HEATHY SOILS FOR HEALTHY CITIES

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Urban – Peri - Urban definition

- Urban agriculture is the practice of farming in the urban and peri-urban areas.
- Peri-Urban constitute areas that are situated between the periphery of metropolitan and regional centers and the rural environment, shifting from rural land uses (such as agricultural or animal production) to urban ones.
- **Urban Farming Systems features**
- Urban farming connotes varied range of food and non-food products that are cultivated , including rearing livestock, aquaculture and bee-keeping.
- Most striking feature of urban agriculture, which distinguishes it from rural agriculture, is that it gets integrated into urban economic and ecological system.
- Plays a key part in the world's food and nutritional security, creation of livelihoods, particularly for women, reduction of poverty, and the resilience and sustainability of cities

Common forms of Urban Agriculture Practiced

Controlled-environment Agriculture (CEA)

- CEA is a method of farming where environmental parameters like temperature, light, and humidity are precisely controlled to optimize crop growth

Aquaponics

- Nitrogen and carbon cycles, are utilized in closed-loop and is more sustainable
- Fish farming and plant culture are combined, fish waste serve as nutrients for plants

Hydroponics

- **P**ractice of cultivating crops in nutrient solutions, which serve as a soil less base
- Requires separate management of nutrients and the plant-growing medium

Vertical farming

- Primary goal of the vertical farming strategy is to expand the amount of agricultural land by vertically stacking numerous crop racks and building various layers on a single piece of land

Aeroponics

- Advanced method involves suspending plant roots in the air and spraying them with a nutrient-rich mist.
- Uses even less water than hydroponics and offers faster growth rates.

Container Farms

- It is the practice of growing plants in containers as opposed to in the ground.
- In container farming, weeds are eradicated and soil-borne illnesses are less of a problem.
- Moisture, temperature and sunlight can be easily managed.

Rooftop Plant Production

- The practice of raising crops on building roofs is known as "rooftop farming." Crops that require more vertical space and more powerful lighting can be grown

Backyard gardens

- It is a typical practice to plant and grow fresh fruits and vegetables in any backyard space that is available.

Greenhouse and Poly house farming

- These structures allow farmers to create microclimates that protect crops from harsh weather and pests.

Small scale animal husbandry

- Cities that let citizens to raise a certain number of chickens for meat and eggs, as well as cows and buffaloes for milk

Mushroom cultivation

- Fungus mushroom can produce valuable commodities suited for human use while growing on organic waste.
- It is a very attractive source of proteins, vitamins, minerals, folic acid, and iron and has gained popularity in recent years.

Advantages of Urban Farming

Nutritious and quality food

- Urban farming delivers fresh, high-quality product right to customers' doorsteps
- Little time is lost throughout the processes of shipping, storage, packing, and processing.

Good physical health

- Urban gardens' vegetables are less exposed to pesticides, and heavy metal contaminants and provides quality fruits and vegetables.

Protection to environment

- Excellent strategy to protect the natural world in the face of climate change because urban areas are so resilient.

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- Beneficial environmental effects of urban farming include a decrease in plastic pollution due to reuse and recycle of waste plastic and less of air and water pollution.

Efficient utilization of land and resources

- Utilization of vacant land in metropolitan areas helps to motivate underprivileged farmers, who would then be able to support themselves.
- Urban biodegradable waste can be fully utilized as a source of manure by composting..

Economic benefits

- Poverty-stricken women and other marginalized groups can find livelihood support through urban agriculture.
- Eliminates need for long-distance shipping, storage, and processing, ensuring that all production profits go directly to the grower and ensure quality food at premium cost.

Soil Health Challenges

Contamination risk

- Soils in cities are highly vulnerable to contamination from industrial waste, municipal waste, vehicle exhaust, and runoff, posing health risks to consumers.

Water scarcity

- Many cities face water shortages, forcing urban farmers to rely on unreliable water sources.
- Lead to the overuse of groundwater or the use of contaminated water for irrigation

Strategies for improving urban soil health

- Use of organic amendments:
- Community level composting, and green manures can dramatically improve soil health and utilize waste collected from localities which serve as source of nutrients
- Soil testing and remediation
- Regular testing of urban soils is crucial for identifying nutrient deficiencies and toxicities especially micro nutrients and heavy metals.
- Phyto remediation strategies, adding fresh soil and organic materials, can reclaim and turn contaminated sites for safer food production.
- Wastewater treatment and increasing water use efficiency
- Use of new technologies, natural filtration systems, process to convert waste water into reusable resources.
- Water management techniques like micro-irrigation systems and rainwater harvesting conserve water and improve water use efficiency.

Innovations and Smart Technology

Internet of Things (IoT)

- IoT sensors monitor critical environmental factors like soil moisture, temperature, and nutrient levels in real-time.
- This data-driven approach automates irrigation and helps optimize resource use.
- Bengaluru-based **BitMantis Innovations** created the GreenSAGE IoT solution for hydroponics, allowing remote monitoring for both individual and commercial growers.

Artificial Intelligence (AI) and Machine Learning (ML)

- AI algorithms analyze data from sensors and cameras to predict yields, early detection of pests and diseases and optimize growth conditions.
- Startups like **Urban Kisaan** and **Cropin** use AI to boost productivity to manage operations

Mobile co-farming platforms

- Apps like **Farmizen** in Bengaluru, connect urban residents with suburban plots carrying out organic farming enabling easy procurement of Oganic produce

Government Support and Scaling Initiatives

Subsidies and funding

- Commercial Horticulture program by National Horticulture Board offer significant subsidies for setting up projects like hydroponics. and other Urban forms of agriculture
- Low-interest loans are also available to agri-tech ventures.

Awareness and skill development

- Initiatives in states like Kerala and Tamil Nadu promote urban farming through workshops, subsidized kits, and educational programs in schools and institutions.

Policy framework

- Initiatives like the National Urban Livelihoods Mission (NULM) recognize and promote urban agriculture as a tool for sustainable employment and food security.

References

- Janzen et al (2011) Critical issues facing humanity and how soil scientists can address them; H.H. Janzen, P.E. Fixen, A.J. Franzluebbers, J. Hattey, R.C. Izaurralde,
- Q.M. Ketterings, D.A. Lobb, and W.H. Schlesinger (2011), Soil Science Society of America Journal (75:1–8)
- Vaishnavi. C and Prashanth. B, (2023), Cultivating the future: Exploring the prospects of Urban Farming in India in Just Agriculture
- Kushal Sachan et al (2024). Soil Health Check and Strategies for Monitoring and Improvement
- Anshul Saxena, Suneel Kumar, Abhishekh Mishra, Archana Verma, D.D Tiwari, Anil Kumar Urban. *Journal of Diversity Studies.* **https://doi.org/10.51470/JOD.2024.03.01.20**

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