Soil Building Dilemmas and Breakthroughs

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This past June, while facilitating a learning journey with a group of 30 young sustainability executives from major food companies, we found ourselves standing quietly under a bluebird Iowa sky in Jeremy Gustafson's farmyard, looking out over a vast field of corn. Moments earlier, the whole group had witnessed a simulation of the impacts on soil when rain falls on farm fields. The "rainfall simulator" visually conveyed what happens in fields that are tilled compared to fields with more crop residue on the surface, where soil-building plants such as oats and clovers grow in rotation with corn or soybeans.

Watching the simulation, the group had just experienced one of those breathless moments of understanding as they watched muddy brown water drain from the tray of conventional tilled corn ground – taking with it the essential nutrients needed for a healthy crop. Then, they had witnessed the clear slow drip from the other end of the simulator, on a piece of ground sprouting a thick root mass of bright green oats dug from one of Jeremy's field – the trickle of clear water signaling that nutrients had remained in the soil, and that most of the rain had been absorbed.

Holding a journal and pen in her hand, one of the most senior executives on the trip, Sally, turned to Jeremy, the farmer, and asked why he didn't plant more oats and cover crops across his whole farm whenever corn or soybeans weren't growing? Just hours earlier, as part of the learning journey, she had heard from agricultural scientists that most of Iowa was bare ground between the cash-crop seasons – roughly eight months of every year.

"Look," Jeremy said, "I have about 40 crop years in my lifetime. That's 40 chances to get it right. The risk of not getting it right is terrifying." Stretching his arms across the corn horizon, he continued, "I am alone out here. I'm the only one of my neighbors who plants cover crops. They don't just think I'm different; they think I'm passing judgment on the way *they* farm!"

There was a momentary pause. "As for oats,' he said, "I would love to grow more oats. I grow great corn after oats. And now that we are adding a legume cover crop, I can reduce my fertilizer use by up to 40% in the corn year. *But I don't have anywhere to sell these oats*."

Slowly, Sally closed her journal. She put her pen down. Until this moment, she thought she knew the answer to Jeremy's dilemma. Farmers, she had assumed, just needed to add soil-building crops between corn or soybean seasons. But Jeremy's answer made the whole situation more complicated and difficult. Jeremy couldn't do what he really wanted to do unless he had more support — particularly, in the form of risk sharing and peer-to-peer learning. The clear water from the oat field tray in the simulator was good, Sally realized, but the challenges stacked up against that

kind of change were big – perhaps too big for her company, a company that just buys corn.

These can be discouraging moments. Everyone can just *see* what needs to happen, but then each key player explains the obstacles from their own perspective. In this case, from the farmer's (Jeremy's) point of view, the obstacles include cultural resistance from neighbors and up-front costs and risks, without the security of markets for rotation crops. Farmers cannot bridge this impasse until there is a solution to deal with short-term costs, as well as organized peer support to overcome cultural resistance to change. The obstacle from the corporate VP's (Sally's) point of view is the thinking that "we just buy corn; it's not our job to help farmers transition by creating markets for rotation crops." For companies to bridge the impasse, they need to move out of commodity silos to collaborate and create markets for rotations. They need to see themselves as actors in the larger system in addition to just "buying corn."

From a Sustainable Food Lab point of view, we know that all stakeholders would benefit from a shift in how they operate. Most specialized commodity systems lack diversity, so growing small grains, legumes, and cover crops would build soil organic matter, and increased soil organic matter would create more resilient productivity, improve water quality, and sequester carbon. Farmers like Jeremy would clearly benefit in the long-term, even if there were short-term investments. We also know that companies would, in the long-term, get a more resilient supply of ingredients, and executives like Sally would be able to meet corporate sustainability goals.

But to get to actual change, a lot else needs to happen. When people and organizations have different stakes and challenges within complex systems, how do we help them collectively create change?

At the Food Lab we believe it's important to hold Jeremy's dilemma and Sally's dilemma together. When we brought our group of corporate sustainability leaders back from their learning journeys to "make sense" of what they had experienced, we asked each of them to develop and practice a short story they might use back in their organization to explain to colleagues what they had learned. We asked them to make these stories personal and evocative. They constructed stories that were simultaneously empathetic and analytic. They found nuggets of institutional strategy in their visceral insights about good farming and how supply chains and government programs might support a transition. They eventually worked on project design so they could pilot better ways to engage farmers, processors, and farm advisors in a different way of farming that made soil health a key goal.

These smart, ambitious, values-driven leaders were beginning to hold system health within the purview of their life responsibilities. They were beginning to face tough dilemmas without flinching. And today, as of this writing, they are beginning to test solutions. Our Food Lab role is to create these opportunities for insight, shepherd

peer learning and support, and help them find partners, measurement systems and project management to take their insights to pilots and eventually, institutional realignment with expanded goals.

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Until recently, virtually all farmers were taught to see the soil as a medium into which inputs are added and outputs harvested. They weren't taught anything about the intricate complexity of billions of organisms living within the soil. I (Hal) know, because I was one of them.

When I farmed 200 acres of Kentucky hillsides as a young man, I used a tractor-driven tiller to create a beautiful seedbed for crops to feed my dairy cows. I realized only later that by pulverizing the soil I was damaging its structure and oxidizing carbon and nitrogen into the air.

