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# Best Practices for the Sustainable Urban Farm



Abu Talib is the director of the Taqwa Community Farm, which he helped establish on a vacant lot in his Bronx neighborhood in 1992. Photo by Preston Keres, USDA

FOR DECADES, URBAN FARMS AND COMMUNITY gardens have helped meet the demand for fresh, local produce. Urban farms are diverse and adaptable, ranging from small farms on repurposed vacant lots to multilevel vertical farms and rooftop gardens. Often, they combine ecological farming practices with some form of infrastructure. Urban growers make clever use of their often-limited space by growing crops in raised beds, under high tunnels, inside repurposed shipping containers and in greenhouses; some use aquaponic and hydroponic growing systems. Urban farms' proximity to large population centers allows them to tap into diverse consumer preferences and provide culturally relevant and specialty products along with more typical fruits and vegetables. These can include microgreens, mushrooms, herbs, niche crops and heirloom varieties. Many farms even incorporate fish, chickens, goats, sheep, rabbits and beekeeping.

At the same time, urban farms provide their communities with many interrelated environmental, economic and social benefits. Urban farmers revitalize neglected and underserved neighborhoods by transforming vacant lots and abandoned buildings into productive greenspaces that often double as communal areas. They increase the local biodiversity while helping to reduce the number of miles that produce travels to market. Urban farmers contribute to local economies by providing training and skill-building for volunteers, employees and aspiring farmers. This can foster entrepreneurship in the local food sector and further increase local food production and distribution. Urban producers may also actively seek to address persistent food insecurity and poverty in their communities through educational outreach and by developing marketing strategies that allow them to serve low-income families or to provide rehabilitation services.

Also available at [www.sare.org/urban-agriculture](http://www.sare.org/urban-agriculture), or order a free hard copy at (301) 779-1007.





Dawson Amico is the farm manager at Fleet Farming, a program of the nonprofit IDEAS For Us that promotes local food systems by turning residential lawns into microfarms and edible landscapes in the Orlando, Fla., area. Photo by Lauren Moore, USDA

Researchers from Cornell University conducted a nationwide survey of successful commercial urban farms and described some of their common characteristics, including:

- » Produce sales are usually not their sole source of revenue. Urban farms typically succeed by diversifying their income streams through activities such as agritourism, public workshops, farmer training or private events. Collaborations with other farms and local businesses are helpful to expand the products and services you can offer your community and clients.
- » Urban farmers build meaningful relationships with customers and local businesses. This can help create a sense of community and invites the residents to get to know you and your farm's values.
- » They define and stick to a clear focus when starting out, then gradually explore others. It's difficult for a new farm to be many things at once.

In recognition of the restorative role that urban farming can play in communities, city residents and their elected leaders are increasingly advocating for policies that support urban food production. Cities across the United States, from Cleveland to Kansas City to Baton Rouge, are supporting urban agriculture

through legislative and policy changes. Policy reform can come in many ways, such as tax credits, improvements to land access or changes to zoning laws that currently restrict urban farming. At the federal level, the USDA has expanded funding in support of local and regional food systems through grants and cost-sharing programs for urban and peri-urban farms. See the Resources section.

This bulletin provides an overview of the important issues to consider as you establish and manage your urban farm or community garden, and it suggests where to go for in-depth information. From accessing land and managing production challenges (including soil, water and pests) to marketing your farm products, we share some of the current best practices that urban producers use to develop successful operations, as well as additional resources at the end.

## HOW URBAN FARMING IS DEFINED

Urban farming refers to agricultural production in and around urban centers, while peri-urban farms are near urban centers. Although urban farms have not been formally defined as a distinct kind of operation, the USDA defines any farm as an entity that produces at least \$1,000 of agricultural products each year. Urban zones are described as areas with a population of more than 50,000 people. Taken together, urban agriculture describes crop-producing operations in densely populated urban areas. Urban agriculture includes both for-profit and nonprofit organizations that operate community gardens, farms and other programs. Farmers grow crops in urban areas in many creative ways; they often take advantage of greenhouses, vacant lots, backyards, rooftops, parks or any viable, unused space like warehouses and basements.

People are taking an interest in food grown in their neighborhoods now more than ever. According to data from the 2017 U.S. Census of Agriculture, urban farms in the 50 most populated cities represent roughly 15% of the country's total number of farms. Urban farms and community gardens have taken hold in cities like Washington, D.C., Chicago, Kansas City, Seattle and many other urban and suburban areas across the country. Data from the Environmental Protection Agency shows that on a global scale, food from urban farms makes up an estimated 15% of the world's food supply.

See the section Nonprofit Versus For-Profit Urban Farms and Farmer Training Programs for a discussion of commercial and nonprofit urban farm operations.





Whitelock Community Farm in Baltimore, Md., combines food production with a social equity mission. Photo by Preston Keres, USDA

## HOW YOU CAN SUPPORT URBAN AGRICULTURE

Whether you're a consumer, urban farmer, researcher or policymaker, there are many ways to advocate for urban agriculture. Some examples:

### Consumers

- Support local urban farming operations that share your values. Buy their products, attend their events and share your experiences with your social circles.
- Participate in city council meetings and advocate for urban agriculture policies, especially policies that support equitable distribution of resources to marginalized residents.

### Urban farmers

- Form relationships with other farms and organizations with similar goals. Collaborations can help build your visibility and customer base.
- Register with the FSA for a farm FSA number. This will make your farm eligible for loans and cost-share programs.
- Participate in the Census of Agriculture. The USDA uses this data to determine where urban agriculture is developing and to make informed decisions about how to target support for urban agriculture.

### Researchers and educators

- Invest in education programs that emphasize urban agriculture topics such as soil, pest and water management to provide broader support for urban farms across the country.
- Conduct studies exploring the production potential and community health benefits of urban farms.
- Conduct research into the factors upholding unequal access to land and food insecurity in order to dismantle barriers for marginalized or socially disadvantaged peoples.

### Policymakers

- Take time to communicate with urban farmers, food justice advocates and food policy organizations to learn the needs of urban farmers in your jurisdiction.
- Advocate for policies that facilitate land access for urban farmers, including long-term tenure.

Source: Siegner A., J. Sowerwine and A. Charisma. 2018. Does Urban Agriculture Improve Food Security? Examining the Nexus of Food Access and Distribution of Urban Produced Foods in the United States: A Systematic Review. *Sustainability* 10(9): 2988.

*Urban farmers define and stick to a clear focus when starting out, then gradually explore others.*

## Part One: Land Access and Security

FINDING LONG-TERM, STABLE ACCESS TO LAND is often the biggest hurdle that urban producers face. Because cities generally have higher property values than rural areas, traditional land ownership is cost prohibitive for beginning or limited-resource urban producers. In cities, land access is further complicated by high input and administrative costs (e.g., water, electricity, permit costs, etc.), land use restrictions set by local governments, and competition from developers. Many urban producers get around these challenges by forming lease agreements with private landowners and nonprofit organizations.

Other urban producers rely on creative land-use agreements when starting out. Land for Good, a New-England-based nonprofit, provides technical resources for farmers looking for help securing land. View their toolbox of resources and guides at [landforgood.org/resources/toolbox](http://landforgood.org/resources/toolbox). Among their resources is *Farmland Access in Urban Settings*, which describes the novel ways urban farmers find land. For example, although nonprofits often focus on charitable and educational activities, they may also rent land to beginning farmers through an urban farm incubator program. Many organizations with a mission to support small farms and local food systems offer fee-based incubator programs. These can be very valuable because they are designed to give new farmers the chance to start their business and to gain both skills and confidence in a relatively

low-risk environment. While the specifics may vary from one organization to another, these programs offer new farmers temporary, affordable access to land, supplies and equipment, as well as training in key areas of running a farm business. At the same time, participating farmers can access the organization's existing networks to begin developing a customer base. Upon completing a program, farmers are often provided technical support in transitioning to their own location.

