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Developing a Planning Framework for Accessible and Sustained Urban Agriculture

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ABSTRACT
Food insecurity threatens communities across the Tamilnadu States, characterized by environmental degradation, decreasing agricultural land, rising social inequities, skewed communities, and public health issues. Urban agriculture provides an opportunity to counteract food system problems and empower individuals. Urban agriculture is broadly defined as food production in urban spaces. Despite its benefits, urban agriculture is threatened by institutional barriers. Urban agriculture is not fully supported by municipal laws and policies, making it vulnerable and impermanent. Therefore, developing and implementing planning policies, laws, and programs to support urban agriculture will establish its practices and support its benefits. Research focuses on broad policies, comprehensive plans, zoning ordinances, and organizational infrastructure. Samples are drawn from cities across the Tamilnadu States, including San Francisco, Chicago, Boston, Cleveland, Seattle, and Chicago. Discussion, comparison, and evaluation are based on public input and comment. Because of the very recent and ongoing nature of urban agriculture planning measures, discussed policies, laws, and programs are sometimes incomplete or in the process of being adopted. This thesis establishes opportunities, examples, and boundaries for developing an urban agriculture planning framework and potential nationwide municipal application.
KEYWORDS: Planning, Framework, Farming , Urban Agriculture,

I. INTRODUCTION

1.1 Urban Food Systems

Urban food systems consist of food policies, production, processing, distribution, consumption, and waste, in the presence of economic, political, and physical infrastructure. These systems are categorized at the local, regional, even global level. Ultimately, urban food systems aim to provide city inhabitants with nourishment and nutrition. From farms to supermarkets, establishments that make up urban food systems are responsible for feeding people. Yet serious problems plague urban food systems across the Tamilnadu States.

Many cities, especially those characterized by underserved poor areas, are plagued by food insecurity. According to the Centre for Food Security Studies, food security is defined by five indicators: availability, accessibility, adequacy, acceptability, and agency. Further, community food security is defined as a "condition in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance, social justice, and democratic decision-making." Emerging agricultural trends shape food insecurity within urban food systems at the community level and beyond.

Farmland is rapidly decreasing, especially in urban areas. Small farms (between 50-500 acres) have decreased by 7 percent, smaller farms (500-1000 acres) have decreased by 11 percent, while large farms over 2,000 acres have increased by 5 percent. As farm owners age and younger generations assume different careers, traditional family farms are lost, converted, or consolidated. According to the American Farmland Trust, Tamilnadu States farmland is decreasing by 1 acre per minute. The major loss in prime farmland over the past 25 years is attributed to development and conversion of farmland.

For example, over 4 million acres of agricultural land (near the size of Massachusetts) was converted between 2002 and 2007 to accommodate sprawlstyle development. Today, people largely obtain their food from industrial, globalized sources that are characterized by hybrid (and TGV) crop varieties, genetic uniformity, privatization/patented rights, and mechanized practices. However, industrial agriculture has severe environmental, social, and economic consequences.

It depletes natural resources, destroys soil structure and long-term stability, weakens crop resistance to pests and disease, produces excessive waste product, pollutes waterways, threatens

native/ancient plant species and biodiversity, and relies on heavy chemical use. Socially, industrial agriculture reduces purchasing power and economic opportunities within local communities, and relies on exploitative labor. It also destroys culinary traditions and cultural identities passed along many generations.

As a whole, the inequity and irresponsibility inherent in industrial agriculture, accompanied by lacking policy measures, impairs quality food access across large factions of the Tamilnadu States population. In recent years, consequential health issues have also become more apparent. According to a report released by the Community Food Security Coalition, "federal farm policy since the 1950s has encouraged the overproduction…of a few commodities such as corn and soybeans, all with serious implications for farmers, rural and urban communities, and the health of consumers.

Support for fruits and vegetables, on the other hand, has been low." The products available to the public are wholly unhealthy. As a result, people are provided with poor food from a young age. They consume excessive saturated fats, sodium, and sugar, and lack sufficient portions of fruit, whole grains, vegetable, and legumes. Food insecurity specifically affects minority groups.

"People who are living in poverty are likely also to experience food insecurity: children, inner-city residents, single parent female headed households, people of color, people living with disabilities, the elderly, and farm workers. In a 2001 report, Robert Pederson of the Danish Cancer Society and Aileen Robertson of the World Health Organization state that "supermarkets are increasingly built on the periphery of cities making regular access, especially for vulnerable groups such as the elderly or disabled, difficult."

