

**POLICY
PAPER**

67

Urban and Peri-Urban Agriculture



NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI
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Urban and Peri-Urban Agriculture



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Preface

Global population will reach around nine billion by the end of 2050, of which, about 70 per cent shall be urbanized. In India, by 2050, nearly 900 million people will be living in urban areas. With the expanding urban fringes, more and more rural areas are becoming peri-urban. Given the high population pressure, rising food prices and the socio-economic and environmental stresses, especially in the peri-urban areas, meeting the food, nutrition, health and environmental security in the urban and peri-urban areas will be a serious challenge. The fast changing dietary habits and increasing income in urban and peri-urban areas will exert still greater demand for fresh fruits, vegetables, flowers, fish, milk and eggs. In this context, an eco-friendly, productive and remunerative **Urban and Peri-urban Agriculture (UPA)** shall become increasingly important.

Urban and peri-urban natural resources should thus be viewed as an integral component of the national agricultural resource system to meet the changing food and livelihood demands and to balance the competitive uses of the resources (water, land, biodiversity, wastes). Judicious management of the resources and of the urban wastes through best practices will help develop climate resilient food and sustainable eco-systems and create greater recreational and aesthetic values of green spaces in the cities and their peripheries. But, generally the complexity of interfaces of urban – peri-urban – rural areas is seldom internalized in the national planning and policy formulation. Neither urban planning nor rural planning duly address the problems and prospects of huge and vital peri-urban areas. And often agriculture is the worst sufferer. For instance, with the growing intensity of peri-urban dairy production systems, the intensifying problem of zoonotic diseases is a growing threat but is largely neglected by policy makers and planners.

In order to critically examine the current status of UPA towards meeting the food demand, utilising wastes, and servicing the environment, the National Academy of Agricultural Sciences organised a Brainstorming Session on Urban and Peri-urban Agriculture in context of food, nutritional and eco-environmental security on 14th April, 2012. The main stakeholders – scientists, representatives of public and private sectors and NGOs had participated. The Session had concluded that strategic promotion of UPA, alongwith other measures, will help overcome the problems of nutritional insecurity, pollution, and poor utilisation of wastes. And, as UPA is a complex and dynamic system, it should be continuously

enriched scientifically coupled with enabling policy and investment in a socially inclusive manner.

On behalf of the Academy, I express my gratitude to Dr. H.P. Singh, Ex-DDG (Horticulture), ICAR, for convening the Brainstorming Session. The consultation had continued beyond the Session and grateful thanks are due to the experts who had helped in updating and shaping this Policy Paper.



(R.B. Singh)

President, NAAS

Urban and Peri-Urban Agriculture

1.0 INTRODUCTION

Indian agriculture has made rapid strides in the last few decades to achieve self sufficiency in food, attaining record productions of foodgrains, milk, fruits and vegetables during the past three years. Yet, the incidences of hunger and poverty in the country are stubbornly high. About one-fifth of our population, about 230 million, is hungry and undernourished, accounting for about one-fourth of the world's food insecure people. The situation is further aggravated with the fast changing climate, the shrinking land and water resources, and the rising food prices particularly in the cities.

By 2050, India with about 1.7 billion people will be the most populous country in the world, accounting for about 17 percent of the global population but only 2 percent of land and less than 4 percent of water. And about 60 percent of the population, nearly 1 billion, will be urbanized and a good part of it will be rural migrants. The rapid urbanization will further accelerate the demand for higher quantity of quality food, especially of high value foods such as fruits, vegetables, milk, meat and eggs, from the shrinking land, water, biodiversity resources. Moreover, the crowding cities and their peripheries will be facing increased pollution and warming.

The enactment of the recent Right to Food Bill seeks to ensure adequate food and nutrition to all people for all time through home-grown food. As per the current reckoning, 65 million tonnes of foodgrains will be annually distributed through the Public Distribution System (PDS). In addition, a sizeable buffer stock of about 30 million tonnes would need to be maintained. Generally most of the PDS and buffer stocking takes place in and around cities and often bulk of these are transported from far off places at considerable economic and environmental costs.

In face of the above challenges, urban and peri-urban agriculture (UPA) which refers to food production systems and value chains within cities and their surroundings, must become an integral part of the national agricultural production and distribution systems. UPA should be seen as a significant approach towards a vibrant “food environment” and resilient food system. An eco-friendly and efficient UPA will not only be overwhelming, contributing to the efforts of adequately feeding the cities, but will also create employment and generate income particularly for the poor, besides greening the cities, the environment and the human health.