Atlanta-based HABESHA, Inc. is a Pan-African nonprofit organization dedicated to promoting healthy living and sustainable urban agriculture skills to area residents. They used a SARE grant (EDS20-15) to expand their farmer training program, HABESHA Works, beyond its existing 200 hours of basic course content. The grant allowed them to establish an incubator farm for advanced trainees that focuses on developing their leadership, interpersonal and business management skills. This experience helps trainees to more effectively plan their next steps toward running a successful, long-term farm business.

Community land trusts offer another opportunity for urban producers to access land. Land trusts are nonprofit organizations that preserve land for agriculture and other conservation uses by purchasing the land, putting a development easement on it, and then offering it to producers at a lower rental price.

The challenge of land access can be stressful for beginning farmers, but the public's increasing interest in healthy, local food options is helping urban agriculture gain ground with local leaders. Examples of favorable policies include property tax credits, discounted utility rates and short-term leases for farming on public land. In recent years, cities like Baltimore have established land-leasing programs for urban farmers to use vacant, city-owned lots. Urban farmers who are farming on city-managed land can apply for a five-year lease with an option to renew. While there is no long-term land security with these agreements, they do allow farmers to build their production and management skills and to run their operation for a considerable amount of time.

Whether owning or leasing, urban producers need to be aware of and compliant with local policies and zoning regulations. When surveying a potential lot for your urban farm, begin by carefully researching its land use, boundaries and transfer history. Your county

Otis Garrison (red shirt), farm manager and alumnus of the Habesha Works program, with a group of young adult students he's mentoring. Photo by Cashawn Myers, HABESHA, Inc





registry and local department of zoning and planning are important resources for determining both property records and appropriate uses for land within city limits.

The USDA Web Soil Survey provides soil data and maps you can use to find information about a property's soil history and quality, including tutorials on how to use the survey. See the next section, Soil Remediation, Soil Health and Nutrient Management, for more on the connection between past land uses and current soil conditions.

It's important to get terms in writing when negotiating land access agreements. An attorney can help you navigate the terms of a lease agreement. The Sustainable Economies Law Center includes a library that highlights important elements to include when negotiating land-use agreements. These include the size of the property to be used, allowable activities, the lease duration, right of entry, growing practices and equipment to be used, payment and liabilities, among others. The library highlights other relevant urban agriculture topics, such as planning and zoning, building codes, insurance and liability. It also includes topics of special interest for both nonprofit and commercial urban producers.

Nationally, urban agriculture has received increased attention and dedicated support through the 2018 Farm Bill. The USDA Office of Urban Agriculture and Innovative Production has been established to promote urban farming. Urban farms are now eligible to apply for a farm number through the USDA Farm Service Agency (FSA), which is needed when applying for federal funding, including cost-share programs, incentives and competitive grants. These sources of



Container farms, such as these operated by Square Roots in Brooklyn, N.Y., can allow for high-intensity food production in small spaces, offering one possible solution when urban land options are limited.  
Photo by Preston Keres, USDA

funding can't be used to rent or purchase land or buildings, but they can help you to defray other costs associated with starting and operating an urban farm. The FSA also provides microloans of up to \$50,000 to eligible urban producers, and some of these options can be used to acquire land. It's important to know that FSA requires applicants to have at least three years of farming experience, defined as having produced and sold at least \$1,000 of agricultural products each year. Other federal, state and local resources may be available to support land access. Take a look at the *Guide to Financing the Community Supported Farm*, produced by the University of Vermont Center for Sustainable Agriculture with support from a SARE grant (ONE11-146).

## Part Two: Soil Remediation, Soil Health and Nutrient Management

FARMING ON URBAN SOILS COMES WITH A somewhat different set of challenges compared to farming on cropland. In many urban situations, soils start off in poor condition due to the land's history. The soil in urban areas tends to be heavily compacted, with low organic matter or topsoil, and it often contains chemical contaminants or construction debris like concrete, asphalt and garbage.

Heavy metal contaminants, such as copper, arsenic and lead, are a main concern for urban growers. These

and other contaminants remain in the soil for long periods of time in bioavailable forms, meaning they can be absorbed by humans. Contaminants may cause chronic health effects when ingested, often by inhaling contaminated soil dust or by consuming soil particles that remain on produce. Although chemical contamination is concerning, practical and effective solutions to reduce its negative impacts exist. If you're considering an urban farming operation, research the land-use history and work with local commercial labs,

conservation districts, USDA or Cooperative Extension to determine the contaminants your soil should be analyzed for and how to control them. This investigation should be done in addition to standard testing for nutrient levels, pH and organic matter.

## SOIL CONTAMINATION

If you're considering a site where soil contamination is a concern, consult with environmental specialists to identify a mitigation strategy that will be effective for the types and levels of toxic compounds that are present. A variety of remediation practices exist to reduce or remove contaminants from polluted soil. These practices work best at sites with fairly low levels of soil pollution. For heavily contaminated sites, remediation is impractical, expensive and requires long-term management to be effective. Removing contaminated soil and replacing it with clean soil is also expensive, but it may be an option for sites that receive some form of public funding.

Otherwise, a more practical option is to use raised beds filled with clean soil. For sites with low contamination levels, one of the best ways to build soil health and reduce the bioavailability of soil contaminants such as heavy metals is through the addition of composts and mulches. Organic matter binds to contaminants, diluting their presence in the soil and reducing the potential for human exposure. Use the right soil amendments to maintain neutral soil pH, and use

optimal nutrient levels to reduce heavy metal bioavailability. Maintaining a soil pH between 5.8 and 7 is ideal for most vegetable crops and helps to minimize the amount of soil contaminants that plants take up.

Practical safety steps you should also take on a regular basis:

- » Follow best practices around produce handling and personal hygiene.
- » Thoroughly wash produce before storing or eating it to wash off traces of surface soil contamination.
- » Peel away the outer layers of leafy vegetables to reduce the risk of surface contamination.
- » Practice good habits such as using gloves and washing your hands thoroughly after handling soil.

Certain crop production and landscaping strategies can help too:

- » Avoid growing food crops like rice or sunflowers that are known to be prone to taking up contaminants.
- » Use mulches in growing areas to minimize the movement of soil onto the edible parts of crops.
- » Use mulches on bare walkways, or cover them with stone or perennial ground covers.
- » If certain areas of your site have particularly high levels of toxic compounds, consider using them for landscaping or buildings instead of for growing food.

Extend these safety protocols to your employees and to members of the community who might visit for activities like tours, classes or workshops. Pay particular attention to children, who are more at risk of consuming soil through their play and by eating unwashed produce.

For more information about soil remediation and safe gardening practices around contaminated soils, visit the Environmental Protection Agency's Brownfields Program ([www.epa.gov/brownfields](http://www.epa.gov/brownfields)). It provides technical assistance and funding to clean up and reuse contaminated sites.

## SOIL HEALTH ON URBAN FARMS

Aside from the risks of soil contamination and poor soil quality at the outset, managing urban soil on an ongoing basis has additional challenges. While it's common to allow cropland to rest and rebuild organic matter through practices such as fallowing or rotating into pasture, urban farmers typically can't afford to rest their soils through a growing season. This is because

A history of construction activity at an urban site oftentimes results in compacted soil that contains both debris and contaminants.  
*Photo by Francisco Andreotti*







Raised beds combined with mulched or vegetated walkways is an effective way to reduce the risk posed by toxins in urban soils. Photo by Lauren Moore, USDA

they're usually operating on much smaller plots that need to be under continuous production for the farm to break even.

Urban producers rely on adding organic matter through composts, yard wastes and leaf litter in order to maintain healthy soil tilth and nutrient levels. Work with your community to source low-cost organic materials you can use to make your own compost. Local businesses like restaurants, grocery stores and breweries can be good sources of food waste. Municipal yard waste collection agencies, power companies and arborists may also have a source of mulch or organic matter to cover and feed your soil. Many urban producers invest in a vermicomposting system, where worms are used to speed up the breakdown of organic materials in compost piles. North Carolina State University Extension provides resources on vermicomposting at <https://composting.ces.ncsu.edu>.

