S U S T A I N A B L E J E R S E Y

SUSTAINABILITY SUMMIT

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Sustainability Brief: Agriculture

Agriculture sustainability issues are not new phenomena. In different forms they have existed since man first farmed. Sustainable agriculture was defined by the USDA in 1990 as,

> *"an integrated system of plant and animal production practices having a site-specific application that will over the long term: satisfy human food and fiber needs, enhance environmental quality and the natural resource base upon which the agricultural economy depends, make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls, sustain the economic viability of farm operations, and enhance the quality of life for farmers and society as a whole" (U.S. Code Title 7, Section 3103).*

Sustainable agriculture in New Jersey is important for its environmental and social benefits of cleaner air and water, a deeper connection with nature and economically as an important sector of our state economy, generating 1.1 billion dollars in 2011 (NJDA, 2012). Local agriculture also is related to food security as it increases our resiliency in the face of perturbations in the global economy.

1 Background

1.1 Unsustainable Farming Practices

The majority of the current agriculture system focuses on providing commodity crops as cheaply as possible. This is attainable through unsustainable farming practices that are heavily reliant on cheap fossil fuels and monoculture production techniques that lead to environmental degradation and potential instability (genetic, species, and methodological diversity all lead to resilience).

1.1.1 Fossil Fuels

Due to their relatively cheap costs, fossil fuels and associated chemical fertilizers have become the dominant agricultural input over the past half century. For every calorie of food produced by the current agriculture system, approximately ten calories of fossil fuels have been consumed. Additionally, "more than half of all the synthetic nitrogen fertilizer ever applied on the planet has been used since 1985; and phosphorus use (another increasingly scarce resource), tripled between 1960 and 1990 (Millennium Assessment, 2005)." (Horlings & Marsden, 2011) Overuse of chemical fertilizers containing nitrates and phosphorus is one of the nation's most persistent water pollution issues, causing increased algae growth that create 'dead zones' where fish cannot survive.

1.1.2 Monoculture Production

Monoculture production, the repeated cultivation or growth of a single crop or organism, is a common practice in the current agriculture system. "Conversion to intensive monocultures increases pest

populations as natural habitats for pest predators are removed and dense cover crops (as used in crop rotation) are no longer available to suppress weeds. This intensifies the use of pesticides and herbicides, incudes the loss of biodiversity, and can give rise to adverse human health effects." (Ellen MacArthur Foundation, 2013) Monoculture production is not limited to crops such as corn and soybean. Concentrated feed lots where animals such as cattle and pigs are prepared for slaughter are a significant source of greenhouse gas emissions. "Recent estimates concerning animal agriculture's share of total global GHG emissions range mainly between 10-25 percent." (UNEP, 2012)

Monoculture production of livestock also has significant public health implications. "Industrial livestock producers routinely dose their animals with pharmaceuticals, mostly administered with limited veterinary oversight and frequently without prescriptions, to encourage faster growth or prevent infection in crowded, stressful and often unsanitary living conditions." "For more than 40 years, scientists and health experts have known that dangerous microbes were developing the ability to defeat valuable drugs." Recently, "government tests of raw supermarket meat published last February 5 detected antibiotic-resistant bacteria in: 81% of ground turkey, 69% of pork chops, 55% of ground beef, 39% of chicken breasts, wings and thighs." (Environmental Working Group, 2013)

1.1.3 Genetically Modified Organisms

Genetically modified organisms (GMOs) are an emerging agricultural issue. In the United States "less than 20% of corn, soy, and cotton plans were genetically engineered in 1996; by 2011 88% of corn and 94% of soybeans were genetically modified." (Center for Sustainable Systems, 2012). The majority of these crops are from a few seed strains controlled by corporations. A defect in or disease in one of these strains could cause major crop losses nationwide and lead to significant food price increases.

1.2 The Loss of the Family Farm

1.2.1 Changing Demographics

Nationally there has been a loss of "family farms", the traditional small and medium sized farms owned and operated by a family, and a movement towards mega farms, characterized by hired managers and cheap farm labor, often owned by corporations. Changing demographics of farming has contributed to loss of family farms. The average age of U.S. farm operators increased from 55.3 in 2002 to 57.1 in 2007. (USDA, 2007) "An estimated 70 percent of U.S. farmland will change hands in the next 20 years, but many family operations do not have a next generation skilled in or willing to continue farming. If a farm or ranch family has not adequately planned for succession, it is likely to go out of business, be absorbed into ever-larger farming neighbors, or be converted to non-farm uses." (USDA, 2010)

While the national trend is towards mega farms, New Jersey has seen the reverse. Between 2002 and 2007 there was an increase in the number of small farmers (1-49 acres) in New Jersey even though the total acreage of production agriculture decreased by almost 100,000. (Newman, et al., 2012).