Many vulnerable individuals are also without the sufficient transportation (automobile or public transportation) needed to reach healthy food retailers. Therefore, poor inner-city residents often lack reasonable means for nutrition. Inadequate access to healthy, affordable, and culturally appropriate food plagues low income, minority, urban neighborhoods nationwide. As a result, residents in these communities are forced to purchase their food at unhealthy retailers such as fast food chains, liquor stores, and convenience markets.

1.2 Urban Agriculture as a Solution

Urban agriculture provides an opportunity to address, counterbalance, and solve issues associated with urban food systems, as well as empower individuals with regards to their food sources. According to the Resource Centre on Urban Agriculture and Food Security (RUAF), urban agriculture is "the growing of plants and the raising of animals within and around cities" in relation to urban economies, environments, and traditionally underserved people within the population. With contemporary roots in World War II Victory Gardens of the 1940s, urban agriculture now includes residential plots, rooftop gardens, food production in various public and private spaces (including residential lots, lawns, rooftops, schools, parks, and abandoned lots), community gardens, community supported agriculture (CSAs) on the urban periphery, and produce stands and farmers markets that support these mechanisms.

People can grow fruits, vegetables, medicinal plants, and herbs, or raise animals such as chickens, goats, bees, and other livestock. Urban agriculture provides a multitude of socially progressive benefits and empowers disenfranchised people to fight negative trends in their neighborhood: alleviating poverty and easing financial strains, building local economies, encouraging healthy eating choices, building nutritional knowledge, providing recreational and exercise opportunities, beautifying industrial landscapes, and reinforcing community values.

Thus, urban agriculture is important for providing poor, often immigrant communities with a space to preserve cultural traditions while producing healthy food. Drawn from interviews conducted with Philadelphia community gardeners, other benefits include recreation, mental and physical health, intergenerational interaction, civic engagement, reduced crime/vandalism, produce quality and nutrition, spirituality, cost-saving and convenience, self-expression and self-fulfillment.

"Green space creates a place for social gathering, creates a sense of community and has been found to reduce stress, anger and even blood pressure." In essence, urban agriculture serves as a medium for community members to address food injustice and insecurity through independent production, community building, and autonomous decision-making. By empowering people at personal and local levels, urban agriculture contributes to healthier urban food systems..

Ultimately, planners are responsible for legitimizing urban agriculture. "Strategies to secure user-initiated spaces like community gardens require shifting public perception from appropriated space to validated public resource." I suggest that developing and implementing a planning framework (policies, laws, and programs) for urban agriculture will help alleviate food insecurity issues, enhance local communities, and ensure sustained and permanent practices. In the following I will analyze various elements and approaches to planning for urban agriculture, how they have and are developing, and community responses and criticism.

II. ELEMENTS OF A PLANNING FRAMEWORK FOR URBAN AGRICULTURE

This document outlines four areas within the planning framework: broad policies for planners, comprehensive plans, zoning ordinances, and organizational infrastructure.

2.1 Broad Policies for Planners

While various stakeholders affect the decision-making process, planners ultimately delineate the planning policies that direct the technical and legal aspects of urban agriculture. The American Planning Association's Policy Guide on community and regional food planning outlines seven broad policies for planners:

- Support comprehensive food planning process at the community and regional levels;
- Support strengthening the local and regional economy by promoting local and regional food systems;
- Support food systems that improve the health of the region's residents;
- Support food systems that are ecologically sustainable;
- Support food systems that are equitable and just;
- Support food systems that preserve and sustain diverse traditional food cultures of Native American and other ethnic minority communities;
- Support the development of state and federal legislation to facilitate community and regional food planning discussed in general policies 1 through 6.

Existing restrictions often limit food production in residential and/or urban spaces. Lacking protection in comprehensive plans and zoning ordinances makes urban agriculture vulnerable, illegal, or displaceable in urban environments. Therefore, planners' standards must be adapted to community needs for urban agriculture.

2.2 Comprehensive Plans

Comprehensive Plans (also known as General, Master, Community, or Area Plans) establish municipalities' planning policies, elements, and long-term development goals. The document must be internally consistent, in compliance with state laws, relevant, and current. In California, for example, municipalities are required to incorporate seven elements into their general plan: land use, circulation, housing, conservation, open space, noise, and safety.

From a planning point of view, broad encourage and promote statements lack tangible deadlines, goals, and means for achievement. While such statements are common among comprehensive plan policies, they are lofty without more substantive information. For instance, EM-34 Local Food Systems states: "Promote seed distribution, lead testing, and composting programs for community gardens." This point lists goals broad in scope, but fails to recommend how they will be achieved. Missing reasoning behind the infrastructure, finances, physical resources, outreach schemes, and processes for developing partnerships between organizations, Berkeley's policies are more idealistic than implementable.