The best practices for maintaining soil health and tilth on an urban farm are otherwise similar to farms in general:

- » Use soil tests to match key soil nutrients (nitrogen, phosphorus and potassium) to the needs of your crops.
- » Provide ample organic matter inputs to feed your soil.
- » Incorporate cover crops like nitrogen-fixing legumes or nitrogen-scavenging species like oats and rye.
- » Rotate crops in your planting areas to reduce the likelihood of pathogens building up.
- » Minimize soil disturbance by practicing no-till or conservation tillage.

Like compost, cover crops are one of the most important soil health tools for urban farmers. They can be planted into beds during the off season to build organic matter and add nitrogen to the soil, as well as to help with weed control.

When it comes to tillage and bed preparation, smaller, in-ground lots can be worked with walk-behind cultivators and tillers. Although it's labor intensive, many urban producers rely on tried-and-true manual tools to prepare beds, manage weeds and aerate the soil. Examples of these include broadforks, rakes and many types of hoes, including paddle hoes, wheel hoes and stirrup hoes. ATTRA provides a resource, *Equipment and Tools for Small-Scale Intensive Crop Production*, which discusses tools for small-scale production. SARE offers a *Manage Weeds on Your Farm* book ([www.sare.org/manage-weeds-on-your-farm](http://www.sare.org/manage-weeds-on-your-farm)), as well as a video series on organic weed management. One video features urban farmers Shakera and Juan Raygoza demonstrating the equipment they use on their farm.

For further information on soil health, explore SARE's *Building Soils for Better Crops* ([www.sare.org/bsbc](http://www.sare.org/bsbc)), which includes a chapter on soil management strategies for urban farms. *Managing Cover Crops Profitably* ([www.sare.org/mccp](http://www.sare.org/mccp)) provides an in-depth understanding of cover crops and profiles on dozens of cover crop species.



*Like compost, cover crops are one of the most important soil health tools for urban farmers.*

Nicolas Reza, an employee of the Ontario, Calif., urban farm Huerta del Valle, dumps organic waste into a compost pile. The farm collects this source of organic matter from an area food distributor. Photo by Lance Cheung, USDA

## PROFILE: VINES (Volunteers Improving Neighborhood Environments)



Straw bales laid end to end will form a raised bed structure (left). After filling the centers with compost and soil, crops such as potatoes are planted (right). Photo by Amelia LoDolce, VINES

### New York

#### FNE19-942: Healthy Soil for Urban Farm Production: Building from Scratch

In south-central New York, staff and volunteers at Binghamton Urban Farm work together to grow more than 7,000 pounds of fresh fruit and vegetables each year that are sold or donated to their community. At the same time, the farm serves as a classroom where people of all ages can learn about nutrition, agriculture and environmental stewardship. The goal of Binghamton Urban Farm, a project of the nonprofit Volunteers Improving Neighborhood Environments (VINES), is to bring together multicultural communities to grow healthy foods, beautify their neighborhoods and contribute to a more just community food system.

Binghamton Urban Farm started out on a half-acre lot in 2010 and benefited from an excellent growth opportunity in 2018. That year, 12 adjacent properties became available after they entered the Federal Emergency Management Agency's (FEMA) flood buyout program. Because these properties were flood prone and no longer suitable for structures, the city of Binghamton agreed to lease them to VINES for the expansion of the Binghamton Urban Farm. Since this new land was previously residential, Kyle Rittenburg, the farm manager at the time, was concerned with toxic contaminants and poor overall quality of the soil. Importing organic matter to build the soil and create a buffer from toxic contaminants was cost prohibitive, so farm staff sought different styles of raised beds that were affordable, compatible with current

farm management and could produce crops at a commercial scale.

With support from a Northeast SARE grant, the farm compared two different strategies to build soil in the raised beds: a typical topsoil bed compared to a straw-bale-style bed. The approach in the typical raised bed was to use a 4-inch layer of topsoil with a 2-inch layer of compost over the topsoil. The straw bale raised beds were made by lining hay bales end to end and backfilling with a 6–8-inch layer of wood chips, a 2–3-inch layer of topsoil and a 2–3-inch layer of compost. Wood chips are often free and can help improve drainage and add organic matter. Over time, the straw bale structure and wood chips decompose and integrate into healthy, productive soil.

To test the productivity of these two styles of beds, the team at Binghamton Urban Farm compared the marketable yield of cucumbers and lettuce grown in each. Straw bale beds produced more than twice as many cucumbers as the topsoil beds but relatively equal yields of leaf lettuce. Although initial costs and labor were higher due to the cost of the straw bales, they reported benefits like improved soil drainage, which is especially important in the flood-prone area wherein they operate. Farm staff and volunteers also found that the straw beds were comfortable to kneel and work on. Others, however, found the footing to be unstable at first. This was no longer a problem after the beds settled in the second year.

While there are some tradeoffs to the straw bale beds, the long-term benefits from added organic matter and deeper soils may be worthwhile. "After comparing the two different methods for building new





Soil sample from a straw bale bed (left) and a soil sample from a raised bed (right). Photo by Amelia LoDolce, VINES

beds, we've decided for new beds to add 8 inches of wood chips before layering on soil and compost," says Executive Director Amelia LoDolce. This adjusted bed design allows for good drainage on sites that tend to be compacted while also saving labor and costs for the straw bale design.

In addition to operating the Binghamton Urban Farm, VINES maintains a strong presence in their community by running community garden and youth education programs. They strive to keep their produce

affordable and accessible to their community. For example, they offer microshares in their community supported agriculture (CSA) program for families that may not be able to afford a full share, as well as discount shares for folks who volunteer on the farm. Their recent expansion has also allowed them to expand their youth education program, Grow Binghamton, which hires teenagers and young adults to participate in food production in the spring, summer and fall.

## Part Three: Water Access and Management

ACCESS TO RELIABLE AND AFFORDABLE WATER is critical for all farming operations. For urban farmers, water access can be especially challenging because many have to depend on relatively expensive municipal water. Depending on your region, installing a permanent water line on your urban farm can be an expensive process, often costing thousands of dollars. Contact local utilities early to determine if a vacant lot you're considering for a farm has reliable access to water. Fortunately, with the increased interest in urban food production, more cities are providing support for urban farms and gardens. In some cases, local

governments may offer programs to subsidize equipment installation and water costs. Baltimore City, for example, offers reduced water costs for people gardening on land through their Adopt-a-Lot program, which allows residents, nonprofits or businesses to use city-owned lots without tax or ownership obligations.

Water conservation practices not only save water, they also save money and provide other benefits, such as reduced levels of pests and diseases, and improved crop productivity through their emphasis on soil health. One of the best ways to manage soil water is by producing crops in healthy, porous soil. Healthy soil

with good till and soil structure acts like a sponge by soaking up water and retaining it for crop use, especially during times of heat and drought. Plants grown in dense urban areas are more prone to heat stress because buildings and roads absorb heat and raise the temperature of urban environments.

Plants grow more vigorous root systems in healthy soils, allowing them to access water from more of the soil surface. Wherever possible, incorporate living (cover crops and living mulches) and dead (crop residues, composts, mulches and manures) sources of organic matter into the soil and continually build soil health. These added organic matter materials help build soil structure, which in turn helps store water, which further encourages plant growth. Conservation tillage strategies like no-till, reduced till, and strip till are encouraged to reduce disturbance caused to the soil.

You can also conserve water by managing the types of crops you grow. When planning crops for the upcoming season, consider the water requirements for each and aim to feed the crops optimally, or grow crops that are more suited for your environment or the season. Avoid growing water-intensive crops when access to water is unreliable or cost prohibitive. Low-water-use crops such as beans, mustard greens or lettuce may be better alternatives in this situation.

