



**Sustainable Food Trust**

*A global voice for sustainable food and health*

*The*  
**TRUE COST**  
*of*  
**AMERICAN FOOD**

*April 14<sup>th</sup>–17<sup>th</sup> 2016 / San Francisco*

Conference Proceedings





Foreword

## Patrick Holden

Founder and Chief Executive of the Sustainable Food Trust

I am delighted to be writing this foreword for the proceedings of our conference. I hope it will be a useful resource for everyone with an interest in food systems externalities and True Cost Accounting; and that should include everyone who eats!

The True Cost of American Food Conference brought together more than 600 participants to listen to high quality presentations from a wide range of leading experts, representing farming, food businesses, research and academic organizations, policy makers, NGOs, public health institutions, organizations representing civil society and food justice, the investment community, funding foundations and philanthropists.

As an organization which has contributed in a significant way to the development of the conceptual framework for True Cost Accounting in food and farming, we were delighted that the conference attracted such an impressive attendance of leaders from a range of sectors, all actively committed to taking this initiative forward.

Looking forward, clearly one of the key challenges is how we can best convey an easy-to-grasp understanding of True Cost Accounting to individual citizens, who have reasonably assumed until now that the price tag on individual food products reflects of the true costs involved in its production. As we have now come to realize, this is often far from the case; in fact it would be no exaggeration to state that the current food pricing system is dishonest, in that it fails to include the hidden impacts of the production system, both negative and positive, on the environment and public health.

Perhaps one of the simplest ways to understand True Cost Accounting is to relate it to the annual profit and loss accounting process, to which anyone running a business is already familiar. When submitting my annual tax return in the UK, I am legally required to share information following an agreed protocol, namely total income minus total expenditure,

plus critically, an adjustment for any alteration of the value of my capital assets, which are highlighted in the balance sheet before the final profit or loss is calculated.

Applying this approach to current pricing systems for farm commodities and foods, it quickly becomes apparent that the impact of the food production system on the balance sheet, in this case natural and social capital, is not currently included. I am speaking here of a wide range of un-costed impacts, not only on farm-based natural capital, such as soil organic matter, but also pollution in the form of emissions, pesticide residues in water or damage to public health.

Failure to account for these impacts is resulting in what economists call perverse incentives, both to farmers and food businesses. As a result of this the most profitable forms of food production remain those which are most damaging to the environment and public health. Conversely, food products from farming systems, which are far more sustainable in the long run and provide multiple benefits to people and the planet, are at present the most expensive, and for many people unaffordable.

In addressing these issues, the True Cost of American Food Conference made progress in several important areas. These included recognizing the need for:

- the development of a common methodology for categorizing, quantifying and monetizing food systems externalities, with future research should ideally be based on such a common framework;
- the establishment of additional ‘communities of practice’ such as TEEB<sub>AgFood</sub> and the Global Alliance for the Future of Food, bringing together researchers, practitioners, food companies, policy makers, funders, NGOs and other interested parties;
- ongoing research, including externalities impact studies on different types of farming systems, with the objective of establishing the true cost of food products;
- case studies, ideally embracing the range of climates, soil types, scales and social structures that are currently involved with producing the majority of the food we eat;
- public empowerment, not only to increase understanding of the true cost of food, but also how best buying power can be used to drive change.


Finally, and looking ahead, there will be a need to investigate mechanisms, both carrots and sticks, through which the externalized costs and benefits of different food systems can be accounted for in various ways, for instance through tax breaks, insurance mechanisms, and redirection of subsidies in the form of incentives.

Taken together over time, this work should enable future food pricing and agricultural subsidies to become better aligned with the interests of society and the health of the

planet. In this connection, we believe the most important contribution the Sustainable Food Trust can make is to act as a catalyst, fostering convergence of thinking and encouraging maximum collaboration between all the organizations with an interest in this work

I'd like to thank everyone who attended the conference, and especially the speakers, for devoting so much time and energy to supporting the event and for contributing towards the preparation of these conference proceedings. We are also particularly mindful that without the generosity of all the conference sponsors and the funding and support they gave us, it would not have been possible to host this conference. We were truly humbled by the scale and diversity of this support, and I would like to extend my warmest gratitude, in particular, to The Global Alliance for the Future of Food, The Grace Communications Foundation, The 11th Hour Project, The Marisla Foundation, Owsley Brown III, Patricia Ross, RSF Social Finance, The McKnight Foundation, Nancy G Schaub and The Panta Rhea Foundation for their generous financial support. I would also like to thank The Bon Appétit Management Company for their magnificent achievement in preparing and serving so much of the delicious food throughout the event, the team at George Lucas' Skywalker Ranch for making this beautiful venue available to us for a pre-conference gathering, and finally, the local producers and businesses who opened their farms and establishments to us for field trips. A full list of conference sponsors and partners can be found on the following page.

Lastly, I would like to thank Nadia El-Hage Scialabba for dedicating so much of her time into putting the proceedings together. Without Nadia's incredible and tireless work, I am certain that I would not be writing this foreword now.

A handwritten signature in black ink that reads "Patrick Holden". The signature is written in a cursive, slightly informal style. Below the signature is a thin horizontal line.

**Patrick Holden**

Chief Executive, Sustainable Food Trust



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The Global Alliance for the Future of Food

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# Executive Summary

In April 2016 the Sustainable Food Trust held a landmark conference in San Francisco, California. The theme of the event was 'The True Cost of American Food'. Over two days, more than 100 US and international speakers presented evidence to quantify and monetize the hidden costs of food production and explore how we might implement a logical, economic system based on the latest evidence. Such a system would recognize these costs, most of which are not reflected in the price of food but paid for by consumers and society in other ways.

## INTRODUCTION

There is an escalating crisis in food and farming systems. Industrial food production is damaging the environment, degrading natural resources and contributing to soaring levels of diet-related ill health. We urgently need to tackle this issue before the problem becomes even worse. But how do we go about this? And what is preventing society from doing more to change these harmful practices?

Arguably, the biggest barrier to making food and farming more sustainable is the distorted economic system which takes account of the direct costs of production, such as land, feed, seeds, labor and farming equipment, but fails to include the many externalized costs including pollution, biodiversity, social, cultural and welfare impacts. This system results in a situation where food produced intensively appears to be cheaper to consumers and more profitable to producers than food produced in a more sustainable way.

However, the external costs of this system are ultimately paid for by consumers, either individually or as part of society, even though they rarely realize this.

The conference had two principal aims, first to bring together scientists, economists and other specialists with expertise in the many different aspects of the food system to identify, categorize, quantify and monetize the externalities, both positive and negative, arising from different production systems. Second, to consider how a new economic model could be developed which reflects the true cost of food and improves the business case for more sustainable production and consumption. It was also hoped and expected that areas where further academic work is needed would be identified and that scientists and economists taking part in the event would be inspired to undertake this and be able to make contact with some of the funders supporting the event and interested in supporting such work.

## AGENDA AND STRUCTURE

The True Cost of American Food conference brought together a wide-ranging community of experts and leaders with the aim of achieving these goals. The 600 delegates represented farmers, the food industry, community groups, non-governmental organizations, food policy groups, researchers and academics, philanthropic institutions, investors and the media.

The conference held seven plenary sessions and 16 parallel sessions, featuring more than 100 speakers. Plenary sessions covered the big questions: Why is true cost accounting needed? What is the food business' perspective? What are the mechanisms for change?

Parallel sessions drilled deeper into a host of topics from concentrated animal feeding operations (CAFOs) and corn-soy systems, to public health and education.

These proceedings provide a summary of each talk and some key audience discussion points and is a valuable resource for anyone interested in sustainable food systems. Please note the following account contains information and perspectives from a range of speakers and conference delegates and does not necessarily fully reflect the views of the SFT.

Films of all the sessions, including interventions and discussions, can be viewed on the Sustainable Food Trust webpage:

<http://sustainablefoodtrust.org/articles/the-true-cost-of-american-food-films/>

<http://sustainablefoodtrust.org/articles/the-true-cost-of-american-food-parallel-sessions/>

## BACKGROUND TO FOOD AND AGRICULTURE IN THE USA

### **Main production features**

Due to its diverse landscape and climate, agriculture in the US varies greatly from state to state. In total, there are 3.2 million farmers working 2.1 million farms across America, with an additional 1 million farm laborers. Key crops grown in the US include corn, soybeans and wheat, while the predominant livestock systems include dairy, beef, pig poultry and sheep.

While the agrarian revolution had begun in Britain in the 18<sup>th</sup> century, from the late 19<sup>th</sup> century onwards the US progressively led the world in the introduction of new agricultural technologies, which from 1940 onwards increasingly moved away from low-impact, diversified means of production. A half-century of agricultural policies encouraged intensification of production, including increased use of chemical inputs and



higher animal stocking densities. Concurrently, demands for specialization led to a massive decrease in production diversity and biodiversity on individual farms. The nation's agricultural landscape is now dominated by monoculture cropping, with 53% of the country's primary cropland consisting of corn and soybean systems. Concentrated animal feeding operations also now dominate the livestock sector.

While intensive production predominates there is now a retroactive move towards more sustainable production, with grass-fed livestock and localized, organic production regaining popularity.

## **Environmental externalities – summary of speakers' key point**

The US food production system is heavily dependent on fossil fuels and chemical inputs. Large industrial farms are responsible for substantial emissions including ammonia, which is a major source of air pollution, and the greenhouse gases methane, nitrous oxide and carbon dioxide. According to the Environmental Protection Agency (EPA), agriculture contributed 9% of US greenhouse gas emissions in 2014.

Nitrogen run-off – ranging from 1 kg to 125 kg nitrogen per hectare per year – causes further environmental problems as 71% of this run-off ends up in freshwater ecosystems, causing algal blooms and 'dead zones', such as in the Mississippi River delta. Public expenses related to agricultural nitrogen leakage in aquatic ecosystems was estimated at \$157 billion in 2000, while citizens in some places spend up to 10% of their income to buy bottled drinking water in order to avoid nitrate and pesticide pollution.

Monoculture cropping, overgrazing and chemical inputs all have a serious negative impact on soil erosion. In Iowa, for example, up to one pound of soil is lost for each pound of corn produced. The high-end estimate of soil erosion reaches a staggering \$44 billion a year. Currently, the cost of soil loss to farmers, however, is only \$4.55/acre/year, while the public foots the bill for conservation program payments costing \$12.5/acre/year. This shows how a problem originating at the farm level ultimately ends up being paid for by society because there is little economic incentive for farmers to change their methods.

The US also imports around 15% of food consumed, and this has a significant impact on the environment. Palm oil, for example, is mostly produced on land in Southeast Asia cleared by burning rainforests, which is a major cause of climate change and is contributing to wildlife decline and threatened extinctions, soil degradation and erosion, river and air pollution and dramatic changes to the landscape.

The news isn't all bad, however, as farms have the potential to be of great benefit to the environment when managed sustainably. Mixed farming systems integrating balanced crop and grass rotations and including forage legumes and grazing animals, as well as more diverse and integrated cropping systems in horticulture and agriculture generally,

reduce the need for chemical inputs, create diverse habitats for wildlife, increase soil carbon sequestration, reduce soil erosion and make more efficient use of livestock manures, reducing both fossil fuel use and gaseous emissions.

## **Social externalities**

The cost of seemingly ‘cheap’ processed food is leading to a decline in health across the nation. Children born today are likely to live five years less than their parents. In areas where there is significant economic deprivation, life expectancy might be decreased by 10 years.

The number of food insecure people in the US has tripled since the 1960s, with 2% of American children now stunted by hunger and malnutrition. Hunger currently costs the nation \$168 billion. But in spite of this worrying trend, food loss and waste amounts to \$162 billion in the retail sector and \$218 billion in wholesale. This comprises 40% of all food produced in the US and represents the world’s highest rate of food loss and waste.

While some people do not have enough to eat, others are eating too much. Over-consumption of processed foods high in fat, sugar and salt has resulted in an epidemic of obesity, heart disease and diabetes. However, evidence was presented which indicates that the trend away from the consumption of animal fats, high in saturated fat, towards vegetable oils high in omega-6 fatty acids may not have been as wise as is widely believed, with meat from grass-fed livestock having a far healthier balance of omega-3 and omega-6 fatty acids than meat from animals fed on grain. Approximately one-third of the US population is now overweight and another third is obese. This obesity costs the US healthcare system \$200 to \$300 billion a year while diabetes cost \$245 billion a year in 2012. By 2030, two thirds of the population will be clinically obese and one in three newborns will grow up to be diabetic.

Agricultural chemicals have also been blamed for serious health problems including cancer. Endocrine Disrupting Chemicals (EDCs), found in herbicides like Atrazine, are of particular concern. EDCs cause neurological conditions, premature birth, male reproductive defects and are even believed to contribute to obesity and diabetes. In the US, damage resulting from EDCs was estimated at \$173 billion per year.

Antimicrobial resistance is another major health concern, with overuse of antibiotics by the intensive livestock sector seen as one of the main causes. The Centres for Disease Control and Prevention (CDC) report<sup>1</sup> that there are 2 million antibiotic resistant infections per year in the US, resulting in 23,000 deaths. The economic burden of resistant infections in the US is about \$22 billion for direct health costs, plus another \$35 billion in terms of lost productivity.

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<sup>1</sup> CDC website: <https://www.cdc.gov/drugresistance/>

It is not just the public whose health is at risk; one million farm workers in the US have a fatality rate seven times higher than workers in other sectors. The EPA estimates that 10,000 to 20,000 farm workers are harmed by pesticide exposure each year. Food processing and agriculture workers are also among the most underpaid and exploited workforce in the country.

## **The future food system**

Consumer demand for more sustainable and healthy food is rising rapidly. Demand for organic food is currently three times higher than supply, while the demand for grass-fed animal products has grown at an annual rate of 25–30% in the past decade. Large companies like Tyson and McDonalds are being forced to change their practices due to consumer pressure on issues such as animal welfare and antibiotics. In 2015, every grocery store in the country, from Walmart to the smallest shop requested 100% cage-free eggs from their suppliers in response to consumer demand. People also want to see more locally produced food. From 2013 to 2015, the number of regional food hubs grew by around 30–40%, increasing community food access from local small and medium-sized farms, while farmers' markets are thriving across the country.

Many of the people driving this change are millennials. They are the most diverse generation yet – technologically savvy, socially conscious and in tune with what they eat. However, they also suffer a difficult economic outlook – burdened with the highest levels of student debt and unemployment.

As the world's most influential social and economic superpower, the US has great potential to lead by example in enabling the next generation of farmers and consumers to work more closely together to realize the vision of a non-exploitative and ecologically resilient food system

## **Key institutional drivers**

Market solutions will be key to bringing about change. Despite growing market demand, farmers face impediments to converting to more sustainable management or fully organic methods. There is a quantifiable relationship between the allocation of farm subsidies and commodity specialization, fertilizer application, reduction in cropland diversity and riverine nitrogen concentrations.

While the federal government recommends a diet of 50% fruit and vegetables, less than 1% of government support goes towards these commodities. Changing this system of support would reduce their price and allow sustainable practices to become more economical for farmers.

Regulation will also be key to improving food systems. Current legislation on pollution and agriculture is weak in some areas. The Clean Water Act, for example, exempts agricultural sub-surface drainage as a point source of pollution from the field to a body of

water, resulting in unregulated nitrate and phosphorus pollution. New regulation that recognizes agriculture as a source of pollution will be essential for future agricultural policy. The American food system also continues to be deficient in regulations regarding farm and food workers. Health and safety, as well as racial discrimination and low pay all need to be addressed.

## BUSINESS CASE FOR TRUE COST ACCOUNTING

We are currently paying three times for the food we eat. Firstly, in agricultural subsidy payments which largely promote intensive crop production. Secondly, we pay for the food at its retail value when we buy it in the shop. Finally, we pay for a third time to cover the costs of healthcare, as well as the costs of measures to tackle poverty and environmental degradation.

A case in point is the \$250 million in subsidies paid annually to maize producers that results in producing cheap high fructose corn syrup for a booming soft drink industry. This leads to increasing incidence of obesity and diabetes, the costs of which are paid for by society.

Another example is the cost of the restaurant system that denies a living wage and benefits to workers, resulting in billions of dollars worth of tips by consumers, and an additional \$16.5 billion annually in public subsidies for food stamps and medication. Increasing the federal minimum worker wage to \$12 per hour would be equivalent to an average household increase in daily food cost of just 10 cents a day.

Responsible investment strategies are growing in the US but investors are dissatisfied with current environmental, social and governance disclosures. Profit-and-loss accounts must include societal costs in order to enhance market efficiency and manage risks related to resource scarcity, climate change or eventual regulations on product or consumer safety. True cost accounting brings all environmental, social and economic strands into a uniform strategic approach, allowing decisions that safeguard soils, plants, animals and people, while simultaneously producing positive business results.

## SUGGESTIONS FOR CHANGE

The conference drew attention to the scale of the problem facing the American food system. It highlighted gaps in our knowledge and the urgent need for further research to achieve the objective of identifying, categorizing and ultimately monetizing food and farming externalities. Throughout the conference, speakers called on policymakers, consumers, the food industry, researchers and investors to play their part in bringing about the goal of true cost accounting in food and agriculture.

### **For policymakers**

To reclaim the constitutional right to clean air, water and soil, a nationwide shift in

policy and attitude is needed. From the White House to town councils, policymakers at all levels can make a vital contribution.

*President.* It is the President's responsibility to ensure the citizens of the United States have access to good quality, healthy food and that America's food system does not have significant detrimental impacts on other nations and people around the world. Health, Environment, Agriculture and Labor (HEAL) Food Alliance is a national coalition that is collectively calling on the US President to ensure that each citizen has access to healthy, affordable food.

*Congress.* US Congress introduced the first bill in US history proposing the elimination of lower wages for tipped workers on as little as \$2.77 per hour, favoring \$12 per hour. It is essential for congress to pass further legislation which enables farmers to be more sustainable, and also protecting workers and consumers.

*Food and Drug Administration.* As with pharmaceuticals used in human medicine, FDA guidelines should require testing the health implications and side effects of agricultural chemicals prior to their approval on the market. Scouting to determine insecticide requirements should be subsidized, along with countering the perceived risk of farmers not using insecticides.

*USDA.* The true cost accounting paradigm requires the appointment of a committee inside the USDA to create a roadmap and the tools required for change. With true cost accounting unveiling the hidden societal costs of food production, no subsidization should be made without a social obligation to protect public goods. Dietary requirements meanwhile should be supported by programs that incentivize fruit and vegetable production, grass-based livestock production and perennials. To this end, the Crop Insurance Program must be revisited to discourage high-risk farming and the Farm Bill should reward farmers for providing healthy food and landscapes. Standards of care for agriculture should also be developed, defining options for progressive farmers. More importantly, there is a need to create a Labor chapter in the Farm Bill to prevent the current farming population becoming extinct. This chapter should also remove impediments for young people entering farming by facilitating land access and training.

Agri-industrial complexes must be taxed on their use of fossil fuels. Most urgently, a fertilizer fee or excise tax would help address the chronic need for safe drinking water in communities that suffer from nitrate pollution. Monitoring nitrogen budgets at farm level would be a vital part of implementing such a nitrogen tax. Subsidization is also required to ensure low-income groups have access to safe drinking water.

*States and counties.* Local jurisdictions can often be more progressive than federal government in establishing instruments of public protection. Other states should look to the example set by California which has the country's most advanced regulations governing environmental health, including the Berkeley tax on sugar and sweet beverages. The money raised from soda tax should be directed to school food in particular, as tackling childhood obesity is an absolute priority.



*Towns and municipalities.* All 250 Food Policy Councils should engage with municipal governments to define good food purchasing programs. With municipality support, a food recovery sector should be developed as an extension of the current waste management system. Special attention should be given to water availability and quality, with producers encouraged to treat water pollution at source where it costs \$1.5–22 per pound, rather than \$15–47 per pound for municipal water treatment. Residents' access to water should be protected by water pricing and rights based on equitable sharing of ground-water resources.

## **For consumers**

Consumers are not just economic agents. They are also citizens with a voice in local government. Each consumer can participate in The Good Food Purchasing Policy or Crowdpac, the crowd-funding platform that enables anyone to create a campaign and be involved in defeating big food and agriculture in the political system. Self-organization can build public pressure to overturn laws, such as the Right to Farm which was promoted by corporations and can lead to encroaching on public goods.

Millennials are increasingly concerned about where their food comes from, and there has been a significant shift in recent years in their attitudes to industrially produced food. Large companies like Tyson and McDonalds are being forced to change some practices due to consumer pressure on issues such as animal welfare and antibiotics.

## **For the food industry**

Food companies can and will change the food landscape in response to market pressures. In particular, farmers and workers can elevate their voices through Voices of the Food Chain. Wholesalers and retailers can promote relationships with suppliers for setting fair prices and, in turn, reflect these values to customers. Food services can source from sustainable farms – such as those implementing cage-free poultry and animal welfare, avoiding non-therapeutic antibiotic use and respecting workers' rights. They should also internalize workers' living wages in their business model. In addition, all food industries should establish a direct channel for donating food surplus, without having to rely on food recovery organizations.

## **For researchers**

*Food and agriculture sector.* The agriculture research agenda needs to refocus on public goods, nutrition and health. Federal programs need to be expanded to take advantage of molecular characterization techniques and improve data on microbial resistance, antibiotic sampling and compliance schemes. In particular, this should include DNA sequencing linking bacteria in the human body to farms, which is required to better understand disease interactions. Comparative studies of different livestock production systems are also needed to determine micronutrient profiles and fatty acids contents. Meanwhile inter-institutional communication is urgently needed to capture nitrogen

data related to soils, water, air and health impacts.

*Health.* High-dose toxicological testing is no longer enough to understand obesogens or endocrine-disruptor pathways. Knowledge needs to be increased in relation to the potential for causal harm due to low-dose compounds and cumulative pesticide toxicity. This will require establishing a system model that defines the links between lab tests and epidemiological data. Health insurance companies should also be educated on the impacts of different food production systems, as sustainable diets go hand-in-hand with disease prevention. Plant-based diets require more rigorous epidemiological studies on the health outcomes.

*Education.* School lunches should be improved with healthy food sourcing and cafeteria spaces redesigned for students to have a dignified meal experience. Sustainable food and farming should be taught in schools and encouraged through school-supported agriculture which connects teachers and sustainable farmers. Technical education is also required to train young farmers with a spirit of perseverance and entrepreneurship, in order for them to cope with diversified ecological farming. Likewise, universities must institutionalize farm experience and career-focused technical education.

## **For investors**

*Banks.* Banks must overcome their hesitancy to support sustainable agriculture and embrace the renewable economy. Quantifying the external costs of intensive agriculture will result in cessation of damaging projects and the increase of financing for restorative and sustainable agroecology.

*Institutional asset owners.* Pension funds in the US hold \$22 trillion and are starting to measure the environmental performance of their portfolios to better understand risks and benefits. Pension holders and fund managers must be educated on the long-term returns of sustainable agriculture. In 2016, green bonds issued \$50 billion for renewable energy projects. Agriculture should be included in these bonds for carbon and other environmental benefits.

*Philanthropic and private investors.* Philanthropic impact investment capital can drive change by investing in small sustainable farms. Individual investments, such as Slow Money, can create a nurturing capital to small food enterprises. The investment costs for converting to organically managed lands are in the range of 8–12% of the land value. While this is often too high for land owners, it is a reasonable amount for investors, who have been able to demonstrate the financial, environmental and social benefits of sustainable organic practices.

*Foreign aid.* Development assistance must be guided by a true cost accounting benchmark that reflects the interest of people not profit. Investment returns taken from high-carbon systems need to be reinvested in sustainable agriculture. Risk reduction is a real cost and accounting for it properly will create a change to the bottom line.

# PLENARY SESSIONS

WATCH THE PLENARY SESSION FILMS ONLINE:

<http://sustainablefoodtrust.org/articles/the-true-cost-of-american-food-films/>

# CHAPTER 1:

## WHY OUR FOOD SYSTEMS MUST CHANGE

**Moderator: Patrick Holden**

Chief Executive, Sustainable Food Trust

**Wendy Schmidt**

President, Schmidt Family Foundation – *Introduction*

**HRH The Prince of Wales** – *Message of Support*

**Professor Jonathan Foley**

Executive Director, California Academy of Sciences – *Failures and challenges of the global food system*

**Tyler Norris**

Vice President, Total Health Partnerships, Kaiser Permanente – *Health and the Food System*

## **Opening remarks – Patrick Holden, Chief Executive, Sustainable Food Trust**

The absence of an enabling economic environment for sustainable food production represents the single biggest barrier to mainstreaming the transition toward sustainable food systems. For people who have been involved with this work for many years, it has been frustrating to see that for all the efforts, a glass ceiling has been reached. The business case for producing food in a way which is good for the environment and public health is not strong enough – in fact the signals are the reverse. At present, the most profitable way of farming causes the most damage to the planet and people's health. Until these distortions are corrected, most farmers will be unable to make the changes that are needed.

We must, therefore, make progress towards identifying the full range of hidden costs and benefits within the food system and carefully consider the ways in which society and policy makers can develop new economic approaches which recognize the true costs of food produced in different ways. I recently read an article describing the food movement as an unstoppable force for change. Everywhere I travel I feel that force and as a result I feel more positive about the possibility of this happening now than at any other time.