The earth's land is mantled with a thin layer of soil within which microbial organisms live and die in a web of relationships with one another, feeding on other organisms as well as biomass returned to soil. Each tablespoon of fertile soil contains more organisms than there are people on earth.

As a farmer, I had tried to follow the best advice from both organic farmers and conventional ones, but I couldn't find much about the impacts of different methods on soil biology. Fortunately agriculture is now in a positive transition, a transition that is awkward and halting, facing resistance from all sides, but necessary for our collective future.

The path toward a healthier agriculture includes farming method innovations, supply chain incentives, and public-sector rules. All these solutions are well known – and yet, they're not implemented across systems in a way that meets the environmental and social challenges we face today. Often times, what's missing is the type of leadership that can help bridge this knowing-doing gap. We call this type of leadership "Systems Leadership".

In many places, however, there already are system leaders who are navigating this path. They are individuals and organizations like those who joined us on Jeremy's farm in Iowa, who are developing crucial capabilities. System leaders learn how to engage diverse actors in learning and acting together. System leaders create experiences by which people come to understand the larger set of institutional relationships within which their organizations prosper (or not). System leaders create opportunities for reflection and creativity, and they have the dogged persistence required to shift institutions from narrow short-term goals to the health of the larger ecosystem within which institutions function.

In short, you could say that *systems leaders tend to the "soil" of the social field*.

Just as soil on a farm contains a web of microbial and bio-chemical interactions, the soil of the social field contains the web of relationships among farmers, businesses and governments, and the sharing of knowledge among farmers that enables them to support each other's appetites for innovation. It's our belief that the earth's soil will be healthy when the social soil is capable of seeing, aspiring and acting for the health of the whole. But what exactly does it look like to aspire and act from the health of the whole?

To take just one perspective, the corporate perspective, it might look like this: companies will need to move from a least-cost approach to a true cost-shared value approach wherein they internalize the risks of the current system and share costs and risks with supply chain partners. To help companies catalyze and sustain a truly viable sustainable agriculture system, The Food Lab has helped define the following change path:

First, companies do what they can do by themselves, largely within the paradigm of efficiency, standards, and compliance. They then discover that they need to collaborate with others to address larger sustainability challenges such as achieving carbon neutrality along the entire supply chain from field to fork. Sally and her company are beginning to try out such collaborations in Iowa and Illinois, for example. Companies eventually learn to deeply engage with farmers because standards and compliance do not create systemic innovation. Each company also has to engage with others who source from each region because whole farming systems produce multiple crops with many buyers. They need to engage with government because many potential incentives lie within the domain of public sector responsibility..

The economic viability of a truly sustainable food system will require more people and organizations to become system leaders who help the public and private sector to collaborate to support practices like multi-crop rotations, and to create positive business models that encourage adoption of these practices.

This is the territory in which the Sustainable Food Lab operates. For fifteen years we have been convening diverse stakeholder groups and peer groups within the global food system, hosting learning journeys, coaching individuals, helping organizations develop and pilot strategies, and managing multi-stakeholder collaborations. Some of the Food Lab's projects aim at enhancing the well being of smallholder farmers in developing countries, while others seek a more resilient and healthy model of larger scale production. With use of the Cool Farm Tool, a global management tool for farmers, our team and colleagues have discovered that in places where the best farmers improve the soil, they simultaneously reverse carbon emissions and eliminate negative impacts on water.

These are long-term outcomes, difficult to achieve for either farmers or businesses in an economy driven by short-term pressures. Ultimately, as the climate becomes

ever more challenging, those farmers and food businesses who are most successful will be those who think and act with long-term interests in mind, with awareness of the web of biological and social relationships within which success is possible.

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In early 2016, on the other side of the planet from Iowa, we were touring farms in New South Wales, Australia, with a grain buyer named Mark Torrens and a few others from the Mars Company. The Food Lab is currently working with Mars Petcare to improve the farming system in southeastern Australia. Mars purchases large volumes of wheat, and as temperatures rise in Australia and around the world, Mark had become concerned with wheat availability for his product portfolio in Asia. From background research and farm visits, it became increasingly clear to all of us that the thin Australian soils have been suffering ever since sheep disappeared from the region, eliminating the soil-building that results from rotations with hay and pasture. Now the very best farmers using the best conservation farming methods are still slowly depleting soil organic matter, generating increasing dependence on external fertilizer.

As we drove back to Sydney, Mark started to wonder how his company could make a difference. We talked about the potential for re-introducing legumes into the grain rotation and keeping living plants on the ground much more. All of a sudden Mark realized that perhaps pet rations might be designed to include lupins, chickpeas or some other legumes in order to provide market demand for rotation crops, markets that Australian farmers currently lack.

Over the two years that followed, Mars and our Food Lab team have enlisted farmers in field trials and carbon measurement, supported by a wonderful local agronomist whom the Food Lab hired. Since farmers produce for other companies, we invited a cereal and a beer company to join the project as well. Our agronomist has enlisted the engagement of the Riverine Plains Group, a large local association of farmers. We're now planning a deep dive into pet ration development to see if there is potential to create a large new market for legumes the farmers could grow in rotation with grains.

Solutions are frequently very specific to a place, but game-changing solutions can unlock positive innovation across a whole system. In this case, new market demand for rotation crops to build soil organic matter might spiral into a much more resilient agricultural system.

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This is slow work and requires patience, deep listening, watching for opportunities, and the ability to face system dilemmas without discouragement but rather as the next domain of innovation.