

SUSTAINABLE BENEFITS OF URBAN FARMING AS A POTENTIAL BROWNFIELDS REMEDY

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OVERVIEW

○ Sustainable Benefits of Urban Farming

- What is urban agriculture?
 - Why urban agriculture?
 - Policy issues and sustainability
- Urban agriculture and risk assessment
 - Site conceptual model (SCM)
 - Direct contact risks
 - Risks from plant uptake
 - Risks from deposition
 - Urban agriculture challenges
 - Risk communication and social amplification of risk
- Conclusions

WHAT IS URBAN AGRICULTURE?

- **Urban agriculture is the Practice of Cultivating, Processing and Distributing Food in, or Around (peri-urban), a Town or City (Bailkey and Nasr, 2000)**
- **Urban Agriculture is NOT New**
 - Ancient Persia used wastes to facilitate farming
 - Allotment gardens (tended by collectives) were common throughout Europe in response to industrialization and rapid 19th century urbanization
 - “Victory gardens” were common during WWII in response to rationing

URBAN AGRICULTURE (*continued*)

○ Why Urban Agriculture?

- Low cost, sustainable remedial action alternative
- It is an effective form of anti-city planning, a proven permanent land use that meets city needs
- Urban agriculture contributes to food security and food safety by increasing the amount of food in cities
- It reduces transportation costs that are becoming prohibitively expensive
- Creates a land bank of properties available for future commercial development

URBAN AGRICULTURE (*continued*)

○ Policy Issues Driving Urban Agriculture

- Approximately 80% of the U.S. population and 50% of the world's population live in cities
- By 2015, 26 cities will have populations of 10,000,000 or more
- Transportation costs are becoming prohibitively expensive
- Office of Sustainable Communities (OSC) – created within the U.S. EPA to help communities take integrated approaches to environmental, housing and transportation decisions, supports urban agriculture as a Brownfields solution

URBAN AGRICULTURE (*continued*)

- **OSC is a Collaboration Between EPA, HUD and the Department of Transportation (EPA 560-F-10-002, March 2010)**
 - Focuses on “next generation infrastructure” and public-private sector partnerships to leverage Brownfield investment
 - Urban agriculture is featured in OSC pilot projects in Indianapolis (Smart Growth Development District) and Denver (La Alma/South Lincoln Park)

URBAN AGRICULTURE (*CONTINUED*)

- **There are Significant Social, Economic, Public Health, and Environmental Costs Associated with the Current Food System**
 - Environmental costs of large-scale, industrial agriculture include: air pollution, surface and groundwater contamination, soil erosion, and reduced bio-diversity
 - Costs include \$288 billion in farm subsidies, economic benefits tend to accrue outside of rural communities
 - May create domestic and international disruptions with food supplies

URBAN AGRICULTURE (*continued*)

○ Urban Agriculture and Sustainability

- Urban agriculture adheres to three main principles of sustainability: 1) it enhances environmental health; 2) it enables economic profitability; and 3) It ensures social welfare
- Cities provide readily available markets and aggregate demand for urban agriculture (McLennan, 2004)
- Environmental stewardship is enhanced through urban agriculture's greening of cities
- Purchasing food that is locally grown decreases energy use associated with shipping and refrigeration

URBAN AGRICULTURE (*continued*)

- **Urban Agriculture is Sustainable Because it is Market Driven**
 - It is a free market response to food safety and demand for fresh food
 - It reduces unemployment and underemployment
 - It kick-starts entrepreneurial activities in underrepresented populations
 - It addresses nutrition needs of urban residents who may be living near or below the poverty level

URBAN AGRICULTURE (*continued*)

- **The Food Sector Is a Significant Part of the Urban Economy**
 - Includes restaurants, supermarkets, specialty food stores, taverns, farmers' markets and food wholesaling
 - Urban agriculture is providing realizable economic benefits and it's use is gaining momentum
 - Allegheny FarmCorps, GrowPittsburgh, others, are examples

URBAN AGRICULTURE CHALLENGES AND RISK ASSESSMENT

- **The Primary Concern for Urban Agriculture and Brownfields Reuse is Human Health**
- **Exposure and Risks Can Occur Through Multiple Transfer Processes**
 - Agriculture involves “High Risk” invasive activities
 - Contaminants present in urban soils may be uptaken by fruits and vegetables

RISK ASSESSMENT (*CONTINUED*)

- **The Site Conceptual Model (SCM) is a Critical Component for Successful Implementation**
 - The history of the property and its location determines what contaminants might pose risks:
 - Soil characterization
 - Water use
 - Surface and groundwater impacts
 - Will determine the need for quantitative assessment
 - Human health exposures related to site-specific farming practices are identified
 - Risk communication requirements are identified to address potential perceptions and to solicit “buy-in”

RISK ASSESSMENT (*CONTINUED*)

- **Each Site is Different and Each Growing Season is Different**
 - Exposure to contaminants entrained on particulates may be more significant during dry seasons
 - Growing season lengths change and effect duration of exposure
- **Precipitation Determines Water Use for Irrigation**
 - Depending on contaminant types, irrigation may mobilize and spread contamination
 - Numerous contaminants can be involved in urban settings and Brownfields sites