## **Introduction – Wendy Schmidt, President, Schmidt Family Foundation**

It is fitting that this event, one of the largest gatherings of its kind, is taking place in Northern California, which in many ways is the heart of the sustainable food movement. True cost accounting is exactly what is missing from conversations and the time has come to build on the groundwork of the food movement pioneers.

This gathering germinated at a meeting with The Prince of Wales at the Highgrove Home Farm in 2015. Prince Charles was not only extremely visionary over 40 years ago when he began his crusade against the hyper-industrialization of agriculture, but over the years, he was somewhat of a lone voice, calling for change in a world that was largely ignoring or ridiculing his message. Today, there is a very large group of people working to find ways to redesign a food system that is becoming increasingly unhealthy for the air, water, soil, biodiversity and the welfare of animals and humans, particularly those with the least resources to choose alternatives.

This gathering will hear all sides of the story – from governments, through small farmers and large vendors, to scientists, journalists, activists and non-profit organizations struggling to thrive in this new world that demands accountability. People today care where their food comes from, who made it and what its story is.

In the US, 80% of seafood is imported, mostly from Southeast Asia, but once it is cleared through customs, the requirement to label it disappears. This leaves a wide space for many types of misrepresentation, some of which are deliberate and criminal.



However, the food system was not damaged by malice. Instead, it has been the subtle seduction of simple economics and the self-interests of larger and larger consolidated players who dictate what is planted, how animals are raised, and how success is measured for feeding the world, whilst at the same time, wasting a third of all the food produced. Today's food system is loaded with perverse incentives, and like anything, designed to be increasingly efficient and self-referencing. It grows in loop after careless loop, until it develops into a kind of cancer, with a cascade of unintended consequences. There is a long way to go to become truly accountable, although there are lots of new technologies to help achieve this. There is a long way to go for safety, or fairness, or mindfulness, or education.

The people gathered here are the leaders who are going to re-shape the road map and better design a food system which takes into account all the externalities that are currently not included in the cost of food.

It is becoming hard to ignore today's food issues, no matter who you are. A recent article in the Wall Street Journal,<sup>2</sup> entitled 'Cargill's new place in the food chain', described how this company is working to re-shape itself after two years of declining profits. The company is described as facing the challenge of satisfying customers in Western markets who are shying away from the mainstream food brands that rely on the low-cost ingredients that are the specialty of companies like Cargill. Cargill's CEO said that increasingly, people want to know what is in their food and what kind of company it comes from: are they ethical, how do they treat animals? This is what North Americans, Europeans and increasingly, other economies want. At last, this is not a cyclical problem like a grain market boom or bust, this is a sweeping change that is happening not just in the food sector but also in energy, banking, fashion, professional sports, personal care, cleaning products and many other sectors.

This subtle change is like the little clouds on the edge of an approaching weather system, signaling what is to come. One of the core things Prince Charles identified in his speech<sup>3</sup> to a gathering in Washington DC in 2011 will be addressed: "It is, I feel, our apparent reluctance to recognize the interrelated nature of the problems, and therefore the solution, that lies at the heart of our predicament, and certainly on our ability to determine the future of food."

With this gathering, many of these interconnections will be addressed, with a view to develop irrefutable talking points and come out as one voice on the true cost of food. The task at hand is the production of a manifesto that all people would endorse.

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<sup>2</sup> Wall Street Journal, 2016. Cargill's New Place in the Food System.

<sup>3</sup> HRH The Prince of Wales, 2011. Speech to the Future for Food Conference, Georgetown University, Washington DC.

## Message of Support: His Royal Highness The Prince of Wales

Ladies and Gentlemen, I cannot tell you how delighted I am to have this opportunity to express my support for your True Cost of American Food conference.

I know that your event has brought together a remarkable group of influential experts associated with food production and sustainability, many of whom I have met and who have been sources of personal inspiration over the years. I only wish I could be with you all in person, because there is no doubt that you are addressing one of the most important challenges of our age.

If we are to have a long-term future on this planet we will have to live within its capacity to support us. Natural systems and natural resources underpin all human activity and they have finite limits. It is therefore essential that the true costs of all our activities are properly understood and reflected in the way we run our economies.

We have the tools to do this. We can measure the rate at which we are depleting natural capital and the level of greenhouse gases we are generating. We know the extent of our pollution, our consumption of water, the loss of forests, fisheries, biodiversity and topsoil. In fact, we know a great deal about all the things that are essential to human existence. Yet all too often we allow ourselves to operate in ways that are quite clearly not sustainable.

Where food production is concerned, it is heartening that more people are recognizing the need for sustainable and resilient systems. Yet there is still a pressing need to provide proper encouragement for food production that substantially reduces pollution of the soil, water and atmosphere; that re-uses natural resources; and that makes a positive contribution to public health.

It is inspiring to see the brave innovators and entrepreneurs who have found ways to do what they feel to be right for the planet and still survive economically. But at the moment it seems to me that there are still too many market incentives which, however benign their intention, actually encourage food to be produced in ways which are simply not sustainable.

I make no apology for saying that ways must be found to make sustainable food systems at least as profitable as unsustainable systems. We can't wait for this particular market to correct itself. With a rapidly growing and increasingly unsustainable population and a changing climate, we need to act

now.

As some of you may know, I decided to act upon my concerns over thirty years ago on my farm at Highgrove, by converting the land to organic methods – one of the most precisely defined ways of farming more sustainably. As such, I know from first-hand experience just how difficult it can be to make a profit... But that is partly because we are not looking widely enough at the system within which food production operates.

When I was at the Paris COP 21 event in December, one of the initiatives that really inspired me came from the French Minister of Agriculture, Stéphane Le Foll. He proposed a '4 per thousand' scheme, to incentivize farmers to increase the levels of organic carbon in their soils by 0.4% each year. It seems to me that measures like that could make a real difference to the profitability of sustainable agriculture, while also, of course, helping to slow the rise in atmospheric carbon dioxide.

Ladies and gentlemen, as the title of your conference clearly suggests, we need new ways of accounting for the true costs and benefits of our food production systems. Only then will we be able to make the rapid transition to the sustainable, resilient and healthy food systems that we so desperately need for the 21<sup>st</sup> century and beyond. I do hope you can make significant progress in this task and I send you all my heartfelt good wishes.

## Failures and challenges of the global food system – Professor Jonathan Foley, Executive Director, California Academy of Sciences

When addressing the global food system, there is a need to step back, identify all the separate issues and put them together again, with a view to ensure a whole, not fragmented, picture.

It is undeniable that the global food system is facing a major crisis, with problems impacting food justice, food security, nutrition, the environment and economics. There are some fundamentally broken things in every aspect of the food system.

The food system fails to meet the needs of people. Of the 7.4 billion people on the planet today, some 800 million people are food insecure. Hunger is not due to the lack of food production but to the fact that 800 million people are disenfranchised from the globalized food system, institutionally and in other ways. Conversely, there are twice as many

people in the world who are oversupplied with food, contributing to large increases in health problems. Together, it can be considered that 1 in 3 people on this planet are not being adequately served by the food system.

By 2050, the global population will see two billion additional souls on this planet, amounting to a 28% increase in population. This does not mean that food production will need to grow by 28% but by 60%,<sup>4</sup> because people in developing countries will have a higher income and global dietary patterns are changing towards higher demand for meat and dairy products which have an extreme impact on the productivity of food systems. While it may be true that more food is needed for future generations, this does not necessarily mean that there is a need to grow more food.

Today's food system is failing to make agriculture even remotely sustainable. The planet is fundamentally changed and damaged because of the prevalent farming system. Agriculture uses approximately 40% of all the land on Earth<sup>5</sup> and 30% of all global soil resources are degraded.<sup>6</sup> Furthermore, agriculture accounts for 70% of global freshwater use and species loss; over the past century, up to 75% of global plant genetic resources have been lost and a third more could be gone by 2050. In California, 80% of all water moved is used for agriculture, with alfalfa alone using more water than all of the cities and human beings in the State combined. Agriculture, fisheries and deforestation are by far the single biggest driver of climate change, accounting for a quarter of global anthropogenic greenhouse gas emissions, with the world's energy sectors sitting in a very distant second place. This is due mainly to deforestation and emissions from methane and nitrous oxide, the latter from overuse of nitrogen fertilizers. Solving the climate problem requires first addressing greenhouse gas emissions from agriculture. However, these are not the signals heard in the media. Media trumpets fossil fuels energy but is silent on fossil fuel-based farming; it should really be the reverse.

Therefore, the biggest problem is how agriculture is conceived. For years, the philosophy has been 'grow our way to success' – grow more by using more. This Green Revolution paradigm has to a certain degree been successful and it increased yields, but is this really how success should be measured? For example, if raw calories are considered, corn and soy do not appear very efficient, considering that half of the calories consumed today in the world come from rice and wheat, while surprisingly, the yields for these crops have relatively stagnated over the last 10 years, with industry investing little time and effort

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<sup>4</sup> Alexandratos N. and J. Bruisma, 2012. World Agriculture Towards 2030/50. 2012 Revision. ESA Working Paper no. 12-03. Food and Agriculture Organization of the United Nations.

<sup>5</sup> N. Ramankutty, J. A. Foley, 1999. Global Biogeochem. Cycles 13, 997.

<sup>6</sup> FAO, 2012. State of Land and Water Resources. Food and Agriculture Organization of the United Nations.

into making improvements.<sup>7</sup>

A paradigm change is needed for a greater delivery of nutrition with less social and environmental harm. There is a need to grow food, whilst at the same time providing public goods. To this end, there are many challenges to overcome, including:

- Curbing deforestation, as deforestation is not feeding the world's poor but producing commodities, such as oil palm and soybean, to feed the world's middle class and rich.
- Using appropriate technologies to deliver more food on less land, by helping smallholders to access resources that deliver agricultural benefits, without harming themselves or the environment. Technologies such as GMOs must be treated with caution and in many parts of the world, are not needed. Instead, investments must target water conservation and assisting producers to optimize biomass cycles.
- Producing more crops with less resources by increasing efficiency. In particular, fertilizers should be used more effectively to reduce problems resulting from run-off and leaching. In many areas of the world, synthetic fertilizer reduction did not adversely impact yields, while reducing environmental impacts and direct input costs to farmers.<sup>8</sup>
- Rethinking diets and biofuel and reducing food waste. In the Midwest, food is not grown for people but for feedlots and biofuels. Biochemically when vegetable matter is converted into animal matter through feedlots, the level of efficiency in terms of calories is approximately 3%<sup>9</sup> – this makes no sense. The issue of food waste is also substantial, with 30–40% of food produced being lost or wasted. Statistics show that for every 100 calories grown, only 55 become food and only 35 are delivered to people.<sup>10</sup> Rather than growing 100 calories, the focus should be on

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<sup>7</sup> Johan Rockström, Will Steffen, Kevin Noone, Åsa Persson, F. Stuart III Chapin, Eric Lambin, Timothy M. Lenton, Marten Scheffer, Carl Folke, Hans Joachim Schellnhuber, Björn Nykvist, Cynthia A. de Wit 4, Terry Hughes, Sander van der Leeuw, Henning Rodhe, Sverker Sörlin, Peter K. Snyder, Robert Costanza, Uno Svedin, Malin Falkenmark, Louise Karlberg, Robert W. Corell, Victoria J. Fabry, James Hansen, Brian Walker, Diana Liverman, Katherine Richardson, Paul Crutzen and Jonathan Foley, 2009. Planetary Boundaries: Exploring the Safe Operating Space for Humanity. *Ecology and Society*. Vol 14. No2.

<sup>8</sup> Deepak K. Ray, Navin Ramankutty, Nathaniel D. Mueller, Paul C. West and Jonathan A. Foley, 2012. Recent Patterns of Crop Yield Growth and Stagnation. *Nature Communications*.

<sup>9</sup> Nathaniel D. Mueller, James S. Gerber, Matt Johnston, Deepak K. Ray, Navin Ramankutty and Jonathan A. Foley, 2012. Closing Yield Gaps Through Nutrient and Water Management. *Nature Letter* **490**, 254–257.

<sup>10</sup> Cassidy, E.S., P.C. West, J.S. Gerber, and J.A. Foley, 2013. Redefining Agricultural Yields: from Tonnes to People Nourished per Hectare. *Environ. Res. Lett.* 8: 1–8.

closing the gap between 35 and 100.

Ultimately, the key lesson is that the era of growth is over. There is a need to learn how to deliver more with less land, and better use existing resources. Now more than ever, there is a reason for optimism. This room of people has the capacity to solve these problems and make the change that is urgently needed.

## Health and the food system – Tyler Norris, Vice President, Total Health Partnerships, Kaiser Permanente

If you are in the food sector, you are also in the health sector. A report by the Institute of Medicine<sup>11</sup> noted that for many years now, children born today will likely live 5 years less than their parents. Americans have been dying at younger ages than people in almost all other high-income countries. This disadvantage has been getting worse for three decades. Not only are their lives shorter, but Americans also have a longstanding pattern of poorer health that is strikingly consistent and pervasive over the life course.<sup>12</sup> Separately, it has been estimated that after the previous century, where life spans increased by nearly 30 years, persistent inequity, including increased consumption of low-nutrient intensively produced foods, will lead to some children born today living five years shorter than their parents. This degradation of health, fueled by an array of chronic diseases and some cancers – many directly impacted by poor nutrition – has contributed to the US spending nearly 18 cents of every dollar on health care services.

For most Americans, the soaring demand for illness care, in great part driven by increasing rates of behavior- and environment-related chronic diseases, is driving costs that are making healthcare unaffordable. The multiple externalities of cheap empty calories, and the food system that delivers them, are reflected in declining population health status, and in turn, in higher health care costs. Cheap calories are not so cheap in the long run.

Kaiser Permanente, the largest US non-profit integrated health system (\$62 billion in 2015) is both a health plan and a health care delivery system. By providing care and coverage, KP both holds the insurance risk for its 10.5 million members, and delivers their health care. Unlike most other US healthcare organizations which are reimbursed by volume of care delivered, KP's incentive is to create value by keeping people healthier in the first place. As such, increasing access to healthy foods, and developments toward a healthier, more equitable and sustainable food system, is viewed as an essential part of improving population health status, and in making care more affordable for all.

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<sup>11</sup> Institute of Medicine of the National Academies, 2013. U.S. Health in International Perspective. Shorter Lives, Poorer Health. Report Brief.



The conventional food system delivers large quantities of food that, although relatively low in cost, is notably high in fats, sugars, oils and calories – and increasingly of lower nutritional value. The intensive application of chemical fertilizers and pesticides and the overuse of antibiotics, hormones, fossil fuels, as well as chemicals in packaging and transportation, are having huge negative impacts on not only developmental, but also reproductive health. The annual cost of all food and nutrition-related chronic diseases such as diabetes are in the hundreds of billions of dollars. Of the \$3 trillion healthcare sector, over two thirds of preventable spending and productivity loss is attributable to chronic diseases, many significantly impacted by what, how and where we eat.

Well-documented research on ‘what creates health’ has shown that 30% of determinants can be attributed to genetics, 10% to medical care access and 60% to a combination of personal behavioral choices to great extent shaped by socio-economics and the environment in which lifestyle choices are made. A few years ago, The National Academy of Sciences reported that “It is unreasonable to expect people to change their behaviors, when so many forces in the social, cultural and physical environments conspire against them doing so.” When it is difficult for people to easily access healthy, fresh, sustainable and affordable food, it is equally difficult to help them change their buying and eating habits.

At present, approximately one third of the US population is overweight, and another third are obese. Conservative cost estimates for this epidemic range between \$200 and 300 billion per year. In addition, one in four pregnant mothers are now obese, with the cost of delivering a baby to an obese mother being \$4300 more expensive than delivering a baby to a healthy weight mother.<sup>13</sup> By 2030, at current rates, two thirds of US citizens will be clinically obese,<sup>14</sup> and one in three newborns will grow-up to be diabetic, or one in two if African American or Latino. Diabetes currently costs the economy \$200 billion a year and is expected to rise to between \$500–700 billion a year, should these trends continue.<sup>15</sup>

At present, the impact of the food system on human health falls disproportionately on low-income groups -- notably communities of color, immigrants, and most conspicuously, those working in the food production sector. The CHAMACOS study which considered Hispanic agricultural workers in Salinas found that they were 59% more likely

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<sup>13</sup> KP member data (2013)

<sup>14</sup> Wang and Beydoun, 2007. The Obesity Epidemic in the United States – Gender, Age, Socioeconomic, Racial/Ethnic, and Geographic Characteristics: A Systemic Review and Meta-Regression Analysis. CDC Behavioral Risk Factor Surveillance System.

<sup>15</sup> Wang, et al, 2007. Will All Americans Become Overweight or Obese? Estimating the Progression and Cost of the US Obesity Epidemic. Obesity 2008;16:2323–2330; Institute for Alternative Futures projections for states. Epidemiology Rev 2007;29:6–28. CDC Behavioral Risk Factor Surveillance System.

to develop leukemia, 70% more likely to suffer from stomach cancer, and 63% more likely to develop cervical cancer than the general Hispanic population – this related to over-exposure to toxic chemicals on the land. The workers were also found to have 30–40% higher levels of organophosphates in their urine, with 14% of women exceeding the health-based exposure benchmarks.<sup>16</sup> This means they are passing these toxins on to their unborn babies via their breast milk. Furthermore, a mother's exposure to these toxins during pregnancy has been found to be directly associated with lower IQ and cognitive function in children. Babies are being born pre-polluted – this is the legacy of our current food system.

Unlike pharmaceuticals which undergo strict scrutiny under FDA guidelines before reaching the marketplace, most agricultural chemicals are not required to be tested for health implications and side effects before use, meaning that they are essentially uncontrolled medicine. This presents a significant policy opportunity to ensure that in future, these chemicals are properly tested before use.

A mother's diet during the first five days post-conception is also extremely important to early fetus development. As early as one day after fertilization, long before she knows she's pregnant (and before protection in the uterus around day five), the fertilized egg is subject to significant developmental sensitivity, during which time cellular programming is taking place that will predispose the likelihood of disease in adulthood. Health is not only determined by what is eaten, but also what mothers eat.

These are just a few examples of the impacts that the intensive food system is having on public health. The question at hand for this conference is: how can a price tag be put on human flourishing, or wellbeing, or quality of life? Boundaries must be spanned in order to tackle difficult and complex issues, such as food justice. Bold investments and collaborative work across sectors and perspectives is needed to develop solutions to healthy food access and affordability. All externalities from the food system must be factored in to the price, not simply transferred downstream to the health care system. In this way, a healthy food system can become disease prevention and health promotion at its finest. Food is health.

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<sup>16</sup> The CHAMOCOS Study: <http://cerch.org/research-programs/chamacos/>

# CHAPTER 2:

## WHY WE NEED TRUE COST ACCOUNTING

**Moderator: Danielle Nierenberg**

President and Co-founder, Food Tank

**Alexander Müller**

Study Lead, TEEBAGFood – *The business case for true cost accounting*

**Kathleen Merrigan**

Executive Director of Sustainability, George Washington University – *A workforce plea for true cost accounting*

**Steve Hilton**

CEO, Crowdpac – *How to trigger policy change*



## Introduction – Danielle Nierenberg, President and Co-founder, Food Tank

Food production does not have to come at the expense of natural resources, human rights or animal welfare. People in this room share the conviction that there are environmentally, economically and socially sustainable ways to put hunger, obesity, poverty, food loss and waste in the past, and not the future, of humanity.

Good news and solutions are presented here, as business-as-usual is no longer an option. The paradigm shift at hand concerns eaters, farmers, funders, donors, businesses, story tellers and advocates. All have a role in envisioning what true cost accounting is about. Increasingly, institutions and individuals are leading and being forceful on the issue and getting more investment and research funds to investigate this matter.

## The business case for true cost accounting – Alexander Müller, Study Lead, TEEBAgFood

The Economics of Ecosystems and Biodiversity (TEEB)<sup>17</sup> is developing a framework for systematically valuing the food system from farm to fork.

While there is general agreement that the food system needs to change, the task at hand is to understand how to change the predominant food system narrative. Firstly, it is important to understand that monetizing environmental impacts does not mean commodifying Nature. The intent is to go beyond Gross Domestic Product (GDP), the most powerful development figure in the world. But something must be fundamentally wrong with this indicator, as wherever there is damage to the environment or to people's health, GDP increases.

There is a great need to reflect natural and social capital costs of food production into economic development. So far, fertile soil, clean water and biodiversity come as free goods that are consumed without a market price tag. However, GDP increases when one cleans-up polluted resources. A clean budgeting is needed on the contribution of natural and social capitals of the food system. Such a holistic view would automatically change the current narrative of food production.

Nowadays, it is believed that more food production is needed for the growing population but there are different ways to provide food. Sometimes, cheap food is very expensive, today or in the future, and true cost accounting aims to demonstrate this. In attempting to link food production with the environment and people, it is clear that there are aspects that cannot be monetized, such as cultural relations. A comprehensive valuation framework needs to consider not only agricultural inputs such as fertilizers and other

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<sup>17</sup> UNEP, 2015. TEEB for Agriculture and Food: an Interim Report. United Nations Environment Programme, Geneva, Switzerland.

purchased goods, but also biodiversity and clean air, water and soil, so that all visible and invisible costs are brought together.

The TEEB for Food and Agriculture (TEEBAgFood) framework seeks to connect the dots. For example, what are the costs of cheap food for the health care system? Such a new scheme should allow policy-makers and consumers to make informed choices. However, this paradigm shift will not occur overnight, due to existing vested interests the world over. The task is not easy.

An example illustrates the potential of unveiling true costs. TEEB has commissioned a study to understand what global maize production systems entail.<sup>18</sup> There are at least three different types of maize systems: a highly diverse system for immediate consumption; small-scale and large-scale organic systems; and industrial production systems taking place primarily in the US. When one talks about closing the yield gap, the industrial system is intended. In fact, the US produces 62–65% of all world's maize but only 1% is used for direct human consumption: the rest is used for industrial purposes, bioethanol or animal feed. So when talking about increasing production, the questions are: what production system, for whom and at what cost?

Talking about costs, 8% of US maize production is directed to producing high fructose corn syrup (HFCS), which has significant health implications by contributing, among other factors, to obesity and diabetes. When a government decides to subsidize maize that is ultimately used for HFCS production, payments are made twice, first for subsidies on maize production and second, for health care related to maize-product's consumption. Over the last century, the average annual consumption of high calorie sweeteners increased to 18 kg per person per year. This is the result of subsidizing maize for producing cheap sweeteners. Producers of HFCS have benefitted from implicit subsidies of around \$250 million every year. Subsidies are being used to produce more HFCS, in order to make soft drinks cheaper, with obvious negative impacts on health. The World Health Organization reports that the global cost of diabetes is \$825 billion annually.<sup>19</sup> Since 1980, diabetes increased by 400%. Furthermore, between 1985 and 2000, the real cost of unsubsidized fresh fruits and vegetables increased only by 40%, at the cost of HFCS decreased. To these impacts of maize production, one should not forget to add the pollution of the Mississippi River and the huge environmental and economic (e.g. fish kills) damages related to this pollution.

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<sup>18</sup> TEEB AgFood, 2015. Food Exploratory Studies: Maize. UNEP.

<sup>19</sup> WHO, 2016. Global Report on Diabetes. World Health Organization.

## A workforce plea for full-cost accounting – Kathleen Merrigan, Executive Director of Sustainability, George Washington University

Lots of numbers were presented above. Here is another number for reflection: 40,000. This is the number of USDA employees who took Organic 101 or Organic 201, a web-based course of instruction developed by Mark Lipson, an organic farmer from the Molino Creek Cooperative just outside Santa Cruz, California, who served for four years as organic/sustainable advisor to USDA Secretary and Deputy. These web-based learning modules provide an important education for the USDA workforce and in many cases, help myth-bust certain misunderstandings about organic methods and their conservation value. These courses were not just done by Mark, as he and a former student of mine, Betsy Rokola, led a team of USDA career employees from across several agencies who were thrilled to be a part of the effort. USDA has 110,000 employees and they come in all shapes and sizes: this is important to my message today.

Prior to becoming the Administrator of the Agricultural Marketing Service (AMS) of USDA in 1999, I used to refer to USDA as the “evil empire”, and only half-jokingly. At AMS, I oversaw the second and final organic rules in 2000, increased *E. coli* testing requirements for ground beef purchased for school lunch (that was a New York Times front page story) and would not seat boards and committees that failed to address diversity concerns. These, among others, were achievements over a 22-month period as AMS Administrator! USDA was not the evil empire at all and I loved it there. Sure, there were some USDA staff hell-bent on making my life difficult by creating bureaucratic barriers and churning-up the industry outside of the building. But far more employees were dedicated and excited to have me there. For instance, staff working overnight to complete the organic rule were not driven by high management orders, but because they were passionate advocates who wanted to get it right and help nurture the organic industry.

Looking down the road reveals two daunting tasks. First, there is a need to build the evidence base of externalized costs and it will take collective energy to do so. Few studies really address the range of costs of food production. Many are looking at true cost accounting, but on very limited parameters. So, there is much work needed here and I am excited to be part of TEEB-AgFood team working on these issues. The other challenge to be dealt with simultaneously is that there are a thousand ways that the so-called cheap food is built into our policy structures and economic assumptions about food and agriculture. Some of these are very large, such as trade balance imperatives, or the costs of nutrition assistance programs. Some are small, such as the bias toward producers’ profitability in any number of regulatory battles. So, getting to where is needed on true cost accounting is not just a matter of politically expressing a desire to do so, but having a road map and the tools to dismantle the reinforcing superstructure which denies “externalities.”

