SUSTAINABILITY briefing

University of New Hampshire
The Sustainability Institute

# Tuckaway Farm: A Cultural Shift Towards Sustainable Agriculture

Dorn Cox is an environmental researcher as well as a farmer. The 250-acre farm in Lee NH has been in the Cox extended family for decades; his parents bought it in the 1970s. Most of the farm has been under conservation easement since 2003 to protect it from development.

## Production and Practices

Tuckaway Farm is a certified organic, diversified farm. Production includes livestock, timber, hay, oilseeds, grains, fruits, and vegetables. They run a Community Supported Agriculture program, sell at a few farmers markets, and have wholesale accounts with about 10 restaurants. Occasionally they sell to a local grocery store.

The Cox family is also very active in the community. Tuckaway Farm frequently hosts events for local organizations and is home to a community garden. Many of their projects are supported by research grants. As Dorn says, "the food produced on a farm should be a small percent of the income, maybe 30-40%. The rest should come from the services provided to the community." These services include research, data, recreation, and ecosystem services such as clean water and habitat. In other words, farm viability involves more than just crop production; community involvement and other activities are vital in sustaining the working landscape.

## Perspective on Climate Change

Those at Tuckaway Farm have certainly noticed changes in climate patterns; Dorn notes increasingly extreme and variable weather in recent years. There have been several blow-downs of trees, and ice storms. They have also had more times of excessive water, which is particularly problematic when mixed with heavy winds. There is likely to be more of this in the future, as projections for New Hampshire predict increased precipitation in the winter and early spring.[1] However, Dorn focuses less on these specific challenges and more on the underlying cultural


*Tuckaway Farm has the capacity to produce enough biodiesel for the entire farm for a year in only 3-4 days. However, there often isn't the time to devote to doing so, an example of a management challenge that the Cox family is working on solving.*

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drivers. “Climate change is a behavioral problem, it is not a technical problem” says Dorn. This means that the solution is also going to be cultural. He explains how our climate situation is a result of our current agricultural and economic system. Essentially, we have a net imbalance of carbon; too much in the air and not enough in the soil. We have large monocultures because this type of farming fits the economic pressure to scale up. However, the current model does not effectively manage complex soil and plant systems. Managing land well requires attention to small details over time, which is very difficult over a large area. Ironically, monocultures are also more susceptible to fluctuations in weather and less resilient to climate change.

*The Cox family divides responsibility for farming the land at Tuckaway*

## Open Source Technology and Networking:

**Networking is particularly important in helping farms develop appropriate technology and adapt to challenges. “Biology is independent of culture,” says Dorn. Solutions that work in France, for example roller crimping as a no till method to kill cover crops, can work just as well here. Thus, it is in farmers’ best interest to communicate with local, regional, and wider networks. In addition, open source technology (free of patents) allows for quick modifications of equipment. This lets farmers rapidly adapt new technologies to their particular problems, and develop optimal unique solutions.**

### Response

Dorn emphasizes that we need to change the way people think. A cultural shift can mitigate future climate change, as well as help farms adapt to changes already underway. More people need to be involved in the food system, and agriculture needs to be more accessible. “We know how to put carbon back into the ground. It is about communicating the practices to people and getting them to value it.” We need the social conventions to support sustainable agriculture.

One possible way of achieving this is quantification of the environmental services provided by farms (such as water filtration, flood control, nutrient management, and carbon storage). Dorn believes that classifying and quantifying such services will make them more visible, and allow them to be valued and put into markets. Conservation easements and certification programs are examples of this. Giving farmers an income from ecosystem services will also help make farming a more viable livelihood.

There is a role for technology as well. Farming can be seen as a socio-technical system, a complex combination of social practices, behaviors, and technology.[2] “What needs to change is the way we interact with technology,” says Dorn, who is a leader in experimenting with new technology. Farmers need to rethink what tools are available to solve a problem, not just what is currently on the market. This type of thinking could even redefine what are considered “problems.”

Problems as Solutions: Hairy vetch is conventionally considered a weed, because it is difficult to harvest and separate out from the main crop, usually a grain. However, including this plant as part of a mix of several species can be more profitable than growing a monoculture of grain alone; there is more nitrogen fixation and more photosynthesis. Instead of oversimplifying the system because of limitations in his equipment, Dorn works to maximize the biological output with as little energy input as possible. With a single pass rotovator he plants a mix of vetch, winter rye, and barley that optimize the nutrient use and production per acre. He uses a Chinese combine design that does not get tangled up by the hairy vetch when he harvests. Now vetch is not a problem, but rather a source of nitrogen that helps fertilize his crops, improve the soil, and control weeds.