UPA expands the economic base of the urban areas through production, processing, packaging, and marketing of consumable products, which results in an increase in entrepreneurial activities and the creation of job opportunities. It will lead to reduction of food cost, better health and nutrition, increased income and employment especially of women, food security within the household and community social life. In fact, studies have shown that UPA practitioners are more food secure and benefit from a more diverse diet. The UPA system helps general increase in the availability of healthy foods – fresh fruits, vegetables, milk, dairy products, eggs and meat.

Optimum utilization of urban and peri-urban resources requires land use planning which views agriculture as an integral component of the urban natural resources and balances the competitive and synergistic interactions among its users. With urbanisation and change in dietary habits and needs and appreciation for harmony with nature, there has been added interest in UPA, not only to utilise the space but also for social, economic and environmental reasons. The entire “food environment” of UPA will thus address the entire value chain, trade and market access, food safety, and ecosystem health. Yet, national policy and strategy options do not adequately reflect the role and importance of UPA in national plan documents and there is little reflection of allocation of specific technical and financial resources for the purpose.

With the above backdrop, a Brainstorming Session was organised by the National Academy of Agricultural Sciences (NAAS) on 14th April 2012 at the NASC Complex, which deliberated on various issues with the following objectives:

- ◆ To understand the current status of UPA and analyse its likely role in improving food, nutrition, livelihood and environmental security in urban and peri-urban areas.
- ◆ To suggest a policy and strategy framework to promote UPA towards greening and feeding the fast expanding Indian cities and peri-urban areas.

2.0 PRESENT STATUS OF URBAN AND PERI-URBAN AGRICULTURE

The Govt. of India has recently been giving greater attention to UPA. Among other things, towards the end of the 11th Five Year Plan, it launched a peri-urban vegetable production (DAC, 2011) scheme which is making good progress (Box 1). The Working Groups on horticulture constituted by the Planning Commission for XII Five Year Plan (2012-2017), under UPA initiatives had advocated attention not only for growing fruits and vegetables, but also for environmental services and

Box 1. Vegetable Initiative in Indian Urban Clusters

In 2011-2012, the Government of India launched a scheme entitled Vegetable Initiative in Urban Clusters for implementation of a vegetable initiative to set in motion a virtuous cycle of production and income for the farmers and assured supply for consumers. To begin with, this program has been launched near major urban centers. Main objectives of the Scheme are:

- (a) Address all concerns related to both the demand and supply side of the vegetable sector in selected cities.
- (b) Enhance vegetable production and productivity, improve nutritional security and income support to vegetable farmers.
- (c) Encourage establishment of an efficient supply chain thereby leading to employment opportunities and incomes for intermediate service providers, and safe, good quality, fresh as well as processed agri produce at competitive price for urban consumers.
- (d) Promote, develop and disseminate technologies for enhancing production and productivity of vegetables in peri-urban areas of major cities.
- (e) Assist states in addressing the entire value chain, right from the stage of pre-production to the consumers table through appropriate interventions.
- (f) Create employment generation opportunities for skilled and unskilled persons, especially, unemployed youth.

To achieve the above objectives, the Scheme will adopt the following strategies:

- ◆ Baseline survey to assess the extant vegetable supply chain to city selected; identify bottlenecks and vegetable growing clusters existing as well as potential.
- ◆ Organize vegetable growers into Farmers Association/Groups.
- ◆ Coordinate with public sector agencies/Municipal Corporations for making land available for cultivation, and for Farmers Markets to ensure direct/transparent transaction of produce.
- ◆ Identify/select Aggregators and enable tie-up with Farmers Associations/Groups.
- ◆ Coordinate with Research Institutions /Agricultural Universities to provide improved varieties of vegetable seeds/seedlings and to introduce innovative technologies as required.
- ◆ Address issues in the credit supply chain.
- ◆ Measures for production and productivity enhancement by adopting improved cultivars, production technologies using precision farming techniques, protected cultivation, micro irrigation etc.
- ◆ Primary processing, sorting, grading, washing, packaging and value additional clusters.
- ◆ Logistics from farm to market including post-harvest management, storage and transport infrastructure. Aggregators for suitable tie ups in the supply-chain.
- ◆ Establishment of Farmers Markets including electronic platform for transparent transactions.
- ◆ Support to urban local bodies to promote controlled atmosphere (CA), static/mobile kiosks etc.
- ◆ Support to institutions/farmers associations/cooperatives/private sector for seed/seedling production, vegetable cultivation, INM/IPM/organic farming, GAP, capacity building etc.