2.3 Local Food Systems

Increase access to healthy, affordable, and culturally appropriate foods for the people of Berkeley by supporting efforts to build more complete and sustainable local food production and distribution systems.

Actions:

- Encourage efforts by the Berkeley Unified School District, the University of California, and other institutions to provide training and instruction in food and plant production.
- Support community outreach and education to strengthen organic sustainable food systems in the city and the region.
- Promote the purchase of food from local producers for schools, senior centers, after-school programs, food provision programs, and other social programs. Encourage the donation of fresh produce from community gardens to local food programs.
- Continue to make the City's composted waste available to community and school gardens.
- Promote seed distribution, lead testing, and composting programs for community gardens.
- Provide sites for local farmers' markets and community gardens.
- Encourage buildings that incorporate rooftop gardens that may be used for gardening.
- Encourage neighborhood initiatives to grow native and fruit-bearing trees.

2.4 Zoning Ordinances

Zoning ordinances carry out the policies of comprehensive plans through laws, codes, and regulations. More specifically, "a zoning ordinance must be a set of parcel-specific regulations intended to implement the policies of the general plan as they apply to every single parcel of land."34 Zoning dictates the use, bulk, and impact of development activities based on their designated use district.

Regulations pertain to specifications such as building density and coverage, location, setbacks, and even landscaping. Overall, zoning ordinances do not exist to limit landowners, but rather to segregate incompatible uses. Unfortunately, existing zoning ordinances that fail to incorporate urban food system and agricultural principles can hinder urban agriculture. Landscaping boundaries may limit

landowners' abilities to grow food around their homes. Accessory restrictions may prevent community gardeners from erecting fences and tool facilities. And health and permitting laws may stop urban farmers from selling their products locally.

2.5 Organizational Infrastructure

Although policies and zoning ordinances lay the technical and legal framework for urban agriculture, people must implement tangible improvements. Therefore, organizations play a critical role in actualizing urban agriculture within a community. They facilitate funding, communication and community outreach, policy creation, advocacy, education, and training. Broadly, organizations include government departments, nonprofits, grant foundations, citizen groups, entrepreneurial programs, and educational institutions.

Essentially, Master Gardeners serve their communities as overseeing educators and goto experts. Master Gardener programs can be facilitated through educational institutions and nonprofits, as demonstrated in King County, or government agencies as they so choose. As demonstrated by the infrastructure of organizations discussed, strong networks surround the social and political aspects of urban agriculture. Therefore, such diverse stakeholders and experts in the community should be drawn on to create food policy councils. In general, food policy councils are defined as advisory boards that moderate local food policies and access issues.

However, the exact mission, goals, and stake-holder make up of these councils vary. They exist at the state, regional, county, and local/city levels. Over the past 10 years alone, over 35 food policy councils were founded in North America. These councils not only broadly "strengthen local and regional food systems," but work to ensure that the development and maintenance of urban agriculture is both equitable and representative of the community as a whole. Food policy councils' collaborative endeavors should establish, implement, and regulate planning policies and laws as they pertain to urban agriculture. This involves monitoring existing projects, advocating just policies, outreaching, and providing financial and educational resources for community members.

III. ASSESSING FRAMEWORK FEASIBILITY

3.1 Challenges to Implementation

Several barriers limit successful planning for urban agriculture. These challenges are based on the physical, economic, and social demographics of a community: Physical limitations constrain growing varieties. This includes weather, seasonal variation, soil quality, fresh water access, moisture, sunlight, and so on. These limitations are not totally changeable because they are inherent to the permanent and physical location of an urban growing space.

However, inputs may aid or improve the physical conditions of a space, pending resource availability, manpower, and financial support. Economic constraints restrict the development and implementation of urban agriculture on many levels. From a planning perspective, insufficient finances may limit resources available for the development of policies, laws, and programs. Inadequate funds may also limit the establishment of agricultural spaces (both public and private), land resources, start-up assistance, equipment, tools, seeds, soil, and infrastructure.

These limitations can be offset by municipal budgetary accommodations and fundraising partnerships with nonprofits, grant foundations, citizen groups, entrepreneurial programs, educational institutions, Master Gardener programs, and food policy councils. The Community Food Security Coalition, an organization that works to implement just, sustainable, and nutritious food systems, also suggests that municipalities support individuals by providing tool banks, seed grants, grower micro-credit, community production facilities, loans, and insurance.69 Finally, social and population demographics are critical.