1.2.2 Economic Unsustainability

While the majority of farms in the Unites States remain family businesses that rely mainly on farm family members for labor, increasingly, they require supplemental off-farm income to stay economically viable. "The contribution of off-farm income to the total household income of U.S. farmers rose from about 50 percent in 1960 to more than 80 percent in 2004 (Fernandez-Cornejo et al., 2007)." (NRC, 2010)

2 Sustainability Issues

"In recent decades many scholars have discussed the side-effects of the dominant food paradigm model and its myths of efficiency (Morgan et al., 2006). "We have, of course, known for a long time that the current agri-food system has also caused serious environmental negative side-effects, which can have a 'boomerang effect' on food production in the future." (Horlings & Marsden, 2011)

2.1 The Federal Farm Bill

The Federal "Farm Bill" which determines how subsidies and insurance coverage are allocated has facilitated the trend towards mega farms.

> "Under the federal subsidy framework as it is currently designed, large-scale farms (those with annual farm sales of $500,000 or more) receive substantial subsidies. These operations represented 6% of all U.S. farms in 2009 and received more than half of all government commodity payments…. To take one example, more than 7,000 large-scale soybean operations received government payments that year—with farms grossing $500,000 or more (but less than $1 million) receiving an average of $32,182, and farms grossing $1 million or more receiving an average of $105,133. These figures understate the total extent of federal support to large-scale commodity crop operations, as they do not include federal crop insurance subsidies." (Breggin, Meyers, & Jylkka, 2012)

2.2 Farmland Appreciation

"Farmland appreciation is occurring in many parts of the United States. However, New Jersey's position as the most densely populated and urbanized state in the Nation has resulted in premium market prices for farmland. A 2002 study found that 82 percent of the average market value of New Jersey farmland is attributable to the future option for nonagricultural development; this was the highest percentage among any state and significantly higher than the national average of 9 percent. (Plantinga, Lubowski and Stavins, 2002)." (Food Policy Institute, Rutgers University, 2008) The Garden State is consistently ranked among the top three states in the US in farm real estate values with an average of $12,200 per acre in 2011 (NJDA, 2012). The high cost of farmland has made it difficult for many farmers to own the land that they work, according to the 2007 Agricultural Census, nationally 38 percent of farmland is rented or leased, while in New Jersey only 5.9 percent of farm operators are tenants. (USDA, 2007)

3 Sustainability Responses

3.1 Overhaul Farm Bill

Many systemic agricultural issues can be most effectively addressed at the national scale through a major overhaul of the Farm Bill. On July 11, 2013 the House pushed through an agricultural bill stripped of the $75 billion (or about 80 percent of the total cost of the bill) food stamp program (officially known as the Supplemental Nutrition Assistance Program). This is the first time that the food stamp program has not been part of the farm bill since 1973. The House and Senate are now working out their differences in order to finalize and pass a new five-year legislation to continue agriculture programs set to expire in September 2013. Both the House and the Senate versions of the bill cut approximately $5 billion in direct payments to farmers, which are made annually whether they grow crops or not. Much of the money saved from eliminating direct payments would go to other subsidy programs, including crop insurance and new subsidies for peanut, cotton and rice farmers. (Nixon, 2013) Substantial differences between the House and Senate versions of the bill remain.

Recommendations for changes to the 2013 Farm Bill to support sustainable agriculture include (NSAC, 2012), (Olson, et al., 2012):

- Reduce crop insurance payouts and tie crop insurance coverage to conservation standards
- Continue or increase funding to conservation programs targeted at environmentally sensitive lands
- Reduce cuts or increase funding for anti-hunger programs
- Continue or increase funding research and support for organic agricultural practices, and programs to support beginning ranchers and farmers

In addition to the current bills, federal initiatives could be directed towards marketing of organic products and new testing, labeling and trade requirements for GMO products.

3.2 State and Local Actions

While a major overhaul of the Farm Bill may have the most far reaching impacts on the agricultural system, it is by no means a sure thing. Locally states, counties and municipalities have already begun taking concrete steps to support and promote sustainable agricultural practices.

3.2.1 Farmland Preservation

Farmland preservation programs have been established across the nation as a method to support local agriculture by preserving prime agricultural lands near population centers from increasing development pressures. New Jersey's program, administered by the State Agriculture Development Committee (SADC), has developed several ways to preserve active farmland from development: sale of development easements, donation of development easements, sale of the entire property and eight-year preservation. The SADC also runs the "Farm Link" a service that links farmland owners with farmers seeking access to land and farming opportunities. New Jersey also has a farmland assessment program, which assess farmland taxes based on their use rather than development potential in an effort to reduce the costs of farming in the state.