The fact is that the evidence base of externalized costs is necessary, but not sufficient, for

inducing change. There is a need for people in the trenches at USDA and in the halls of Congress to make the evidence matter. Who is going to queue-up at the revolving door to get inside USDA to do this work? One of the constraints inside USDA is the shallowness of our bench. There is a need for a much larger cadre of both worker bees and higher level political appointees inside the Department, to help design and implement the multitude of policies that a true cost accounting paradigm will require. It does not have to be a lifelong commitment, especially when embraced by the sustainable agriculture community.

Abraham Lincoln established the USDA as the People's Department. It is our department. It is not 'them and us'. And it is one of the most diverse places to work, serving all kinds of people in every region of the country, many of whom are struggling Americans. One of the most distressing things these days is the degree to which young people are turned off by government. And yet, at the same time, it is encouraging to see the degree to which young people are interested in food, as captured by the book, *A Taste of Generation Yum*.<sup>20</sup> Young people are not only needed to repopulate farms and ranches, but also to hold policy positions in Washington DC. If we, as a crowd, are negative about the government, thinking it is hopeless, why would young people be expected to want to go to Washington and help change the paradigm?

There is so much work to do and reinforcements are needed. We are on the cusp of a new Administration. How do we make sure that food and agriculture are high on the agenda for this new Administration? What are the key questions?

## How to trigger policy change – Steve Hilton, CEO, Crowdpac

The book entitled *More Human*<sup>21</sup> shows how to design a world where people come first. The reason why people are unhappy about the world is because everything, from the way schools, health care and especially the food systems are run, is designed too big, too bureaucratic and too distant from the human scale.

In the past years, what was thought to be unconceivable did happen, such as the ban on smoking or gay marriage, in initially very reluctant countries. Within the food system, there are many arguments, such sugar and nitrogen taxes, or a ban on factory farming that can happen, bringing big change. So how to achieve a revolutionary, not incremental, change in the food sector?

So far, responsibility has been put on people who are not responsible: why seek to change

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<sup>20</sup> Turow Eve, 2015. *A Taste of Generation Yum: How the Millennial Generation's Love for Organic Fare, Celebrity Chefs and Microbrews Will Make or Break the Future of Food*. Kindle Edition.

<sup>21</sup> Hilton Steve, 2015. *More Human: Designing a World Where People Come First*. WH Allen.



consumers' behavior when they are the victims, rather than targeting those who create the problem? US suffers from a “culinary industrial complex” and this is what needs to be tackled. To this end, there is a need to use the same weapon used by large food and agricultural companies, and this weapon is money.

The number of Agricultural Committees' members taking money from corporate agrochemical industries is striking: within the Senate Agriculture Committee, 90% and within the House Agriculture Committee, 72.7% of members (from employees to congressional candidates) receive donations from Monsanto and Syngenta. Should other companies that do not disclose the data be considered (e.g. Cargill), the proportion of corporate donations to those making agricultural laws and regulations would immediately go up to 100%, and this has been ongoing for decades. Thus, money buys the outcomes from the political system. This is what needs to be tackled.

What could be done is not just to inform people about what is happening in the political system, but to empower them to take action by pulling resources to defeat big food and agriculture. Crowdpac is a crowd-funding platform for politics that enables anyone to create a campaign and be involved in the elections that matter to them and achieve the outcomes they want.

It is important to identify the number one enemy of good food and raise the money to defeat insiders' interests, whether they are running in competitive districts by funding an opponent from a different party, or whether they are in a safe district (as is most often the case) by funding a primary opponent. The culinary industrial complex can be beaten through collective action and it possible to make the food system more human.

## Discussion Points

- A full-cost accounting framework should include negative impacts on the environment and people, as well as subsidies and unhealthy practices, so that the whole food system's dynamics are captured – and alternatives are identified. Through a comprehensive true cost accounting framework, double payments, unfair pricing, pollution and policies can change.
- It should be recalled that not all subsidies are equal, including direct subsidies, crop insurance, conservation and food and nutrition subsidies that need to be calibrated in the 2018 Farm Bill. Conversations on full-cost accounting will empower policy-makers on novel things.

# CHAPTER 3:

## THE FOOD BUSINESS PERSPECTIVE

### **Moderator: Naomi Starkman**

Founder and Editor-in-Chief, Civil Eats

### **Walter Robb**

Co-CEO, Whole Foods Market – *Whole Foods Markets' relationship model*

### **Theresa Marquez**

Chief Marketing Executive, Organic Valley – *Organic Valley' cooperative model*

### **Howard Shapiro**

Chief Agricultural Officer, Mars – *Mars Inc. and sustainability*

### **Fedele Bauccio**

CEO, The Bon Appétit Management Company – *Bon Appétit rights-based model*



## Introduction – Naomi Starkman, Founder and Editor-in-Chief, Civil Eats

How to move the needle forward faster to scale-up sustainable food and agriculture?  
What are the challenges and experiences faced by the industry that will drive change, without losing sight of equity issues?

## Whole Foods Markets' relationship model – Walter Robb, Co-CEO, Whole Foods Market

Whole food, healthy food and fresh food has taken a generation to trigger enough awareness for policy change. The principles that yielded results are transparency, responsibility and accountability of concerned companies. Investing in true cost accounting with suppliers means setting prices based on the costs of production and the return on investments and profit: this is not a commodity-based model, but a relationship-based model.

Investing in the market place includes also the provision of fair prices to producers in the developing world. Another focus are the 65,000 under-served communities in the US; for instance, in South Chicago, the life expectancy is 10 years less than in the rest of Chicago. This lost cost of human potential cannot be quantified: this is a moral problem.

Disparity in food access is the main issue in the food sector and the health statistics (such as the incidence of diabetes and high blood pressure) speak for themselves. The idea is that healthy food is restricted to some people; but healthy food is for all communities, including people living in downtown Detroit, New Orleans and South Chicago. In Baltimore (especially the East and West sides) – a city characterized by the worst disparity in healthy food access – the predominant food model offered is subsidized cheap food. Up to 85% of food stamps are spent in community stores because there are no market alternatives within 2 miles and public transportation does not always properly function. In these cases, food access and food justice do intersect, and the integration of these two areas can create the opportunity to make tangible steps. In Detroit and other cities, investments in Whole Foods stores are creating jobs and widening shopping opportunities. A new Whole Foods format is now opening in Los Angeles, called 365, offering the same food quality and standard, but taking a step further towards more affordable food to communities, through their participation.

As regards relationships with producers, Whole Foods is building contracts based on true cost accounting that include three main components: cost of production, including unsubsidized land, water, etc.; return on invested capital, with continuing investments in the farm; and fair return/profit to producers. Throughout, the transparency principle prevails in setting a stable (sustainable) price that is fair to producers, sellers and customers.

Whole Foods' contracts with mango producers in Haiti, provides an example. When the storm hit that country, a mango tree was worth 38 cents for charcoal production, as the

prime need was wood for heating. Selling the fruits to middle men was worth \$15 a year. After the storm, a fair price was set by Whole Foods as \$75 for a mango tree per year, including also social costs, such as incentives to plant more trees. Also, the goal was to go from 500 to 3000 mango farmers. Fruits were sold with a label that reflected the true cost of the product. Thus, what matters is to structure human relationships, and not on a commodity basis, and reflect these values to customers.

## Organic Valley cooperative model – Theresa Marquez, Chief Marketing Executive, Organic Valley

The dominant economic paradigm is not really working – just eight individuals own the same wealth as the poorest half of the world's population. In 1988, the US had already lost 4 million farmers and today, there are less than one million farmers in the country, many of which are business farmers, sometimes using robots.

Starting with just 7 farms in 1988 and today with \$1 billion sales and 1,837 farmers, Organic Valley's objective was always to do what is fair, what is stable and what farmers needed, at a time when farmers were going out of business. For these failing farmers, nothing was to be lost by doing something bold – boldness is needed today for true cost accounting.

For example, in 2000, conventional dairy pay-price to farmers in the Midwest went down to \$11.55 for 100 pounds of milk, the same price they were getting in the 1980s, which is criminal. On the other hand, the Organic Valley cooperative model kept yielding healthy incremental dairy pay-prices: in 2016, conventional dairy received \$17.56 and organic dairy received \$35.60 pay-price per hundred pounds of milk.<sup>22</sup>

The economic model demands that lots of time is spent on serving the value of stockholders, while in cooperatives, one is serving the coop members. Cooperation is about democracy and it is not always easy. For example, when the raw milk option was under discussion, farmers decided not to produce it, despite the organic industry demand. What do you do when you are in a democracy and you do not get your way? At the time of the Roman Empire, Marcus Aurelius said “we are born to cooperate”, and the cooperative model offers a way forward, as it allows decisions that are not necessarily serving the bottom line, but farmers' interests. This means taking bold risks to serve farmers in a cooperative way.

The true cost of food is a tactic towards a goal with a bigger purpose. The 20 cents of each dollar spent on health should really go to farmers, whose status should be elevated to doctors. Education and information is important but consumer engagement is more important, as healthy food does truly cost more to produce.

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<sup>22</sup> Progressive Dairyman, 2016. Organic Valley Paid \$36.79 per Hundredweight in 2015.

## Mars Incorporated and sustainability – Howard-Yana Shapiro, Chief Agricultural Officer, Mars Incorporated

Mars Inc. offsets its carbon emissions through one of the largest wind farms in the world and is becoming a zero waste company, as everything is recycled. Supply chains are 100% transparent and development projects worldwide are working to raise the nutritional level of poor populations. It is sad to highlight that in the US, 7% of children are stunted,<sup>23</sup> with permanent neurological, physical and economic impacts.

All innovation requires money but money inherently has a high degree of uncertainty, and this can stop innovation. Innovation – thus money – is needed to increase food production for a growing population, to reduce food loss and waste, to improve food safety standards, to shift from food security to nutrition security, to create resilience to climate change, to develop optimal nitrogen fixation in maize, rice and wheat (and reduce nitrogen pollution), to create inclusive wellbeing and to source exclusively sustainable raw materials. Where is this money coming from? The key is uncommon collaborations – you need to think about who are unlikely participants.

## Bon Appétit rights-based model - Fedele Bauccio, CEO, The Bon Appétit Management Company

Since 1985, Bon Appétit has worked in the contract environment by bringing chefs and good food into business, while counteracting the corporate food model. In the 1980s, work was undertaken directly with farms, in the attempt to bring better flavor and source food as close as possible to the kitchen. Bon Appétit was the first company in the US to deal with cage-free eggs, since 2003, while non-therapeutic antibiotic use in proteins has been a central pre-occupation for many years. Bon Appétit has also led the industry in animal welfare initiatives and also done a lot with farm workers' rights across the country. They are a highly sustainable company, committed to ecological principles, using sustainability to define their sourcing practices and leading the industry towards a more ecological model.

The key to the future is how concerns about food are messaged. Young people on university campuses understand food issues. They are asking questions about where their food comes from. This journey might take another generation, but there is hope because of the young people that care about these issues.

Bon Appétit's business is worth \$1 billion, buying from over 1000 small farmers. In 2015, it served over 200 million meals in a highly sustainable way, while remaining a profitable enterprise. Farm workers' rights is a prime concern that started with the pioneering code

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<sup>23</sup> FAOSTAT, 2016. Food Utilization USA: Percentage of Children under 5 Years of Age who are Underweight and Stunted.

of conduct for Florida's tomato growers. US citizens should worry about who will harvest their food in future, if migrant workers rights and working conditions aren't improved.

In California, Bon Appétit provides a minimum wage of \$16 to food service workers but the conditions of those working in the field requires attention; to this end, protection guidelines are being developed together with Oxfam, United Farm Workers and others. At the end of the day, such a costly choice results in slightly higher service prices, but it guarantees the delivery of really sustainable food, rather than just paying lip service to sustainability. For instance, wild salmon is not served because it is not available; not being a chain, means that what is offered can be customized dependent on a product's availability.

Generally, the supply of good food is an issue, especially for pork. Furthermore, when one works with small producers, distribution is an issue. The big question is not how to feed the 10 billion, but rather changing diets, offering a healthier protein supply for all, and decreasing the average calorie intake. Of the 40% of food wasted in the US, half is left on the ground due to market requirements. By tackling waste in the field, food services and homes, there would be no need to increase food production.

## Discussion Points

- Whole food is more expensive because it reflects the true costs of production, while cheap food is dishonestly priced.
- Mechanisms for change include companies' responsibility to take direct and bold actions. Solutions exist but there is a need to learn how to work together. Solutions could be either complementary and conducive to cooperation, or competitive and requiring regulation, such as in the case of certified sustainable cocoa.
- Messaging is about having a story to share with consumers. In the last two years, there has been a tectonic shift, because it is customers that are compelling food companies to change. A recent Wall Street column reports a statement from Cargill's CEO recognizing that his business model is broken because mainstream food brands have relied on low-cost ingredients.<sup>24</sup>
- The emergence of plant-based diets, including gluten-free and vegetarian, is a result of a consumer demand that triggered a reverse, over the last 8 years, in spending on fresh plant produce. Bon Appétit is currently sourcing novel products, including Just Mayo that has no eggs or animal fats, Impossible Burgers made only with plants, and chef Jose Andres' Beefsteak restaurants, where vegetables

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<sup>24</sup> Jacob Bunge, Wall Street Journal, April 7 2016, <https://www.wsj.com/articles/cargills-new-place-in-the-food-chain-1460060881>

are the focus of the meal. Technology is changing the landscape of agriculture and in 5–6 years, food intake will be completely different from today, based on a totally different use of plants.

- The US government, states and even cities have put together programs to encourage developers to establish sites for grocery stores and this is triggering the establishment of healthy food stores where they were missing. The 2018 Farm Bill should focus on subsidies, or incentives, for fruits and vegetable, as well as grass-based agriculture. The latter would result in fewer animal treatment requirements, especially non-therapeutic antibiotic use, highly nutritious food and increased soil carbon sequestration. Pastures and more perennial agriculture can solve many problems and deserve attention in the next Farm Bill.
- There is an urgency to preserve the current population of farmers from extinction and revitalize rural communities: long-term contracts that allow farmers to grow and buy more land, training and supportive relationships between buyers and producers are key to this end.



# CHAPTER 4:

## FOOD JUSTICE

**Moderator: Anna Lappé**

Author and Educator

**Joann Lo, Co-Director**

Food Chain Workers Alliance – *The hazards of being food workers*

**Oliver Gottfried**

Senior Advocacy and Collaborations Advisor, Oxfam America – *The hidden price of chicken on our plates*

**Saru Jayaraman**

Director of the Food Labor Research Center, UC Berkeley, Co-Director, ROC-United – *Dehumanized restaurant workforce*

## Introduction – Anna Lappé, Author and Educator

The thread running across all the true costs of the food system is the cost inflicted on the people who work in it – from farm workers and farmers, through meat packers and truckers, to restaurant workers and retailers. In the US today, the 20 million people who constitute the food chain workforce are among the most underpaid and exploited workers in the country.

When the National Labor Relations Act was passed in 1935 and a few years later, the Fair Labor Act that established the minimum wage, both acts expressly exempted farm and domestic workers, so that even the most basic rights, including child labor, minimum wage laws and more, did not apply to these workers.

Restaurant and other tipped workers are also excluded from minimum wage policies and receive only \$2.13 an hour, unless otherwise legislated at state level. Furthermore, 52% of fast food workers are not able to feed their families on the wages they receive and must rely on government assistance for food and other basic necessities.

The impacts of the dominant food system on workers, the business case for improving wages and conditions, and some of the most promising strategies for making change are explored here.

## The hazards of being food workers – Joann Lo, Co-Director, Food Chain Workers Alliance

The Food Chain Workers Alliance's affiliate organizations have over 300,000 workers as their members across the food chain. The Alliance's report entitled *The Hands that Feed Us*<sup>25</sup> documents that the food sector represents the largest sector of employment in the US, comprising of some 20 million workers. From frontline workers up to CEO level, food chain workers earn less than the general US workforce. Some of the key findings from the report include the results of a national survey of 600 food system workers, which showed that the median wage was \$9.65 per hour, with 1 out of 4 people surveyed paid less than the minimum wage required by their state. In addition, over 50% of workers reported injury or illness on the job, and the majority did not have any type of health insurance and thus use the emergency room or urgent care centers for their primary medical care.

The US food system was built on slavery, and the structural racism embedded in it is a legacy that continues today. Workers of color, on average, earn \$5600 less a year than white workers in the food sector. Food workers also face higher levels of food insecurity,

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<sup>25</sup> Food Chain Workers Alliance, 2012. *The Hands that Feed Us: Challenges and Opportunities for Workers Along the Food Chain*.

as compared to the general population.

There are between 1-2 million farm workers in the US and they are employed in the most dangerous occupation. In 2011, the fatality rate for agriculture workers was seven times higher than that for other workers. The US Environmental Protection Agency estimates that 10,000 – 20,000 farm workers are poisoned by pesticide exposure each year.<sup>26</sup>

### The hidden price of chicken on our plates – Oliver Gottfried, Senior Advocacy and Collaborations Advisor, Oxfam America

Americans love chicken and this has tripled per capita consumption of chicken in the last 50 years. The average American eats 89 pounds of chicken every year with 8.6 billion pounds of chicken produced every year. This number has been increasing and will continue to increase. While in the past one would buy a whole chicken and use all of it, today 90% of the chicken found on the market is processed – pre-breaded, pre-fried, pre-seasoned.

In order to meet the consumer demand, poultry factories have rapidly increased production. Consequently, the chicken processing line speed doubled in the last 30 years, with the average worker having to process between 35-45 chickens every minute. Workers have the same specific task (e.g. remove the legs or pull-off the skin) all day, standing closely with sharp knives next to other workers, having to process one chicken every two seconds for 8 hours per day, with only a 30 minute break. Poultry workers are largely people of color, with a significant number of immigrants employed in the workforce.

There are three primary issues associated with this kind of occupation. The first problem is that workers repeat the same motion 20,000 to 100,000 times a day, day after day, resulting in carpal tunnel injury and skeletal system illnesses in wrists, arms and upper body parts. The poultry industry relies on the line in plants across the country to process 8.5 billion chickens every year. Each worker stands at the line for hours on end, performing the same motions over and over. A conservative estimate is 20,000 motions per shift. Workers are unable to pause or slow down for even a few seconds. The incidence of repetitive strain injuries is shockingly high. Poultry workers suffer illness five times more than the average worker. Injury rates, however, tend to be artificially decreased by the chicken industry in their reporting to the government.

Second, poultry workers receive near poverty level wages – \$11 per hour – qualifying them to receive federal assistance, such as food stamps. Meanwhile, CEOs in the poultry

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<sup>26</sup> Environmental Protection Agency (2008) About Pesticides

industry are making astronomical benefits, with salaries of \$5-10 million a year;<sup>27</sup> for example, the CEO of Pilgrim's, the second largest poultry company in the US, made a 200% increase in salary compensation over four years, earning in 8 hours what a worker would earn in an entire year. As a company, Pilgrim's made over \$400 million of net income in 2016.<sup>28</sup>

Third, poultry workers operate in a climate of fear. Poultry companies deliberately take advantage of the demographics of the work force and keep workers silent through threats of firing, deportation, harassment and discrimination. Workers are routinely denied the ability to leave the line to stretch or urinate, so they often wear diapers to come to work. They are punished if they drop a chicken on the floor, or interrupt the production line by slipping and falling. On top of all this, paid sick leave is not offered, so workers will frequently work sick, in order not to lose their paycheck. This is the true price of the chicken on our plates.

### Dehumanized restaurant workers – Saru Jayaraman, Director of the Food Labor Research Center, UC Berkeley, Co-Director, ROC-United

Of the 20 million food workers, 11 million work in the food service industry. The restaurant industry is the second largest growing sector of the whole economy in the US and it offers the absolute lowest pay sector in the country. In 2015, the US became the first country on earth where people spent more money on eating-out than eating in their homes, and the restaurant industry continues to score record profits year on year. Every year, the US Department of Labor releases a list of the 10 lowest paid jobs, and 7 of these are in restaurants (only one of the lowest paid jobs is in a fast food restaurant).

This state of affairs is entirely due to the power of a trade lobby called the National Restaurant Association, considered the most powerful lobby in Congress and State legislatures, since the times of the emancipation of slaves.<sup>29</sup> Tipping, which is a dehumanizing vestige of the feudal system, was abolished in Europe, and in 1860 six states in the US passed a ban on tipping. However, the restaurant industry was demanding to hire newly freed slaves, letting them live on customers' tips. Consequently, the idea that tips sufficed as a wage was codified in the very first Minimum Wage law passed in 1938. When the Minimum Wage law was first passed, tipped workers were exempted entirely. Not much has changed in the intervening period. In 43 states, tipped workers are paid \$2-7 per hour. California is one of seven states that have rejected the system and require tipped workers be paid the state minimum wage.

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<sup>27</sup> Morningstar, 2015. Sanderson Farms Inc. Total Executive Compensation (SAFM).

<sup>28</sup> Morningstar Premium Membership. Pilgrims Pride Corp (PPC).

<sup>29</sup> Saru Jayaraman, 2016. Forked. A New Standard for American Dining.

Women made up 70% of tipped workers, and suffer three times the poverty rate and five times the sexual harassment rate, when compared with workers in any other industry. When one lives entirely on tips, the only choice is to tolerate whatever a customer might do, because “customers are always right”.

The true cost of the restaurant system is huge, with the public paying billions of dollars in tips to workers as well as an additional \$16.5 billion annually in public subsidies for food stamps and medication. For full-service restaurants, the cost to the tax payer is a quarter of a million dollars every year in public assistance. The entire faulty business model is subsidized by the public.

## Discussion Points

- One study has estimated that, should the proposed federal minimum worker wage be accepted for \$12 per hour, that amount that would be passed on from the tipped worker to the consumer is equivalent to an average household’s increase in daily food cost of just 10 cents a day. However, considering the huge profits made by companies, this need not be necessarily passed on to consumers. If the minimum wage for fast food workers was to increase to \$15 per hour in 4 years, these restaurants could cover the costs by reduced turnover and overall, the economy would grow.
- An OXFAM report<sup>30</sup> makes many recommendations that can simply improve workers’ wellbeing without costing more money, for example rotating workers along the production chain to avoid repetitive gestures that cause injury and disease. Companies are losing money because of turnover costs, estimated to \$200–300 million a year. Very little of the food dollar goes back to workers – of one dollar spent on chicken nuggets, just 2 cents goes back to processing workers.
- Large companies keep increasing their profit by not paying a living wage and not offering benefits (e.g. sick time) at the expense of tax payers. In 2014, the poultry industry saved \$2 billion by not offering a living wage to their workers. However, a good jobs strategy (i.e. treating workers better) is estimated to yield companies over \$2 billion in benefits a year.
- In the last 15 years, the Restaurant Advancing Industry Standards and Employment (RAISE), which includes 200 employers, documented quantitatively and qualitatively the impact of paying a living wage to workers. Worker turn-over (at a rate of 300%) costs millions of dollars each year. Paying workers a living wage would cut this rate by half. Statistical regression of data from the seven states in the US that pay a living wage shows that higher restaurant revenues are achieved, as well as higher job growth and higher tipping (Alaska has the highest

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<sup>30</sup> OXFAM, 2016. Lives on the Line: the Human Cost of Cheap Chicken. OXFAM America.

tipping rate, while workers receive a wage). Thus, companies that have internalized worker wages in their business model are achieving both higher profitability and higher productivity.

- In 2013, a campaign called One Fair Wage was launched to eliminate the lower wage for tipped workers throughout the country. Last year, the US Congress introduced the first bill in US history, proposing the full elimination of the abysmal lower wage for tipped workers of \$2.77/hour to \$12/hour in May 2017; it will be on the ballot in Washington DC in November 2016. The most interesting aspect of this campaign is that it was the industry itself that split from the NRA and forged this new path. Another campaign to stop the NRA led to commitments to provide paid sick days and tuition reimbursements for NRA's 85,000 national workers. Diners United maintains an App<sup>31</sup> which provides information on how restaurants are faring on the issue of workers' wages, benefits and promotion practices. The more the restaurant industry moves ahead on justice for its workers, the easier it is to go to legislators and make change happen.
- The Good Food Purchasing Policy is the most comprehensive institutional purchasing food policy in the US. This policy includes standards on buying local, sustainable, fair, humane and healthy food, similar to a certification standard: it has a baseline in each category that needs to be met (e.g. people, environment, animal welfare, etc.) In Los Angeles, this policy twice stopped Tyson from getting a contract, while it created 150 new well paid jobs. Currently, the policy is getting more traction throughout the country and workers unions (e.g. United Food and Commercial Union) are increasingly finding shared values in common with the food justice movement.
- Those claiming to be "sustainable and local" should be challenged with questions about how good they are to their workers. Similarly, advancing workers' rights goes hand in hand with issues of animal welfare or antibiotic resistance. Workers' low wage and lack of benefits impacts the whole public health system.
- This is a racial justice issue – in the restaurant industry, the wage differential is \$4 between white workers and workers of color – even though employers tend to use immigration status to prevent workers from engaging in organized action. Guest workers, however, depend on employers' visa and this administrative route empowers employers to exploit workers.
- In promoting food justice, it is important to elevate the voice of the workers themselves through video and audio on dedicated websites, such as Voices of the Food Chain. Also, there is a severe disconnect between CEOs of large food companies and those managing the working line and filling this gap helps

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<sup>31</sup> ROC National Diners Guide App: Google Store.

improve conditions.