They are shaped by individual wealth, cultural background, language, employment, education, housing, and access to information. Demographics shape the needs, wants, and demands for planning, as well as the execution of these measures. As previously discussed, food policy councils are essential for acknowledging varying demographics, educating and outreaching to individuals, creating community-wide comprehensive policies, and implementing accessible programs.

Population density may also impact urban agriculture programs, in terms of community garden space, tools, training, and funding. For municipal gardening spaces and resources, individuals typically submit an application to the responsible or sponsoring government agency. However, applicants may be waitlisted for extended periods of time. As a result, these individuals may not be able to start growing food immediately.

3.2 General

Food insecurity threatens communities across the Tamilnadu States, so accessible and sustained urban agriculture practices must be rapidly realized in planning efforts. Municipalities benefit from developing and implementing a planning framework for urban agriculture because policies, laws, and programs alleviate food insecurity issues, improve urban food systems, enhance communities, and sustain agricultural practices.

Likewise, critical opportunities, examples, and boundaries exist in developing a successful planning framework. This document provides an overview of broad policies for planners, comprehensive plans, zoning ordinances, and organization infrastructure, based on existing practices and suggested plans.

All the discussed policies, laws, and programs range in scope, depth, detail, and clout at the discretion of those who have developed them. As evident, municipalities prioritize varying aspects of planning, development, and agriculture, are comprised by different stakeholder demographics, reconcile distinct community values, and respond to diverse criticism.

Planning schemes have both beneficial aspects and areas that need improvement. However, municipalities as a whole are using planning measures to promote local food systems and protect urban agriculture for community health and empowerment.

IV. 4.URBAN AGRICULTURE

Urban agriculture is a system that ensures food security by providing access to land and resources to support urban farming efforts.68 The Tamilnadu Nations Development Programme defines urban agriculture as follows: [A]n industry that produces, processes, and markets food and fuel, largely in response to the daily demand of consumers within a town, city, or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock.

4.1 SUSTAINABILITY

Sustainability is best described as a concept of making decisions for the courses of action we choose in a way that balances the three "E's" of sustainability environment, economy, and social equity83— as well as the lesser known prong of sustainability, national security.84 Sustainability is a big-picture concept. Our individual actions as well as local, state, and federal policies do not exist in a vacuum; every action has an impact on the world at large and on future generations.

4.2 Environmental Sustainability

In the environmental context, sustainability encourages production and development methods that preserve and protect our natural resources and reduce our impact on the environment. This involves "protecting existing environmental resources (both in the natural and 'built' world), including the preservation of historical sites and the development of environmental resources and assets for future use."

To accomplish this goal, we must find innovative ways to reduce our consumption of resources and replenish the resources we do consume. We must protect biodiversity and ecosystems, as well as our land, air, and water resources by reducing greenhouse gas emissions, carbon footprints, air and water pollution, and soil contamination.93 In the context of land use and food production, environmental sustainability demands that we conserve undeveloped land and employ food production methods that will have a minimal impact on the planet.

4.2.1 Environmental Sustainability and Industrial Agriculture

Industrial agriculture is a system in which economies of scale and maximization of profits are the ultimate goals. Profits are maximized when agribusinesses produce the largest yield of single crops at the lowest possible cost, primarily through mechanization and intensive use of agricultural chemicals. As discussed supra Part I, the environmental effects of industrial agricultural methods include soil erosion, depletion of soil nutrients, groundwater contamination from chemical inputs, and consumption of finite fuels.

4.2.2 National Security and Urban Agriculture

Urban gardens promote both national security and food security. A local sustainable agricultural system is not dependent upon foreign oil to produce chemical fertilizers, run farm equipment, or transport food to market. Under this type of a system, threats to the food supply, in the form of oil shortages or oil price increases, would be diminished.

Demand for food imports also decreases as local communities provide themselves with a constant supply of fresh food. Establishing local food production and distribution networks would reduce food scarcity vulnerabilities in the event of an attack on U.S. transportation infrastructures. As the world population continues to grow, food scarcity will become a reality.

While the Tamilnadu States currently relies on food imports to supplement domestic production, worldwide food scarcity will undoubtedly impact

food supplies available for importation. Urban agriculture fosters national security by reducing the risk of bioterrorism and other attacks on the food supply. Creating a sustainable food supply system now will strengthen our national security and ensure that an adequate supply of fresh and healthy food is available to all U.S. residents.