RISK ASSESSMENT (CONTINUED)

○ Types and General Sources of Contamination at Brownfields Sites

Specific Contaminant(s)	General Source
Lead	Paint (manufactured before 1978)
Lead, Zinc, PAHs	High Traffic Areas
Arsenic, Chromium, Copper, PAHs, Pentachlorophenol	Treated Lumber
PAHs, Inorganics, Dioxins	Burning Wastes
Copper, Zinc	Manure
Molybdenum, Sulfur	Coal Ash
Cadmium, Copper, Lead, Zinc, PBTs	Sewage Sludge
PAHs, Benzene, Toluene, Xylenes	Petroleum Spills
PAHs, Petroleum Products, Solvents, Lead, Other Inorganics	Commercial/Industrial Site Use
Lead, Arsenic, Mercury (historical use), Chlordane, Other Chlorinated Pesticides	Pesticide Applications

Heinegg et al., 2000

RISK ASSESSMENT (CONTINUED)

○ Human Health Direct Contact Risks

- Urban farming activities lead to a variety of potential human exposure pathways
- Direct soil contact scenarios
 - Dermal contact, accidental ingestion and inhalation risks
- Ingestion of contaminated fruits and vegetables
 - There are two general modes by which produce may be impacted
 - Plant Uptake
 - Deposition

RISK ASSESSMENT (*CONTINUED*)

○ Potential Risks From Plant Uptake:

- Inorganic and some organic contaminants can be present in fruits and vegetables including strawberries, lettuce, spinach, endive, and kale
- Lead and cadmium may be present in arable crops including barley and wheat as well as fodder crops including grasses and hay (Albering et. al, 1999)
 - Uptake of Inorganics From Soil by Plant Species is Influenced by Physico-chemical Characteristics
 - These Characteristics are Altered by Agricultural Practices (i.e., Human Factors)

RISK ASSESSMENT (*CONTINUED*)

- **Some Important Human Factors Include:**
 - Irrigation - contaminants can be passively uptaken (generally) by plants from soil water via irrigation
 - Soil pH adjustments - alter the bioavailability of metals and may enhance uptake
 - Selection of plant species, variety and farming methods (i.e., raised bed versus tilling) can influence contaminant uptake
- **Human Factors Must be Considered BEFORE Implementing Urban Agriculture as a Brownfields Remedy**

RISK ASSESSMENT (*CONTINUED*)

○ **Potential Risk From Deposition**

- Contaminants can also spread through air and deposit as dust or by precipitation (Shaylor et al., 2009)
- Proper washing of plants will all but eliminate risks from deposited contaminants
- Deposition can, however, with time impact soil quality
- Deposition can be a major contributor to soil quality in urban areas (egs. PAHs)

○ **Soil Quality Must be Monitored Periodically to Estimate the Potential for Exposures Resulting From Deposition**

RISK ASSESSMENT (*CONTINUED*)

- **The SCM Can Also Provide Information About Potential Acute versus Chronic Health Effects**
 - Acute risks are those which result in immediate harmful effects. Acute exposures are defined as contact with a substance that occurs once or for only a short time (up to 14 days)
 - Chronic risks are those which show up only after prolonged exposure. Chronic exposures are defined as contact with a substance that occurs over a longer timeframe (i.e., more than 1 year - ATSDR, 2010)
- **Both Chronic and Acute Risks are Possible in Urban Agriculture**

URBAN AGRICULTURE CHALLENGES RELATED TO RISK

○ Social Amplification of Risk

- Because risk is a perception, the severity (or lack thereof) is governed by heuristics and biases (Kasperson et. Al, 1992)
- Some perceptions about risk contrast with the results of formal reasoning
- Equity issues (race, socio-economic, etc.) and timeliness of management responses are examples of potential contrasts
- No comprehensive communication theory exists to deal with minor risks or events that cause massive public reactions

CHALLENGES RELATED TO RISK (CONTINUED)

- **Health and Safety Risks are Classic Examples of Risk Amplification (i.e., Three Mile Island, Toyota Recalls, etc.)**
 - Risk communication must be targeted to address community concerns before soliciting community acceptance
 - Standard public notification is not sufficient to address potential risk amplification liabilities

CONCLUSIONS

- **Urban Agriculture is a Sustainable Alternative for Brownfields Remediation**
 - Serves the local community requiring minimal capital costs
- **Urban Agriculture Lacks Integration into the Urban Economy**
 - Rigidity of urban planning overlooks social issues like food security
- **Anti-City Planning Has Long Been a Permanent Land Use that Meets City Needs**
- **Regardless of Typology, Urban Agriculture Links Environmental, Social and Economic Strategies**

CONCLUSIONS (*CONTINUED*)

- **Urban Agriculture Allows for Reuse of Smaller Parcels not Suitable for Major Redevelopment**
 - Fits well into local community initiatives for addressing blighted properties
 - Creates a property land bank for future use
- **Risk Assessment and Risk Communication are Vital to Urban Agriculture Success**
 - Standard risk assessment practices are not sufficient to address farming risks
 - Standard risk communication is a potential liability
 - Social and cultural issues need to be considered and integrated into communications strategies

THANK YOU!

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