- In California, a bill was introduced to cap the ratio between CEOs and workers' pay and a shareholder's resolution was also introduced to cap CEO pay. There is a momentum on CEO pay legislation in the restaurant industry, as it can be as much as 850 times more than the pay workers receive.
- Agriculture, food and food workers are absent from the current presidential election campaign. Health, Environment, Agriculture and Labor (HEAL) is a national coalition that brings together national and grassroots organizations to collectively advocate and call on the next US President to adopt its platform for healthy and sustainable food.
- It is time for a better business model, one that pays living wages to food workers, rather than displacing the costs onto taxpayers.

# CHAPTER 5:

## CASE STUDY ANALYSIS OF US FARMING SYSTEMS

**Moderator: Patrick Holden**

Chief Executive, Sustainable Food Trust

**Presentation: Harpinder Sandhu**

Lecturer and Research Fellow, Flinders University – *Quantifying social and environmental benefits and costs of different production systems*

Responses from case study farms:

**Jim Erdahl** – *J-ACE Farms Inc., Minnesota*

**Albert Straus** – *Straus Family Creamery, California*

**Joel Salatin** – *Polyface Farm, Virginia*





## Introduction – Patrick Holden, Chief Executive, Sustainable Food Trust

The economics of our food and farming systems are so distorted that those working in ways which safeguard the environment and public health are probably earning significantly less money compared to those whose farming practices have extensive negative impact on these things.

Thanks to the Global Alliance for the Future of Food's funding of the TEEB<sub>AgFood</sub> project, commodity studies have demonstrated that negative externalities of food, such as palm oil, would double their true cost. At the farming system level, there is a need to understand the extent of both environmental and social externalities. This has recently been explored by Dr Harpinder Sandhu on three different US farms.

## Quantifying social and environmental benefits and costs of different production systems – Harpinder Sandhu, Lecturer and Research Fellow, Flinders University

A conceptual framework and farm sustainability assessment method to assess social and environmental externalities, both benefits and impacts, has been developed to guide management practices at farm level, raise consumers' awareness and influence agriculture policies.

Environmental and social benefits are generated on the farm and they contribute to natural and social capital. Case studies undertaken in the USA in 2016 show that:

- A bushel of conventionally produced corn generates environmental benefits worth \$0.40, social benefits of \$0.60 and has an environmental cost of \$1.00, as compared to its farm gate value of \$4.00.
- A bushel of conventionally produced soybean generates environmental benefits worth \$1.29, social benefits of \$1.90 and has an environmental cost of \$3.17, as compared to its farm gate value of \$10.00.
- A gallon of certified organic milk generates environmental benefits worth \$0.08, social benefits of \$0.20 and has an environmental cost of \$0.25, as compared to its farm gate value of \$3.44.
- A pound of Polyface farm beef generates environmental benefits worth \$0.70, social benefits of \$2.67 and has an environmental cost of \$0.63, as compared to its farm gate value of \$1.60.
- A pound of Polyface farm pork meat generates environmental benefits worth \$0.71, social benefits of \$2.70 and has an environmental cost of \$0.63, as compared to its farm gate value of \$3.67.

- A pound of Polyface farm poultry meat generates environmental benefits worth \$1.91, social benefits of \$7.20 and has an environmental cost of \$1.70, as compared to its farm gate value of \$3.50.
- A dozen of Polyface farm poultry eggs generates environmental benefits worth \$3.40, social benefits of \$13.00 and has an environmental cost of \$3.06, as compared to its farm gate value of \$3.75.

The diversified Polyface Farm investigated in this study has a benefit to cost ratio of 5:1, whereas the organic dairy farm cluster and conventional corn/soy farm have a ratio of 1:1.

All three farming systems investigated are delivering more positive externalities than negative ones, due to the sustainable practices already in place at these farms. There is a need to investigate industrial-scale farming systems, such as confined animal feeding operations, confined dairy systems and high input farming systems. There is also a need to examine public health impacts, such as antibiotic resistance and risks of human and animal diseases and other issues associated with these farming systems, in order to include them in future assessments.

The assessment of environmental and social benefits and costs can help develop long-term sustainable production systems that can supply nutritious food in required quantities, without impacting on environmental and human health.

You can access the full report by Dr Harpinder Sandhu here:

<http://sustainablefoodtrust.org/wp-content/uploads/2013/04/The-Future-of-Food-and-Agriculture-web.pdf>

## J-ACE Farms Inc., Minnesota – Jim Erdahl

Since 1878, five generations have been living on this family corn and soy farm in Southern Minnesota. Since the mid-1970s, special attention has been given to protect its soil, and land stewardship is seen as essential to keep the family's future generations on the land.

In 2008, a strip-till system was introduced to produce soybeans as 30% less disturbance is inflicted on the soil. It leaves up to 70% of the previous crop residue intact on the soil, and it allows incorporation of mobile nutrients in the autumn. Soil health (in terms of nitrogen fixation by legumes), water retention and soil carbon sequestration are enhanced by the strip-till system.

The farm is equipped with the best technology, including GPS navigational tracking and a variable rate of fertilizers that are used to build the strip zones after harvest. At planting, corn seeds are placed in the strips, along with liquid fertilizers, and all functions of the

strip-till are electronically monitored from the tractor, such as field tracking, seeding rates and fertilizer application. Three different nitrogen fertilizer applications ensure adequate fertilization rate, thus preventing de-nitrification and leaching of nutrients. Soybeans, being legumes do not need added nitrogen. Pesticide and fertilizer run-off is limited by native vegetation buffer zones around streams, as well as wetland restoration uplands in order to enhance water retention.

Total production value per acre per year includes \$884 of corn and \$690 of soybean. Bountiful harvests are dried and stored in modern silos. Social benefits include family labor and four employees.

External costs are associated with pesticide and fertilizer usage and less visible impacts, such as loss of pollinators, costs to the water industry and greenhouse gas emissions from fossil fuel-based inputs and machinery.

The federal food policy and the farm program are challenging for Midwest farmers who want to balance environmental and financial benefits; for example, additional rotations are difficult to introduce without financial loss. Farm policies, in particular crop insurance, should become more conducive to addressing environmental externalities. Environmental conservation programs are not consistent and change constantly.

Land stewardship is continuously improved to ensure our grand-children inherit a farm that is both environmentally and financially sustainable.

## Straus Family Creamery, California – Albert Straus

Founded in Marin County in 1941, the Straus family farm has stayed in business through two generations. Since the late 1970s, Straus's environmentally-minded family have avoided the use of synthetic inputs, protected streams and waterways with fences, used no till planting for silage crops and established the first Agricultural Land Trust in the United States (Marin Agricultural Land Trust) that preserved half of the farmland in Marin County.

In 1994, the farm finished its conversion to organic management and became the first certified organic dairy farm west of the Mississippi River, and at the same time, the creamery became the first 100% organic creamery in the United States. Today, nine certified organic family farms supply the creamery. Production benefits include local climate regulation due to increased carbon sequestration by trees and pastures, as well as by a methane digester, while external costs are mostly associated with animal feed and manure addition.

Metrics on farming practices are valuable for the determination of the true cost of milk. Such a benchmarking measurement is important to answer some very complex questions surrounding the externalities of milk production, such as quantifying the environmental

benefits of sustainable dairy farming.

Trials are being implemented with a view to establishing a model farming system that others can replicate. This consists of being part of a green carbon project focusing on pasture management, water development, fencing, rotational grazing, composting, planting hedgerows and windbreaks and generating energy through methane digestion.

Carbon farming is a new practice prioritized on the Straus farm and advocated by the dairies that supply the Creamery with organic milk and cream. The adoption of these practices could bring huge benefits. For example, if farmers spread a half-inch of compost on just half of California's rangelands, 42 million metric tons of CO<sub>2</sub> would be offset,<sup>32</sup> equivalent to all the energy use for commercial and residential sectors in California. Furthermore, should two-thirds of the dairies in California add methane digesters to their manure management practices, the reduction in emissions would be the equivalent of taking around 1 million passenger vehicles off the road according to the Straus's calculations.

There is a need to properly inform and influence policy-makers in order to incentivize support for sustainable agriculture systems, rather than leaving consumers, taxpayers and future generations to pay for the externalized costs of current agriculture.

## Polyface Farm, Virginia – Joel Salatin

Located in Virginia's Shenandoah Valley, Polyface Farm produces salad bar beef, pig aerator pork, pastured chickens (eggs and meat), pastured turkeys, forage-based rabbits, hair sheep, pastured ducks, honey, maple syrup and occasional vegetables. Purchased by Bill and Lucille Salatin in 1961, the farm was arguably the most eroded, gullied rock pile in the region, having been absentee-owned for half a century from about 1900–1950.

Today, the second and third generations of Salatins operate the farm with the fourth generation already developing their own enterprises and a cadre of staff, subcontractors, and interns rounding out the 20-person team.

The farm's principles are both simple and profound:

- All healthy ecosystems have animals.
- Animals move.
- Perennials build soil; annuals deplete soil.
- Nature doesn't move carbon very far; it's grown and digested in situ.

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<sup>32</sup> Marin Carbon Project, 2013.

- Local food systems offer both abundance and security.
- Multi-speciation is safer and more productive than mono-speciation.
- Equity should be in management, information and customers.
- Infrastructure should be mobile, modular and management-intensive.
- Sustainable farms must employ at least two people from two different generations.
- Every bite we take creates the landscape our children will inherit.

The Polyface farming system is carbon-centric and its prime “technology” is the synergistic use of plant-animal relationships, such as:<sup>33</sup>

- Carbonaceous diapers: wood chips from sawmilling are used to line animal houses in winter for cows feeding on hay. Corn is placed in the bedding, for the animals to trump-out the oxygen and stimulate the fermentation process.
- Pig aerators: when the cows come out to graze in the spring, pigs are introduced to seek the corn in the cow bedding and hence, turn the bedding from anaerobic to aerobic compost.
- Landscape massage: as it was 5000 years ago when the planet’s carrying capacity of mega-fauna was much superior to today, the historic disturbance role of pigs is used to bring back magnificent silvo-pastures. Seeds latent in the soil germinate again with short-term pig grazing, creating a whole tier of production that doubles the biomass.
- Biomass accumulation re-start buttons: cows, the herbivore pruners that replaced buffalos, take the pasture’s senescent forage and prune it back to very rapid juvenile growth.
- Mob stocking herbivorous solar conversion lignified carbon sequestration fertilization: cows are moved every day on pastures, with 80 heads on half an acre in winter and 300 heads on 2 acres in summer. If every farm in North America implemented this system, within 10 years agriculture would sequester all the carbon that has been emitted since the beginning of the industrial age.
- Portable control mechanisms for migratory choreography of animals: portable shade mobiles hooked together can shelter up to 240 heads.

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<sup>33</sup> Salatin Joel, 2010. The Sheer Ecstasy of Being a Lunatic Farmer. Polyface Inc. Swoope, Virginia.

- Gravity-powered irrigation: in a permaculture type fashion, ponds are constructed on highlands in order to supply 6 miles of water lines holding 80 pounds of pressure irrigation water flowing by gravity – no electricity to pump water, no relays, just gravity.
- Holistic management combined with no-till planting technology: use of animals as preparation tool to beat down the perennials and create a window of opportunity for planting an annual crop. While this technique is used in Australia to grow cereals, Polyface plants cow peas, sudex and other forage crops.
- Pasture sanitation: just as birds follow rhinos in wild areas, cows are followed by egg mobiles, for free range chicken to scratch the cow paddies, eat the fly larvae and turn the grasshoppers and crickets into eggs. More protein per acre in insects can be produced than with meat or milk. So what would be a parasite or worm liability if turned into an asset? \$300,000 of eggs are produced as a by-product of pasture sanitation program.
- Functional genetics: eggs are incubated in stackable houses with pigs underneath and chickens above, and as animals come out in spring, vegetables are grown in hoop houses that have been debugged and fertilized by animals. Rabbits on one acre of pasture generates \$50,000, and with portable floorless shelters for broilers, turkeys in the field and cows in the background, a functional stacking enterprise is created.

Polyface operates a formal intern/apprenticeship program and offers a 24/7/365 open door to anyone from anywhere to visit anytime and see anything unannounced. The farm only ships products within four hours' drive and services 6000 urban families, 50 restaurants, 10 retail outlets, 1 farmers' market, and 1 multi-farm electronic aggregator.

Polyface believes firmly that commercial high production farming can and should enhance wildlife, while growing soil and increasing the natural resource commons.

## Discussion Points

- Truly sustainable systems exist and they are profitable, even without government's assistance. Replication of such experiences requires consumers to participate and understand that through their spending, they can contribute to the healing of the land.
- Growing sustainable farms first requires trained young people with the personal entrepreneurial savvy for diversified and synergistic farming and the perseverance it demands. Career technical education programs in farming are increasing and universities are institutionalizing farm experience, which ensures more equity for succession farmers.
- Externalities of farming systems differ and the three studies above have

demonstrated the benefits of diversified systems. Comprehensive accounting can benefit farmers and practitioners and encourage adoption of technologies that have less detrimental impacts on human health and the environment. Consumers can make informed decisions, based on the benefits and costs of different production systems, and choose products that have higher environmental and social benefits and less environmental costs. Policies can be adjusted to better serve societal goals.

- This farm sustainability assessment methodology can supplement other assessments which seek to investigate the benefits and costs of different farming systems worldwide. More studies are required and more importantly, there is a need to scrutinize and standardize the methodology in order to develop a uniformed metric system for use by the food and agriculture industry to create a label, or a standard, for farm sustainability.
- However, more work is required to properly account and monetize externalities related to social well-being such as public health and indirect community costs and benefits, the impact of low wages as well as other varied cultural benefits and costs.



# CHAPTER 6:

## MECHANISMS FOR CHANGE

**Moderator: Corby Kummer**

Senior Editor, The Atlantic

**Alexander Müller**

Study Lead, TEEBAgFood – *A strategic entry point to valuing food and farming*

**Thomas Harttung**

Chair, Sustainable Food Trust – *Impact investment capital for small-scale agriculture*

**Scott Edwards**

Co-Director of the Food and Water Justice project, Food and Water Watch – *Self-organization in the face of political impediments*

**Janaki Jagannath**

Coordinator, San Joaquin Valley Sustainable Agriculture – *The need for robust regeneration metrics*

**Paula Daniels**

Founder, LA Food Policy Council – *Using the power of procurement*

**Daniel Imhoff**

Author, Publisher and Small-scale Farmer – *The 50-Year Farm Bill*



## Introduction – Corby Kummer, Senior Editor, The Atlantic

Once the benchmarks of sustainable farming are established, what are the actual levers of change that can make sustainable agriculture profitable? Defining the actual costs of inputs and outcomes and proving the economic viability of sustainable farming is not enough, and policy suggestions are needed, along with practical ideas to take home.

## A strategic entry point to valuing food and farming – Alexander Müller, Study Lead, TEEBAgFood

Now that insights have been gained regarding the work required to establish a true cost accounting framework, a strategic entry point is needed in order to change the food system and guide its transformation.

The transformation of the energy sector, from coal and nuclear to renewable sources, started in Europe about 15–20 years ago. In 2000, just 2% of Germany's electricity supply was derived from renewables. The introduction of the 'Feed-in Tariff', which allowed households to produce renewable energy and feed it into the grid, resulted in an increase of renewable energy production from 2% in 2002 to 35% in 2015. This meant that rather than having just four major companies producing electricity, thousands of communities were producing their own renewable energy. People were motivated to make the change because, firstly, many were unhappy with the way energy was produced, and secondly, financial incentives were put in place to facilitate the transition. To change the food system, a similar strategic entry point must be created.

True cost accounting has the potential to be this strategic entry point, it can guide food and agriculture policies around the globe, putting at the forefront the true cost of the production of food, including environmental, social and health costs and benefits. Tariffs for food imports and exports should also be guided by true cost accounting. There is a need to reduce the complexity of the food system in order to make decisions easier for policy-makers and consumers, while also showing where there are research gaps. Farms are all different, management practices are different, but there is a need for a common denominator to value farm practices – something which is transparent and easy to understand and applicable for both developed and developing countries. Energy was easy in comparison to the challenges faced by the food system, as the food system is highly decentralised, with multiple actors and many unintended side-effects. However, input/output ratio cannot continue to be the only success metric of production systems. Other societal outcomes, such as livelihoods or biodiversity, must be part of the equation. In this ongoing learning process with multiple stakeholders, there is a need to develop a new food narrative, along a single benchmark: true cost accounting.

Development, whether in the US or elsewhere, needs to consider all food system components. With Africa's population growing from 1.3 billion to 3.8 billion by the end of the century, how are food and jobs going to be secured, while preserving the environment? Development assistance will need a benchmark to follow, not in the

interest of profit, but of people. True cost accounting can generate this knowledge and guide development efforts.

## Impact investment capital for small-scale agriculture – Thomas Harttung, Chair, Sustainable Food Trust

Denmark is known for having an organic sector that has risen above 10% of market retail. However, even in Denmark where policies have been conducive to organic food production – including support for organic conversion – there are still barriers preventing individual actors from doing the right thing.

One of the main barriers is hesitancy within the banking system. Banks are playing a negative role in the growth of sustainable agriculture. The banks that lend money to farmers have a tendency to put farms in silos, and very often, diversified farms do not benefit. There is also a demographic challenge with regards to an aging population of farmers, which is causing difficulty with many people questioning the legitimacy of absentee and passive ownership of land. It is difficult for young people to gain access to land, unless it has been passed-down through their family.

All European countries are now facing high levels of immigration. Can agricultural models incorporate this new trend? There is a need for a new narrative, not about sustainable agriculture alone, but about sustainable agriculture as an agent of societal change. This new narrative should focus on sustainable agriculture as knowledge intensive and site-specific and it does not need to be capital intensive. In Denmark, philanthropic impact investment capital is being utilized to set-up a centre for the economies of small-scale agriculture, because it is these farms that can be the true drivers of change.

## Self-organization in the face of political impediments – Scott Edwards, Co-Director of the Food and Water Justice project, Food and Water Watch

The problem is that the laws and policies that control how industry operates – whether it's fracking or industrial agriculture – are increasingly being set by corporations, not by communities and citizens. In order to fix broken systems, political power needs to be built at various levels, from community to town, city, state and federal levels. Democracy must be taken back from large companies and corporations if we want to see change in our food system.

We need to take away the impediments to sustainable farming and this means defeating the system of corporate political power currently in place, which facilitates things like the passage of the 'right to farm' laws – decided by corporations – which take away the rights of citizens on neighboring farms to protect their property. There is even a law in

Wyoming that makes it illegal to take a water sample from public land and use it to stop polluters from polluting. For example, in Maryland, very intensive poultry systems on the narrow Delmarva Peninsula are decimating the Chesapeake Bay with nutrient pollution. The reason why this continues is due to the political power of the Purdue family, who initiated and own poultry operations on the Peninsula, and the strong alliance they have with the state governor of Maryland.

Communities must organise and build their own political power, bringing public pressure to overturn laws which privilege the rights of corporations over those of citizens. This includes the ‘right to farm law’ and Pennsylvania’s ‘Acre’ law which prevents communities from legislating on anything that detrimentally impacts agricultural production, such as the density of CAFOs allowed. The extent to which elected officials have gone to ‘immunise’ corporations and make them exempt from all of our laws and protections, to make them exempt from democracy, is outrageous. Democracy must be promoted through self-organization.

### The need for robust regeneration metrics – Janaki Jagannath, Coordinator, San Joaquin Valley Sustainable Agriculture

Communities in the Central Valley of California are facing third world conditions, with problems including lack of water access, pesticide exposure and poor air quality. The most severe impacts of the drought in California are felt by low-income farmworker communities. Because of the abundant use of water in agricultural fields – and due to the discriminatory nature of where water infrastructure is created and maintained – over 1 million California residents do not have access to clean, reliable and affordable drinking water. This disparity of this natural resource represents a major cost to citizens.

Environmental justice groups have worked with state officials to establish certain criteria for what is considered to be a disadvantaged community in order to advance the state’s policy to increase direct investments into these areas. Health problems, such as asthma and low birth rates, are connected to residents’ exposure to pesticides in proximity to large farming operations. Mapping this data<sup>34</sup> serves to encourage state agencies to invest in these disadvantaged communities.

In collaboration with the State Water Board, a program was created to recycle ‘enforcement dollars’ back into communities suffering from high water pollution rates. Although it is still difficult to prove point source pollution from large agricultural operations due to the obscurity of data collection and the reporting of synthetic nitrogen fertilizer use, the program allows large producers applying to the State Water Board to offset their impacts by financially contributing to a supplemental environment project.

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<sup>34</sup> Cal Enviro Screen Version 2.0, 2014. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency.

These funds are given to a foundation that distributes it to non-profit/community groups for well remediation, community education purposes, or related initiatives with a local benefit to impacted residents. This is a model that constructively utilizes the state's money. The problem arises when metrics are not proven, or widely accepted. For example, greenhouse gas reduction funds and carbon credits are auctioned on the open market, generating billions of dollars every year that are administered by the State Air Resources Board: in 2015, \$3 billion were raised from pollution credits. By California statute, 10% of these carbon funds must go back into localized pollution abatement and emission reduction in 'red' areas of the Cal Enviro Screen. However, due to the lack of solid metrics to assess the impact of agricultural practices on greenhouse gas emissions, the state's investments cannot be adequately directed to support regenerative agriculture. The funds are instead being directed to large industrial agriculture emission reduction practices, such as the development of manure digesters on industrial-sized cattle operations.

Although these sorts of projects may represent an overall reduction of greenhouse gases in the State, they are not, for instance, supporting the development of local, sustainable or pasture-raised cattle and dairy. The metrics for the 'suffering' side exist but the regeneration metrics are not yet in place. It is now time to work with State agencies to create projects that improve the situation in agriculture, such as the Healthy Soils Initiative, a \$20 million project currently being approved by the legislature.

## Using the power of procurement – Paula Daniels, Founder, LA Food Policy Council

The Good Food Purchasing Program was developed by the Los Angeles Food Policy Council and adopted by the City of Los Angeles and Los Angeles Unified School District in 2012. The Los Angeles Unified School District is the biggest food service provider in the city, producing 750,000 meals/day (at \$2.75/meal) with their \$150 million food budget. By adopting the Good Food Purchasing Program, local procurement was raised from 10% to 60% in a year and sustainably produced wheat for bread products grew to 85%. In just two years, \$12 million were redirected to the local food economy, 150 new jobs were created in processing local produce, and the meatless Monday resulted in a 15% reduction of meat purchases.

The Good Food Purchasing Program is designed to do for the food system what LEED (Leadership in Energy and Environmental Design) certification did for energy efficiency in buildings. The Program provides a metric based, flexible framework that encourages large institutions to direct their buying power towards five interconnected values: local economies; environmental sustainability; valued workforce; animal welfare; and nutrition. The Good Food Purchasing Program is a leading procurement model across the country and the first of its kind to support these food system values in equal measure.

The Center for Good Food Purchasing also provides planning, implementation and evaluation support for institutions using the Good Food Purchasing Program framework.

The Center works with institutions to establish supply chain transparency from farm to fork, evaluates how current purchasing practices align with a set of standards, assists with goal setting, measures progress, and celebrates institutional successes in shifting towards a values-based purchasing model. The Center issues a Good Food Provider verification seal to participating institutions that meet baseline requirements across the five value categories.

The initiative is place-based, aggregating the buying power of the largest institutions in cities around the Good Food Purchasing framework. The Good Food Purchasing Program is also policy focused, aimed at building the capacity of communities, elected officials and administrators to use the public contracting process to demand transparency and accountability from suppliers, and ensure that public funds are spent in a manner consistent with an institution's social and environmental values.

Soon after the policy's adoption by Los Angeles Unified School District, food policy councils and procurement officials from across the country expressed interest in advancing a similar model in their cities. In 2015, the Center for Good Food Purchasing was created as an independent nonprofit with national reach to meet this growing demand and share a tested procurement model, centralized verification infrastructure and technical assistance. The Center for Good Food Purchasing guides a networked city-by-city expansion strategy and supports robust implementation efforts to achieve large-scale impact and system-wide reach.

Recently, school districts in San Francisco and Oakland also adopted the program, and it is currently being explored in cities throughout the US, including Chicago, Austin, Minneapolis-Saint Paul, Cincinnati and New York City.

A networked city-by-city strategy has tremendous power to move markets and transform supply chains. As the Good Food Purchasing Program is implemented in more cities, these institutions can together compel major food suppliers to make changes in ways that a single institution may not be able to achieve on its own, creating massive scale and enormous potential impact. This collective power provides a model that can revolutionize the food system.

Turning the Farm Bill on its Head – Daniel Imhoff, Author, Publisher and Small-scale Farmer

The Farm Bill is a \$100 billion annual budget that the government spends on food and agriculture. It offers an extraordinary opportunity to shape the food system, to do things better and more fairly and to compensate for values and costs that the market does not recognize. It is important to consider the possible outcomes that might be achieved with a True Cost Farm Bill: protecting the natural world while we farm; providing health and sustenance, especially to the most needy; creating a culture that values farmers, workers and vibrant rural farming communities; and commitment to conservation and stewardship, research and innovation, fairness and health.