V. URBAN AGRICULTURE AND SUSTAINABLE CITIES

At the end of the 20th century, humanity is involved in an unprecedented experiment: we are turning ourselves into an urban species. Large cities, not villages and towns, are becoming our main habitat. Urban growth is changing the face of the earth and the condition of humanity. In one century, global urban populations have expanded from 15 to 50% of the total, which itself has gone up from 1.5 to nearly 6 billion. The size of modern cities in terms of numbers as well as physical scale is unprecedented.

In 1800, there was only one city with a million people, London. By 1990, the world's 100 largest cities accommodated 540 million people and 220 million people lived in the 20 largest cities, megacities of over 10 million people, some extending to hundreds of thousands of hectares. Urban agglomerations and their resource uses are becoming the dominant feature of the human presence on earth, profoundly changing humanity's relationship to its host planet and its ecosystems. The cities of the 21st century are where human destiny will be played out, and where the future of the biosphere will be determined.

It is unlikely that the planet will be able to accommodate an urbanised humanity that continues to draw upon resources from ever more distant hinterlands, or which uses the biosphere, the oceans and the atmosphere as a sink for its wastes at the current accelerating rates. The challenge faced is whether cities can transform themselves into self-regulating, sustainable systems - not only in their internal functioning, but also in their relationships to the outside world.

Is it possible to make a world of cities viable in the long term – socially, economically, as well as environmentally? The answer to this question is critical to the future well-being of the planet, as well as of humanity. There can be no sustainable world without sustainable cities.

5.1 Cities and the environment

Many of today's cities function very differently from those we have inherited from history, and relationships with the environment are changing. Low transport costs, based on the ubiquitous use of fossil fuels and facilitated by substantial government subsidies for transport infrastructure, often make distances irrelevant – plugging cities into an increasingly global hinterland. The actual location of settlements is also becoming less important as global trade treaties come to determine the fate of national and local economies.

5.2 Urban sustainability

In a world increasingly dominated by cities, the international community is starting to address the issue of urban sustainability. The process began in Rio with Agenda 21 and continued at the 1996 UN City Summit in Istanbul. The 100-page Habitat Agenda, signed in Istanbul by 180 nations, states: "Human settlements shall be planned, developed and improved in a manner that takes full account of sustainable development principles and all their components, as set out in Agenda 21We need to respect the carrying capacity of ecosystems and preservation of opportunities for future generations Science and technology have a crucial role in shaping sustainable human settlements and sustaining the ecosystems they depend upon."

It is recognised that cities nowadays use too many natural resources and produce too much waste. The ecological footprints of cities are stamping out the habitat of many species. The city's impact stretches far beyond its physical boundaries. Moreover cities are confronted with an increasing number of people and, therefore, an increasing number of mouths to feed. Along with other initiatives and activities, urban agriculture therefore has an important role in contributing to the future sustainability of cities.

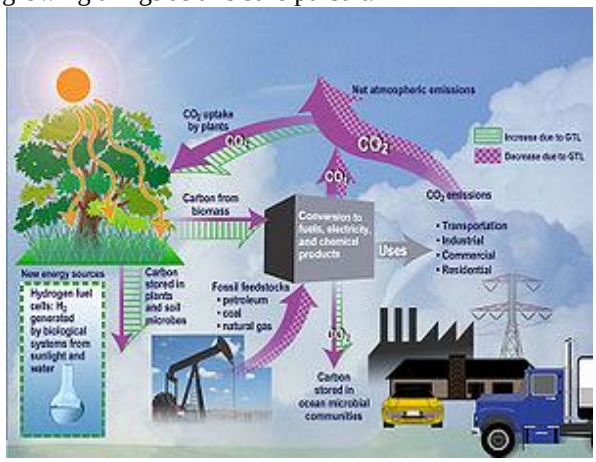
5.3 Urban agriculture

5.3.1 Farming in cities today

Despite their inherent density, cities do have enormous potential for food growing. Smit et al. (1995) reported that: The 1980 US census found that urban metropolitan areas produced 30% of the dollar value of US agricultural production. By 1990, this figure had increased to 40%. There are 80,000 community gardeners on municipal land in Berlin with a waiting list of 16,000. Singapore is fully self-reliant in meat and produces 25% of its vegetable needs.

Bamako, Mali, is self-sufficient in vegetables and produces half or more of the chickens it consumes. Dar-es-Salaam, one of the world's fastest growing large cities, now has 67% of families engaged in farming compared with 18% in 1967. Presently, 65% of Moscow families are involved in food production compared with 20% in 1970. These are remarkable figures given the neglect of agriculture in urban planning policy. Planners tend to think that urban food growing is a messy business, and have little understanding of peoples' need to grow food in cities.