3.2.2 Urban Agriculture and Other Non-traditional Models

"Urban agriculture can include a number of food production and distribution-related activities, which for our purposes include food production through plant cultivation or animal husbandry, as well as some nonindustrial processing and distribution of that food." (Mukherji & Morales, 2010) Urban agriculture systems provide a range of positive community benefits, "community gardens tend to nurture neighborliness in the suburbs; in cities they can play a very integral role for poorer residents, who often lack easy access to fresh fruits and vegetables." (Khavkine, 2010) Interest in other non-traditional agricultural methods such as organic farming, hydroponics, aquaponics, aquaculture and vertical farming has also grown as communities consider ways to increase access to healthy food while reducing their carbon footprint. Increased interest in growing crops in community gardens, on roof tops, and keeping chickens and bees in backyards has forced many communities to reconsider their zoning ordinances to allow urban agriculture.

In New Jersey as in other states, the creation or re-establishment of farming networks and markets are necessary to make farming economically viable for small farmers. "Nationwide, the number of community-hosted farmers' markets has grown from 2,863 in 2000 to more than 7,800 in 2012, according to the nonprofit, Virginia-based Farmers Market Coalition. In New Jersey, roughly 148 such markets will operate this season." (La Gorce, 2013) "'Farmers typically only get 50 percent of retail when selling wholesale, so

[farmers' markets are] a much more profitable way to sell their produce,' says [William] Walker [an NJDA agriculture marketing specialist]." (La Gorce, 2013) Food hubs provide small and medium sized farmers with another outlet for their produce help to move food from the fields to market, link farmers to institutions, and provide facilities for farmers to create "value added" products. There is also an opportunity to increase consumers of organic products to expand the diversity of farming.

4 Implications

4.1 Overhaul Farm Bill

Any changes to the farm bill along the lines of the recommendations above could have a profound impact on the current mega-farm system for commodity crops, with a lesser impact on the types of farming that occur in New Jersey. Changes to direct subsidy payments and insurance payouts that would favor smaller whole farming or poly-culture practices would likely have a positive impact on farming in New Jersey. Continued or increased support for conservation, anti-hunger, organic research and beginning farmer and rancher programs would also have a positive effect on current programs that support farming in New Jersey.

4.2 State and Local Actions

4.2.1 Farmland Preservation

New Jersey's farmland preservation program has successfully preserved over 200,000 acres since it started in 1983, however the State continues to loose thousands of acres of agricultural land per year. The farmland tax assessment program has had a mixed impact on the price of agricultural land; the state still has one of the highest farmland tax rates in the country and farmland value per acre is almost ten times higher than the national average. "High farmland values affect both the accessibility to farmland for new and beginning farmers as well as the ability of existing farms to expand. They also stand to increase the tax burden on owners of farmland. According to 2002 Census of Agriculture data, even under farmland assessment, New Jersey farmers paid more in farm property taxes (an average of $52.13 per acre) than their national counterparts ($5.70 per acre)." (Food Policy Institute, Rutgers University, 2008) Additionally the two programs provide benefits to *farmland owners*, not necessarily to the *farmers* actively working the land.

4.2.2 Urban Agriculture and Other Non-traditional Models

"Sundkvist et al. (2005) speculate that local-scale food systems are more sustainable because they have 'tight feedback loops' linking consumers, producers and ecological effects. In such systems, positive adaptive responses are more possible because of earlier and stronger signaling of negative effects requiring a change in behavior in the system." (Horlings & Marsden, 2011) Producing food near consumers has the additional benefits of lowering the transportation costs of food through the decreases the food vehicle miles travelled (VMT) and associated reduction in greenhouse gas emissions while providing the freshest produce possible.

