Engaging the Public in Improved Water Management through Community-based Urban Agriculture

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Resilient Food Systems

- Urban Agriculture
  - Source of labor, resources, and demand

- Urban/rural Interface
  - Waste and resource exchanges (e.g., phosphorus recovery)

- Rural Restoration
  - Solar-fed, agroforestry farming systems
  - Staple annual crops
Why Invest in Urban Agriculture?

The public sector will not fully meet watershed goals without full engagement of the people.

To engage the people, we need to implement strategies that directly serve their personal needs.

HOW?

Urban Agriculture

- A solution for indirectly but efficiently achieving a broad set of goals
- Where top-down meets grassroots
Urban Agriculture

“…production of food within urban and peri-urban perimeter, using intensive methods, paying attention to the human-crop-animal-environment relationships, and taking advantage of urban infrastructure with its stable labor force.” – Sinan Koont

- **Scales:**
  - home plots – community gardens – distribution/processing facilities – urban farms – urban/rural connection

- **Models:**
  - private
  - cooperative,
  - community-based
  - institutional, public/private partnerships
National Trends

- **Urbanization (83% of U.S. population)**
  - Contributes large volumes of pollutants, waste, and runoff

- **Rising Food Costs/Food Security**
  - Average food mile in U.S. = 1300-1500
  - Resource uncertainty, climate change impacts
  - 50-75% increase in food production required by 2030

- **Growing poverty and economic inequalities**
  - SNAP enrollment increased from 4.5% to 14.5% since 2000

- **Food Activism Increasing**
Evidence of Biophilia
Urban Agriculture for Resilient Cities

- Community revitalization
- Diversity (spatial and biological)
- Closes loop of energy and nutrients
- Adapted to local climates
- Reduce carbon footprint
- Inspire innovation
The Water Connection: RAINWATER

- Most limiting factor in plant growth
- Oxygenated
- Atmospheric deposition = free fertilizer
  - 70-90% of TN in urban runoff (Wu et al., 1998)
  - 15-30% of TP (Bannerman et al., 1993)
  - Minerals and microorganisms
  - Sulfur (essential to amino acid formation)
- Desirable pH
- Relatively inexpensive
Problem to Solution

- Match quality of runoff with intended end use

**Runoff Quality**

- Better
  - Rooftops
    - Managed pervious, on-lot impervious

- Worse
  - Residential Roadways, Parking areas
    - Bioretention
    - Stormwater
    - Wetlands
    - Green Roofs
    - Wet ponds

**LID Features**

- Agro-swales
- Raingardens
- Landscape storage

**Engineered BMPs**

- Cisterns
- Green Roofs

**Active Irrigation**

- Annual Vegetables
- Aqua/Hydroponics
- Mushrooms

**Passive Irrigation**

- Edible Perennials

- Native Beneficial Plants
County-level: Cuba

- Country-wide urban farming movement
- Education and research in agroecological systems
- Supplies 90% of Havana’s vegetable consumption
Ultra urban: NYC Rooftop Farms

- Brooklyn Navy Yard
- Chicago Botanical Garden
- Eagle St. Rooftop Farm
Rust Belt Cities

- Vacant lot conversions
- Fight urban “food deserts”
- Ex. Detroit – 15 acres of idle land in food production

Source: The Anthropik Network
Source: CCC Food Policy Coalition
Neighborhood Example

- **Village Homes** (225-home, 70-acre subdivision, Davis, CA)
  - Early LID pioneer (started in 1975)
  - Edible landscaping
    - 23 acres in food production
    - Incorporated into stormwater management systems
Goals:
- Model large-scale stormwater treatment and reuse for agriculture
- Quantify hydrologic, energy, and economic benefits

Methods:
- Runoff source: 740 acre area (40% impervious)
- Runoff sink: 128 acre residential development (49 acre farm)
- 41-year water balance simulation

Results:
- 81% of farm irrigation offset
- 60 ton/yr carbon reduction
- 13.9 year payback period (food revenue excluded!)
- 560 tons/yr fruit and vegetable production
Multiple Barriers to Broader Use

- **Land access** (cost, zoning, competition)
- **Legal/regulatory issues**
  - Water rights
  - Rigid permitting pathways
  - Land use and urban development ordinances
- **Safety and compliance**
  - Soil contamination (e.g., Brownfields)
  - Food safety
- **Gaps in education, experience, and business training**
  - “Status-quo” within local governments and public utilities
  - Start-up and operating costs
Discussion of R & D Needs/Opportunities

- **TBL Metrics for Improved Decision Making**
  - Environmental: ecological diversity, hydrologic, material balance/load reduction
  - Economic: local job creation and benefits of new entrepreneurial models
  - Social: improved health outcomes, reduced crime

- **Urban Agriculture Planning & Implementation Toolbox**
  - Codes & ordinances
  - Economic models and business training
  - Design standards and guidance
  - Site planning tools (e.g., for prioritizing sites)
  - Operating guidance
  - Public education and outreach

- **Pilot Projects**
  - To generate data and build local capacity
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