*The carbon cycle can be difficult for people to understand. Instead, Dorn suggests talking about the water cycle; everyone can relate to clean water, floods, and droughts. Steps taken to improve the water cycle will also help manage carbon.*

Improved monitoring for improved land management: Dorn is working with others to develop devices for aerial imaging and ground monitoring. Unmanned aerial vehicles (UAVs) are equipped with low cost high-resolution cameras that provide a different point of view to identify larger patterns, detect plant stress, and identify different species, diseases or pests. Farmers can identify the location of irregularities, diseases and pests from a computerin their home or on their mobile devices. This will help improve farmers' capacity to manage diversity, and perhaps deal with climate challenges. John McLean from Woodman Horticultural Research Farm sees great potential for UAV's to help farmers combat apple scab. Apple scab is a fungus occurring in cool and moist areas.[3] As springs in New Hampshire become wetter, apple scab is a serious concern for orchard farmers. In part thanks to open source technology, Dorn estimates that UAV's can be built for as little as $350 each. Dorn thinks the culture of observation and having access to detailed aerial imagery is also important culturally; it can change the perspective of farmers and influence how they place themselves within their environment.

*Dorn works to manage complex biological systems in order to maximize production on the farm.*

## Challenges:

The biggest challenge at Tuckaway Farm is not yet having fully developed markets to support what they want to do. Building a business for the future does not always fit with the best decisions for today, and current markets don't fully support that kind of longer-term approach. Dorn would like to see even more diversity on the farm, but they need to build supporting infrastructure and markets as well as the knowledge to manage that diversity. In doing so, research is a key part of the strategy at Tuckaway Farm.

## Recommendations

Seed Production. If farms can save seeds rather than buy every year, they save money, and know that the seeds are well adapted to farm conditions. Local seed production also improves the security and resilience of a local food system. Challenges? Seeds require infrastructure to clean and store. Dorn is using a spiral separator to separate out the round seeds, like hairy vetch or mustards, from the non-round ones such as wheat, oats or barley. Storage is especially difficult; seeds need to be completely dry, in a cool climate, and protected from hungry critters!

Silvopasture. Integrating forest and field management in a system-oriented approach allows for a greater return per acre. Tuckaway Farm is currently planning to integrate silvopasture with cows and sheep. The animals can help manage invasive species, the shade allows for longer production of grasses, the forest provides biomass and environmental services, and the farm benefits from the livestock production.

Most importantly? Be willing to network and experiment. "Every farm needs to be a research farm and a laboratory," says Dorn. There is a role for everyone in the food movement. Of course, this is not all a direct response to climate change, but a healthier food system in which more people are involved (think agrarian society) will increase the resilience to climate stressors.

## Resources:

•New Hampshire based Green Start focuses on practices and technology for a resilient food and energy system: http://www.greenstartnh.org

•Farm Hack is an Open Source Community for Resilient Agriculture: http://farmhack.net/home/

•Information on the sociotechnical system framework for transitioning to a more sustainable agriculture: http://www.inra-ifris.org/activites/open-science/system-innovations-knowledge-regimes-and-design-practices-towards-transitions-for-sustainable.html

•An article on agriculture and ecosystem services: http://rstb.royalsocietypublishing.org/content/365/1554/2959.full.pdf+html

## References:

1. Wake, C., Burakowski, E., Wilkinson, P., Hayhoe, K., Stoner, A., Keeley, C., LeBranche, J., 2014. "Climate Change in Southern New Hampshire" Climate Solutions New England https://climatesolutionsne.org Accessed on 30 June 2014

2 .Belz, F.M., 2004. "A transition towards sustainability in the Swiss agri-food chain (1970-2000):using and improving the multi-level perspective" in System innovation and the transition to sustainability: theory, evidence, and policy Edward Elgar, MA, USA

3.University of New Hampshire Cooperative Extension, 2013 "Apple Scab Fact Sheet" http://extension.unh.edu/resources/resource/2816/Apple_Scab- Accessed on 16 July 2014

## Climate Change and the New England Food System Case Study Series

This case study was researched and written by UNHSI's 2014 Thomas W. Haas Climate Fellow, Ruby Woodside. Ruby's fellowship focused on documenting and communicating climate impacts and adaptation strategies for New England farmers and fishermen. Ruby is currently working on a Masters of Environmental Science and Policy as well as an MBA in Sustainability at Clark University. The fellowship is based at the UNH Sustainability Institute, and hosted in collaboration with Food Solutions New England (FSNE). FSNE is a regional, collaborative network organized around a single goal: to transform the New England food system into a resilient driver of healthy food, sustainable farming and fishing, and thriving communities. Learn more at www.foodsolutionsne.org.

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