Overall farmers markets are a big deal in New Jersey, in 2007 "1,931 New Jersey farms generated $30.1 million in revenue through direct marketing, which includes sales at farmers' markets, roadside stands and at the farms themselves…. A farmers' markets study found that in 2010, the Flemington market, operated by the Hunterdon Land Trust, had an annual regional impact of $2.6 million." (La Gorce, 2013) While providing a better return for those farmers who can participate, farmers markets and CSAs can only

support portion of the consumer market, they cannot support the wider market looking for year round inexpensive produce. "Any single farming system is unlikely to meet fully all of society's production, environmental, economic, and social goals and objectives. Indeed, it is most probable that meeting many of society's goals will require a mixture of many farming types and systems rather than the adoption of any one type." (NSAC, 2012)

5 Defining and Tracking Sustainability

Agriculture is sustainable when it:

- **Satisfies human food and fiber needs** and when children and other sensitive populations in urban neighborhoods have health effects related to food access and nutrition that are comparable to those in other areas
- **Enhances environmental quality, makes the most efficient use of nonrenewable resources and on-farm resources and integrates, where appropriate, natural biological cycles and controls**
- **Sustains the economic viability of farm operations, and enhances the quality of life for farmers and society as a whole**

Table 1 provides a preliminary set of indicators and targets for each of the sustainability statements below. Municipal action will be feasible for certain aspects of sustainable agriculture.

6 Conclusions and Links to Sustainability

Agriculture sustainability is a topic of growing interest, however "research on the economic and social dimensions of agricultural sustainability complementary to the research on productivity and environmental sustainability is scarce despite its importance in providing farmers with knowledge to design systems that balance different sustainability goals and improve overall sustainability." (NRC, 2010)

Recent growth of the locavore and organic consumer movements has led to emphasis in New Jersey to preserve agricultural lands and support alternative forms of food production. "By preserving this agricultural character, New Jersey continues to support traditional agriculture, but also provides opportunities for new and emerging agricultural markets, such as aquaculture, agri-tourism, organic and ethnic foods. Together, the traditional and the new enable the state's agricultural industry to continue contributing to the economic success of a diverse Garden State." (NJDA, 2006)

Table 1: Preliminary Agriculture Sustainability Indicators and Targets

Sustainability Definition	Preliminary Sustainability Indicators	Preliminary Sustainability Targets	Scale of Analysis	Availability and Period of Data
Satisfies human food and fiber needs and when children and other sensitive populations in urban neighborhoods have health effects related to food access and nutrition that are comparable to those in other areas	• Health outcome comparison of urban and nonurban communities	• Incidence rate of obesity related diseases by community type • Incidence rate of malnutrition or related health issues in children by community type	• State • County • Municipality • Neighborhood/community	• Health outcome data compiled by NJDOH • Health data compiled by CDC
Enhances environmental quality, makes the most efficient use of nonrenewable resources and on-farm resources and integrates, where appropriate, natural biological cycles and controls	• Amount of prime agricultural lands preserved • Meet national water quality standards	• Percent prime agricultural lands retained and percentage change over time • Food calories output per fossil fuel input • Water quality related to non-point source pollutants - nitrogen, phosphorus, etc.	• National • State • County • Watershed	• USDA and NJDA data on agriculture activities • NJDEP data on water quality
Sustains the economic viability of farm operations, and enhances the quality of life for farmers and society as a whole	• Average farm income compared to average regional income • Stabilization of farmer age and demographics	• Agriculture a percent of State/National GDP and change over time • Farm ownership vs. rental	• National • State • County	• USDA and NJDA data on agriculture activities

The 2006 update to the New Jersey Department of Agriculture's *Agricultural Smart Growth Plan* established objectives and policies for the promotion of a more sustainable agricultural system for its five key components (farmland preservation, agricultural land use planning, economic development, natural resource conservation, and agricultural industry sustainability), however it did not set out targets or metrics for most of its sections. Farmland Preservation is the only exception; with a target of a minimum of 18,000 acres permanently preserve a year.

More recently, the *Five Borough Farm* project by the Design Trust defines nineteen outcomes toward which urban agriculture activities in NYC can contribute. They are grouped into 4 categories – health, social, economic, and ecological. Each outcome has attendant actions, and proposed indicators which can be used to measure progress.

The United States Department of Agriculture (USDA) and the New Jersey Department of Agriculture (NJDA) publish statistics on various agricultural activities, such as types of crops grown, total value of crops, acres farmed, farm operator demographics, etc., which could provide data sources for other indicators of sustainable agriculture growth. Every five years the USDA also publishes the agricultural census (due out in late 2013), which includes data on things such as farmer land ownership vs. rental, etc.

7 References

Breggin, L. K., Meyers, B., & Jylkka, Z. (2012). *Subsidies with Responsibilities: Placing Stewarship and Disclosure Conditions on Government Playments to Large-Scale Commodity Crop Operations.* Washington, D.C.: Environmental Law Institute.

Center for Sustainable Systems. (2012). *U.S. Food System Factsheet.* Retrieved March 2013, from University of Michigan: http://css.snre.umich.edu/css_doc/CSS01-06.pdf

Design Trust for Public Space. (2012). *Five Borough Farm: Seeding the Future of Urban Agriculture in New York City.* Newy York City: Design Trust for Public Space.