Let's turn the Farm Bill on its head and for a moment, re-imagine it with broad brush strokes, 50 years from today. That is roughly 10 future Farm Bills, and that's about how long it was from when Secretary of Agriculture Earl Butts officially told American farmers to "get big or get out" and where we are today.

The first key tenant should be: "If you're too big, get out." It is time for real limits on income eligibility for crop insurance and price supports, instead of an open checkbook for the biggest agricultural operations today. Every cent of that \$100 billion is needed to do all the good that has to be done.

"No subsidization without social obligation" will be a second tenant. If tax payer dollars are going to be used to support farming businesses, the public should get something of real value in return: zero soil erosion; clean air and water leaving farms; biodiversity protection at the highest levels.

Over the next 50 years, programs must foster the transition "from the fossil fuel monoculture mind to an agroecological mind." Future agriculture systems will be far more locally adapted, intelligence based, and rich in labor, skills and knowledge about how we can optimize exchanges of energy and nutrients on farms, like Joel Salatin has shown. Rotational grazing systems, no-till organic farming, perennial polyculture crops that provide new ways to raise grains and protect the soil with deep rooted plants, will slowly take over tens and then hundreds of millions of acres.

Conservation incentives will be impressive and far reaching: 10% of the land will be in Conservation Reserve Programs at all times, with increasing moves toward large permanent contiguous acres – 10% and then 25%, 50% and eventually 100% of farms will incorporate cover crops and permanent ground-cover on portions of farms. Measurable gains in soil carbon and soil organic matter will be rewarded.

The cultural shift at the USDA will move from feeding the world with industrial agriculture, to leading the world with knowledge and practices that can be locally applied and adapted, ensuring the world is fed without destroying the Planet.

A Labor Title in the Farm Bill, which currently does not exist, will offer support to nearly 6 million farm workers in the country. A Transparency Title will uphold labeling and production information systems that teach consumers about the true costs and realities of production. An Urban Agriculture Title will support the inner city food production movement. And just for a cherry on top, dietary and nutrition requirements will be supported by the policies and programs that incentivize crop production.

How one talks about policy, so that people get excited, may be as important as what one asks for. Let's think carefully about what is needed and then give them poetry.<sup>35</sup>

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<sup>35</sup> Imhoff, Daniel. 2012. Food Fight: The Citizen's Guide to the Next Food and Farm Bill.



## Discussion Points

- In order to move towards sustainable agriculture systems, a huge amount of redirected investment is needed. This was the case for renewables in Germany, where education about the nature of the investment was necessary to assure people about the low risk alternative. In the case of sustainable agriculture, using true cost accounting will ensure there is a business opportunity for the banks. It's not just food systems that need to be re-designed but also the banking system. What is needed is a renewable economy education for banks. We have to make money green.
- The secret of the success of organic agriculture in Denmark is because organic produce has never been seen as elitist, but as something that is accessible to everyone. However, it was also due to bipartisan endorsement of organic as a viable production method. The politicians used organic to balance-out the power of big agriculture – it gave politicians leverage when working with large companies.
- Negative banking behavior is not uncommon. When banks feel that agriculture is an unstable investment, they limit their exposure by taking steps to reduce the balance sheet, which trickles down and impacts all areas of the food supply chain. Banks play an extremely important role, including a role as lobbyists against the Farm Bill, as they do not want money to go into a 'quid pro quo envelope', but instead into the 'money for nothing box', which is where most of their lending goes. Therefore, there is a need to expose, at a societal level, the counter-productive behavior of banks.
- There is a big development going in Europe, where pension funds and insurance companies are reducing investments in coal mining operations because they feel it's not sustainable. How could pension funds be convinced that sustainable agriculture is good for the long-term sustainability of their stocks? Changing the food system will require going far beyond agriculture and involving the health sector, banking and some related state level legalization.
- The upstream infrastructure of food, including banks and other financing, is very important.
- Today, the mid-scale level in farming is missing – farms are either large or small-scale operations. We need to build infrastructure for mid-scale farming. Driving investment towards mid-sized farms requires also paying close attention to the water infrastructure that supplies huge farms. In California, one needs to be a large land owner to make decisions about how water is distributed. This must be changed. Food hubs could offer the answer, but their financial viability is an open question. Health insurance companies have a huge influence on the direction of food production and have a lot of money to potentially invest into preventive

healthcare, which perhaps could manage the current upstream imbalance. They have traditionally been focused on end stage interventions, but they are now beginning to look a bit further upstream at issues like food access and preventive healthcare.

- Regulation drives research and there needs to be a better link between the research agenda and consumer demand. This goes beyond regulation. Research funding is becoming more and more politicized, seeking incremental improvements. What is needed is to radically change the research agenda to serve the global public good in general.
- The levers of change, those that will make sustainable agriculture more profitable and intensive agriculture less profitable, primarily include: creating a strategic entry point to make the business case for sustainable agriculture; reforming the banking sector to make more impact investments; and strengthening the capacity of independent bodies such as food policy councils.

# PARALLEL SESSIONS

WATCH THE PLENARY SESSION FILMS ONLINE:

<http://sustainablefoodtrust.org/articles/the-true-cost-of-american-food-parallel-sessions/>

# CHAPTER 7:

## CORN & SOY SYSTEMS

**Moderator: George Boody**

Land Stewardship Project

**Craig Cox**

Environmental Working Group – *Financial incentives for better farming*

**Eugene Turner**

Louisiana State University – *Corn/soy landscapes, water quality and the Gulf of Mexico dead zone*

**Matthew O'Neal**

Iowa State University – *Consequences from agricultural intensification and preventative pest management*

**Richard Cruse**

Iowa State University – *Soil erosion: How much and at what cost?*

**Respondent: Jim Erdehl**

Minnesota farmer – *A farmer's perspective*

## Introduction – George Boody, Land Stewardship Project

Traveling through the Midwest and parts of the Great Plains, one sees a sea of corn or soybeans. Half of the 320 million acres of primary cropland (1.2 million km<sup>2</sup>) in the US is occupied by the highly specialized system for the production of corn and soy commodities. The major drivers of the corn-soy system include multinational corporate-controlled technology providing seeds, fertilizer, pesticides and machinery, along with dedicated credit for investments. In the Midwest, this system up to 50% is rented farmland, and short-term leases tend to diminish the operator interest in conservation investments.

This industrialized system also relies on public support for roads and the Mississippi River transportation system, publicly-funded agricultural research and federally subsidized Farm Bill commodity and crop insurance supports, along with conservation program incentives. The system is strongly dependent on extensive markets that include exports, processed foods, fuel and feed for confined animal feeding operations. Farmers have been strongly driven by this to adopt this system on a widespread basis. At the same time, there are unintended, externalized costs that result from the way the entire system scales-up from individual farms to landscape-level impacts, even when farmers adopt individual conservation practices, including a range of environmental, social and public health externalities and equity issues.

The focus of this session is on ecological impacts and issues of corn-soybean systems, seeking to identify monetary costs of these externalities, as well as structural changes in policies and economic infrastructure that could drive a transition to more sustainable food production.

The downstream environmental impacts in the Gulf of Mexico are directly linked to the extent of corn-soybean systems in the Mississippi River watershed. A notable farm level impact is soil erosion, with land being uncovered for most of the year. This has costs of soil erosion and conservation for farmers and the public. The monoculture and technology used in these systems has significant implications for the diversity of pollinators that can survive in this landscape. A large number of pollinators that dwell in corn-soybean fields are impacted by pesticides and monoculture and the options to restore functioning ecosystems and diversify the system are rather limited.

Farm policy is a significant driver of the corn-soybean system, with large public investment in conservation practices intended to ameliorate harmful ecological and hydrological impacts. Despite these investments by the public and the much higher federal subsidies for commodity production, sustained conservation is lacking. Farmers have adopted this system at the behest of virtually all their advisors: bankers, extension agents, sales people for the technology used in this production system, as well as the highly functional market infrastructure and federal policy drivers. A Minnesota farmer noted the practical economics of why he and other farmers remain in this system and why he decided to address externality costs himself, despite the prevailing drivers.

## Financial incentives for better farming - Craig Cox, Environmental Working Group

An important, but often overlooked, cost of American food is the billions of public dollars used to fund the traditional – and failing – approach to reducing the damage to public health and the environment caused by dominant farming systems. The US Corn Belt is a landscape utterly transformed by intensive row crop and livestock production. This landscape is highly productive but also extremely vulnerable to soil loss and water pollution by farm chemicals and manure. That vulnerability is exacerbated by extensive drainage and more frequent and intense rainfall events.

The good news is that solutions are readily available. Well-understood conservation and pollution prevention practices are highly effective at protecting soil and water. Unfortunately, far too few farmers are using those practices. Publicly funded financial incentives are the traditional approach we have relied on to expand the use of these practices. This approach has proved costly – \$7.2 billion in payments to Corn Belt farmers and landowners in just the last 5 years. The most important question that needs to be answered is why, despite this level of spending, are problems escalating? The most common answer provided is that there is a need for even more money to pay more farmers to do more. That's the wrong answer.

The first component of a better answer is to look at the \$25.3 billion in production subsidies that support the very farming systems that are causing the most damage. Fundamental reform of, and in most cases elimination or drastic cuts to, these production subsidies should be at the top of the list of policy objectives to lower the true cost of American food. The second and most immediate component of a better answer lies in the inherent weaknesses of relying on financial incentives. Financial incentives are notoriously poorly targeted and the producers who volunteer are often not the landowners who most need to improve their operations. Reformers have confronted these weaknesses for years, with limited success.

The Environmental Working Group is increasingly using remote sensing to track implementation of conservation practices. Something fatal is occurring in the US financial incentive programs: landowners who voluntarily start using a conservation practice can also voluntarily stop. Rather than steady and lasting progress towards more conservation practices, such practices are blinking on and off. This is the primary reason for which no progress is made, despite spending billions. For example, one important conservation practice was tracked – stream buffers – in eight Iowa watersheds, between 2011 and 2014. The good news is that some landowners added stream buffers. The bad news is that over the same period other landowners, sometimes just down the road, plowed-out even more stream buffers. The upshot was a net *loss* of stream buffers between 2011 and 2014. Moreover, 80% of the stream buffers plowed-out had previously been installed with financial assistance from taxpayers. More money for business as usual will not help, unless this fatal flaw is overcome. What is needed are mandatory

standards defining a basic set of pollution prevention practices that end disproportionately damaging activities, tailored, of course, to farming systems and landscapes. These are activities that many, if not most, farmers would agree are just bad business practice and bad for agriculture. Such a basic standard of care can be implemented through Farm Bill conservation compliance provisions and state/county laws and regulations. A basic standard of care will level the playing field for conservation-minded operators. Meeting these basic standards will not completely address the clean water issue, but would still bring a major improvement. Much work is needed for funding to provide technical and financial support to those who will go beyond these basic standards.

## Corn/soy landscapes, water quality and the Gulf of Mexico dead zone – Eugene Turner, Louisiana State University

Low-oxygen areas, sometimes called “dead zones” on continental margins, have increased in size and number during the last several decades. The appearance of the hypoxic zone off the Louisiana-Texas coast in the 1970s, and subsequently its variation in size, reveals insights about nutrient loading from the Mississippi River watershed. Causes and natural consequence here and elsewhere are directly related to corn-soybean land use in the Mississippi River basin, and there are steps that society can take to reduce the size of the dead zone. The interdependent relationship of coastal zones, watersheds and people need to be better understood.

The Mississippi River watershed is largely agricultural: 58% agricultural and 21% range or barren. It is drained by a world-class river in terms of its sediment yield, water discharge, size and suspended sediments. And at its terminus is a hypoxic zone ( $< 2 \text{ O}_2/\text{l}$ ) stretching from the river mouth to Texas in the summer. This low oxygen zone (up to 22,000 km<sup>2</sup>) is about the size of Lake Erie, or the State of Massachusetts. It is found mostly at 4–5 m depth near shore, to 35–45 m offshore. It is a seasonal phenomenon that is most widespread and severe from June to September. This particular zone is one of 350+ zones in the world, with its distribution matching the global human footprint in developed countries and with the number of dead zones increasing in developing countries.

It is called the ‘dead zone’ by laypersons, because self-propelled and motile organisms leave the area, including fish, shrimp and invertebrates. The end-of-the-pipe consequences affects one-third of US commercial fisheries and also contributes to the degradation of water quality in individual regions, including drinking water supplies, but also recreation and economic loss for farmers. The excessive nitrogen and phosphorus loading contributes to the formation of harmful algae blooms in lakes, rivers and offshore and changes oceanic food webs.

The principle cause for the formation of the ‘dead zone’ is the stratification of water masses and nutrient-enrichment from farm run-off into the Mississippi River. The former has remained fairly stable for the last 150 years, whereas nutrient enrichment, especially nitrogen, has increased several fold because of land-use changes throughout



the watershed that are strongly related to the dominating influence of corn-soy farming. The corn-soy influences on nutrient loading has had a more significant effect on water quality, than the conversion of native vegetation to cropland and grazing pastures, or land drainage up to World War II. The restoration of coastal Louisiana wetlands is indirectly compromised when nutrient-rich Mississippi River water enters coastal systems.

There is a quantifiable relationship between the allocation of farm payments and indicators of commodity specialization, fertilizer applications, reductions in cropland diversity and riverine nitrogen concentrations. This suggests that federal farm policies have an intended effect on land-use decisions and that they ultimately affect water quality.

Farm payments, therefore, might be used as a potent policy instrument to influence alternative environmental and economic outcomes which protect soil and water resources, while keeping working land in business. The development of fair and sustained management of inland, coastal, and offshore ecosystems is thereby linked in many dimensions.

## Consequences from agricultural intensification and preventive pest management – Matthew O'Neal, Iowa State University

Ecologists recognize that global land use has entered a phase in which the majority of land is managed for human use, primarily agriculture.<sup>36</sup> A consequence is that the natural habitats required for key ecosystem services are reduced. Natural predators that control insect pests often need natural habitat to persist in an agricultural landscape.<sup>37</sup> Many insect pests, however, only require a cultivated crop field. In this way, agricultural intensification contributes to a need for insecticides to maintain crop productivity.

Insecticides are used frequently in a preventative manner, regardless of the density of pest insects. For example, neonicotinoid insecticides are applied as seed treatments to approximately 80% of the corn and 30-44% of the soybean grown in the US.<sup>38</sup> Although insecticidal seed treatments have less impact on non-target insects than broad spectrum

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<sup>36</sup> Foley, J. A., R. DeFries, G. P. Asner, C. Barford, G. Bonan, S. R. Carpenter, F. Stuart, M. T. Coe, G. C. Daily, H. K. Gibbs, J. H. Helkowski, T. Holloway, E. A. Howard, C. J. Kucharik, C. Monfreda, J. A. Patz, I. C. Prentice, N. Ramankutty, and P. K. Snyder. 2005. Global Consequences of Land Use. *Science*. 309: 570-574.

<sup>37</sup> Landis, D., S. Wratten, and G. Gurr. 2000. Habitat Management to Conserve Natural Enemies of Arthropod Pests in Agriculture. *Annual Review of Entomology* 45: 175-201.

<sup>38</sup> Douglas, M. R., and J. F. Tooker. 2015. Large-Scale Deployment of Seed Treatments has Driven Rapid Increase in Use of Neonicotinoid Insecticides and Preemptive Pest Management in US Field Crops. *Environ. Sci. Technol.* 49: 5088-5097.

insecticides applied to foliage, the dust produced from the planting of treated seed can be collected by honey bees foraging for pollen, contributing to the loss of hives.<sup>39</sup>

Neonicotinoid seed treatments do not provide a consistent return on the farmers' investment, especially for the major soybean growing regions of the US.<sup>40</sup> As is the case with neonicotinoids, the pre-emptive use of any insecticide can work against efforts to grow crops economically, with limited environmental impacts.

While the use of neonicotinoid seed treatments has escalated since their commercialization in the mid 1990's, the use of foliar applied insecticides has declined for corn.<sup>41</sup> This is due to the adoption of insect-resistant corn that provides protection both to above and below ground pests of corn. Unlike corn, foliar insecticide use in soybeans has increased by 140% because of the establishment of an invasive pest, the soybean aphid. Aphid-resistance discovered by USDA and Land Grant University breeding programs is capable of replacing both seed and foliar applied insecticides.<sup>42</sup> Because this resistance occurs naturally in the soybean germplasm, it is available in certified-organic seed, but is not yet available commercially in herbicide-tolerant soybean varieties (i.e. GMOs). Sustainable use of this trait and others require on-going research and education to develop resistance management programs to help farmers retain their utility. Accelerating the release of aphid-resistance could save farmers money and reduce the use of insecticides over the millions of acres at risk of soybean aphid outbreaks in the US.

The last 100 years of land use in Iowa is a microcosm of these trends. Before European settlers arrived in what would become the 29<sup>th</sup> US state, 80% of Iowa lands were tall grass prairie with euphorbias, providing flowering resources from May until September. Today, 86% of Iowa is classified as farmland by the USDA, with 13.6 million acres of corn and 10.1 million acres of soybean in 2014. However, the lack of non-crop habitat and the domination of these annual crops, produce a landscape of limited biodiversity, leading some to call the corn/soy system a "green desert".

An example of declining biodiversity in Iowa can be seen in non-pest insects, especially pollinators. Although corn and soy do not require insect pollination, they produce flowering resources that several bee species use as forage,<sup>43</sup> including honey bees. Recent

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<sup>39</sup> Krupke, C. H., G. J. Hunt, B. D. Eitzer, G. Andino, and K. Given. 2012. Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields. *PLoS One*. 7: e29268.

<sup>40</sup> Johnson, K. D., O'Neal, M. E., Ragsdale, D. W., DiFonzo, C. D., Swinton, S. M., Dixon, P. M., Potter, B. D., Hodgson, E. W., and Costamagna, A. C. 2009; Probability of Economical Management of Soybean Aphid (Hemiptera: Aphididae) in North America. *J. Econ. Entomol.* 102, 2101–2108.

<sup>41</sup> Yi, Y., and S. Suh. 2015. Changes in Environmental Impacts of Major Crops in the US. *Environ. Res. Lett.* 10: 094016 doi:10.1088/1748-9326/10/9/094016

<sup>42</sup> McCarville M. T., E. W. Hodgson, and M. E. O'Neal. 2012. Soybean Aphid-Resistant Soybean Varieties for Iowa. *Agriculture and Environment Extension Publications Book 92*.

<sup>43</sup> Gill, K. A., and M. E. O'Neal. 2015. Survey of Soybean Insect Pollinators: Community Identification and

studies suggest soybean yield increases when bees visit their flowers, by as much as 18%.<sup>44</sup> Despite this relationship, honey beekeepers in Iowa report unsustainably high colony mortality of 47.4%, with summer losses reaching 29%.<sup>45</sup> To what extent honeybee mortality is due to insecticide use, or lack of forage after both corn and soy senescence, is an active research topic. During 2015, Dolezal and Toth observed honey bee hive weights increased during soybean bloom, but lost 16% of their weight after bloom, a time when hives should be adding honey for the winter. These combined observations suggest an unappreciated positive relationship between insect pollinators and commodity crops, such as soybeans. Even if insecticide use was limited, the lack of late summer forage is a critical obstacle for honeybees and other pollinators to survive in such intensely cultivated landscapes.

Conservation of pollinators alone will likely not drive a significant change in land use within states like Iowa. But, by addressing other environmental consequences resulting from a landscape dominated by corn/soy production, there is an opportunity to deliver multiple environmental services. This coupling occurs with STRIPS, or Science-based Trials of Row-crops with Prairie Strips,<sup>46</sup> in which a small area of land is taken-out of production and replaced with native, perennial habitat, such as prairie. By strategically replacing only 10% of a watershed committed to crop production with prairie strips, sediment and nutrient export was reduced by 95% and 88% respectively, with an increase in the abundance and diversity of birds and insects, including pollinators. Switching only a small amount of land committed to annual crop production to perennial grasses and forbs can achieve multiple conservation goals.

Meeting the demand for food, fuel and fiber, while limiting the environmental impact of agricultural practices, will require incentives to discourage the unnecessary use of agricultural inputs. This could be achieved through policies that support farmers' use of best practices, like scouting to determine the need for insecticides, possibly subsidizing scouting costs and countering the perceived risk of not using insecticides when recommendations suggest that they are not needed. Furthermore, land-use policies can be designed to promote management that returns perennials back to the agricultural landscape, through both market and non-market incentives. These, in turn, may improve

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Sampling Method Analysis. *Environmental Entomology*.

<sup>44</sup> Milfont, M. O., E. E. M. Rocha, A. O. N. Lima, and B. M. Freitas. 2013. Higher Soybean Production Using Honeybee and Wild Pollinators, a Sustainable Alternative to Pesticides and Autopollination. *Environ. Chem. Lett.* 11: 335–341.

<sup>45</sup> Seitz, N., K. S. Traynor, N. Steinhauer, K. Rennich, M. E. Wilson, J. D. Ellis, R. Rose, D. R. Tarpy, R. R. Sagili, D. M. Caron, K. S. Delaplane, J. Rangel, K. Lee, K. Baylis, J. T. Wilkes, J. A. Skinner, J. S. Pettis and D. van Engelsdorp. 2016. A National Survey of Managed Honey Bee: 2014–2015 Annual Colony Losses in the USA, *Journal of Agricultural Research*, DOI: 10.1080/00218839.2016.1153294

<sup>46</sup> [www.prairieSTRIPS.org](http://www.prairieSTRIPS.org)

the production of annual crops by supporting beneficial insects that contribute to crop pollination and pest suppression.

## Soil erosion: how much and at what cost? – Richard Cruse, Iowa State University

Different perspectives would give you different answers to the cost of soil erosion. There are on-site and off-site costs. What does it cost and who will pay, especially in the future, in terms of global food security? What is the relationship between soil loss and crop yield?

Yield reductions of approximately 4% per 10 cm (4 inches) of soil loss should be considered realistic.<sup>47</sup> Where nutrient deficits are avoided by fertilization, response curves are generally convex, implying that reductions will become increasingly severe with further erosion. In other terms, thinner top soils give decreased yields, so the question is: how much soil is actually lost? The Iowa statewide average is 5.7 tons/acre/year, that is, more than one pound of soil lost for each pound of corn produced!

Simplifying this, an average of 2.2 bushels/acre yield loss is expected for each inch of lost topsoil. Using the Iowa average corn yield for 2006–2015 of 170 bushels/acre and a 5% corn yield reduction<sup>48</sup> per 4 inches (10 cm) of topsoil thinning, with \$4.00/bushel of corn value and 5.7 tons of soil loss per acre, the economic loss to the producer the following year is only \$0.35/acre. That's not very much. However, if one considers nutrient redistribution and loss, nutrient value in eroded topsoil approximates \$5.7/acre. Yield loss due to thinning topsoil is basically permanent; costs accumulate through time rendering a compounding cumulative cost effect on yields. Considering redistribution in the field and sediment delivery ratio (35%),<sup>49</sup> nutrient value loss is \$4.20/acre/year. Stacking erosion costs, after 50 years financial loss is estimated at \$650/acre. Compared to an assumed soil conservation costs of \$30/acre/year, the cumulative cost of exported topsoil in 50 years is \$28.3/acre/year.

Regarding off-site costs, \$12–\$38/acre can be confidently assumed for US cropland.<sup>50</sup> Between 2005 and 2014, US taxpayers spent \$3 billion in Iowa through five USDA conservation programs to pay landowners to farm in more environmentally-friendly

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<sup>47</sup> A Horizon Depth (in) DRY Corn Yield vs A Horizon Depth Boone County. Tom Kaspar, USDA/ARS Personal communication.

<sup>48</sup> Study in the process of being published.

<sup>49</sup> Iowa Learning Farms. 2013. Cost of Soil Erosion.

<sup>50</sup> Tegtmeier, Erin M; Duffy, Michael, External Costs of Agricultural Production in the United States, International Journal of Agricultural Sustainability Vol. 2 no. 1 (2004): 1–20.

ways: approximately \$125/acre for 24 million row crop acres, or \$12.50/acre/year<sup>51</sup>. In summary, farm costs are approximately \$4.55/acre/year, off-site damage \$25/acre/year and public investment about \$12.5/acre/year, for a total of over \$40/acre/year.

If 9 billion people must be fed by 2050, this soil will really be needed.<sup>52</sup> For industrial agriculture, short term soil conservation is more expensive than soil erosion for the farmer. Soil conservation is an added expense, unless the farmer owns the land for an extended time and erosion rates are high. The erosion cost to the public is greater than the cost to the farmer.

A farmer's perspective – Jim Erdahl, Minnesota farmer

I am a corn/soy farmer and we have done some things like conservation tillage, but I find we need to go further. We're not doing enough to solve some of the problems like pollution and erosion. However, price dictates what people do – when prices for corn and soy are low farmers jump on payments for conservation practices, but as soon as prices of corn/soy go up farmers lack incentive. I have no other income other than farming and I need to provide for my family so therefore the way I farm is dictated by economics first and foremost. However, the environment is important as I want to pass my farm on to my kids. But ultimately food policy will need to change for us to implement some of the things we want to do.

