

ANTI-FRAGILITY: CROP DIVERSITY & CLIMATE CHANGE

Advanced Studio 4 - Spring 2018

Columbia University Graduate School of Architecture, Planning and Preservation

Critic: Caitlin Taylor



Photo: Jim Richardson

INTRODUCTION

Agricultural production exists at a particularly fertile intersection between the common themes of Studio 4 - scale, technology, environment, circular economics, resilience and anti-fragility. Nowhere is the environment more intimately interwoven with technological advancement than in modern farming practice, the privileging of productive landscapes via control and mechanization. Farming is a complex system of inputs and outputs (embodied energy, nutrients, labor, sunlight, water cycles, climate patterns, indigenous knowledge, globalized economies, localized ecologies, government incentives, capital investment, political will, waste streams, nourishment, corporate colonization, scientific discovery, environmental impact, cultural memory) that reveals the interconnection of global forces, but is also necessarily local and literally rooted to its place.

A looming food crisis calls into stark relief the reliance of our food system on increasingly fragile industrial-scale monocultures. 10,000 different varieties of wheat once grew in China alone; now the documented number is well below 1,000. 6,500 species of apples that once grew in North America have gone extinct. Meanwhile, corporate monopolies introduce new monocultural crops that are genetically modified for increased productivity but dramatically upend local ecological balance.

Mechanical radii of new machines map the historical ideals of technocracy across the modern landscape, while computerized management tools privilege homogenizing ecologies as the pseudo-scientific answer to a technocratic social order. Automated systems are built whereby food production is a result of optimized chemical inputs, satellite communications, remote sensing devices and GPS tracking. Lockheed Martin's tractor-based technologies measure 13 weather parameters in 15 minute increments and send the data to a computer in the field. 430 gauges per 10 acres measure irrigation and yield measurements are taken every three seconds during harvest. Constant feedback informs the automated input systems - seeds, fertilizers, and pesticides are dispensed accordingly. Local difference disappears.

Agricultural monocultures, like all fragile systems, fail when subject to stress. Invasive pests find new opportunities for growth, soil degrades, fields erode, and ecological equations are imbalanced as native species die off en masse. Meanwhile, climate scientists have issued a call to action - global food production requires climate-ready crops within two breeding cycles. In the face of a rapidly changing climate, the resilience of our global food system relies on genetic crop diversity, which provides an invaluable resource in the form of a multiplicity of options. The effect of genetics and evolution in agricultural methodology is inherently anti-fragile because annual growth cycles provide an opportunity for constant adaptation. The most resilient germ lines reveal themselves under stress.

One notable response to this recent discourse in agriculture has been the formation of seed banks, which have been designed to protect and preserve the genetic information of our modern crops for use at some unknowable future point when our food supply requires a complete reboot. Though many scientists believe firmly in the merits of these seed banks as insurance policies against a global food crisis, there are as many critics that identify limits to the centralized model of corporate and governmental management. Critics claim that crop diversity and resilience depends on farmers' ability to quickly adapt and scale based on changing conditions, without wading through corporate hierarchy to access trademarked seed stock. Though both scientists and farmers recognize the immense power that resides in the agricultural memory of seeds, their methods of leveraging that power are at odds.

STUDIO FRAMEWORK

The Hudson Valley is a productive territory on which to study these issues, as it is both an agricultural hub in the northeast (New York City's most proximate "foodshed"), and a crucial component of the New York City watershed. Within the context of the larger Studio 4 curriculum, we will seek to understand the watershed as a water body with particularly complex environmental, political, ecological, and infrastructural control. The resilience of the watershed will be analyzed specifically as it relates to agricultural production in the Hudson Valley, projective climate change scenarios, and New York City's unmet demand for "local" food.

Students will locate their work precisely within the networked landscape of food production surrounding New York City and imagine future scenarios in which climate change has redesigned those landscapes according to new environmental variables. Specifically, how food is grown and travels within the region will be understood as a key infrastructural pathway in the face of a changing climate, and the resilience of that pathway will be examined at multiple scales. Food access will be understood as infrastructure and politics, economics and social justice.