Recordkeeping is an important part of all farm management, and this applies to water management as well. Monitoring is the key to measuring and conserving water. Read your water meter and keep track of the amount of water your operation is using. Many urban producers rely on watering cans and garden hoses to water crops, but it's hard to track your water use this way. To use and manage water more effectively, consider installing an efficient irrigation system and

Drip irrigation is used on Project Feed the Hood's farm, located in Albuquerque, N.M. Photo courtesy the USDA



Clarence Webb waters seedlings inside a high tunnel at Grow Dat Youth Farm in New Orleans. Photo by Kristen Strough, USDA

water meters to deliver only the necessary amounts of water to crops. Drip irrigation is one of the most efficient methods for this, as it avoids wetting crop foliage (which encourages plant pathogens) and minimizes water lost to evaporation. When long periods of extreme heat are a concern, drip irrigation combined with mulching is a good way to conserve water while reducing heat stress to plants.

Routinely inspect and maintain your irrigation system to ensure it's working properly. NRCS's Environmental Quality Incentives Program (EQIP) provides technical assistance and funding for producers transitioning to drip irrigation. Regardless of what watering system you use, schedule your irrigation activities earlier in the day or at night to reduce water loss to daytime evaporation.

If your farm includes many rooftops, for example high tunnels, greenhouses or other buildings, then rainwater catchment may be a viable strategy to supplement your farm's water needs. However, certain areas may have safety concerns about heavy metals or pathogens contaminating harvested rainwater. GrowNYC, an environmental nonprofit, has released a Rainwater Harvesting How-To Guide that provides guidelines for safely planning and building rainwater harvesting systems. Be sure to check on local policies regarding rainwater harvesting and using stormwater runoff. Learn more about water conservation and smart water use in SARE's bulletin, *Smart Water Use on Your Farm or Ranch*.



## PROFILE: Using Water Recapture to Save on Water Costs



A high tunnel with attached rain gutters and a 50-gallon rain barrel. Photo by Cherry Flowers, Holistic Health Farms



A drip irrigation system inside a high tunnel that's fed by reclaimed rainwater. Photo by Cherry Flowers, Holistic Health Farms

### Minnesota

#### FNC13-909: Water Capture from High Tunnel Diversion into Irrigation System Using Renewable Energy

At Holistic Health Farms, located in the Twin Cities area of Minnesota, growers Cherry Flowers and Tim Page demonstrate how urban farms can be both sustainable and productive. Having over 18 years of combined experience with organic farming on lots across the Twin Cities, they produce a wide variety of high-tunnel-grown fruits and vegetables like tomatoes and peaches, and value-added products like specialty infused vinegars. Farming in a high tunnel allows them to plant a month earlier and harvest a month later than typical outdoor production. A common challenge for urban farms is inconsistent access to water and the often high cost to keep crops well irrigated.

In 2013, Flowers and Page received a SARE Farmer/Rancher grant to develop a water conservation system for their high tunnel that collects rainwater and recycles it to irrigate their crops through a drip system. To do this, they collaborated with the University of Iowa State Extension and installed gutters along the sides of their high tunnel that would collect rainwater and store it in nearby 50-gallon rain barrels. They also installed a solar-powered water pump to pump

rainwater from the barrels into the high tunnel drip irrigation system.

Considering their project a success, they estimate that for every inch of rain, their modified high tunnel system can divert as much as 600 gallons of water from the municipal water system. Other advantages of the system include erosion reduction and the use of alternative sources of power and water. The addition of the gutters protects crops near the high tunnel by directing rainwater into a collection tank rather than it pouring off sides of the roof and onto crops. As a result of their work, they were recognized by the Capitol Region Watershed District, which also provided funds in support of their project.

Holistic Health Farms serves its community by producing healthy foods and providing education, training and consulting services on sustainable practices such as organic farming, crop rotation, cover crops, composting, and succession and companion planting, among others. From 2017 to 2019, Holistic Health Farms participated in a SARE Partnership grant project (ONC17-029) to develop hands-on high tunnel education and training for immigrant farmers in the Twin Cities area. As part of this grant, Holistic Health Farms demonstrated how cover crops like red clover, rye, peas and vetch are grown and managed in a high tunnel.

## Part Four: Season Extension and Controlled Environments

URBAN GROWERS CAN GET THE MOST OUT OF the growing season—and continue production into the off season—through season extension. Season extension strategies, especially physical structures, allow you to produce crops beyond their normal growing window by protecting them from harsh weather like freezing temperatures and strong winds. Products grown and stored for off-season sales can sometimes earn more than when they are sold in season. You can also use season extension structures to improve crop growth and yield. All of this means your farm can generate more stable income and, potentially, more stable employment for farmworkers.

Structures like high tunnels, greenhouses and row covers trap and maintain heat to warm the soil, improve crop growth and even deter pests. Low tunnels, cold frames and raised beds are lower-cost alternatives to high tunnels that occupy less space. You can also use structures to get a good head start on the growing season by starting your crops indoors before transplanting in the spring.

Along with season extension structures, consider the use of cold-hardy cultivars, and natural and plastic mulches on the soil. Plastic mulches trap heat from the sun, increasing the temperature of the soil and speeding up plant growth. Windbreaks may be useful

for protecting crops on farms exposed to strong winds, like rooftop farms, that directly damage crops or dry out the soil. Carefully selecting the site for your season extension structure can help you make the best use of sunlight. For example, orient your plants to the south-facing side of your farm because crops get more sunlight from this direction. Take advantage of natural light as much as possible and supplement with artificial light if necessary.

If you are growing crops in high tunnels or other structures, keep in mind that pests may be different from what you would see in field conditions. For example, insect pests like aphids, thrips and mites that thrive in dry environments are more prone to outbreaks in season extension structures.

It's also important to consider soil salinity when using high tunnels or hoop houses. High tunnels protect crops from rainwater, but over time salts from fertilizers, composts and other soil amendments may build up in the soil and become harmful to your crops, so you should regularly test your soil salinity levels.

Post-harvest and storage practices can improve the shelf life and lengthen the marketing window of your crops. Preserve produce over the short term by storing crops at their optimal temperature and humidity levels. Common short-term storage options include refrigerated walk-ins, root cellars or cold rooms. Canning, pickling, fermenting, drying and processing are good ways to preserve crops in the long term while also adding value. It's important to familiarize yourself with all regulations associated with selling food products prior to getting started; laws will vary by state. University of Minnesota Extension provides recommendations for developing a food safety plan and practices and resources in their "Growing Safe Food" guide.

Season extension can offer many benefits, but you may find the infrastructure is costly to acquire, especially for smaller-scale and beginning farmers. Financial assistance is available through cost-share programs like NRCS's Environmental Quality Incentives Program (EQIP) for high tunnels and other season extension structures. The FSA's Farm Storage Facility Loan Program can help producers finance cold storage options. Learn more about season extension strategies you can use on your farm in the SARE bulletin, *High Tunnels and Other Season Extension Techniques*.

Low tunnels are relatively easy to set up and take down, and they can provide for both season extension and pest protection. Photo by Annie Corrigan, Indiana Public Media





## PROFILE: Low-Cost Alternatives for Season Extension in Buffalo

### New York

#### FNE20-961: Economic Feasibility of Caterpillar Tunnels on Urban and Small-Scale Farms

In 2020, Mayda Pozantides and Anders Gunnensen of Groundwork Market Garden received a SARE Farmer grant to test the economic feasibility of caterpillar tunnels on their 3-acre urban farm in Buffalo, N.Y. They were interested in using caterpillar tunnels as a lower-cost season extension alternative to high tunnels, which are often cost prohibitive to small-scale farmers.

Compared to high tunnels, caterpillar tunnels are smaller, made from lower-cost materials like wire hoops and floating row covers, and can be taken down during the off-season. Caterpillar tunnels are typically 6–8 feet tall and cover the width of multiple growing beds. Low tunnels are a yet smaller option that are typically 2–3 feet high and the width of one growing bed.

The goal of Groundwork Market Garden's project was to compare the economics of vegetable production in caterpillar tunnels with in-field beds over two growing seasons. They standardized their caterpillar tunnels and in-field growing bed to 50 feet long by 2.5 feet wide and tracked costs associated with labor and production inputs, along with yield data like yield quantity, length of harvest and fruit size.