## Discussion Points

- Despite gains in efficiency (e.g. yield per unit input of fertilizer), the externalized impacts of corn-soy systems continue to expand; the dead zone is not shrinking in the Gulf of Mexico, and one-third of US rivers are impaired from nitrogen and/or phosphorous run-off.
- Some farmers have chosen to adopt greater conservation leading to a reduction of external impacts, so why don't more farmers follow? Adopting conservation practices costs farmers more than the value of the reduced soil erosion, which highlights the need for structural changes in the drivers. However, it costs the public more in the short-term and, of course, it costs farmers more in the long-term, due to the devaluation of their soil. However, those costs are built into the corn/soy system.
- At this time, federal Farm Program' incentives are overwhelmingly stacked in favor of maximizing production. Federally subsidized crop insurance strongly

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<sup>51</sup> Rundquist, Soren and Craig Cox. 2016. Fooling Ourselves: Voluntary Programs Fail to Clean-up Dirty Water. Environmental Working Group. Washington DC.

<sup>52</sup> Seth Watkins, IA. Kezar, Mitch. 2016. There's No Magic Bullet to Stop Erosion. Commonsense Practices Help. Successful Farming.

incentivizes maximizing yields and total production of the corn/soy system. Farmers are essentially penalized for adopting conservation and too few safeguards are built into this program.

- How can these drivers be changed? An ethical commitment by farmers and landowners who rent farmland is needed, along with community support for stewardship. Regulatory options could include requiring standards of care for both farmers and landowners to be implemented before public support can be accessed. It will take structural change including enhancing the leadership of farmers who take it upon themselves to make changes. New crops will be needed and more emphasis on management in relation to off-farm technologies. There are practical options farmers can adopt to introduce more diversity and continuous living cover that include, for example, prairie strips on 10% of steeply sloped corn and soy fields to capture eroding sediment before it leaves the field, as well as to support pollinators. Smaller markets exist for organic and grass-fed beef and other products from such systems.
- Can beginning farmers get started in this environment? It is difficult with the price of land and the amount of land needed for commodity farming, but it is happening and many family farmers are interested in seeing that kind of transition. Often, they get started on smaller acres growing crops for direct consumption, such as vegetables. However, in terms of land required, only about 117,000 acres could grow much of what is needed for Iowa consumers. So while beneficial, this will not lead to widespread diversification in the corn/soy landscape. Integrating animals back onto the land would help because that leads to greater diversity of crops for feed and pasture that have an economic use for livestock and positive soil conservation impacts.
- Substantial public and private investments will be needed to expand this agenda, along with new markets for farmers and products from continuous living cover systems, for it to compete with the extensive nature of corn and soy infrastructure that includes biofuels.

# CHAPTER 8:

# CAFOS

**Moderator: Andrew Gunther**

A Greener World

**Kendra Kimbirauskas**

SRAP – *Rural people in crisis: exploring the impacts on communities when a CAFO comes to town*

**Keeve Nachman**

Center for a Livable Future – *Exploring the societal burden of animal agricultural antibiotic use*

**Viney Aneja**

North Carolina State University – *Pollution and emissions from CAFOs*

**Kim Lyerly**

Duke University – *Impacts on public health*

**Leah Garces**

Compassion in World Farming – *The hidden costs of CAFOs: livestock feed, animal welfare and ways forward*



## Introduction – Andrew Gunther, A Greener World

CAFO stands for Confined Animal Feeding Operation, and this is where as many as 50,000 animals are confined for 45 days or more in large pens or sheds and fed primarily a grain-based diet. Animals have a role to play in a sustainable future and there is an obligation to create an environment in which animals can exhibit their natural behavior. Externalities of CAFOs include low animal welfare standards, greenhouse gas emissions and the environmental impacts of feeding grain, air and water pollution from CAFO facilities that is detrimental human health, and negative social and economic impacts for those working in CAFOs and for people living nearby in local communities.

## Rural people in crisis: exploring the impacts on communities when a CAFO comes to town – Kendra Kimbirauskas, SRAP

The Socially Responsible Agricultural Project (SRAP) is a unique project in the US that brings together people who have had factory farms come to their communities and who can therefore help rural citizens and farmers take on the injustices of industrial animal agribusiness.

One major problem facing rural communities is the mishandling of waste by large industrial operations. Pits filled with untreated and liquefied hog feces and urine, for example, cause numerous problems for local people in terms of smell, environmental impact and negative health effects.

Animal manure becomes a problem when over-applied on agricultural land and can create pollution in waterways, which damages aquatic species and makes drinking water unusable. About 160 different toxic gasses are released by animal waste lagoons, including hydrogen sulfide, methane, ammonia, carbon dioxide and carbon monoxide. These gases can be fatal if inhaled. In addition, winds carry pathogens from manure and composted dead chickens into neighboring areas where people, including children and the elderly live.

Hubert Brumett, a 94 year old WWII veteran from Indiana, is currently fighting plans to build a CAFO for 4,000 hogs, which would result in 1 million gallons of hog manure, just 557 feet from his front door. As he has pulmonary disorders, he fears that he will be put in a nursing home, as the CAFO could significantly affect his breathing. In Wisconsin, where 20,000 people live, 80,000 cows in confinement buildings are contaminating 34 of the State's domestic wells with nitrates and/or *E. Coli*, making the water unusable for households.

Research<sup>53</sup> shows that when a factory farm comes into a community, 1.5 to 3 family

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<sup>53</sup> Weida William, 2000. CAFO Operations and the Destruction of Agricultural Communities. Department of Economics. The Colorado College, Colorado Springs, CO. April 18, 2000.



farmers are displaced. Factory farms that have a gross annual sale of \$900,000 spend less than 20% of purchases on goods from the local community. On the other hand, sustainable farms of under \$100,000 of gross sales purchase about 95% of goods from the local community.

When we consider the wider impact of CAFOs on local communities, it becomes apparent that the true price is far higher than it first appears.

## Exploring the societal burden of animal agricultural antibiotic use – Keeve Nachman, Center for a Livable Future

Antibiotics are routinely used in animal husbandry, for both therapeutic uses (treatment, control) and non-therapeutic uses (growth promotion or disease prevention). The same drugs, or drug classes, are used in both human and animal medicine. Bacteria in the animal production system can become resistant; those bacteria leave the farm and can cause infections in people. Rural communities are the most exposed to these bacteria and they carry the greatest burden. Resistant infections are difficult to treat as well as expensive. Antimicrobial resistance is worsening, and humanity is running out of treatment options. Existing approaches to solving the antibiotic resistance problem are not likely to work, and there are no plans to evaluate them in a meaningful way.

What is known about antibiotic use in animal husbandry suggests it may be responsible for a significant fraction of resistant infections in humans. However, there is a lack of credible data to quantify the externalized societal costs stemming from the misuse of antibiotics in animal agriculture, unlike in the case of clinical medicine. In the US, it was estimated by the Centre for Disease Control and Prevention that 2 million people develop infections that require treatment and these result in 23,000 deaths/year, of which 20% are assumed to be from food-borne bacteria (which is different from bacteria that originates from farms). While these numbers are underestimated, and there is a lack of universally accepted estimation methodology, the order of magnitude of the economic burden of direct health costs is in the order of \$20 billion, plus another \$35 billion in terms of lost productivity costs. It must be noted that data is inadequate to differentiate clinical and agricultural contributions but this is a huge societal burden. Globally, the burden is 10 million deaths and \$100 trillion per year, according to an AMR review of 2016.<sup>54</sup> These figures are very inclusive estimates, including malaria, tuberculosis, HIV/AIDS and other bacterial diseases.

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<sup>54</sup> AMR, 2016. Tackling Drug-Resistant Infections Globally: Final Report and Recommendations. Review on Antimicrobial Resistance, Chaired by Jim O'Neil, May 2016.

Key differences in human vs. animal antibiotic use:

	Human (responsible clinical medicine)	Veterinary
Dose ranges	Therapeutic only	Primarily sub-therapeutic
Duration	Specified, brief	Majority of animal lifespan (available to farmers over the counter)
Oversight	Physician-prescribed	OTC and veterinarian-prescribed
Drug selection	Often targeted	Preventive uses not targeted

Information requirements for assigning the burden should primarily identify the fraction of human infections originating from agricultural misuse. To this end, one would ideally have: antibiotic use pattern information for animals; molecular characterization of bacteria from food animals and environmental media around production sites; and molecular characterization of bacteria isolated from humans with infections. With this information, it is possible to confidently link infections to farms (when a link exists), and match antibiotic uses to patterns of resistance observed in human infections.

The existing information and the information that research is trying to generate includes antibiotic use pattern information for animals. This information is derived from: antibiotic sales data from drug manufacturers (Animal Drug User Fee Act); spotty, low resolution, non-geographic antibiotic use data (National Animal Health Monitoring System and National Antimicrobial Resistance Monitoring System – NARMS); molecular characterization of bacteria from food animals and environmental media around production sites; food animal only, to a limited extent, and not molecular characterization (NARMS).

Opportunities for filling the gaps include moving towards better usage data. Agencies have publicly recognized the need for usage data, especially in the context of their plan to address misuse, but funding and compliance will be ongoing issues. In addition, molecular characterization is becoming easier and less expensive, although still not a routine part of clinical practice. Federal programs would need to be expanded to take better advantage of these techniques, including more bugs (not just gastro-intestinal pathogens, but others too), and stronger sampling program and compliance schemes.

The conclusion is that it is not possible to pin a specific quantitative burden of human

AMR infections on agricultural or human misuse. Chiefly, the necessary data is not collected and there are many barriers to doing so – most involving political will. Is there a need to pin down a number definitively before taking more meaningful action? Solving the problem is more important than putting a number on costs.

## Pollution and emissions from CAFOs – Viney Aneja, North Carolina State University

Agricultural (both crop and animal) air quality is an important emerging area of environmental science, which offers significant challenges to many aspects of research, policy and regulatory frameworks. Agricultural emissions produce significant local, regional and global impacts, including odor, Particulate Matter (PM) exposure, eutrophication, acidification, climate change, and exposure to toxic compounds and pathogens. Agricultural emissions are variable in space and time. Most important in the US are ammonia (where agriculture accounts for about 90% of total emissions), reduced sulfur (unquantified),  $PM_{2.5}$  (~16%),  $PM_{10}$  (~18%), methane (29%), nitrous oxide (72%) and odor and emissions of pathogens from hazardous air pollutants (both unquantified). PM affects human health through breathing, thus interacting at a cellular level in the lungs. Consequences include climate change greenhouse gases, a high level of cancer-causing factors in hog houses, ammonia increasing the  $PM_{2.5}$  incidence to the limit of 35  $\mu\text{g}/\text{m}^3/\text{day}$  and nitrogen eutrophication in rivers (such as the Mississippi River).

The US and Europe largely focused on increased food production between the 1940s and the 1990s. Supported by public investment, this resulted in mechanization combined with the abandonment of traditional practices, reliance on non-renewable inputs such as inorganic fertilizers and pesticides, the cultivation of marginal land and improvements in production efficiency through plant breeding. Agricultural policies encouraged intensification, including the sustained use of chemical inputs, increasing field size and higher animal stocking densities. Traditional fallowing practices were discontinued and crop rotations resulted in a displacement of leguminous fodder crops with increased use of silage and maize. Specialization and intensification resulted in fewer farm holdings and less farm employment, as well as the homogenization of production leading to less diversity of local agricultural habitats.

In the US, the size and geographical concentration of animal-feeding operations (CAFOs) and crop production are increasing. In North Carolina, for example, the number of hogs (7.9 million) approaches that of the human population (11.9 million). Increased CAFO emissions include coarse particles, odors (e.g. organic acids,  $\text{H}_2\text{S}$ , ammonia), GHG (e.g.  $\text{CH}_4$ ,  $\text{N}_2\text{O}$  and  $\text{CO}_2$ ) and air pollutant gases ( $\text{NO}_x$ ,  $\text{NH}_3$  and  $\text{H}_2\text{S}$ ).

There are significant public and regulatory concerns about the increasing emissions of these compounds and their adverse impacts on the quality of the air, water, soil, and biodiversity. For example, atmospheric nitrogen deposition is thought to be a major cause for global biodiversity loss in this century, along with land-use change and climate change; and will continue to pose serious threats to biodiversity and ecosystem function.

## Impacts on public health – Kim Lyerly, Duke University

While increasingly large amounts of environmental data are being generated from satellites and reports, we also have health-related data from healthcare systems. Can an infrastructure be developed that marries these data and understands the linkages?

In North Carolina, hog farms represent a significant source of ammonia emissions<sup>55</sup>. A yet unpublished study found that there is up to 90% correlation between the levels of ammonia from North Carolina and the number of hogs in hog operations. A variety of health effects on nearby residents of CAFOs have also been reported, including: more depression and fatigue, stress-mediated impact of immune function,<sup>56</sup> children and adults' susceptibility to pulmonary dysfunction<sup>57</sup> and acute blood pressure increase.<sup>58</sup>

In order to determine the impact of CAFOs on death rates and medical utilization of nearby residents, several datasets were used. First, data on health characteristics of North Carolina residents 2007–2013 were gathered from the National Inpatient Database (Healthcare Cost and Utilization Project data on disease-specific admissions), the State Emergency Department Database (H-CUP data on emergency departments' visits) and mortality statistics from the North Carolina Center for Health Statistics. Second, data on environmental factors included the list of animal operations registered with the North Carolina Division of Water Quality, and levels of ammonia in the air from US/EPA ground monitor measurements. In addition, data was collected on additional co-factors that require consideration in the analysis, such as US Census Bureau demographics, socio-economic characteristics (H-CUP data files and the US Census Bureau) and adult smoking prevalence (Behavioral Risk Factor Surveillance System and Centre for Disease Control – CDC). This county-specific analysis selected North Carolina counties with over 2 million animals each (i.e. Sampson and Duplin) and counties hosting 100,000 to 760,000 hogs. Health outcomes, as well as levels of ammonia in the air, were compared in residential populations of CAFO-associated counties, versus North Carolina control counties. Analyses were adjusted by age, type of health insurance, median household income and adult smoking prevalence.

This study showed environmental health relationships in CAFOs, especially of hog farms that generate 20–25 times more waste than humans, in 17 counties of North Carolina (3.5

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<sup>55</sup> EPA, 2008. National Emissions Inventory. Environmental Protection Agency.

<sup>56</sup> Avery et al., 2004. Perceived Odor from Industrial Hog Operations and Suppression of Mucosal Immune Function in Nearby Residents. *Arch Environmental Health*, 59:101–108.

<sup>57</sup> Keil et al., 2011. Suitability of Public Records for Evaluating Health Effects of Treated Sewage Sludge in North Carolina. *North Carolina Medical Journal*, 72(2):98–104.

<sup>58</sup> Kilburn, 2012. Acute Blood Pressure Increase.

million people). Higher risks of infectious diseases (30%)<sup>59</sup> and respiratory diseases (20%) have been reported for hog farm workers and local residents. Neurological disorders such as epilepsy was 70% higher, as occupational exposures to hydrogen sulfide at hog farms can be associated with transitory Central Nervous System symptoms,<sup>60</sup> with children being particularly susceptible to these neurological effects.<sup>61</sup> Complication of pregnancy was also higher (25%), due to excessive nitrate ingestion which is associated with miscarriages (CDC blamed water contaminated with nitrates from swine farms for some miscarriages that occurred in 1991–94).<sup>62</sup> Hypertension, but not a spectrum of cardio- and cerebral-vascular diseases, has also been associated with CAFOs, with arterial hypertension 30% higher. Although not previously associated with CAFOs, diabetes was found 70% higher and kidney diseases (nephritis/nephrosis) 30% higher.

There is a higher risk of emergency department visits, hospitalization and death from various diseases in populations living in counties with CAFOs of over 100,000 pigs, with children and older residents having worse health outcomes for many diseases compared to middle-aged residents.

## The hidden costs of CAFOs: livestock feed, animal welfare and ways forward – Leah Garces, Compassion in World Farming

We have a moral obligation towards sentient beings. Animals, including chickens, pigs, and cows, have needs and wants and yet suffer in confinement, most often than not in extremely inhumane conditions. Factory farms are leaving behind hungry people, while being unsustainable.

The land needed to meet US feed requirements is equal to an area the size of the European Union. The use of arable land for animal feed must be revisited, as today one third of all cereals are used as feed. Animal feed also uses one third of global fish production. Production of fish meal in the Chimbote, Peru, for example, creates sludge that pollutes air and waters, causing skin lesions in 70% of local children close to the fish meal production factories.

About 1.7 more people could be fed with land currently used for livestock feed production. Similarly, 2 million more people could be fed with food that is lost or wasted in the world. This raises questions about the efficiency of CAFOs, especially when the protein

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<sup>59</sup> All percentage given here refer to ED visits, per population count, for all ages.

<sup>60</sup> National Research Council, 2003. Air Emissions from Animal Feeding Operations: Current Knowledge, Future Needs. Final Report. National Research Council of the National Academies.

<sup>61</sup> Hannah et al., 2013. The Psychological and Neurological Bases of Leader Self-Complexity and Effects on Adaptive Decision-Making. *Journal of Applied Psychology*, Vol. 98, No. 3, 393–411.

<sup>62</sup> CDC, 1996. Spontaneous Abortions Possibly Related to Ingestion of Nitrate-Contaminated Well Water – LaGrange County, Indiana, 1991–1994. *MMWR Weekly*, July 5, 1996 / 45(26); 569–572.

conversion ratio is so low in grain-fed animals.

## Discussion Points

- Food justice considerations should start by recognizing that most CAFO workers are not covered by oversight from the Occupational Safety and Health Administration, so these operations typically involve a small number of people and are below the threshold for protection attention.
- Communities are given the tools to fight new CAFO establishment. However, CAFOs across the country are really good at padding the pockets of politicians in order to prevent a legislative fix. For example, in Arizona where there is no legislative mechanism, the Hickmans Family Farms provide eggs to the governor, and family members are strategically placed in all sorts of political positions, from the county to the State legislator's level.
- Policy opportunities include the Massachusetts State Ballot Initiative<sup>63</sup> that is seeking residents' votes in November, to make it illegal to confine animals and banning the sale of CAFO products (this has since been passed). A similar initiative has already passed in California.
- In addition to animal welfare and pollution concerns, which are increasingly entering corporate policies, change will come from tangible environmental health evidence, such as DNA sequencing linking bacteria in the human body to farms. Educating oneself on the challenges facing the public in relation to CAFOs and educating others is paramount.

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<sup>63</sup> See [www.citizensforfarmanimals.com](http://www.citizensforfarmanimals.com)

# CHAPTER 9:

## INTEGRATED FARMING SYSTEMS

**Moderator: Richard Young**

Policy Director, Sustainable Food Trust

**Kristine Nichols**

Rodale Institute – Practices for improving soil health and biology

**Claire Kremen**

UC Berkeley – The advantages of diversified farming system

**George Boody**

Land Stewardship Project – Integrating continuous living cover into Midwestern farming systems: perspectives from a watershed project

**Seth Watkins**

Iowa Farmer – The practicalities and realities of crop/livestock integration: a farmer's perspective





## Introduction – Richard Young, Policy Director, Sustainable Food Trust

Since the Second World War there has been ever-increasing pressure on farmers to specialize. This has been advocated by academics as a way of increasing productivity and farm incomes and promoted as part of national policy and subsidy schemes in the US, Europe and many other parts of the world. The basic theory was that specialization helped to encourage mechanization as farmers would only need to invest in the machinery for one type of farming and sometimes just one crop. That would allow them to increase efficiency by reducing labor. Farmers, it was also argued would be better able to gain a high degree of expertise since they could concentrate their efforts on a narrow area and become experts in it. To some extent this is all true. As a result today, relatively little of food is produced from traditional mixed farming systems in developed countries, though at the present time small mixed systems are still very important in many developing countries – for how much longer though is unclear.

The approach was also based on assessments of efficiency in terms of capital invested and output per acre or per labor unit. What was overlooked was that systems which integrate crop and livestock production, that are highly diverse and sometimes have several enterprises taking place on the same area of land, bring efficiencies and benefits in areas that were not initially considered important. They reduce the need for fertilizers, pesticides, antibiotics and wormers. They protect soils better, improve biodiversity and reduce non-renewable inputs and transport, and often they employ more labor, which could, and perhaps should, be seen as a benefit of such systems rather than a weakness. Mixed and other integrated farming systems, it is slowly being realized, also offer solutions to some of the problems now arising on specialized farms in relation to soil degradation, herbicide resistant weed and crop pests and diseases which no longer respond to chemical control due to the buildup of resistance.

A single crop as far as the eye can see and concentrated animal feeding lots constitute the typical US food production landscape. Most modern farming involves highly specialized monocultures. The traditional diverse farming landscapes of animals grazing, with vegetables in the field next door and various grains growing in the background have almost disappeared. Driven by the current economic system, this trend has caused huge environmental damage and the social loss of farming communities. Farming practices which integrate crops and livestock and diversify landscapes are essential for moving towards more regenerative farming systems. But what are the economic barriers and opportunities for transitioning agriculture in this direction?

Such systems generally build soil fertility through crop rotations and often incorporate livestock enterprises to convert the forage produced during the fertility-building period into meat or milk as a source of income. For farms to be environmentally sustainable they need to be diverse and include multiple crops and enterprises. To be economically sustainable they also need to make a profit. Integrated systems can bring input savings, but require more financial capital and labor, while often also having lower income because the most profitable crops are not grown on every field every year. However, if the

hidden costs of production were factored in, mixed and integrated systems would become the most profitable approach.

## Practices for improving soil health and biology – Kristine Nichols, Rodale Institute

There is a need to recognize the carbon problem that we have and thus, a need to regenerate depleted soils and create resilient systems to negotiate it. Plants have evolved over 500 million years in relationship with soil organisms. Everything thrives on nutrient and energy flows and there is a need to focus on the carbon economy in soils. Addressing the true cost of food means creating a system that provides food to soil microorganisms (i.e. having a plant growing) and means providing a habitat with minimal soil disturbance, for the soil organisms to do their job.

Side-by-side comparisons of conventional and organic systems over 30 years at the Rodale Institute<sup>64</sup> showed that organic systems retain water, while nutrients are leached-out of conventional systems. The organic system uses its own biological resources and is more resilient to weather uncertainties. In chemically-based systems, 30 to 50% of nitrogen (N) fertiliser and 30% of phosphorus (P) is used by the plant. Farmers pay for a product that is less than 50% efficient. Nobody would pay 100% for a product that has less than a 50% efficacy rate. More than water-stress, nutrient' stress is the main feature in today's agriculture.

Mycorrhizal fungi and legumes in grasslands are key to trading of P and N between plants in biological systems. Either inputs are added into the system, or soil microorganisms and plants are encouraged to do so themselves. Grass plants which are cut need fewer proteins to heal the smaller wounds, while grasses which are grazed by animals need to utilize more resources below-ground to heal the larger 'tearing' wounds, which stimulates more biological activity.

It is not that one cannot achieve better soil carbon sequestration with a row crop system, but the same plateau of grazing will not be obtained. Therefore, even if animals were not needed for human consumption, having grazing animals is still needed for soil health.

## The advantages of diversified farming systems – Claire Kremen, UC Berkeley

Biodiversity provides benefits for farming systems, such as pollination, as well as reducing the cost of agricultural inputs to control pests. Some of the benefits are invisible

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<sup>64</sup> Rodale Institute, 2011. Farming Systems Trial. Celebrating 30 Years.

to farmers and therefore not valued.

In the central region of California, farm research<sup>65</sup> was conducted to cost beneficial ecosystem services of diverse integrated systems (i.e. strawberries and lettuce producing areas), including 27 different organic farms representing a gradient from simplified to diversified landscapes. These farms were measured against indicators of biodiversity, including ecosystem services relevant to the farmer, such as: pest and disease control, pollination, soil nutrient, soil water holding capacity, as well as services relevant to the public, such as greenhouse gas emissions.

For example, birds can control pests, such as Lingus bugs that affect strawberries. However, birds can also be pests themselves and there is a need to suppress bird pests. So, seeking a balance between the costs and benefits is important. The study found that bird pest suppression cancels out the damage from birds themselves. However, there are more pest birds on the simplified farming landscapes and there are more insectivorous birds on the diversified farming landscapes.

Farming practices and also the farming landscape itself determine the type of bird communities and the costs and benefits it brings. It is important to measure, monitor and account for these different ecosystem services and then provide this information to farmers and create a dialogue.

Elucidating the values that biodiversity provides to farming through science could be a powerful motivator to farmers to adopt diverse sustainable practices.

## Integrating continuous living cover into Midwestern farming systems – George Boody, Land Stewardship Project

In the Western Minnesota 1.3 million acre catchment, tile runoff from corn-soybean fields increases flows in streams and erodes banks. Despite millions of dollars of mitigation investments (such as buffer strips, grassed waterways and closed tile inlets) the watershed was still impaired. In 2011, something different was attempted. The Land Stewardship Project (LSP) and the Chippewa River Watershed (CRW) Project co-launched the Chippewa 10% Project – C10 (named for the 10% increase in perennial cover) as a broad based, watershed-wide, public and private partnership. In-stream monitoring and modeling showed that it achieved water quality goals. The science-based, multi-faceted approach to engage farmers and landowners is transferable to other areas.