Multiple scales will be studied simultaneously - from the genetic data of indigenous crops to the biotechnology enhancing productivity, from the scale of a single plant to the deep soil section of native grassland root structure, from a field to a networked urban food system. We will learn from farmers and ecologists about the intelligence of native ecologies, and what information is preserved along with genetic diversity. We will study politicians, corporations, and governments through history as they defined the singular economic power of crop subsidies and incentives. We will learn from scientists about how to preserve genetic diversity in seed banks, and about bioengineering advancements in crop productivity. We will learn from activists and community groups about how to build just and self-determined food systems in regional economies.

We will ask what wisdom the regenerative practices of crop rotation, diversification, pollination, seed banking and intercropping can lend to our urban food infrastructure. We will ask how architecture can act as a mediator in the fraught relationship between biotechnology research and local agricultural intelligence.

PROGRAM AND SITE

The program for this studio will be a crop breeding research facility and seed storage vault, with associated agricultural production landscape, for the Hudson Valley Farm Hub. The Farm Hub is an existing non-profit center for research and education located in Hurley, NY that provides farmer training, hosts research, promotes an equitable food and farm economy, and acts as an educational resource for area farmers. Located between the Ashoken Reservoir and Esopus Creek, just upriver from the arterial Catskill Aqueduct, the Farm Hub is currently developing an applied research program for the Hudson Valley that will focus on resilient agriculture and climate-smart farming. At the building scale, students will design a home for this initiative within an anti-fragile food network. As all students in Studio 4 will be asked to grapple with the Circular Economy, in this section we will examine the buildings and landscapes designed in each project according to their inputs and outputs, and ask what role architecture can play in shaping the discourse around agricultural production for our cities.

While the primary site of building-scale intervention may be a research and education facility for the Farm Hub in Hurley, NY, each student's work will also take a clear position on future climate scenarios as they relate to the Hudson Valley as a regional foodshed and watershed. Design work will include an investigation into how innovative resilient landscapes can be replicable, scalable, flexible, and anti-fragile in a variety of rural, suburban, exurban, and urban conditions.

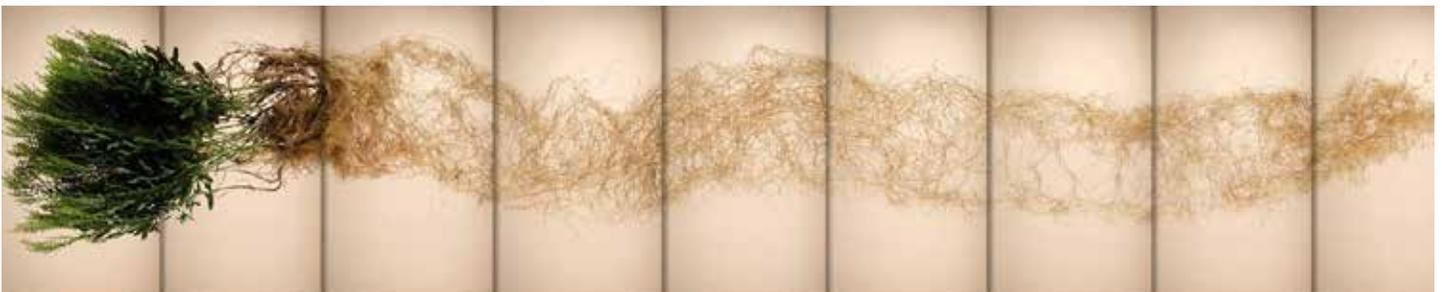


Photo: Jim Richardson

FORMAT

PROJECT 1: RESEARCH FRAMEWORK (2 weeks) - As a studio we will develop a vocabulary with which to rigorously describe modern agricultural production and its effect on the landscape, to be catalogued in a booklet before midreview. Economic and policy drivers, tools of mechanization, methods of crop breeding and seed banking, and indigenous planting techniques will be studied, diagrammed, and analyzed for their spatial potential. We will read about the history of agrarian urbanism in order to position our discourse.

Part 1: Each student will analyze and document the food from one meal you eat this weekend and try to track at least one individual source ingredient back to: how it's grown (tools and/or machines); where it's grown; labor requirements; economic and policy drivers that shape production (historically and/or today), water requirements for production, how it gets to you and in what quantity.

Part 2: Each student will catalogue one each of the following: historical and/or contemporary architectural precedent of an agricultural experiment relative to urban form; method of maintaining crop diversity; method of limiting crop diversity or developing monoculture; piece of food infrastructure pathway from farm to consumer; method of corporate control; indigenous agricultural practice; and one specific effect that climate change is having on agricultural production.

