ANTI-FRAGILITY: CROP DIVERSITY & CLIMATE CHANGE

Advanced Studio 4 - Spring 2017
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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, economies, government incentives, nourishment, corporate colonization, scientific discovery, environmental impact) 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 needing to wade through corporate hierarchy to access trademarked seed stock. Though both scientists and farmers aim to leverage genetic data for increased resilience in our food system, their methods of doing so are at odds.

Studio Framework

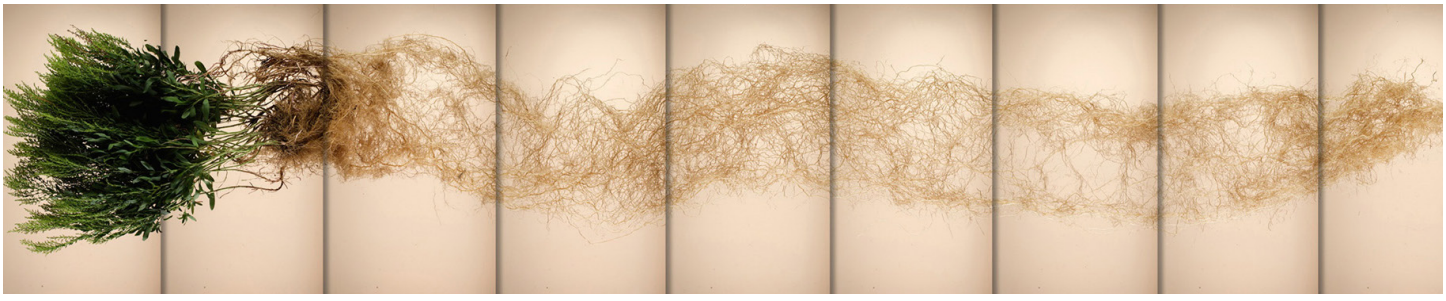
The Hudson Valley is a productive territory on which to study these issues, as it is both an agricultural hub in the northeast (New York City's most proximate "foodshed"), and a crucial component of the New York City watershed. Within the context of the larger Studio 4 curriculum, we will seek to understand 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.

In collaboration with the NYC Agriculture Collective, 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 from the Hudson Valley into the metropolitan area 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.

Typical architectural signifiers of quasi-urban agriculture include micro-scale rooftop gardens, vacant lot community gardens, and unrealized designs for vertical urban farming; these models sometimes succeed on an individual basis, but, though they are not ruled out entirely, we go into this studio suspicious of their many requirements and limited production potential.

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 ask what wisdom the agricultural resilience practices of crop rotation, diversification, pollination, seed banking and intercropping can lend to our urban ecologies. 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 will 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 foodshed and watershed for New York City. 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.

Schedule & Format

(detailed schedule to be discussed at the start of the semester)

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. 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.

Project 2: Mapping of Hudson Valley as Foodshed and Watershed (2 weeks) - Students will perform a series of mapping exercises individually to understand the rural to urban continuum (and associated flows of energy, water, and food) of the Hudson Valley as it relates to New York City. Half the studio will analyze the foodshed and half the watershed, and 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 project moving forward.

Project 2 will include site visits to the Hudson Valley Farm Hub and Stone Barns Center for Food and Agriculture, where we will meet some of the pioneers of resilient agriculture and major farmers in the NYC foodshed.

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.

The Start of a Studio Bibliography

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