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health care. A National Dialogue organised jointly by the National Horticulture Board and the Indian Institute of Horticultural Research (IIHR) also discussed urban and peri-urban horticulture and advocated for full land utilisation, interior and exterior landscaping, vertical gardens, and terrace cultivation of fruits and vegetables and mushroom culture (Singh and Malhotra, 2013).

Urban agriculture is generally practiced on small to medium size holdings within cities for growing annual and tree crops, raising small livestock and fish for home consumption or sale. The peri-urban agriculture is aimed to meet part of food demand of urban population by efficient utilisation of land. Globally, urban and peri-urban agriculture is gaining attention from governments, and many international organisations like the United Nations Conference on Environment and Development (UNCED), United Nations Center for Human Settlements (UNCHS), the FAO and the Consultative Group on International Agricultural Research (CGIAR) – Urban Harvest have been supporting the cause.

FAO Committee on Agriculture had mandated FAO to consider UPA as an integral part of agricultural system and had recognized its important role in feeding and greening the cities with due attention to health and safety regulations (Veenhuizen and Danso, 2007; FAO, 2009). As early as 1999, the COAG had requested FAO to develop an integrated approach to assist the member countries in dealing with UPA issues at policy and technical level. Since 1999, FAO has been implementing a global project entitled “Growing Greener Cities”, which underpins (i) ensuring political and institutional commitment, (ii) securing land and water for UPA, (iii) ensuring product quality while protecting the environment, (iv) ensuring participation of all stakeholders, and (v) securing market for the produce. Currently FAO is supporting several Asian countries, such as Cambodia, Mongolia and Philippines, in setting up UPA programmes.

Notwithstanding the advantages of UPA for improving livelihood and making available fresh fruits, vegetables, milk and eggs in urban areas, there are a number of problems related to its promotion, notably, environmental and health related issues, including solid waste management (Ghosh and Ganguly, 2008). For instance, in Mumbai about 20% of the leafy vegetables come from fields adjacent to railway tracks grown using domestic sewage which is contaminated with fecal matter and nitrates for irrigation. Urban and peri-urban land use patterns are changing dramatically due to the pressure of population and the role of urban fringes in supplying food, fuel, forage and industrial forest products has declined considerably. The environmental crisis of the urban region has become acute and interlinked in complex ways to urban energy, land use and the political economy. On the other hand, cities will continue to need increasing resources such as food, fibre, clean water, and recreational

space. Therefore, UPA should be positioned to maximize the positive outputs and outcomes and minimizing the negative effects.

3.0 DIMENSIONS OF URBAN AND PERI-URBAN AGRICULTURE

3.1 Urban and peri-urban horticulture

In cities, environmental benefits and synergies can be achieved when horticulture is planned as a part of the urban landscape including safe recycling of solid waste and waste water (Sharholly *et al.*, 2008). Further, trees and other ornamental plants are crucial for sequestration of carbon from atmosphere and play an important role in reducing carbon footprint. Moreover, flowering /foliage plants in the garden not only add beauty but also help to improve the ecosystem.

India has responded well to the needs for effective urban and peri-urban horticulture (UPH) with emphasis on green space, green building, development of parks and gardens, and promotion of peri-urban vegetables production, but the integration appears to be poor. The design of UPA must include a large component UPH aimed at improving access to food and enhancing the livelihoods of people living in and around cities besides nurturing the environment. UPH is now a necessity rather than a luxury. The government's initiative of peri-urban vegetables production alone is not enough for the huge challenge to be met. This necessitates holistic approach having vertical and horizontal integration of the efforts of all the stakeholders, which should concurrently link all components of UPH.

Among the various gardening options, terrace gardening, a raised ground space around a dwelling house or on the sides of a hill, forms a link between the house and the rest of the outdoor living space and must, therefore, be designed in harmony with the plan of the house. Roof garden is one of popular alternatives in urban and peri-urban areas, because of the lack of available space on the grounds of a house. Particularly, in the big cities and towns, the only space left for garden enthusiasts is the roof of the house and the balcony. To ensure the success of roof gardening, technical and developmental support is inevitable. Currently, a green space of 20 M² park as minimum standard has been suggested. No dwelling should be more than 500 meters away from a green area of at least 6,000 m². Green spaces in urban systems should essentially be developed as networks. There is no definite standard for green space in Indian cities based on scientific data. Therefore, the standard for green space and tree cover in the cities needs to be formulated for meeting the challenges of climate change which is expected to put increasing stress on urban and peri-urban areas. Green cities have become an option to mitigate the impact and adapt to climate change.