Over the course of their project, Pozantides and Gunnensen found that cucumbers and bell peppers grown in the caterpillar tunnels were harvested earlier



Mayda Pozantides tends to plants under a caterpillar tunnel. Photo courtesy of Mayda Pozantides, Groundwork Market Garden

and for longer than in-field ones. Caterpillar tunnels extended the growing season by up to six weeks. As a result, Pozantides and Gunnensen were able to introduce a new winter CSA, which can be critical to the survival of new urban farms because it extends the revenue stream through more of the year.

However, caterpillar tunnels aren't without challenges. During the first year of the project, Pozantides and Gunnensen saw higher pest pressures in the caterpillar tunnels. Caterpillar tunnels also required more initial labor and input costs due to the need to buy and set up the tunnels over beds. By the end of the two-year project, they didn't reach a breakeven point with the tunnels, but with the production numbers they were seeing they expected the tunnels to bring a substantial profit in the third year.

Pozantides and Gunnensen plan to make further improvements to their caterpillar tunnel growing system. One way is by including insect netting, which they hope will reduce the number of pests like cucumber beetles. Another way is by focusing on growing cold-hardy leafy greens, which were the most profitable crop during the project. They shared what they learned with other urban producers through farm tours, grower-oriented articles and collaboration with urban agriculture organizations and Cooperative Extension.



Mayda Pozantides with a ginger harvest from a caterpillar tunnel. Photo by Mayda Pozantides, Groundwork Market Garden

## Part Five: Sustainable Pest Management

INSECT PESTS, WEEDS AND PATHOGENS ARE A challenge to farmers everywhere, and they're often symptoms of poor environmental quality, crop stress or excessive soil disturbance. Frequent soil disturbance and fragmented habitats for pest predators are of special concern to urban farmers. The hotter temperatures that are common in urban areas can also result in increased growth and spread of insect and weed pests. Therefore, pest management on an urban farm prioritizes a healthy growing environment for crops.

Managing pests on urban farms is similar in many ways to rural farms, only it's done at a smaller scale. Producers rely on a mix of cultural, physical, biological and chemical practices.

The first step to sustainable pest management is routine scouting to monitor for emerging pest problems. Make it a priority to check your crops for pests at least once a week and record what you see in a field notebook. When scouting, randomly select your plants and examine them for signs of insects, stress or disease. Take pictures and videos of new or unknown pests; the images will be useful when getting help with correct identifications. Regular scouting will help you develop your knowledge of the types of pests visiting your crops and the time of year they're present. From this you can create an action plan that best manages pests on your farm.

Here are a few tips to consider when scouting for pests on your urban farm, according to Cornell Cooperative Extension Urban Agriculture Specialist Sam Anderson:

- » Set aside a regular time to scout crops for pests. This includes the upper and undersides of leaves, stems and soil under the plant.
- » Familiarize yourself with the pest or disease. Learn how to identify pests, their life cycle and early warning signs of their presence.
- » Before the season, develop an action plan for pests you expect to encounter. Ask yourself what strategies you will use to manage the pest. This type of information can help you get ahead of any potential infestations. For example, insecticidal soaps have low toxicity and are effective for managing spider mites early in the season.

### CULTURAL CONTROLS

The primary aim of cultural practices is to maintain healthy, porous soil where crops can access water and



Interns at the Rivoli Bluffs Farm in St. Paul, Minn., use stirrup hoes to control weeds. Photo by Christophe Paul, USDA

nutrients, and where pest populations remain relatively low. Inadequate access to water and nutrients, as well as other suboptimal growing conditions, will stress your crops and make them more vulnerable to pest attacks and weed competition. Common cultural practices include:

- » Planting **cover crops**, which can smother weeds, support beneficial organisms and improve soil health
- » Planning a **diverse crop rotation** to disrupt the life cycles and habitat requirements of pests
- » Building soil structure and fertility with **composts and amendments**
- » Following **sanitation practices**, such as cleaning tools after use and clearing out crop debris after harvest
- » Using **practices that improve crop competition**, such as transplants and disease-resistant varieties, and water and nutrient applications that are targeted to your crops and not to weeds.

### BIOLOGICAL CONTROLS

Biological control most commonly involves enlisting the help of pest predators to keep insects, weeds and other pests in check. The cultural practices described above that promote soil health also represent a form of biological control because healthy soil fosters beneficial organisms like arthropods, fungi and bacteria that suppress pathogens and prey on both insect pests and weed seeds.

Also, consider including flowering plants in and around your farm to attract beneficial insects, including both predators and pollinators. You can order and

*The first step to sustainable pest management is routine scouting to monitor for emerging pest problems.*



## PROFILE: Wood Chips for Weed Management

### Virginia

#### FS18-308: Evaluating the Effectiveness of Locally Available Wood Chips for Weed Control

Weed management represents a major barrier to production for urban producers. Problematic weeds like crabgrass and pigweed compete with plants for nutrients, water and light, and can result in less productive crops. Patrick Johnson contends with weeds on a regular basis on his urban farm, NANIH (Neighborly Affiliations for Naturally Idealized Health) Farm and Garden, located in Sandston, Va.

Established in 2013, NANIH is an urban farm where Johnson's philosophy is to grow foods naturally and free of pesticides. Johnson grows and markets organic produce like strawberries, cucumbers and okra at his local farmers market in Ashland, Va. In addition to produce, Johnson provides permaculture consulting services along with his team, Diversity Permaculture, on topics related to organic agriculture, permaculture and nonprofit management.

In 2018, Johnson used a SARE Farmer/Rancher grant to compare the ability of two types of mulch to suppress weeds on his urban farm. Johnson was interested in mulch because it was a low-cost approach to weed management that didn't involve chemical inputs or excessive tillage, and he could source it locally. Mulch offered many potential benefits to the growing system, including improved soil structure as



Locally sourced mulch was used for the weed management experiments on NANIH Farm and Garden. Photo by Jermaine Hinds, SARE Outreach



Patrick Johnson on his farm in Sandston, Va. Photo by Jermaine Hinds, SARE Outreach

the mulch breaks down, reduced soil erosion and improved water retention.

As part of the project, Johnson set up a replicated, randomized complete block design experiment where he compared a blended hardwood mulch, a double shredded hardwood mulch and a control plot. He measured weed mass, water retention and okra production weekly over the course of the study. Although there was no difference between the two types of mulch, he did find that the mulched plots had significantly less weed pressure than the control plots. Mulched plots also retained more water and produced more okra yield on average than control plots without mulch. Some of the problem weeds Johnson found were crabgrass, pigweed and morningglory, among others. He regards the project as a success, concluding that locally available wood chips provide multiple benefits to the growing system.

Johnson was able to source his mulch from local arborists and power and landscape companies for free or at low cost. Since the project ended, Johnson has found that leaf litter debris works just as well as hardwood mulch at suppressing weeds and retaining water, but with the added benefit of being much lighter and easier to work with. "By recycling our locally available resources like leaf litter and hardwood mulch on the farm, we can help close the loop and rely less on off-farm inputs," he says. As a result of the project, he engaged with more than 1,600 farmers by presenting at regional conferences, where he shared practices on weed management and organic production for urban farmers.



Flowering plants support pollinators and beneficial insects. They also help beautify urban farms and can add a revenue stream through cut flower sales. Photo by Christophe Paul, USDA

release beneficial insects like predatory mites and lady beetles for short-term insect pest management as required. Growing pollen-producing plants like ornamental peppers can sustain beneficial insects for longer-term control. These strategies are also highly effective in enclosed growing systems like high tunnels.

Ornamental flowers (e.g., sunflowers) or herbs (e.g., lavender) are another option to keep soil covered and attract beneficial insects. They can also be sold, but bear in mind that the flowers are critical for biological control, so cut them selectively and plan rotations to ensure that plants in flower remain on your farm throughout as much of the growing season as possible.

## PHYSICAL CONTROLS

Common physical control tactics include the use of traps, barriers and cultivation. Traps, such as yellow sticky cards and baited pheromone traps, attract insects based on visual and chemical cues. Traps are effective in detecting and managing problem insects like thrips, fungus gnats and whiteflies, all of which are often problems in greenhouses and hoop houses. Physically removing infested crops is also effective at limiting the buildup of insects and pathogens.