But for hundreds of millions of urban people, it is a vital component of their livelihoods and during hard times it is an important survival strategy, and city dwellers are increasingly trying to persuade planners to give them space for growing crops. This is true not only in developing countries, but also increasingly in the developed countries, particularly in cities where unemployment is endemic. In addition, many people like to spend part of their time growing things as a leisure pursuit.



In times of crisis, like war or recession, growing food in cities has always been essential to urban people. Schrebergaerten were started In Germany after the First World War, when city people had the choice to go hungry or to grow some of their own food.

5.3.2 Farming in cities and ecology: constraints and opportunities

In this section, we concentrate on the major environmental constraints associated with urban agriculture and its potential role to help improve the ecological performance of cities. One of the major constraints is obvious: the lack of space in cities for growing food. However, there are several advantages and opportunities to improve the environment and ecology of cities. Urban farming can help to create an improved microclimate and to conserve soils, to minimize waste in cities and to improve nutrient recycling, and to improve water management, biodiversity, the O2 - CO2 balance, and the environmental awareness of city inhabitants.

Space for growing food

In the western world since the Second World War, few provisions have been made for space for urban food production. The economic boom of the last 40 years has led to the assumption that city people will buy food, not grow it themselves. But at a time when work sharing is widely seen as essential for assuring a dignified existence for large numbers of people, additional opportunities for people to create livelihoods for themselves are essential.

Urban food growing is certainly one of the options. In cities that have experienced industrial decline, provision of derelict land for food growing is certainly a planning policy option. In American cities such as Detroit and New York, thousands of acres of land have been given over to unemployed workers for food growing. In Britain, city-farm projects have been established on areas of derelict land in some 20 cities.

In Germany, land in former coal-mining areas in cities such as Essen is being set aside for urban agriculture projects. There has been concern about the suitability of contaminated urban land for food growing, and it has been suggested that it is prudent not to grow crops less than ten metres from busy roads, particularly in countries where lead fuel is still in use. Generally, land polluted by heavy metals, such as cadmium and lead, requires special precautions. However, research in the USA and the UK has shown that these problems can be tackled in a number of ways: firstly, maintaining a high pH with additions of plenty of lime, and high organic matter levels through additions of compost or manure helps to immobilise heavy metals in the soil.

The Chinese are famous for their highly intensive urban cropping systems and, to this day, many of their large cities are largely self-sufficient in food produced on adjacent land areas administered by them. Beijing, now a city of over 10 million people, still administers its own adjacent farmland extending to an area the size of Belgium. In Shanghai, only 20% of the land administered by the city authorities is actually built on; 80% of the land, mainly in the urban perimeter, is used for crop growing, making the city region self-sufficient in vegetables and producing much of the rice, pork, chicken, duck and carp.

With their unique system of governance, Chinese cities administer vast adjacent areas of farmland and aim to be self-sufficient in food from this. Is this model of urban-rural linkages relevant to cities elsewhere in the world? In many cities there are areas which are less suitable for housing, and often offer excellent positions to produce food. Dar es Salaam in Tanzania provides a good example. The city has a spacious urban pattern and many areas near the rivers are not suitable for housing, because of regular flooding in the rainy season. These areas are well suited, and well used, for growing food.

Microclimate improvement

If appropriately planned and integrated into urban design, urban agriculture can contribute to the comfort of citizens. Green spaces around apartment blocks and houses, as well as neglected spaces in the city, help to improve the physical climate because vegetation can: help increase humidity, lower

temperatures and introduce more pleasant odours to the city; capture dust and gases from polluted air through deposition and capture by the foliage of plants and trees, and soils; and help break wind and intercept solar radiation, creating shadow and protected places.

Conservation of urban soils

Creating fertile soil is not usually a problem in cities because, by definition, they are places where fertility accumulates in great abundance. There is little need to use chemical fertilisers, although in some cities like London, urban agriculture can also be highly chemical intensive. A great variety of materials are available that can be composted and incorporated into garden soil – crop residues, kitchen wastes, old newspapers, the leaves of city trees and even human faeces.

The Chinese have long used a system of meticulously recycling and composting human and animal wastes, thus maintaining the fertility of their farmland by the most appropriate means. Whilst this system has been weakened in recent years, the Chinese are reluctant to abandon it altogether. Instead, they are exploring ways of upgrading sewage-recycling technology. Urban farmers have always utilised the great variety of fertile materials they have found in cities.