3.2 Urban and peri-urban aquaculture

The significance of aqua farming in and around Kolkata and other metro cities suggests potential of fisheries in waste water. Aquaculture in waste water is regarded as an answer for reversing declining supplies from capture fisheries, and the activity has notable potential for new livelihood opportunities, providing a mechanism for availability of low priced fishes, enhanced nutritional security and employment for poor communities by servicing urban markets. It also provides an important opportunity to recycle wastes generated by zero grazing and other agriculture practices increasingly common in the urban and peri-urban zones, contributing positively to tackle problem of urban waste disposal, and adding value to scarce water resources. In metro cities, catfish are mainly cultured in tanks of varying sizes ranging from 1-50 m³, which are linked to re-circulating systems of varying degrees of sophistication and in earthen ponds. Since catfish are air-breathing fish, they can be stocked at high densities.

3.3 Livestock in urban and peri-urban areas

Peri-urban and urban dairy production system is becoming an important supplier of milk products to urban centres, where the demand for milk and milk products is remarkably high. As a result of this, peri-urban and urban dairying is being intensified through the use of cross bred dairy cows, purchased and conserved feed and stall-feeding. The system is favoured due to the proximity of the production sites to centres of high fresh milk demand, easy access to agro-industrial by-products, veterinary services and supplies. Nonetheless, the existing dairy farming practices in peri-urban and urban areas of the country are largely characterized by modern dairy farming practices covering a range of intensive management practices and zero grazing. This production system also involves the use of exotic crossbred animals. The natural resources are thus under increased pressure due to the mushroom growth of peri-urban and urban dairying. The livelihoods of the poorest inhabitants of the rural-urban fringes of many cities are adversely affected by the associated problems of land and water degradation. Intensive livestock production in peri-urban areas, if not carried out properly, may pose new threats to public and environment with the consequences of emerging zoonotic diseases since intensified and poorly guarded human-animal interface establish common route of disease transmission.

Commercial poultry production is mostly located in outskirts of the urban areas. The impressive growth in the poultry meat industry is the result of technological breakthroughs in breeding, feeding and health, and sizeable investments from the

private sector. Private sector partnership in broiler production through contract farming systems and the vertical integration has played a major role in this spectacular growth, especially in Tamil Nadu, Andhra Pradesh, West Bengal, Maharastra, Karnataka and Punjab which are the major broiler producing states of the country. During the recent three decades there have been major changes in the structure, size and the number of broiler farms. Now a typical broiler farmer raises 10,000 to 50,000 for a weekly cycle against a few hundred broilers per cycle before. This sector employs around three million people. About 80 percent of the employment is generated directly by the farms, while the remaining 20 percent of the employment is contributed by the feed, pharmaceuticals, equipment and other services required by the poultry sector. Further, there may be a similar number of people who are employed in marketing and other channels of servicing the poultry sector.

4.0 ISSUES EMERGING IN UPA

The low availability and high cost of land in urban / peri urban areas may not encourage UPA. While horticultural crops appear environmentally compatible in densely populated urban set up, livestock farming has the constraint of transmission of many diseases. A global zoonoses map developed by ILRI shows India as a zoonotic hotspot. Likewise aquaculture may have potential but certain water born diseases will be of concern. Recent phenomenon of cross-species transmission of virus from animals to human is becoming a challenging problem as seen in the origin of HIV, cow mad disease, SARS virus, bird flu and swine flu. Many of these seem to have originated in countries where heavy density population of the live stocks exist very near or in thickly populated areas. Small fishpond impoundments increase the overall aggregate shoreline of ponds causing spread of malaria. Use of untreated animal or human wastes in aquaculture ponds to increase fish production also puts both human and animal at risk (Ruel *et al.*, 1998).

The use of waste water for irrigation without careful treatment and monitoring can result in the spread of diseases. Besides, cultivation on contaminated land also represents a health hazard for the consumers. Therefore, public health safety is essential to ensure that any of the activities of UPA does not cause unacceptable risks to public health and negate its potential economic and nutritional benefits. Utilization of available water and pre-treatment measures for waste water utilization for growing plants in the cities is an important aspect. Pesticide residue in the urban and peri-urban horticulture may become high, besides polluted water with heavy metals and cleaning vegetables in water contaminated with bacteria and viruses after harvesting is also an issue. Solid waste management projects in past have

failed because cost of management for preparation of compost is very high, and would need a re-look.