Other physical controls include barriers, such as row covers and shade cloth, that prevent insects from getting to your crops. Natural and plastic mulches are an effective physical barrier against weeds. At the smaller scales typical of urban farms and market gardens, hand tools and walk-behind tractors are often more feasible for cultivation and weeding than the tractors and larger tools commonly found on larger rural farms.

## CHEMICAL CONTROLS

Many urban producers use organic inputs to manage insect, weed and disease pests. Because urban farms and community gardens are in highly populated areas, the

use of non-organic pesticides is generally discouraged. Like your rural counterparts, if you do consider the use of chemical controls, be sure to follow integrated pest management (IPM) principles. IPM is a knowledge-based approach that seeks to minimize pesticide harm to human health and the environment by using preventive, low-risk methods before resorting to higher-risk methods. IPM begins with the cultural, biological and physical practices described above to minimize the risk of pest damage. Some IPM-based tips:

- » Learn about the most common pest problems for the crops you intend to grow.
- » Begin by developing a working knowledge of the pests you have or expect to find on your farm, and monitor for them regularly.
- » Consult with a local Cooperative Extension specialist to correctly identify pests so that you can apply the appropriate control strategies.
- » Conduct weekly surveys for pests and record their numbers to determine whether they warrant management.
- » Use your records to anticipate pests, and manage around them with appropriate strategies like changing your planting dates or using transplants.
- » In every case, begin with strategies that are the least toxic and that have the lowest potential to disturb the environment.

To learn more about IPM, visit your regional IPM center's website ([www.ipmcenters.org](http://www.ipmcenters.org)), where they provide resources such as IPM guidelines and field guides. Whole-farm pest management strategies are discussed in more depth in SARE's bulletin, *A Whole Farm Approach to Managing Pests*.



Along with its potential for season extension, shade cloth can be a low-cost option for urban farmers seeking to protect crops from insect pests. Photo by Christophe Paul, USDA



## PROFILE: Partnerships for the Prevention of Pests in New York

### New York

#### ONE19-327: Two-Spotted Spider Mite IPM for Urban Agriculture

The two-spotted spider mite is a widespread and destructive pest that poses a threat in greenhouses and high tunnels across the country. These tiny arthropods thrive in hot, dry conditions and can explode in number when their natural predators are absent. Under the right conditions, a female spider mite can lay several hundred eggs over its four-week lifespan. A few of the telltale signs that spider mites are infesting your plants are tiny, yellow to brown spots and webbing on the undersides of plant leaves. When left unchecked, spider mite infestations almost always result in stunted or dead plants.

Cornell Cooperative Extension's Sam Anderson, an urban agriculture specialist, is finding that two-spotted spider mite infestations are increasingly common on urban farms in New York, not just in greenhouses and high tunnels, but also in outdoor plantings of tomatoes, cucumbers and several other crops. Previous scouting found two-spotted spider mites on as much as 75% of urban farms visited in New York City. Anderson suggests that urban farms may be at a higher risk of spider mite infestations due to higher temperatures in cities compared to rural areas, as well as a lack of biodiversity and natural enemies to control them.

Using a 2019 SARE grant in partnership with Brooklyn Grange, Red Hook Farms and East New York Farms, Anderson and his collaborators set out to develop methods to more effectively scout for and manage two-spotted spider mites on urban farms. Their approach combined weekly scouting and the release of biological control species like predatory mites and gall midges. They chose bush beans as a potential sentry plant to detect early infestations of two-spotted spider mites. This is because bush beans develop spider mite damage symptoms earlier and the leaves of the plant are easier for farmers to examine compared to tomatoes. The research team established bush bean plantings at the end of tomato rows and tracked spider mite numbers over two seasons.



Sam Anderson (far right) and colleagues scout for two-spotted spider mites on tomato plants. Photo courtesy of Sam Anderson, Cornell Cooperative Extension

Anderson and his collaborators found that two-spotted spider mites typically arrived in early July, reached damaging levels in late July and August, and often caused complete crop loss of tomatoes by early September. The effectiveness of the biological controls they released were inconclusive. However, they noticed significantly fewer two-spotted spider mites on tomato plants bordered by marigolds or bush beans. They found high numbers of another mite predator, the minute pirate bug, in these areas and identified marigolds and bush beans as potential habitats to build up the population of this predator.

Although their biocontrol approaches were somewhat inconclusive, the rigorous scouting for two-spotted spider mites helped participating farmers develop an awareness of the pest. As a result of the project, information about two-spotted spider mites was shared with more than 300 farmers and agricultural educators through workshops, conferences, webinars and newsletters. By the end of the project, 50% of urban farmers in New York City could identify two-spotted spider mites in the field compared to 20% at the beginning of the project. Anderson regards this project as a success, saying, "We've definitely noticed that this project has garnered a lot of interest in learning how to scout for pests."



Bush beans (front) can be scouted for early signs that two-spotted spider mites are present. Photo by Sam Anderson, Cornell Cooperative Extension



Early season two-spotted spider mite damage (left) and advanced damage symptoms on tomato leaves later in the season. Photo by Sam Anderson, Cornell Cooperative Extension

## Part Six: Aquaponics and Hydroponics

IN RECENT YEARS, GROWING VEGETABLES WITH soilless media has become more common and represents a growing market opportunity for urban producers. These growing systems are increasingly popular among urban producers as a way to get around the challenges of poor soil and limited space typical of urban settings. **Hydroponic systems** involve producing vegetables in water enriched with nutrients instead of soil. **Aquaponic systems** combine hydroponic vegetable production with fish production in a mutually beneficial system. In aquaponic systems, fish food and waste provide ammonia, which is broken down into nitrates, a valuable source of nutrition for plants. In turn, plants filter waste to maintain a clean environment for fish.

Aquaponics is a clever way farmers produce both vegetables and protein on a small-scale urban farm. Also, aquaponic systems make more efficient use of available nutrients and water. As much as 80% of the nutrients required by plants can be provided through fish waste<sup>1</sup>. Because water is recycled and recirculated within aquaponic systems, they use up to 90% less water than in-ground growing systems.

While there are many benefits to aquaponic systems, they can have disadvantages. To use an aquaponic system, you need to understand both vegetable and fish production. Another thing to consider is that aquaponic systems require frequent monitoring to maintain water quality and optimal nutrient levels for both fish and vegetables. Nutrient deficiencies are common in aquaponic systems but can



Plants grow in a hydroponic system at the Lamond-Riggs Urban Food Hub in Washington, D.C. Photo by Jermaine Hinds, SARE

be managed with readily available supplements. Aquaponic systems are highly customizable and varied, and they can be designed to work on both small farms and on larger operations.

The costs to start an aquaponic system may be prohibitive for some growers. The FSA offers funding for small and niche farms, including equipment for hydroponic, aquaponic and vertical growing systems. If you're considering a hydroponic or aquaponic system, be sure to consult local expertise. Resources are widely available online. Kentucky State University published a comprehensive overview of aquaponic production, Kentucky State University Aquaponics Production Manual.

### AQUAPONICS: BIG FOOD PRODUCTION AT SMALL SCALES

In 2013, Greg Fripp, founder of Whispering Roots Farm, used a SARE Farmer/Rancher grant (FNC13-911) to expand local, school-based aquaponics programs to demonstrate aquaponic system design and crop management. Through this grant, Fripp collaborated with students at a local Omaha, Neb., school to build a tilapia-based "flood and drain" recirculating aquaponic system. Their setup consisted of a 100-gallon fish tank, a grow bed with a clay growing medium, tubing and a low wattage pump to circulate water from the fish tank into the grow bed. With Fripp's guidance, students grew a range of crops in this system like lettuce, eggplants, basil, strawberries, tomatoes, kale and peppers, as well as tilapia that reached marketable harvest weights after nine months. They consider their project a success, and local restaurant owners are happy with the quality and taste of their produce.