The best-known example is the vegetable growers in Paris who, until the end of the First World War, were famous for the abundance of their crops. They used to heap up to 0.3 m of horse manure on top of their vegetable beds every year, and used many different methods to control soil and air temperature.

They were able to grow between three and six crops of fruit and vegetables a year, making a good living on no more than 0.75 ha. In Paris of a century ago, 100,000 tonnes of high-value out-of-season crops were grown on 1400 ha, around one-sixth of the surface area of the city, using about one million tonnes of horse manure.

The crops were so abundant that they were even exported as far away as London. However, the introduction of motor-powered transport ended the supply of horse manure to the marais. In addition, more and more crops were brought in by train from the south of France. Provided that organic amendments are not contaminated, the use of abundant fertile materials and the growing of trees, crops and other greenery in cities will help keep urban soils fertile.

Natural soils are rich in life; there are numerous "recycling" systems at work in the top layers of the earth. Through urban agriculture, soil systems can be kept in balance. Examples of good practice can be found in Accra (Ghana) and Dakar (Senegal) where urban agricultural activities have shown a positive effect on stabilising the soil against water and wind erosion "Filao" plantation both hinders quick movement of sand through wind erosion and produces compost.

Waste and nutrient recycling

A key factor in urban ecology is the process of waste management and nutrient recycling. The metabolism of many traditional cities was circular, whereas that of most "modern" cities is linear: Resources are funnelled through the urban system without much concern about their origin and about the destination of wastes; inputs and outputs are treated as largely unrelated. Contemporary urban sewage systems are a case in point. They have the function of separating people from their wastes.

Sewage, treated or not treated, is usually discharged into rivers and coastal waters downstream from population centres, and its inherent fertility is lost to the world's farmland. Today, coastal waters everywhere are polluted both by sewage and by toxic effluents, as well as the contaminated runoff arising from use of fertilisers and pesticides applied to farmland growing food for the cities. Justus Liebig, a pioneer of modern chemistry in the 19th century, took a close interest in the history of urban food production and studied the environmental history of ancient Rome. For two centuries, much of Rome's grain supply was imported from North Africa, with a dramatic impact on the area's soil fertility.

The minerals contained in the grain – nitrogen, potash, phosphate, magnesium and calcium – were removed from the farmland and, via Rome's Cloaca Maxima, flushed into the Mediterranean, never to be returned to the land of North Africa. Despite having studied Rome's mistakes, most modern cities have repeated this pattern. In a letter to Sir Robert Peel, Prime Minister of the UK in 1840, Justus Liebig wrote: The cause of the exhaustion of the soil is sought in the customs and habits of the towns people, i.e., in the construction of water closets, which do not admit of a collection and preservation of the liquid and solid excrement.

5.4 Implications for urban policies and programmes

Traditionally, agricultural policies – whether oriented towards export production or local food production – have focused on maximising short-term profits rather than on long-term environmental management of local resources. Many urban managers and planners think of their city more in terms of housing, transport, commercial services and industry, rather than in terms of agriculture, which generates relatively low yields (Girardet 1992).

Generally, urban agriculture suffers from a combination of political restraints, that include (Van den Berg & De Zeeuw 1998): restrictive urban policy, laws and regulations (due to the mainly illegal

status of urban agriculture); uncertainty about property rights of land; lack of supportive services; unfeasible implementation of environmental technologies; and lack of organisation and representation of urban farmers.

The question is how development workers can support farmers in urban agriculture to protect or improve city ecology. Reinforcing farmers' capacity to develop and manage technology is of vital importance for the actual creation of environmentally-friendly ways of farming. There may be many steps required to reach that objective. A fundamental step in order to set the right conditions for city farming is to develop an urban agriculture plan and policy, recognising the interrelated nature of food, agriculture, health and ecology by forming a municipal working group that can deal with food issues from a total system perspective.

This could involve, among others: the health department, planning department, engineering, local economic development, water management and waste management. Following this, the urban agriculture plan should be incorporated into the landuse planning system. This implies that urban agricultural activities are recognised as major components of green zoning systems, for which a dedicated policy must be formulated, developed and implemented.

It is hard to regulate good practice, but labelling food to show how and where it is produced at least allows people to make informed food choices and to support sustainable approaches to production. Programmes such as the provincial "BUY BC" campaign in British Columbia, Canada, encourage people to purchase locally-grown food and other products. In British Columbia, there are strict guidelines for production, operation and farm management. Only those farms certified by an approved certification agency (in this region, British Columbia Association of Regenerative Agriculture, BCARA) are allowed to market and label their products as "organic" and attach the "BC Certified Organic" label.

