establishing close, longer-term network relations between UPA practitioners and policy makers to facilitate mutual learning and understanding;
- active creation of markets and infrastructure, and stimulation of public procurement;
- more integrated policy and spatial-planning approaches;
- more SME-sensitive regulations and support systems.

## **6.2. Importance of balanced mix of (market, public and civic) governance mechanisms**

The development of initiatives for urban and peri-urban agriculture as well as short chain food provisioning initiatives are to a different degree driven by initiatives of market parties (including producers), government agencies and civil society. An analysis of the role and relative weight of different food governance mechanisms based on market governance, public governance and civil society organisation therefore appears to be an important tool to analyse success factors.

On the basis of the analysed set of case studies it can be said that generally initiatives which build on a balanced and complementary mix of governance mechanisms (e.g. through public-private partnerships, multi-stakeholder platforms and an increased role for SMEs) appear to be relatively successful and more resilient.

In general, a clear vision on urban and peri-urban agriculture (in all its aspects of and linkages to multi-functionality, short food supply chains and resource recovery) within integrated policy-frameworks, for example established in the form of a well-defined Urban Food Policy or Strategy document, could be the starting point. Sustainable food policies urgently need a more effective and more transparent system of multi-level governance if it is to gain political traction. Food Policy Councils or multi-stakeholder

platforms can give voice and profile to the multi-functionality of food and urban agriculture. The issues of disintegrated policy fields, limiting regulatory frameworks and contradictory governance systems are mentioned as important hampering factors. Designing more experimental space within regulatory frameworks would boost developments and assist in dealing with conflicts involving differentiating sustainability and land-use claims. In turn, such experimental space can also stimulate the creation of new coalitions that can better deal with the diverse issues to which UPA gives rise. Clearly, extra financial budgets for UPA and more creative use of available public funding is also necessary to further explore UPA benefits and potentials.

### **6.3. Need to define clear exit strategy for policy and external support**

Notwithstanding the important role of policy, there is a danger of a too strong, one-sided, dependence on external funding and policy support, which can make urban agriculture and food provisioning initiatives excessively vulnerable in the case of government change or imposed budget cuts. It is therefore important that policy support is well-defined and focused, policy implementation activities to the extent possible are taken over by market-based organisation forms (in a gradual phasing-out strategy), and that a clear exit-strategy for externally funded policy support is formulated. This all keeping in mind that certain government support functions (e.g. food security of vulnerable social categories, sanitation) correspond to the core activities of public administrations and never can be fully transferred to markets. Social aims are then a priority and cannot be replaced by market goals.

In some of the cases intermediate SMEs (of which Harvest of Hope, Cape Town or Schaduf in Cairo are examples that were analysed in this study) may take over a “business role”, functioning themselves as a business and breaking even/making profit, while supporting specific social groups of beneficiaries that deliver products to the business. This is especially a relevant option in situations where direct beneficiaries involved in UPA have (initial) insufficient capacities and education levels themselves and where these can also not be easily remediated e.g. by training or capacitation activities.

## 6.4. Research gaps and recommendations

Finally, a number of important research gaps were identified in relation to available data sets and research methods for the study of UPA and urban food provisioning initiatives. For example information on business models for the different thematic areas, their costs and benefits, organisational models and logistical set-up, customer segments and market demand generally were found to be still very scarce.

Other research gaps include access to financing, while also the role of social enterprises was seen as an important issue for further analysis. In addition, better insight is needed regarding options for creating value or reducing costs.

Overall there are considerable problems with quantitative data availability and moreover existing business model analyses are not always well-suited for application within the framework of urban food production and provisioning systems. This implies a need for further empirical research and conceptual development, e.g. by further developing the methodological approach of the “business model canvas” to the activities within urban agriculture and food provisioning and more specifically in the context of countries in the global South.

Similarly the value of urban agriculture value chains to the urban economy needs to be better estimated; while also information is lacking on what kinds of jobs are created. How to secure decent employment and income-generation through urban and peri-urban agriculture? How do they benefit excluded urban groups? How to address decent work deficiencies in the food production chain? What is the contribution of different urban agriculture value or commodity chains to employment creation? In which parts of the chain are or can most jobs be created? Further action and policy research is needed in these fields.

Concerning the further economic, social and environmental impacts and performances of existing models of urban agriculture and food provisioning there is a considerable lack of comparable data and a further need to develop indicators and assessment methods that are suitable for the specific context of urban and peri-urban agriculture. There are several interesting and promising approaches in this direction (e.g. social cost-benefit analysis, analysis of social return on investments, run-off and temperature

measurements to assess the impact of UPA on climate change adaptation and mitigation, valuing public appreciation and willingness to pay / willingness to accept in the context of multifunctional agriculture, etc.) but these are generally still in an exploratory or experimental stage and need further refinement. These methods have yet only been applied to a very limited extent in urban agriculture and in localities in the global South and merit broader application and testing.

## References

- Cofie, O., Jackson, L. and Van Veenhuizen, R. (2013) - Thematic paper 1: Innovative experiences with the reuse of organic wastes and wastewater in (peri -) urban agriculture in the global South. International Water Management Institute / RUAF Foundation. Leusden, Netherlands.
- Dubbeling, M, H. De Zeeuw and R. Van Veenhuizen. (2010) Cities, poverty and food: Multistakeholder policy and planning in urban agriculture. RUAF Foundation. Leusden, Netherlands. Practical Action Publishing.
- Oudewater, N., De Vries, M., Renting, H. and Dubbeling, M. (2013) - Thematic paper 2: Innovative experiences with short food supply chains in (peri -) urban agriculture in the global South. ETC / RUAF Foundation. Leusden, Netherlands.
- Renting, H., Naneix, C., Dubbeling, M. and Jianming Cai (2013) Thematic paper 3: Innovative experiences with multifunctional (peri -) urban agriculture in city regions in the global South. RUAF Foundation. Leusden, Netherlands.
- Schans, J.W. van der and Wiskerke, J.S.C. (2012) – Urban Agriculture in Developed Economies, Chapter 21 in: In: Viljoen, A.M., Wiskerke, J.S.C. (Eds) Sustainable food planning: evolving theory and practice, Wageningen: Wageningen Academic Publishers, p. 245 - 258.
- Groot, P. De (2011) Room for Urban Agriculture. Paul de Graaf Ontwerp & Onderzoek. / Edible Rotterdam. [http://www.pauldegraaf.eu/downloads/RvSL\\_Summary.pdf](http://www.pauldegraaf.eu/downloads/RvSL_Summary.pdf)
- World Mayors Council on Climate Change (2013) 2013 Bonn Declaration of Mayors, 4th Global Forum on Urban Resilience and Adaptation, 31 May - 2 June 2013, Bonn, Germany, [http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Resilient\\_Cities\\_2013/MAF\\_2013\\_Bonn\\_Declaration\\_of\\_Mayors.pdf](http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Resilient_Cities_2013/MAF_2013_Bonn_Declaration_of_Mayors.pdf)