PROJECT 2: MAPPING THE HUDSON VALLEY AS FOODSHED AND WATERSHED (2 weeks) - Students will perform a series of mapping exercises to understand the rural to urban continuum (and associated flows of energy, water, and food) of the Hudson Valley. This project will culminate in a pin-up where each student synthesizes their research into one large projective drawing that indicates the direction of their individual project moving forward.

Project 2 will include a site visit to Stone Barns Center for Food and Agriculture, and the Hudson Valley Farm Hub, where we will meet some of the pioneers of resilient agriculture and tour their operations.

PROJECT 3: FARM HUB RESEARCH FACILITY AND AGRICULTURAL LANDSCAPE

Building design and infrastructural networks will be designed according to a more detailed schedule to be developed at the beginning of the semester.

SCHEDULE

W	Jan 17	Lottery
Th	Jan 18	Studio Intro
M	Jan 22	Project 1, Part 1: Pin-Up
Th	Jan 25	Project 1, Part 2: Pin-Up
M	Jan 29	Desk Crits
Th	Feb 1	Project 1: Pin-Up
M	Feb 5	Desk Crits (& Project 1 booklet complete)
Th	Feb 8	Desk Crits
M	Feb 12	Project 2: Pin-Up
Th	Feb 15	Desk Crits - Individual Project Direction
M	Feb 19	Desk Crits
Th	Feb 22	Desk Crits
M	Feb 26	Midreview
Th	Mar 1	Desk Crits
M	Mar 5	Desk Crits
Th	Mar 8-9	Hudson Valley Trip: Stone Barns, Hudson Valley Design Lab, Farm Hub
M - F	Mar 12 - 16	Spring Break, no studio
M	Mar 19	Desk Crits
Th	Mar 22	Desk Crits
M	Mar 26	Desk Crits
Th	Mar 29	Desk Crits
M	Apr 2	Desk Crits
Th	Apr 5	Studio Pin-Up
M	Apr 9	Desk Crits
Th	Apr 12	Desk Crits
M	Apr 16	Desk Crits
Th	Apr 19	Desk Crits
M	Apr 23	Desk Crits
W-Th	Apr 25-26	Final Review

THE START OF A STUDIO BIBLIOGRAPHY

- Alkon, Alison and Julian Agyeman. *Cultivating Food Justice: Race, Class, and Sustainability*. Boston, MA: The MIT Press. 2011.
- Belanger, Pierre. *Landscape As Infrastructure*. New York, NY: Routledge. 2017.
- Easterling, Keller. *We Will be Making Active Form*. AD: *City as Catalyst*. Ed: Alexander Eisenschmidt. Sept/Oct, 2012.
- Fitzgerald, Deborah. *Every Farm a Factory: The Industrial Ideal in American Agriculture*. New Haven: Yale University Press. 2003.
- Gandy, Matthew. *Concrete and Clay: Reworking Nature in New York City*. Cambridge, Mass: MIT Press. 2003.
- Goodman, David, Bernardo Sorj, and John Wilkenson. *From Farming to Biotechnology: A Theory of Agro-Industrial Development*. Oxford: Basil Blackwell. 1987.
- Jackson, Wes. *Consulting the Genius of the Place: An Ecological Approach to a New Agriculture*. Berkeley, CA: Counterpoint. 2010.
- Peed, Mike. "We Have No Bananas." *New Yorker*, 10 January 2011.
- Shiva, Vandana. *Stolen Harvest: The Hijacking of the Global Food Supply*. Cambridge, Mass: South End Press. 2000.
- Stoll, Katrina and Scott Lloyd. *Infrastructure as Architecture: Designing Composite Networks*. Berlin: Jovis Verlag GmbH. 2010.
- Ventura, Steve and Martin Bailkey (ed.). *Good Food, Strong Communities: Promoting Social Justice Through Local and Regional Food Systems*. Iowa: University of Iowa Press. 2017.

Civil Eats (www.civileats.com)

NYC Regional Foodshed Initiative - Urban Design Lab

Hudson Valley Foodshed Conservation Plan

Rising Waters: Helping Hudson River Communities Adapt to Climate Change