Ellen MacArthur Foundation. (2013). *Towards the Circular Economy: Opportunities for the consumer of goods sector V.2*. Retrieved from https://emf-packs.s3-eu-west-1.amazonaws.com/Towards%20the%20Circular%20Economy%202/TCE_Report%202013.pdf?AWSAccessKeyId=AKIAITAQSOURJ2COPP2A&Signature=b%2B193tPUCHjiOCALf7cyM6KxVoQ%3D&Expires=1431877790

Environmental Working Group. (2013, April). *Superbugs Invade American Supermakets.* Retrieved from http://static.ewg.org/reports/2013/meateaters/ewg_meat_and_antibiotics_report2013.pdf

Food Policy Institute, Rutgers University. (2008, October). *Evaluating Changes in the Eligibility Provisions for Farmland Assessment in New Jersey.* Retrieved March 2013, from State of New Jersey Department of Agriculture: http://www.nj.gov/agriculture/divisions/md/pdf/farmlandassessmentreport.pdf

Horlings, L. G., & Marsden, T. K. (2011). Towards the real green revolution: Exploring the conceptual dimensions of a new ecological modernisation of agriculture that could 'feed the world.'. *Global Environmental Change 21*, 441-452.

Khavkine, R. (2010, May 13). *Garden State indeed: community plots sprouting up all of N.J.* Retrieved from The Star Ledger: http://www.nj.com/news/index.ssf/2012/05/garden_state_indeed_community.html

La Gorce, T. (2013, March 12). *A Trip to Bountiful: Jersey Farmers' Markets*. Retrieved from New Jersey Monthly: http://njmonthly.com/articles/lifestyle/a-trip-to-bountiful.html

Mukherji, N., & Morales, A. (2010, March). *Zoning for Urban Agriculture.* Retrieved from Zoning Practice: American Planning Association: http://www.planning.org/zoningpractice/2010/pdf/mar.pdf

Newman, K., Azzarello, M., Capece, A., Cassidy, M., Chamberlain, L., Faust, B., et al. (2012, May). *Community Food Hubs: Community Food Security and Economic Development.* Retrieved March 2013, from Edward J. Bloustein School of Planning and Public Policy, Rutgers University: http://policy.rutgers.edu/rwv/food/FoodHubFinalReport.pdf

Nixon, R. (2013, May 16). *House Agriculture Committee Approves Farm Bill.* Retrieved from The New York Times: http://thecaucus.blogs.nytimes.com/2013/05/16/house-agriculture-committee-approves-farm-bill/

NJDA. (2006, April). *Agricultural Smart Growth Plan for New Jersey.* Retrieved March 2013, from New Jersey Department of Agriculture: http://www.state.nj.us/agriculture/divisions/anr/agriassist/smartgrowth.html

NJDA. (2006). *State Agriculture Development Committee*. Retrieved from State of New Jersey Department of Agriculture.

NJDA. (2012). *New Jersey Annual Report & Agricultural Statistics.* Retrieved March 2013, from New Jersey Department of Agriculture: http://www.state.nj.us/agriculture/pdf/2012annualreport.pdf

NRC. (2010). *Toward Sustainabile Agricultural Systems in the 21st Century.* Committee on Twenty-First Century Systems Agriculture. Washington, D.C.: National Research Council.

NSAC. (2012). *Farming for the Future: A Sustainable Agriculture Agenda for the 2012 Food & Farm Bill.* Retrieved March 2013, from National Sustainable Agriculture Coalition: http://sustainableagriculture.net/wp-content/uploads/2008/08/2012_3_21NSACFarmBillPlatform.pdf

Olson, W., Murphy, D., Johnson, R., Cowen, T., Messinger, R., Cox, C., et al. (2012, February 21). *Room for Debate: The Farm Bill, Beyond the Farm.* Retrieved March 2013, from The New York Times: http://www.nytimes.com/roomfordebate/2012/02/21/the-farm-bill-beyond-the-farm

UNEP. (2012, October). *Growing greenhouse gas emissions due to meat production.* Retrieved March 2013, from United Nations Environmental Programme: http://www.unep.org/pdf/UNEP-GEAS_OCT_2012.pdf

USDA. (2007). *2007 Census of Agriculture*. Retrieved 2012, from United States Department of Agriculture: http://www.agcensus.usda.gov/index.php

USDA. (2010, June 18). *Family Farms Overview*. Retrieved from National Institute of Food and Agriculture: http://www.csrees.usda.gov/nea/ag_systems/in_focus/familyfarm_if_overview.html

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