Fripp provides a detailed overview of aquaponics systems and their management in the webinar, "Small Scale Aquaponics" (<https://youtu.be/DY8F4wG4oS8>).

These fish tanks are part of an aquaponics system at the Firebird Research Farm, operated by the University of the District of Columbia. Photo by the Chesapeake Bay Program



<sup>1</sup> Lennard W. and S. Goddek. 2019. Aquaponics: The Basics. In: Goddek S., A. Joyce, B. Kotzen and G.M. Burnell (eds.). *Aquaponics Food Production Systems*. Springer, Cham.



## Part Seven: Marketing in Urban Areas

URBAN FARMS SUPPORT THE COMMUNITY AND local and regional food systems by directly marketing fresh, healthy foods to nearby residents, businesses and institutions. Marketing your products comes with challenges, however. Perhaps most significant is competition from rural farms that can typically produce higher volumes at lower costs. Still, there can be many upsides to growing and marketing produce from an urban farm. One opportunity in urban spaces is the higher density of potential customers—both businesses and individuals—and the shorter distances required to find them. The dense nature of urban centers allows for urban farmers to create highly efficient delivery routes.

Choosing the right way to market your products will be critical to the success of your farm. Most smaller urban farmers rely on direct marketing through pop-up shops, farmers markets and CSAs, as well as some sales to locally owned restaurants and retail stores, whereas larger, more established urban farms may have the capacity to do more of their marketing to food distributors and wholesalers.

Also, because urban growing space is limited, consider how you can maximize production in your space. For example, grow high-turnover, high-value



Urban Roots staff prepare CSA boxes and load them onto a truck for delivery. The nonprofit's activities also include operating both a farm and a storefront in St. Paul, Minn., and extensive youth education programs. Photo by Christophe Paul, USDA



Metro Atlanta Urban Farm (MAUF) CEO Bobby Wilson (center) established MAUF in 2009 to address the growing need of affordable food in low-income communities. Photo by Preston Keres, USDA

crops like microgreens and mushrooms in addition to other vegetable crops. Structures that allow for season extension are important as well.

Be sure to carefully consider your farm's brand and how to market your products effectively. Clearly define your product and highlight what makes it stand out. Incorporate unique features of your product, farm's values and production practices in your product's marketing. Is it local, organic, non-GMO or produced using good agricultural practices? (Although, be aware that some labels, like organic, require a formal certification and review process.) Emphasize values and themes that can differentiate you from your competitors, such as the ideas of hyper-local and urban renewal, as well as any social justice work you might engage in. Customers may be more willing to support your business when you share your values and highlight the positive role you play in their community.

Common marketing channels have their own advantages and disadvantages, so choose the types that work for your operation. University of Maryland's Urban Agriculture Guide nicely summarizes common direct and indirect marketing approaches, as well as the basics of marketing and urban agriculture.

## Part Eight: Nonprofit Versus For-Profit Urban Farms and Farmer Training Programs

THE FORMAL BUSINESS STRUCTURE OF AN urban farm influences its business strategies and potential revenue streams. Urban farms are typically established as either for-profit or nonprofit, or they may take a hybrid approach where a part of the farm business is established as a nonprofit organization for charitable purposes. For-profit or commercial urban farms focus primarily on farm production and activities that generate income, including both produce sales and, possibly, agritourism activities like pop-up dinners or U-Pick events. With commercial farms, education and training programs are usually not the focus, but many do find ways to incorporate educational

activities into their business model because they can improve marketing and community relations. Some farms, for example, provide farmer training, cooking demonstrations, gardening workshops or internships.

Adam and Melissa Millsap of Urban Roots Farm in Springfield, Mo., for example, have successfully managed their urban farm since 2010. They use natural and sustainable practices to harvest more than 500 pounds of produce a week on their half-acre lot. As a commercial urban farm, they generate income from a variety of different sources such as direct sales through their farm stand and CSA, farm design and consulting services, and hosting special events like weddings and farm-to-table dinners.

Nonprofit community gardens and urban farms, on the other hand, are established with more of a focus on community revitalization by supporting educational development and advocating for social justice and public health. Nonprofits provide community support through education and job training programs. Community urban gardens aim to foster a greater sense of community and to expose residents to agricultural career opportunities. Some nonprofit organizations provide beginning farmers with access to land to gain experience developing an agricultural operation. While nonprofit farms make money from the products grown and sold on the farm, they rely primarily on financial support from public and private donors, and other grants and awards.

Success for both commercial and nonprofit farms depends on being visible: Are residents aware of your operation? Are they curious or inclined to visit your space and support your organization's values? Urban farm operators need to also be aware of the socioeconomic dynamics between residents in the community and aim to develop and maintain positive community ties. After all, local residents will probably be among your main customers, and how they see your operation can affect its success.

Successful urban operations depend on committed partnerships between other farms, local businesses, nonprofits, policymakers and other organizations that share similar values or goals. These partnerships can help build your farm's capacity, spread risk, extend your customer base or provide resources such as farm

Audrey Nunez, who lives in the Lower Ninth Ward of New Orleans, harvests fresh produce and flowers from a community garden operated by the nonprofit Sankofa Community Development Corporation. Photo by Kristen Strough, USDA





equipment, and they often result in longer-term support for urban agriculture in your city.

Big Muddy Urban Farm, located in Omaha, Neb., is a nonprofit with a mission to promote sustainable agriculture education. They offer a year-long farm training residency program where residents learn aspects of sustainable production while cooperatively managing a farm business. They used a SARE Youth Educator grant (YENC16-101) to develop a collaboration with local youth gardeners, wherein youth learn sustainable growing techniques in small raised beds. They also offer free tool lending to residents interested in managing their own gardens.

Establishing a commercial or nonprofit structure for a farm business is an involved process that requires legal and financial help. SARE provides in-depth information about business structures and how to choose one in the book *Farmers' Guide to Business Structures*.

## FROM GRASSROOTS MOVEMENTS TO GREEN GENTRIFICATION

For decades, historically marginalized Black, Indigenous and People of Color who suffered from a lack of equitable access to housing, land, fresh foods and medical care used urban agriculture as a means to beautify and cultivate safe spaces within their cities. Vacant lots and otherwise abandoned properties became places of life: sites to find flowering plants and heirloom and ethnic varieties of vegetables like scotch bonnet peppers, callaloo and bitter melon.

Urban and community gardens continue to be a valuable avenue for residents to build community through the shared effort of beautifying their neighborhood and growing their own food. Especially since the onset of the COVID-19 pandemic, more and more people have developed an interest in gardening and learning how to grow food. By participating in urban farming activities, residents connect with each other by sharing their culture, knowledge and foods. Community gardens and urban farms serve as neighborhood hubs, places for celebration and socializing.

This kind of improvement to once disinvested neighborhoods, however, often has the unintended consequence of causing gentrification. Newly rehabilitated spaces often attract wealthy investors seeking to turn a profit in low-income areas where property values are lower, yet still out of reach for lifelong residents. Further development in these areas leads to increased overall property values and the eventual displacement of lifelong residents in favor of wealthier residents and investors.



As a result, much of the food produced by for-profit urban farms, often faced with tight profit margins, is then marketed toward upscale eateries and farmers markets. Gardens originally intended to create community and provide affordable, healthy food for residents instead become inaccessible to lower-income families. Gentrification perpetuates the systemic displacement of historically marginalized people. Over the past decade, cities like Austin, Texas, and Washington, D.C., have seen rapid redevelopment and displacement of lifelong residents.

Given the impacts that urban farms can have on the communities they are established in, operators of urban farms should consider ways to be inclusive of the established community:

- » Be respectful of established communities' culture and aim to develop genuine relationships with lifelong residents.
- » Offer events like farm dinners and cooking demonstrations that create opportunities to engage with the community.
- » Consider approaches to make your foods more accessible to lower-income customers, such as accepting Electronic Benefits Transfer (EBT) for the Supplemental Nutrition Assistance Program (SNAP) and the Women, Infants, and Children (WIC) program.
- » Participate in community advocacy for marginalized groups on the issues that affect them.
- » Hire residents or provide outreach, volunteer and training opportunities to them, including teenagers.