Science-based packages of technologies and authentic literature on UPA are not available. In particular, technologies for protected cultivation suiting to urban and peri-urban agriculture are needed.

5.0 RECOMMENDATIONS

5.1 Policy framework

- ◆ The Government must address environmental, social and economic benefits of UPA which shall allow UPA practitioners access to land, credit, agricultural inputs, and services, and formulate land and water use policy with context to UPA for effective implementation. Although a multi-stakeholder concern, municipalities must own the system and the local government should set-up Urban Agriculture Department to provide technical and input support. Government's role in and political support to UPA should be defined with built-in mechanism for outcome monitoring and feedback.
- ◆ Encourage contract/ cooperative farming in peri-urban areas with concept of technology-led development, which allows the farmers and investors to adopt contract farming. Establish producers companies and involve local self-government systems in the management of UPA value chain.
- ◆ UPA should drive the agenda of greener cities. Enforce laws for safe utilization of urban effluents, sewage sludge, waste water and urban compost in UPA. Urban development authorities must take appropriate measures for recycling and making safe water and other inputs available for use in urban and peri-urban horticulture.
- ◆ Ensure safe practices by farmers and consumers in producing different agricultural crops in urban areas. Critically document, establish and strengthen role of women in UPA and promote their leadership role in food production, processing and distribution.
- ◆ Decision support systems should be developed with periodic updation of data emanating from remote sensing for use of urban development authorities (UDA) and the Town & Country Planning Departments. They should establish a mechanism of quality control for both inputs and produce, and create marketing hubs for perishables and information for strengthening of marketing system needs.

- ◆ Map UPA typologies as a high priority and promote technology transfer based on climatic and agro-economic homologies. Collect high resolution Indian Remote Sensing (IRS) satellite data providing spatial information related to UPA in terms of open lands, transportation network, water bodies, trees outside the forest limits, terrain in terms of slope, elevation and different landscape features. Establish strong databases for robust planning for UPA, which must be based on rigorous socio-economic, ecosystem and environmental studies.

5.2 Research

- ◆ Inventorise, validate, refine and develop (if not available) UPA technologies on input supply (seeds, seedlings, manures, pesticides etc.), growing vegetables, ornamental plants and herbs in pots, shade, trays and hydroponics and on small scale protected cultivation structures for roof top gardening as well as on peri urban production of fruits, vegetables and flowers.
- ◆ Critically analyse new and existing technologies and UPA programmes regarding crop intensification and diversification opportunities including integrated livestock, poultry and aquaculture production systems with special reference to biosafety and to human and environmental health.
- ◆ Strengthen research on risk assessment and management and on development of safety standards for inputs like water, manures and pesticides as well as for products like fruits, vegetables, milk, meat, egg and fish; and also assess extent of heavy metal removal from city waste by vermi-composting and earthworm activity.
- ◆ Integrate biodiversity conservation with urban landscaping to make the urban areas biologically and aesthetically rich.

5.3 Development and coordination

- ◆ National Seed Corporation, State Seed Farms Corporation and National Horticulture Board should jointly strengthen production and cost-effective distribution of quality seeds and planting materials of selected varieties tolerant to diseases and insect pests, and suitable for UPH.
- ◆ Emphasise increased and quality production under protected cultivation for year round supply of fruits, vegetables and flowers and home scale production of horticultural crops; popularise nutrition gardening / terrace gardening / container gardening / turf gardening / roof gardening, with due emphasis on safe use of pesticides, sewage water etc.

- ◆ Build professional skills among urban youth for growing indoor plants, interior and exterior landscape, avenue plantation and landscape planning, turf grass management, mushroom production, post harvest management, including packaging storage and transport, and overall entrepreneurial and agribusiness skills.
- ◆ Strengthen value addition in the various value chains related to horticultural, livestock, poultry, fisheries and aquaculture products. Document success stories of UPA, organize pilot demonstrations and up- and out-scale the selected ones.
- ◆ UPA is truly a multi-stakeholder and multidisciplinary task. As several ministries, such as Ministries of Agriculture, Food, Rural Development, Urban Development, and Health will be involved varying in different aspects of UPA, a coordination cell may be established in the Ministry of Agriculture and Cooperation to synergistically converge the various programmes.

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Note: The designations and affiliations of the participants are as on the date of BSS.

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