The dominant story heard in the farm media is that what farmers choose to do is driven only by economics – meaning farmers are unlikely to adopt continuous living cover practices (such as filter strips, rotational grazing, longer crop rotations or cover crops), if

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<sup>65</sup> Kremen, C and Albie, M. 2012. Ecosystem Services in Biologically Diversified versus Conventional Farming Systems: Benefits, Externalities and Trade-offs. *Ecology and Society* 17(4):40.

doing so may reduce yields or total production – even on marginal fields. While economics is critical, stewardship values can also play an important role in decision-making by farmers and landowners. One-to-one conversations used in the C-10 project lift-up the stewardship values people hold in a way that helps change what they consider possible. Learning networks, connections to resources, field days or workshops and community building events like a BioBlitz<sup>66</sup> are used as well. These approaches have led to 360 farmer landowner partners adopting continuous living cover, or other conservation practices over 13,480 acres.

Specific technical tools to advance watershed analysis and farmer adoption include: GIS mapping to identify opportunity areas based on ecological sensitivity and economic marginality. The Cropping Systems Calculator<sup>67</sup> uniquely compares corn-soybean rotations with longer rotations, cover crops and managed grazing options on a per acre basis, using farmer or regional default values.

Scenarios that represent practices currently being adopted by local farmers to diversify sensitive corn and soy fields were included in a hydrological model for the CRW. Shifting to continuous living cover-perennials on just 3.7% of CRW project (49,000 acres) in three focal areas could reduce nitrogen loads from baseline conditions in the stream by 18.4% and reduce sediment loads by 1/3 of the amount needed to restore water quality.

Barriers to adoption include federally subsidized crop insurance that benefits corporate agribusiness and the largest farmers by strongly incentivizing corn and soy production. In the CRW, \$19.6 million per year over 10 years in income from crop insurance and other programs for corn and soy have masked risk, while disadvantaging integrated systems with livestock on the land.

Externalized costs include about \$1.1 million to support community organization over four years and \$31 million for structural practices, such as feedlot improvements and filter strips. One public well system is under caution for nitrate contamination, along with private wells in certain areas. The Land Stewardship Project organizes people to work for structural changes in public policy and much greater public investment is needed to shift larger portions of agricultural landscapes toward integrated systems with crops and livestock on the land.

## The practicalities and realities of crop/livestock integration: a farmer's perspective – Seth Watkins, Iowa Farmer

Pinhook Farm is a diversified crop and livestock farm located in the Southern Iowa Drift Plain. Its revenue sources include cattle, out-fitting and land mitigation, USDA subsidy

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<sup>66</sup> Cherveney, Tom, 2015. Outdoors: Simon Lake Bio-Blitz. West Central Tribune. Willmar, Minnesota. 18 July 2015.

<sup>67</sup> Land Stewardship Project. Chippewa 10% Cropping Systems Calculator.

payments and the farmer's wife's income from teaching. Because tax dollars are part of the farm revenue, there are reasons for giving back clean water and healthy soils to the community.

Prior to March, 1998, Pinhook Farm had a total focus on production, convinced that with the use of science, the latest technologies and sheer determination, farmers could beat any natural hazards. The farmer meeting sponsored by a feed company, agronomy company or the Farm Bureau, acted as a reminder of how important it was to produce food to feed the world, while offering a free meal and most likely a free hat (it is almost shameful what a farmer will do for a free hat).

On 11 March 1998, a severe blizzard hit. Instead of asking the experts how to deal with the problems caused by the blizzard, a question started the Seth Watkin's journey into sustainability: why am I working against Mother Nature instead of with her? We do not have a shortage of corn and soy; we have a shortage of clean water, healthy soil and wildlife. As this question was contemplated, the Seth decided to trust his gut. Baby calves are not supposed to be born in cold weather but on warm spring days with lush green pastures. From that point onwards, the primary focus would no longer be on production but on having clean water, healthy soil and happy cows.

That summer, bulls were brought-in in early July, meaning that calves arrived in early April. With this simple change in management, something pleasantly unexpected happened: production increased and profits too. It was 'The Deming Theory' in action: focus on quality and quality goes up, while costs go down. This is the foundation of a good system.

Making a happy cow is a wonderful system and for the last 18 years, several practices were added to enhance the system: no more chemicals for weed control, inter-seeding clover in pastures was introduced to reduce N-fertilizers, along with other improvements to the grazing system and water quality. Ultimately, all these practices contributed to greater herd health and production. The same principles applied to cows were also used on the hay and crop parts of the operation: no-till, crop rotation, cover crops and science-based trials of row crops integrated with prairie (STRIPS). When combined, these practices reduce the costs of tillage and fertilizer, increase production by restoring soil health, protect water, feed the cows and increase revenue.

Although still a "conventional farmer", meaning use of GMOs, chemicals and from time to time antibiotics, synthetic inputs are used as means to gradually establish a sustainable system. For example, GMOs allow the shift to a no-till system and away from the post-WWII heavy pesticide applications. This is certainly not a "best practice", but sustainability is about continuous improvement. For no-till to really work, it must be part of a system of practices, called conservation agriculture, that combines minimum tillage with cover crops, crop rotation with 3 or more species, wildlife-friendly strips and corridors and incorporation of grazing.

There are benefits to such systems that are hard to measure. For example, this year's

rainfall was 108 inches, while the region's average is usually 36 inches: cover crops increased soil structure and porosity and thus, enhanced water infiltration, allowing timely crop planting. During drought, such soils hold moisture for longer periods of time and are more resilient to weather vagaries.

When the use of chemical inputs decreased, all sorts of wonderful things started to happen: first, the forbs, flowers and clover started to reappear, and then the birds followed. With the birds, came a wonderful variety of other wildlife as well, such as the endangered Indiana Bat. Rather than fearing some restrictions, as neighbors did (e.g. cutting down a hickory tree, bats key habitat), a grazing management plan was established to work around the bats' lifestyle. This began Seth Watkin's relationship with Green Financial Exchange (whose purpose is to serve as a trading floor for green and renewable products) and the land mitigation business. Today, about 25% of the farm's net income comes from outfitting and land mitigation. This money has allowed him to accomplish many projects that could not be justified from cattle revenue alone. Healthy farms need healthy communities and healthy communities need healthy farms. It is not possible to have communities without people.

Key economic and social barriers facing farmers in moving from specialized to integrated systems include: federal crop insurance, Renewable Fuels Standard, 1031 tax free exchange, cheap oil, apathy and linear thinking. Well-intended programs have significant unintended consequences, such as the destruction of grazing infrastructure (e.g. ponds, fences, even corrals and buildings). At the end of the day, because of subsidies and artificial markets, a farmer may show cash profit on some very marginal land. The reality is all that happened is that he converted fossil fuel energy into grain energy and more often than not, converted the grain back into fuel.

Sustainability is a lifelong commitment to continuous improvement. Farming should not only sustain, but actually regenerate soil, protect water and enhance wildlife habitats. With better landscapes, people will be more willing to live in rural areas, thus bringing back the markets needed by smallholders. There is a need to create responsible land owners.

## Discussion Points

- Specialization, monocultures and factory farming are more financially profitable with less capital invested and agro-chemicals controls for pests and diseases. With the Federal Crop Insurance pushing in that direction, what are the incentives for farmers to undertake a different path? Land needs grazing and models show that pastures could hold 1.2 to 1.8 animal units per acre if managed well. Nature Conservancy, Minnesota Department of Natural Resources, US Fish and Wildlife Service and others could be convinced that their natural areas are degrading without grazing. Many livestock farmers do not get a lot of benefit from the crop insurance programme. With good access, farmers and agencies could be assisted in better land management.



- In the face of climate change and increasing drought events, rain cannot be controlled but farmers can control how soil (and water) is managed. Integrated systems, with continuous vegetation and grazing, drive carbon below ground: deeper root structures build-up, and as grazing occurs, some of the root hairs break off and release exudates into soil that stimulate more microbial activity and thus, storing more carbon deeper below ground. Perennial crops cannot achieve the same level of carbon sequestration as grazing because it is the tugging of ruminants at the plant that stimulates more soil biological activity, in an effort to heal the wound pattern of the plant.
- The value of land, including its social value, goes well beyond the rental value, driving management choices. It is important for lease agreements to include conservation stipulations and covenants.
- More clarity is needed on the greenhouse gas emissions of different systems: confined feeding operations have a decreased emission rate per unit of produce but the overall picture is missed in terms of the role of grazed pastures and global carbon flows play in this assessment.
- During the last Farm Bill, there were discussions on which standards farmers had to meet in order to benefit from taxpayers' contributions to the subsidy system of Federal Crop Insurance, especially for arable lands and wetlands. Crop Insurance could be used in a multi-structured way so that when the full-cost of food production is considered, sustainable farmers would be able to profit most.



# CHAPTER 10:

## DOES SIZE MATTER?

**Moderator: Ann Thrupp**

UC Berkeley Food Institute

**John Ikerd**

Author and economist – *The true cost of large-scale farming*

**Mike Hamm**

Michigan State University – *Food hubs and scale for food*

**Doria Robinson**

Urban Tilth – *Urban agriculture: scaling-up community gardens to urban farms and regional food systems*

**Jim Slama**

FamilyFarmed – *Feeding the 99% good food*

## Introduction – Ann Thrupp, UC Berkeley Food Institute

The increasing consolidation of farms – ‘the bigger, the better’ – is the current orthodoxy and financial reality in relation of most food production systems, with fewer and fewer farmers, processors, distributors and retailers responsible for an ever greater percentage of the food produced. At the same time, access to land is difficult for people without capital, in both urban and rural settings, and small farms are being squeezed.

Is there such a thing as the right scale, and can small be profitable, as well as beautiful? How can true cost accounting help address these current imbalances and scale-related issues? And what besides true cost accounting needs to be done?

## The true cost of large-scale farming – John Ikerd, Author and Economist

Does farm size affect the true cost of food? The short answer is yes! The increase in size of farms in the US is a result of a quest for economic efficiency. As farms have grown larger, the *external* economic costs of farming have risen, suggesting a relationship between farm size and economic externalities. The *non-economic* external costs of large farms may matter even more than the economic externalities. Most advocates of sustainable agriculture seem to believe that in farming size *does not* matter. Today’s large farms would need to be managed like well-managed small farms if they were to be sustainable.

A farm is a single management unit, a combination of land, labor and capital, managed as a single farm or economic entity. The greater the reliance on management and labor relative to land and capital, the greater the *management-intensity* or human-intensity. The greater the management-intensity, the *smaller* the size of the farm in terms of land, capital, or total value of production. The less the intensity of management and reliance on the human factors of production, the larger the farm or ranching operation or economic unit.

Management intensity determines whether the economic benefits go primarily to farmers or to those who provide land and capital – raising the question of how much of the economic benefit goes to those in rural communities? But even more important, management intensity matters because the sustainability of a farming operation depends on the intensity with which farms are managed. The large farms that dominate today’s agriculture are not unsustainable because they are large, they are large because they are managed unsustainably.

Sustainable farms must meet the basic food needs of all the present generation, without diminishing opportunities for the future. Today’s large farms obviously are doing neither. The percentage of people in the US classified as “food insecure” today is about three times larger than during the 1960s. Today’s industrial food system is linked to an epidemic of obesity and other diet-related health problems. In addition, today’s dominant farming systems are degrading the health of soils and mining the productivity

of the land and demeaning the agricultural workforce – resources essential for the future of agriculture.

Today's call for true cost accounting is a direct result of the rising economic cost of the negative ecological and social impacts of industrial agriculture. While a step in the right direction, sustainable farming ultimately will require an approach to farm management that is fundamentally different from the extensive-management paradigm that characterizes today's large farms.

As Wendell Berry calls it, we ultimately must be *Solving for Pattern*.<sup>68</sup> The pattern of large farms is that of a machine or mechanism – of industry. The natural ecosystems and rural cultures within which farms must function are living systems rather than machines – organisms rather than mechanisms. In fact, a farm itself is an organism – a living system. The ecological and social externalities of large farms are a natural consequence of the inherent disharmony and conflict between the industrial extensive-management paradigm, which causes large farms to be large, and the ecological and social context within which farms must function. Economically viable small farms must be managed intensively to function in harmony with their ecological and social environment.

The lack of sustainability in US agriculture today is an outcome of a management paradigm chosen to maximize economic efficiency, which inevitably conflicts with ecological and social integrity. Small farms provide higher-quality employment opportunities and allow farmers to farm sustainably. Today's large farms are the right size for economic efficiency but they are too large for ecological, social, and economic sustainability.

## Food hubs and scale for food – Mike Hamm, Michigan State University

Food distributors have redefined themselves as food hubs. However, food hubs have been around, though not called as such, for the last 20 years.

A food hub is defined as a financially viable business that demonstrates a significant commitment to place through aggregation and marketing of regional food. A National Food Hub Survey<sup>69</sup> showed that the number of food hubs grew by 30-40%, from 2013 to 2015. Food hub suppliers and customers are almost entirely regional, within 400 miles from the food production. Food hubs are good for small and medium-scale operations, with less than \$500,000 gross income. Most food hubs have a mission statement that includes the desire to increase community food access and health outcomes.

The National Survey documents how food hubs act as valuable intermediaries, getting

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<sup>68</sup> Wendell Berry, 1981. *Solving for Pattern*. In: *The Gift of Good Land: Further Essays Cultural & Agricultural*. Chapter 9. North Point Press.

<sup>69</sup> Centre for Regional Food Systems, 2016. 2015 National Food Hub Survey. Michigan State University.

food from small-and-medium farms to various outlets, creating regional food systems in the process. It should be recognized that it is relatively difficult to source all food from small farms. However, that does not mean that these cannot be managed well and intensively. In the last census, there were 194,000 farms in the US producing fruits and/or vegetables; if all of what is currently consumed came from 2 acre farms, there would be a need for 5.6 million small farms today and 7 million small farms in 2050. For everything to be done on small farms, it would take a huge increase in the number of people farming; even if small farms were 20 acres, it would take a 2-3 level increase in farm number to meet demand. Also, if consumption increased as the dietary guidelines suggest – with more consumption of fruits and vegetables – this would require even more farms. What is needed is a broad diversity of farms that are managed with low chemical and energy inputs.

What kind of scale of increase in farms is needed in the US? What kind of increase in the value of farming as a profession? A massive increase of farmers is what the country definitely needs.

### Urban agriculture: scaling-up community gardens to urban farms and regional food systems – Doria Robinson, Urban Tilth

Cities like Richmond, California, are the dumping ground of capitalism, of industry and of industrial food. Health consequences of poor access to healthy affordable food is serious: by 2020, 70% of the adult population will be overweight, of which 42% will be obese, with serious illness like diabetes and other health conditions.

Size matters in the way it impacts on human bodies and access to food. The excuse for operating on a large scale is to create access to cheap food. But cheap food is killing people.

The sustainable agriculture movement is needed and valuable, but it serves higher income people. Lower income families cannot afford sustainably produced food. The crash of industrial capitalism has led to empty and available lots where urban gardens can be established. Urban gardens remind people about the importance of cooking and healthy eating, as well as valuing farmers and farm workers. However, the impact of food gardens on food access has not been dramatic. Only low levels of food are actually produced in these urban spaces. So, how is a bigger impact made? Is healthy food a human right? Does this mean that land and water should be subsidized to improve this access?

Reconnecting people with land and food is important and urban food systems can help towards this end. There is a need to harness the energy from food hubs with a more regional perspective, creating vibrant urban and rural linkages, where even labor exchanges can strive, such as the urban poor assisting rural farmers in the fields.

There is an urgent need to rethink the food system, so that economic enslavement and

humiliation is ended, especially for poor urban recipients.

## Feeding the 99% good food – Jim Slama, FamilyFarmed

Good food is defined as delicious, healthy and accessible food, produced as close to home as possible, by family farmers and producers that use practices that are sustainable, humane and fair.

Currently, strong customer demand is driving a rapid increase of the “good food” movement. However, the greatest challenge is scaling-up, as 99% of all food consumed flows through wholesale channels, with little coming from local sources, such as Community-Supported Agriculture, farmers’ markets and farm stands. FamilyFarmed has a number of programs that support the development of the good food value chain.

In 2004, FamilyFarmed launched the Good Food Trade Show. It is now the oldest local, sustainable food trade show in America, with over 185 vendors present in 2016. Held annually, it connects food producers with buyers, such as Whole Foods Market, US Foods, O’Hare International Airport, Chicago public schools, restaurants, supermarkets, distributors and food hubs. McCormick Place, where the Trade Show is held, is the largest US convention center; it can host 10,000 diners and it currently sources 42% of food from sustainable sources.

The Wholesale Success Manual and Training, which the USDA has invested a billion dollars in, teaches farmers about post-harvest handling; packing; maintaining the cold chain; food safety; and building relationships with wholesale buyers. Over 11,000 farmers have been trained in more than 40 states to date. These are the farmers who today are supplying restaurants and hospitals with good food that is also food safety certified.

The Good Food Business Accelerator, started in 2014, helps entrepreneurs access the capital with the resources they need to grow strong businesses that increase the supply of local and sustainably produced food. It now involves a network of small businesses, 120 mentors, super-mentors, advisors and 80 investors (including Angel, Venture Capital, Small Business Administration and Farm Credit and banks). The Good Food Business Accelerator’s first year success averaged a 62% increase in sales: businesses averaged a 107% increase in customers and 68% increase in full-time employees; and fellows have raised \$5.62 million in debt and equity financing. Farms and food businesses are landing financing, with a total capital of \$23 million through FamilyFarmed connections.

Mid-size farms are what is needed to feed the 99%. “You never change things by fighting the existing reality. To change something, build a new model that makes the existing

model obsolete<sup>70</sup>.”

## Discussion Points

- How can small farmers be protected if the emphasis is on medium-scale farming? The old farming model is obsolete because it is not sustainable, nor it is ensuring livelihood opportunities and food security; the new model is small and intensively managed farming operations. In 50 years, there will be a fundamentally new food system. This new system will be based on food sovereignty, where everyone has a basic right to good food. Then federal policies will support the model of food sovereignty and environmental responsibility and farm sizes will shrink. Supermarkets and franchise restaurants will be obsolete. The market economy provides food to rich people but markets are not the answer to food security. There is a need to rethink assets and the current infrastructure, while connecting it to the people who need it. Fair food and just food need to be part of true cost accounting, in addition to farming impacts on the land.
- The changes needed are not just about size. How do we bring about change? Who are the farmers of the future and where will food come from? There is an urgent need to remove impediments for young people (and there are many) to choose to go into farming and facilitate financing, land access and navigating markets. Most of these young people either come from urban suburbs, with no generational farming experience, or they are immigrants with no knowledge of farming strategies in the US. The starting point right now is a short walk, through the Food Climate Research Network, to make it feasible for those willing to do so, to enter into the farming profession – and do it well. For example, in Michigan, there are conversations about making land available to beginner farmers, for example, by donating it to universities.
- Scale is needed so that farmers can produce large amounts of sustainable and nutritious food (not just commodities), while giving farmers’ fair wages and a stake in the company. Small farms can make it work by becoming management intensive, or by linking with customers, thus by-passing the dominant retail system.
- With regards to the consolidation of the corporate industry (e.g. Syngenta, Monsanto, Dupont), the Constitutional right of democracy to clean air, clean water and clean soil needs to be reclaimed.

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<sup>70</sup> Buckminster Fuller, 1982. Critical Path.

# CHAPTER 11:

## SOILS

**Moderator: Sarah Bell**

11th Hour Project

**David Montgomery**

University of Washington – *Soil: The big picture*

**Whendee Silver**

UC Berkeley – *Reversing the negative impacts of agriculture on soil*

**Lara Bryant**

NRDC – *The value of soil in American policy*

**Respondent: Richard King**

Farmer and Educator – *Farming and ranching to grow soil*



## Soil: the big picture – David Montgomery, University of Washington

The invention of the plow altered the balance between soil production and soil erosion, dramatically increasing soil erosion on agricultural land. Archeological studies show that soil erosion played a key role in the demise of ancient civilizations, decreasing their resilience.<sup>71</sup>

Any food security conversation must start by considering the loss of productive land and reduced soil fertility. At least 430 million hectares of arable land have been lost to soil degradation, an area equivalent to about one third of all present cropland.<sup>72</sup> The world's agricultural soils have already lost 66 to 90 billion tons of carbon, mostly due to tillage.<sup>73</sup>

Soil erosion results in on-site losses of nutrients, organic matter, water holding capacity, fertility, yield and planted area. Off-site losses include sedimentation in lakes and rivers, impaired water quality, loss of biodiversity, reduced food supply and increased food prices.

The estimated cost of soil erosion in the US varies 100 fold, depending on what on- and off-site costs are included, with estimates of up to \$44 billion per year, and globally the per hectare on-site cost of soil erosion ranges from \$5 to \$1 500 per year.<sup>74</sup>

The societal value of soil organic carbon is estimated at about \$120/ton<sup>75</sup>. At a global average sequestration rate of 0.77 tons/ha/year for conservation agriculture<sup>76</sup>, which comes to \$40/acre/year. The cost to a farmer of a 1% loss in soil organic matter translates to an indirect cost of about \$66/acre/year<sup>77</sup>.

No matter how it is considered, the high societal cost of soil erosion warrants revisiting farming practices. Regenerative agriculture builds soil fertility and increases soil carbon through minimal disturbance (no till), permanent ground cover (cover crops), complex rotations that also reduce pathogen carry-over, and livestock in intensive rotational

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<sup>71</sup> Montgomery D. R., 2007. *Dirt: The Erosion of Civilizations*, University of California Press, Berkeley.

<sup>72</sup> Pimental et al., 1995. Environmental and Economic Costs of Soil Erosion and Conservation Benefits, *Science*, v. 267, p. 1117–1123.

<sup>73</sup> Lal, R., 1999, Soil Management and Restoration for Carbon Sequestration to Mitigate the Accelerated Greenhouse Effect. *Progress in Environmental Science*, v. 1, p. 207–326.

<sup>74</sup> Telles et al., 2001. The Costs of Soil Erosion. *Revista Brasileira de Ciencia do Solo*, v. 35, p. 287–298.

<sup>75</sup> Lal R., 2014. *Journal of Soil and Water Conservation*, v. 69, p. 186A–192A.

<sup>76</sup> West T. O. and Post W. M., 2002. *Soil Science Society of America Journal*, v. 66, p. 1930–1946.

<sup>77</sup> Tsiafouli et al., 2015. *Global Change Biology*, v. 21, p. 973–985.



grazing<sup>78</sup>.

Estimates of the global carbon sequestration potential of soils range widely, from offsetting less than 15%<sup>79</sup> to all<sup>80</sup> fossil fuel emissions, depending on assumptions used and methods considered. In any case, however, there is substantial potential to put carbon back into soils.

## Reversing the negative impacts of agriculture on soil – Whendee Silver, UC Berkeley

Reducing greenhouse gas emissions is no longer sufficient to reduce climate change. A large fraction of anthropogenic climate change resulting from CO<sub>2</sub> emissions is irreversible on a multi-century to millennial time scale, except in the case of a large net removal of CO<sub>2</sub> from the atmosphere over a sustained period. Surface temperatures will remain approximately constant at elevated levels for many centuries after a complete cessation of net anthropogenic CO<sub>2</sub> emissions. Due to the long time scales of heat transfer from the ocean surface to depth, ocean warming will continue for centuries. Depending on the scenario, about 15 to 40% of emitted CO<sub>2</sub> will remain in the atmosphere longer than 1000 years<sup>81</sup>.

Evolutionarily, grasses are built to store a high proportion of their photosynthate below ground in roots, forming greater soil carbon (C) pools. Thus, grasslands are an important place to try to sequester C in soils, because grasses put a lot of their energy (and thus C) below ground in roots. They do so because they need to search for water and nutrients in the seasonally dry climates where they grow.

Grasslands are one of the most extensive land cover types globally: 30% of global land surface area; 30% of US land area and 40–50 % of California land area. However, the majority of grasslands are degraded because of inappropriate land-use practices. It is possible that some of the C lost in the past could be replaced through management.

In California, there are approximately 23 million hectares of rangelands. Assuming that half of California's grasslands would be available for carbon sequestration projects – at a rate of 0.5 tonnes C/ha/ – 21 million tons of CO<sub>2</sub>e per year could be stored. To put that in perspective: the livestock sector emits, through enteric fermentation, about 12 million tonnes CO<sub>2</sub>e per year; commercial/residential activities emit about 43 million tonnes CO<sub>2</sub>e

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<sup>78</sup> Montgomery D. R., 2017. *Growing A Revolution: Bringing Our Soil Back to Life*, W. W. Norton, New York.

<sup>79</sup> Lal R., 2004, *Soil Carbon Sequestration Impacts on Global Climate Change and Food Security*, Science, v. 304, p. 1623–1627.

<sup>80</sup> Rodale Institute, 2014, *Regenerative Organic Agriculture and Climate Change*, Kutztown, PA.

<sup>81</sup> IPCC, 2013. *Fifth Assessment Report*.

per year; and electrical generation (in the State) about 50 million tonnes CO<sub>2</sub>e per year. This indicates that there is considerable potential to offset some of California's energy use with carbon sequestration in agricultural soils.

Research showed that soils that had received organic matter amendments stored 50 tonnes carbon per hectare more in the top meter of soil than un-amended soils. Livestock manure is the most common amendment and is also a major greenhouse gas emitter. Modelling<sup>82</sup> was undertaken to determine future net carbon (C) sink benefits of manure amendments and actually, soil C sequestration was offset by emissions. Raw manure might not be the solution but composted manure has a much lower C footprint, besides improving water-holding capacity and forage growth.