The nonprofit EarthDance Organic Farm School seeks to train beginning farmers in sustainable agriculture and to serve low-income communities in Ferguson, Mo., through programs such as their "pay what you can" farm stand.

Photo by Josh Colligan, USDA

**PROFILE:** HABESHA, a Pan-African nonprofit leading the Urban Agriculture Movement in Atlanta and Beyond

**Georgia**

**EDS18-07: HABESHA Works Program Expansion and Incubator Development**

**EDS20-15: HABESHA Agriculture Leadership Opportunity (HALO Program)**

Located in the Atlanta metropolitan area, a rapidly developing hub of urban agriculture, the nonprofit HABESHA, Inc. (Helping Africa By Establishing Schools Home and Abroad) provides youth education and leadership training to children, teenagers and young adults each year. In classrooms and on the farm, participants learn to become urban growers through STEM-based programs that emphasize the culture and history of the Pan-African identity, leadership development, and sustainable living. Cashawn Myers led the formation of HABESHA in 2002, wanting to make a positive impact on his community and across the African diaspora. The organization maintains a one-acre garden complex where the staff train

participants in sustainable urban growing practices, entrepreneurship and agribusiness development.

HABESHA has grown to include five distinct training programs, including HABESHA Works, which is a green jobs training program that provides certification for aspiring farmers in the principles and practices of sustainable urban agriculture. These include practices like cover cropping, crop rotation, organic pest management and soil management. The 14-week course includes rigorous instruction and training that includes classroom, lab and field training through activities like interactive classroom work, visits to and volunteer work on partnering urban farms, and conference attendance, as well as a final practical project.

In 2018, HABESHA received a Southern SARE grant to increase the availability of the HABESHA Works program to more participants. The staff leveraged their grant into a partnership with two local organizations to establish an urban farm incubator for graduates of the training program. The urban incubator farm provides new producers with access to land and a relatively low-risk environment to gain experience growing crops and developing an agribusiness plan. Myers reported that, because of the grant, 35 participants completed the training and had several opportunities to incorporate outreach and professional development through conferences like Georgia Organics, AgLanta and Black Urban Growers (BUGs).

Recognizing that beginning farmers need support in a wide range of areas if they are to be successful, Myers used a second SARE grant in 2020 to establish the HABESHA Agriculture Leadership Opportunity (HALO) program. This program, meant for intermediate-level growers, consists of a seven-month advanced course meant to refine farmers' skills in areas like business and financial planning, marketing, leadership and interpersonal communication. Specific topics include developing an Organic System Plan (OSP), succession planning, retail readiness, and accessing USDA funding, among others. Myers says, "It's one thing to grow food; it's another thing to grow food with intent."

Some of HABESHA's biggest impacts are the more than 150 growers currently working in Atlanta and neighboring areas. "Alumni from HABESHA educational programs have seeded the urban agriculture movement in all aspects in Atlanta and abroad," Myers says. In Ghana, HABESHA recently launched the Kweku Andoh Sustainability Institute (KASI), a research and training institution that provides workshops on a range of sustainable agriculture and eco-holistic practices.

Cashawn Myers, HABESHA co-founder. Photo courtesy of Cashawn Myers, HABESHA, Inc.







Youth help out at the Well at Oxon Run, a farm in Washington, D.C., that is operated by the nonprofit DC Greens. Photo by Preston Keres, USDA

## Part Nine: Looking to the Future

URBAN FARMING IS AN ACTIVELY DEVELOPING sector of agriculture, with more and more cities recognizing its value by responding to residents who advocate for policies that promote urban farming. Taking California's lead, states like Missouri and Louisiana recently passed legislation to establish urban agriculture incentive zones where urban farmers are provided with tax incentives to grow food. Other states like Maryland and Minnesota have created grants and appropriations toward the development and expansion of urban food hubs. Researchers and farmers alike are working together to develop sustainable methods to grow food in urban spaces.

While urban agriculture is not likely to match the volume of food produced by rural agriculture, it represents an important avenue for people to gain access to local, fresh and niche foods. The food produced by urban farms and urban gardens is a supplemental source of local food production, especially in communities with low access to fresh foods or during times of emergency, such as the COVID-19 pandemic. At the same time, urban farming can have important community-building impacts for urban residents, such as increased self confidence and connection to neighbors, as well as a stronger connection to their food and environment.



Chickens are kept at the Garden of Happiness in New York City. Photo by Preston Keres, USDA

*Urban farming is an actively developing sector of agriculture, with more and more cities recognizing its value.*

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## Resources

This represents only a partial list of the many online resources available to urban farmers. Consult local nonprofits and Extension specialists for more comprehensive support.

### LAND ACCESS

- *Urban Ag Law* ([urbanaglaw.org](http://urbanaglaw.org)): A collection of resources hosted by the Sustainable Economies Law Center.
- *Urban Agriculture State Legislation*: The National Conference of State Legislatures provides a database of enacted state legislation that supports urban agriculture.

### SOIL AND NUTRIENT MANAGEMENT

- *Building Soils For Better Crops* ([www.sare.org/bsbc](http://www.sare.org/bsbc)): This book includes comprehensive information on soil management, and includes a chapter on urban soils.
- *Brownfields and Urban Agriculture*: An EPA report that covers guidelines for safely gardening and farming in urban areas.
- *Cover Crops for Sustainable Crop Rotations* ([www.sare.org/cover-crops](http://www.sare.org/cover-crops)): An online collection of resources related to cover crops.
- *Farming with Soil Life* ([www.sare.org/farming-with-soil-life](http://www.sare.org/farming-with-soil-life)): This book discusses management practices that support beneficial soil invertebrates.

### WATER

- *Smart Water Use on Your Farm or Ranch* ([www.sare.org/water-bulletin](http://www.sare.org/water-bulletin)): A guide to conserving water through management of soil, plants and irrigation.
- *Urban Agriculture – Water*: A collection of University of California Cooperative Extension’s online resources related to water management for urban farmers.
- *Rainwater Harvesting*: Cornell University’s Small Farms Program provides online resources that address the capture and use of rainwater.
- *Natural Resources Conservation Service*: The NRCS provides technical and financial assistance for farmers seeking to improve water quality and conserve its use.
- *Rainwater Catchment from a High Tunnel for Irrigation Use* ([www.sare.org/rainwater-catchment](http://www.sare.org/rainwater-catchment)): This Iowa State University Extension video describes how to install a catchment system on a high tunnel.

### SEASON EXTENSION

- *High Tunnels and Other Season Extension Techniques* ([www.sare.org/season-extension](http://www.sare.org/season-extension)): An online collection of resources related to high tunnels.
- *Guide to Season Extension*: This publication by the Land Connection includes management information and case studies.
- *Hightunnels.org*: This website includes extensive information for both educators and growers, and is managed by Extension specialists from four states.

### PEST MANAGEMENT

- *A Whole-Farm Approach to Managing Pests* ([www.sare.org/pest-bulletin](http://www.sare.org/pest-bulletin)): A short publication that outlines ecological pest management practices.
- *Manage Weeds on Your Farm* ([www.sare.org/manage-weeds-on-your-farm](http://www.sare.org/manage-weeds-on-your-farm)): This book provides in-depth guidance on the ecological management of weeds.

### MARKETING

- *From Surviving to Thriving: Strategies for Urban Farm Success*: This guide from University of Maryland Extension includes information on marketing as well as risk management.
- *EPA Urban Farm Business Plan Handbook*: A guide for planning the startup of a new urban farm operations, including both nonprofit and for-profit enterprises.

### AQUAPONICS AND HYDROPONICS

- *A Practical Guide for Aquaponics as an Alternative Enterprise*: A University of Florida Extension guide to setting up and managing an aquaponics system.
- *Oklahoma State University - Aquaponics*: An in-depth aquaponics guide from Oklahoma State University Extension.
- *Small Scale Hydroponics*: This University of Minnesota Extension guide outlines the management of a hydroponics system.

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