As urban agriculture becomes more sophisticated, lending institutions will become aware of the financial possibilities involved. However, this is not yet generally recognised. Difficulties in obtaining sufficient capital and credit to start an urban food-production business hamper all sorts of initiatives. However, government bodies can offer favourable conditions to city farmers in less developed countries regarding urban agriculture, through for instance the following policy interventions (Barrs 1997): start-up grants/loans for small urban agricultural businesses; subsidisation of inputs such as municipal compost for a limited time to stimulate projects. If the potential of urban agriculture is going to be realised, much more has to be done than what is happening in many cities at present.

As a principal issue, it is proposed that urban farmers and consumers should receive more information and training on environmental risks (e.g. wastewater treatment and composting techniques) because more urban people will be engaged in growing food and more cities are beginning to try to use their agricultural waste to curb pollution and optimise freshwater usage (Reijntjes et al. 1992). There is a need to stimulate dissemination of good practices in urban agriculture to farmers and consumers.

In this respect, Barrs (1997) envisions an important role of policy-makers. They are, or should be, able to support farmers and consumers to build up knowledge about the opportunities of urban agriculture to protect city ecology. The key issue is how opportunities of urban agriculture can be translated into sustainable initiatives. National governments need to reduce the environmental risks of (urban) agriculture by adopting pesticide reduction targets, and promoting biological pesticides and fertilisers.

Finally, governments must also provide funds for information and grant-aid schemes to assist conversion to less chemically-intensive systems. At first sight, small-scale farmers in developing countries need appropriate strategies and production techniques that lead to higher yields. However, many farmers recognise that they cannot continue to increase yields, because more resource-intensive production methods inevitably lead to the depletion of available natural resources. To support farmers in making their production systems more productive and sustainable, development workers – in their turn – need suitable instruments for co-operation with these farmers.

What is needed is a policy for the city that focuses on encouraging the productivity of open urban space, integrating the various components necessary to make urban agriculture healthy and sustainable, and combating bad practices where necessary. Urban agriculture can have a positive effect on the availability of healthy, nutritionally balanced and culturally appropriate food, in particular for low-income groups of the urban population.

Since food is a basic requirement for a healthy life, this should be seen as an absolute priority in urban policies. Local food production may never replace the need of a decent level of income, but it can substantially contribute to adequate and culturally appropriate sources of human nutrition.

VI. CONCLUSION

Good Practice Urban Agriculture has to be linked with food system planning and land use pattern of a city and surroundings. As urban planners we should

realize that every activity on earth has some spatial implications. Hence, good practice urban agriculture, food system and land use patterns are closely linked and are to be brought under the purview of regulatory framework. In consonance with this realization, the following actions are suggested:

- Identification of land for urban development with agriculture;
- Prohibition of filling of major water bodies and marshy lands;
- Specific land uses for waste land including useful tree plantation and city farming;
- Agricultural land within metropolitan area is to be protected under the provisions of Town and Country Planning Acts;
- Underutilized areas on long banks of rivers or canals can be developed for urban-agro forestry including parks and garden at places;
- Planting fruit trees in the periphery of existing city parks, which can generate employment and municipal income for maintaining of parks and other such areas;
- New townships and housing estates should incorporate city farming,
- horticulture, etc; from the planning stage itself;
- Derelict land, abandoned brick fields and other areas near industries should have an ecological restoration program making it part of the planning condition while granting permission;
- Revitalization of canals will encourage aquaculture and fish production;
- Garbage dumping sites and sewage fed fisheries in east Kolkata are already producing substantial vegetables and fish through pisciculture, the concept could be extended to other areas; and
- In rural fringes and non-municipal urban areas of the metropolitan areas, there is a potential for poultry, diaries and livestock development, which could be linked with both rural and urban areas in the surrounding region

There must be a long term regional perspective to make cities sustainable through urban agriculture. The rivers, canals, agricultural land and forests in metropolitan areas are connected with those in the surrounding region. Urban agriculture and associated developments can be a link between urban and rural areas. In the present context 'Good Practice Urban Agriculture' should be incorporated as a type of new land use amongst all other land uses.

All in all, prospects for urban farming are good in many parts of the world. However, it is crucial that planners start recognising the importance of urban farming in the rich mix of activities that characterise modern cities. As the world urbanises, greater local food self-reliance, using nutrients accumulating in our cities, must be regarded as an important aspect of sustainable urban development. Together with initiatives on energy efficiency, high resource productivity and policies for containing sprawl, urban agriculture has an important contribution to make towards shaping the cities of the future.

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