Monetization of costs is problematic. However, using a low estimate from EPA and high estimate from a Stanford paper,<sup>83</sup> the social cost of C emissions from livestock manure in California (especially from operations that congregate manure in CAFO-type systems) ranges from \$450 million to \$2.7 billion a year. Social savings that could be obtained from composting that manure and applying it to the land, on just 25% of California's rangelands, are \$780 million to \$4.6 billion a year.

It is critical that soil C sequestration be included in climate action planning at all levels. Agriculture is poised to contribute to climate change mitigation; this is supported by science. Soil is a resource that can facilitate both mitigation and adaptation. More research is needed in this area. At the moment we are just scratching the surface. Creative solutions may cross sectors, posing new regulatory challenges and new opportunities.

## The value of soil in US policy – Lara Bryant, NRDC

Soil is an important natural resource that is often over-looked and under-appreciated by policy-makers. Soil is an important factor in the development of the planet's diverse ecosystems. Water passes through soil in almost every part of its cycle, impacting water quality. Improved soil tilth and water holding capacity is important in both times of drought and flood. Healthy soil is a key component of climate change resilience and has a major role in the carbon cycle. When healthy soil is advocated, one is also advocating for clean water, clean air and biodiversity.

The Dust Bowl of the 1930s caused devastating soil loss in the Central Plains of the US and clearly illustrates the relationship between soil security and the economy – especially the rural economy. The USA government responded to this economic and environmental

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<sup>82</sup> Owen, J., W. J. Parton, and W. L. Silver. 2015. Long-Term Impacts of Manure Amendments on Carbon and Greenhouse Gas Dynamics of Rangelands. *Global Change Biology* 21:4533–4547.

<sup>83</sup> Moore, F. C. and D. B. Diaz. 2015. Temperature Impacts on Economic Growth Warrant Stringent Mitigation Policy (vol 5, pg 127, 2015). *Nature Climate Change* 5.

crisis by creating the Soil Conservation Service – now known as the Natural Resources Conservation Service (NRCS). While the NRCS was established to secure the soil, the government also created programs to provide a safety net for American farmers and agriculture. One of these programs is the Federal Crop Insurance Program (FCIP); though it was created in 1938, it was not widely used before the 1990s, when lawmakers began to make changes to increase enrollment in the program through subsidies. Currently, more than 70% of cropland acres (294 out of 390 million acres) are enrolled in the FCIP, and many farmers rely on the program as their primary safety net to manage weather-related risks.

Unfortunately, the program is structured so that it does not recognize soil condition and may actually be putting soil resources at risk. The FCIP is highly subsidized: on average, 62% of individual premium costs are paid for by the federal government. As climate change causes more extreme weather and the cost of the FCIP continues to rise, lawmakers will be forced to consider whether the US government can continue to afford the heavy subsidies offered by the FCIP without changes to the program. The FCIP is currently structured using a flawed formula that lets high-risk farmland and management off the hook and ignores soil regenerative practices that would protect soil security.

What if the FCIP rewarded good stewardship practices, such as cover crops, that could result in lower indemnity payments and also improve carbon sequestration, water quality, and biodiversity? NRDC proposes the development of a pilot crop insurance program offered by the FCIP in select areas of the Mississippi River Basin. The 508(h) pilot cover crop program would offer actuarially sound crop insurance discounts to producers whose appropriate use of cover crops puts them at a lower risk for crop loss.

## Farming and ranching to grow soil – Respondent: Richard King, Farmer and Educator

Agriculture has the greatest impact on the life-support system, more than anything else humans have ever done. It is possible to do better and convert current agriculture into a regenerative system. Time is upon us and it is time to act.

Life creates soil and soil creates life and they feed on each other. So far, 58% of soil organic carbon in the world's agricultural lands have been lost, both on croplands and grazing lands. Currently, soil degradation is masked with fossil fuel-based agricultural inputs and there is little knowledge on what biodiversity and life activity is below ground.

While annual crops grow roots a few inches long, perennial grass roots go far deeper into the soil: to grow soil, there is a need to understand how nature works and photosynthesis is central to this process.

Main management practices include: building functional biodiversity; having a soil cover 365 days of the year; minimum soil disturbance from tillage, compaction and chemicals;

planned grazing in a way that honors plant vigor; recycling biomass; and managing complexity holistically.

## Discussion Points

- Growing soils requires growing conducive policies, especially to encourage cover crops. Incentivizing good practices includes educating land owners on soils and having more initiatives such as the Healthy Soils Initiative in California.
- Engineering efforts seeking to minimize the root mass to the benefit of the above-soil growth is outdated, as it ignores the symbiosis between microbial life in soils and the plant. The whole reason why the plant is pushing exudates out of the root system is to promote the soil ecosystem because this creates mutual benefits. Minimizing the importance of the roots falls into the same problems brought by the use of nitrogen fertilizers that result in less exudates and less microbial interactions in the soil. New knowledge on the relationship between the plant, microbes and the soil must lead to rethinking the assumptions behind conventional practices.
- There are growing businesses around regenerative agriculture, as more seeds and urban compost are needed. More than climate change mitigation, it is the co-benefits such as increased profitability that motivate farmers to change practices. Adaptive management (versus prescribed paths) is the only way ahead, as environmental, social and economic environments are changing quickly.

# CHAPTER 12:

## WATER

**Moderator: Peter Lehner**

Senior Attorney, Earthjustice

**Bill Stowe**

Des Moines Water Works – *External costs and public health threats from nutrient pollution in agricultural watersheds*

**Hal Candee**

Altshuler Berzon LLP – *Environmental legislation for water conservation*

**Jenny Rempel**

Community Water Center – *California's drinking water crisis: Addressing agricultural groundwater contamination*

**Dennis Baldocchi**

UC Berkeley – *Implications of the true cost of water on California's agriculture*

## Introduction – Peter Lehner, Earthjustice

Human bodies are two-thirds water. Water is a sign of life in the universe. Water is particularly important to humans and yet history shows that humans are particularly bad in managing it. Water is often wasted or polluted because it usually comes at little to no cost.

With over 60% of California's citizens relying on groundwater supplies, and the state now into its fifth year of drought, the importance of water availability in California has never been more paramount. Furthermore, in many communities, the small amount of water accessible to people is polluted to levels above federal legal limits, resulting in significant health implications, particularly to pregnant mothers and babies. What can be done to redress this problem of wasted and polluted water? What are the possible mechanisms for reversing this trend?

## External costs and public health threats from nutrient pollution in agricultural watersheds – Bill Stowe, Des Moines Water Works

Drinking water is a public health commodity. Water quality is driven by land activity – particularly in the Corn Belt, where nutrients, especially nitrogen and phosphorus, in surface waters are unacceptably high.

Nitrate pollution in Iowa surface waters, which presents a health concern, is the basis of a lawsuit. While 90% of Iowa produce is exported, radical changes are hitting Iowa's hydrology in terms of polluted waters. Whilst Iowa's farms are "feeding the world", they are causing significant problems, particularly to wildlife and its local residents. Costs to quality of life include increased public health risks, recreation (closed beaches) and impaired waterways, gulf hypoxia and costs to taxpayers.

In US, the three water pollution hotspots are all in the Midwest, including east-central Illinois, central Iowa and the southern Great Lakes, where artificial drainage tiles create a point source of pollution that should be regulated. In a lawsuit made by The Des Moines Water Works which was partly based on a violation of the Clean Water Act, but was mainly focused on the high nitrate effluent from artificial drainage tiles that rapidly remove groundwater from the soil by means of the drainage infrastructure. Artificial drainage systems in areas of Sac County transport concentrations of nitrate greater than 10 mg/l into surface water streams.

Sub-surface drainage systems that transport nitrate from the field to a navigable body of water are point sources by definition but have been erroneously considered exempt from regulation under the Clean Water Act. If successful, this lawsuit would put agricultural drainage systems on the same regulatory footing as other point sources.

Billions of dollars are spent in federal agricultural subsidies, with no great use of conservation practices. There are no ties between federal subsidies and long-term

accountability. There must be agricultural accountability for environmental protection, because resources follow accountability, not vice versa.

Pollution should be treated at the source with in-field or edge-of-field solutions. There should be transparent measuring and monitoring of public health (National Pollutant Discharge Elimination System compliance), as well as the enforcement of the EPA's Nutrient Reduction Strategies for Iowa and other Mississippi River Basin states.

## Environmental legislation for water conservation – Hal Candee, Altshuler Berzon LLP

In California, agriculture uses 80% of its total freshwater withdrawals, and shockingly, one county's agriculture uses as much water as all California's cities put together. Despite increasing drought periods, California is exporting produce and with it, its scarce water. In addition, allocation of water among farmers is unequal and it is not unusual that some farmers receive more water than they need and others can hardly meet a fraction (5%) of their water needs. Water allocation issues are often blamed on environmental conditions (El Niño) and protection laws, rather than on ill-conceived and poorly managed water systems.

Addressing the impacts of huge agri-business demand is a priority. There has been progress made in water conservation projects (e.g. irrigation efficiency, groundwater recharge) and water policies now exist. A 1992 Central Valley project in 28 districts encouraged better practices across the board, including actions such as: increasing the price of water for heavy water users, giving a break to farmers who are using their farms as wildlife habitats (particularly for salmon) and reforming lawn water contracts.

Despite powerful vested interests, a water dam case, which has been ongoing for the last 19 years, was recently won and today, water has returned to what has been a 60-mile stretch of dry river.

## California's drinking water crisis: Addressing agricultural groundwater contamination

– Jenny Rempel, Community Water Center

Each year, more than one million Californians are served water that does not meet safe drinking water standards, violating their human right to clean, safe and affordable drinking water – a moral right, and in fact, in California, a legal right recognized in the state since 2012. This urgent problem is also a chronic one: almost 300 communities are out of compliance with drinking water standards, and some have failed to provide safe drinking water for years or even decades. To deliver on its promise of the Human Right to Water (AB 685), California must fund drinking water solutions and protect groundwater quality. Solutions to California's drinking water crisis are not possible without collaboration from agriculture.



Nitrate contamination is the most prevalent man-made source of groundwater pollution in California beside salt<sup>84</sup> and an acute contaminant that poses great health risks to communities.<sup>85</sup> In California, nitrate contamination is largely a product of more than 50 years of unchecked use of commercial fertilizer and the unregulated storage and disposal of dairy wastes.<sup>86</sup> 88–96% of total nitrogen contamination results from agriculture, where excess nitrogen applied to crops is leached into the groundwater.<sup>87,88</sup>

A quarter million people are highly susceptible to exposure to unsafe levels of nitrate in their drinking water, which can lead to Blue Baby Syndrome and cancer.<sup>89</sup> Nitrate contamination of drinking water is widespread and increasing in California. If current practices do not change, by 2050, more than 80% of the population in the southern San Joaquin Valley and Salinas Valley will likely be served by a drinking water system that has at least one well with nitrate over the legal limit.<sup>90</sup>

Nitrate contamination of groundwater has and will continue to cost taxpayers hundreds of millions of dollars to replace, blend, or treat contaminated drinking water wells.<sup>91</sup> When replacement water costs are included (e.g., bottled water), some families spend as much as 10% of their income on water to protect their health.

Nitrate contamination impacts the future livability of the entire Central Valley, as most Valley residents rely on groundwater for their drinking water supply. A fee on nitrate would not only help address the need for drinking water solutions, but it would also incentivize farmers to reduce ongoing nitrate contamination.

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<sup>84</sup> Harter, T. 2009. Agricultural Impacts on Groundwater Nitrate. *Southwest Hydrology* 8:22–35.

<sup>85</sup> Water & Health in the Valley: Nitrate Contamination of Drinking Water and the Health of San Joaquin Valley Residents. Community Water Center. Page 4.

<sup>86</sup> *Ibid.*

<sup>87</sup> Tomich, T. et al., eds. 2016. The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment. Executive Summary. University of California Press. Page 7.  
[http://asi.ucdavis.edu/programs/sarep/research-initiatives/are/nutrient-mgmt/california-nitrogen-assessment/ExecutiveSummaryLayout\\_FINAL\\_reduced.pdf](http://asi.ucdavis.edu/programs/sarep/research-initiatives/are/nutrient-mgmt/california-nitrogen-assessment/ExecutiveSummaryLayout_FINAL_reduced.pdf).

<sup>88</sup> Harter, T. et al. 2012. Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater. Report for the State Water Resources Control Board Report to the Legislature. Center for Watershed Sciences, University of California, Davis. 78 p. Page 3.  
<http://groundwaternitrate.ucdavis.edu>.

<sup>89</sup> 254,000 people within the Tulare Lake Basin and the Salinas Valley “have drinking water supplies susceptible to significant nitrate contamination” that require significant drinking water treatment. See Tomich, T. et al., eds. 2016. The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment. University of California Press.

<sup>90</sup> Harter, T. et al. 2012. *Ibid.* See page 5.

<sup>91</sup> The cost for long-term drinking water solutions for the Tulare Lake Basin and Salinas Valley to be \$36 million annually, not including costs for temporary solutions like emergency bottled water. Harter, T. et al. 2012. *Ibid.* See page 5.

Nitrate contamination impacts the health and wellbeing of California families and strains the state economy. Investing now will save California communities money over time, and it will ensure that future generations have safe water to drink.

## Implications of the true cost of water on California' agriculture – Dennis Baldocchi, UC Berkeley

How much should water cost, given a limited supply and demand from numerous stakeholders? Before the recent drought, people paid \$15–60 acre ft, while during drought, people paid \$1,200–1,500 acre ft. However, capital costs could be up to \$3,000 acre ft. Surely a more accurate cost for water must be advocated.

The reasons why demand for water exceeds its supply include: Mediterranean climate (wet winters and dry summers), high evaporative demand during summer growing season, high year-to-year rain variability, extended droughts, reduced snowpack, cheap water and rapid growth in acreage of intensive water using crops like almonds and climate change causing more climate variability.

How much water is available in California for agriculture, now and in the future? Given the desert conditions of California (high evaporation rate), which crops must be favored, based on California's unique ability to produce them and their economic and nutritional value? Can they be grown elsewhere more cheaply and with less water?

How many acres of specific crops can be supported with highly subsidized water? Are 400,000 or 900,000 acres of almonds needed which use over a meter of water per year, when most of them are being exported to China? Is there a will to pay for the true cost of water to produce certain crops and establish a better equilibrium in crop choice and its acreage? There is obviously a need to produce certain fruits, nuts and vegetables in California as many cannot be produced anywhere else in US.

Why shouldn't Californian water be heavily subsidized? Water is a scarce resource in California and it needs to be shared among a mix of legitimate stakeholders. Better water pricing achieves this. Climate change is causing the water system to experience a new normal in terms of supply and demand; vast quantities are pumped uphill (20% of energy use) from the North to the South. Very expensive water is used to produce low-value forage crops.

Business with large capital (not small farmers) is expanding production into the semi-arid and desert regions, which have huge evaporative demand. Many societies in semi-arid regions, based on irrigated agriculture, eventually succumb to salinization of soils, impervious clays and depletion of ground-water.

The untended consequences of cheap/subsidized water includes: inefficient water use, expansion of acreage of water-intensive fruits and nuts, reduced out-flow of delta affecting water quality, altering fisheries' habitats to meet water contracts, salinity

build-up, depletion of ground-water and expensive water on second markets. This is compounded by loss of jobs and a shift of agriculture elsewhere.

Planting is encouraged by: low interest rates; low returns outside of agriculture (e.g. stocks and bonds); profitable almond prices; increased yield potential; a growing demand in emerging markets giving growers confidence to plant more; the Central Valley's housing crisis that caused some properties that were soon to become housing or commercial developments being developed into young orchards; growers who have capital. This last factor cannot be underestimated.

A study has estimated the capitalized value of water to \$3,723 per acre-ft (95% CI USD 1,146 to 6,300)<sup>92</sup>. The estimated capitalized value of one acre-ft of water is one and a half to four times larger than the estimate obtained in the cross-sectional analyses. Although there is limited evidence on whether the average capitalization value of \$3,723 per acre-ft of surface water extends to all agricultural lands in the San Joaquin Valley, studies relying on cross-sectional data and methods may underestimate the capitalized value of irrigation water.

Cheap water has provided many benefits for consumers, in terms of fresh, healthy and local produce, including nuts and fruits. Cheap water has also led to the over-expansion of irrigated forage crops, fruits and nuts, putting pressure on the resource among competing legitimate stakeholders. Charging capitalized value of water would make water too expensive for growers, making food too expensive and displacing farm workers. There is a need to re-invent the Californian water system, so that it is fair and equitable, while considering the warmer and drier environment as a new normality.

## Discussion Points

- In New York there was the unusual circumstance where the Safe Drinking Water Act required New York City to filter its drinking water, which comes from upstate reservoirs, unless the city could show that it was adequately protecting its water supply. This would have cost something in the order of \$10-16 billion. This was a rare instance where the true cost of the natural protection of water was apparent. Because of this legal mandate, it made more sense for the city to spend \$1-2 billion on buying land around the reservoirs and encouraging or even paying people to upgrade sewage plants and take other actions to keep that water clean.
- The idea of payments for ecosystem services is just theoretical, but it is embedded

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<sup>92</sup> Buck S., M. Aufhammer and D. Sunding, 2014. Land Markets and the Value of Water: Hedonic Analysis Using Repeat Sales of Farmland. American Journal of Agricultural Economics..

in certain sections of various federal laws that require someone who pollutes water or groundwater to pay, not only to clean up the mess, but for lost ecological services at the market cost. However, this section of the law is not often used.

- If water should be subsidized, without however subsidizing it too much, what is the right level of fees? Setting water subsidies according to specific crops and changing supply and demand prices, is challenging. There is a need for better data on state water use, including years with the lowest water flow, in order to design systems that work.
- Pricing nitrogen in drinking water needs some sort of subsidization to ensure that low-income groups have access to this basic human right. Water pollution is a tragedy of the unregulated commons. One model could be a user fee, the other a fertilizer fee. Subsidizing should also include conditions of water use, such as ensuring local communities have clean drinking water.
- Allocation of water resources should be based on regulations; 150 years of drainage tiles and CAFOs need to be regulated for their effluents. Ironically, there are no restrictions on constructing more feedlots. For water regulation, agriculture is the most complex sector to handle. True cost accounting can correct the predominant short-term economy of apparently profitable farming systems.

# CHAPTER 13:

## NITROGEN

**Moderator: Barbara Gemmill-Herren**

**Jana Compton, US Environment Protection Agency** – *The cost of nitrogen use in the USA*

**Sonja Brodt**

UC Davis – *The quantities and impacts of nitrogen use in California*

**Bill Stowe**

Des Moines Water Works – *Impacts of Nitrogen fertilizer use on escalating water treatment costs*

**Mark Muller**

McKnight Foundation – *A positive and practical vision for addressing the nitrate issue*

**Laurie Drinkwater**

Cornell University – *Legume contribution to agricultural sustainability and human well-being*



## Introduction – Barbara Gemmill-Herren

The management of nitrogen provides a point of convergence for talking about both the positive and the negative externalities of agricultural production systems. Nitrogen is fundamental to the highly productive systems of crop and animal production in the US, yet has substantial downstream costs for people and biodiversity. The production of nitrogen, for high-input systems, is a life-cycle cost with respect to greenhouse gas emissions and release to waters that are rarely accounted for. In addition, there are larger questions that need to be brought into the equation, including: is the tremendous productivity of US agriculture, fueled by nitrogen inputs, needed in the overall scheme of global food security?

Both national and state-level assessments describe how agricultural systems use and lose nitrogen. Alternatives include more biologically-based systems to manage nitrogen in crop production. There is a need to understand the costs of the use of nitrogen and the release of its reactive forms (such as nitrous oxide and ammonia) in agriculture. In particular, what are the measures that governments, consumers or the health industry could take to rectify a flawed accounting system on the costs and benefits of the current management of nitrogen, and alternatives that may confer many additional benefits, such as climate change resilience?

## The cost of nitrogen use in the US – Jana Compton, US Environment Protection Agency

Growing human demands for food, fuel and fiber have accelerated the human-driven fixation of reactive nitrogen (N) by at least 10-fold over the last century. This acceleration is one of the most dramatic changes to the sustainability of the Earth's systems. Approximately 65% of global N fixed within the US is used in agriculture, as synthetic N fertilizers and by N-fixing crops such as alfalfa and soybeans. Leakage of N from human activities to the environment can result in a host of human health and environmental problems. These costs include effects on human respiratory health via mortality, hospital visits and loss of work days due to the formation of smog, costs associated with treatment and replacement of drinking water contaminated with nitrate, losses to recreation and fisheries resulting from algal blooms and hypoxia in freshwater and coastal ecosystems.

Often, these harmful effects are not reflected in the costs of the food, fuel and fiber that depend upon N use. A recent US/EPA study<sup>93</sup> quantified the potential damage costs associated with N leaked from the following sources: synthetic and manure fertilizers,

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<sup>93</sup> Sobota, D.J., J.E. Compton, M.L. McCrackin and S. Singh. , 2015. Cost of Reactive Nitrogen Release from Human Activities to the Environment in the United States. *Environmental Research Letters* 10:025006.

crop N-fixation, wastewater and fossil fuel combustion. Each source was traced through the nitrogen cascade to the environment, in order to connect to existing data on the costs of specific forms of N in specific situations, in order to calculate the annual damage cost of anthropogenic N. Estimates of N leakage ranged from less than 1–125 kg N per ha per year, with approximately 71% of this N leaking into freshwater ecosystems. Areas with substantial agricultural N inputs tend to have greater damage costs when compared to urban and non-cultivated lands. Eutrophication of freshwater ecosystems and respiratory effects of atmospheric N pollution are important across all the sites.

For the US, potential health and environmental damages of anthropogenic N in the early 2000s totaled \$210 billion per year (range: \$81 – 441 billion per year). Nearly, 75% of the damage costs were associated with agricultural N leakage and effects on aquatic systems. The costs associated with agricultural N used were approximately \$157 billion, ranking it as the source with the greatest damage costs. Similar work in the EU also identified \$45–296 billion in damages associated with agriculture. Significant data gaps remain in the ability to fully assess N damages, such as damage costs from harmful algal blooms and drinking water contamination. Despite the gaps and uncertainties in these estimates, this work indicates that the costs of N use are substantial and can be used as a starting point to engage stakeholders and inform management of N pollution.

Individuals could visit and enter their data into a website called “Nprint.org”: The Nitrogen Footprint Calculator measures the amount of reactive nitrogen released into the environment as a result of human activities. One receives a rating of nitrogen use, for food, housing, transportation, etc. compared to national averages.

## The quantities and impacts of nitrogen use in California – Sonja Brodt, UC Davis

Nitrogen (N) is a critical nutrient required to sustain the vibrant agricultural economy in California. However, increases in N use have also resulted in excess nitrogen emissions to the environment. The California Nitrogen Assessment (CNA),<sup>94</sup> authored by 43 contributors and led by the Agricultural Sustainability Institute at the University of California, Davis, is the first comprehensive accounting of N quantities and movement in California, including how N enters the state, where it is used and its eventual fate. The CNA was guided by stakeholder-derived questions, falling into one of the following four broad categories: what are the big sources of N pollution in California? What are the impacts of N management on air and water quality and human health? What practices and technologies are most effective in mitigating N pollution? What are the policy challenges and opportunities? What follows describes the key findings of this study.

The use of synthetic fertilizer on cropland and turf grass represents the largest flow of N

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<sup>94</sup> Tomich, TP, Brodt, SB, Dahlgren, RA, and Scow, KM. 2016. The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment. University of California Press, Oakland, California.



in California: 519 Gg N per year (90% used on cropland), or 32% of 1617 Gg total annual imports/inputs. Manure excretion by livestock is the second largest N flow: 416 Gg N per year, or 26% of total outputs/storage. N in the food and fiber produced by California's agricultural systems accounts for only 33% of total annual N outputs/storage from agriculture. Nitrate-N entering groundwater (88% coming from cropland) accounts for 35% and ammonia-N (78% coming from crop and livestock production) accounts for 16%.<sup>95</sup>

Nitrate concentrations in groundwater have increased over the past six decades, and in some parts of California, now exceed federal drinking water standards: an estimated 212,000 to 250,000 people, or approximately 9% of the population in the Tulare Lake Basin and Salinas Valley, the most highly affected regions, are considered to be “highly susceptible” to nitrate exposure in drinking water that exceeds the federal standard.<sup>96</sup> From 2005 to 2009, the state spent \$21 million on nitrate-related drinking water mitigation projects, out of a total of \$150 million in proposed projects.<sup>97</sup>

Ammonia emissions from all sources (including fossil fuel combustion) contribute to total particulate matter pollution with annual costs estimated in the billions of dollars as a result of respiratory and other health effects.<sup>98</sup> Air pollution effects from nitrate emissions have been estimated at \$1600 per person per year in the San Joaquin Valley and \$1250 per person per year in the South Coast Air Basin; should federal ozone and PM<sub>2.5</sub> standards be met, savings could be made of nearly \$6 and 22 billion, respectively.<sup>99</sup> N-related air and water pollution disproportionately affects low-income Hispanic and African-American communities, representing an environmental justice concern.<sup>100</sup>

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<sup>95</sup> Liptzin D, Dahlgren R and Harter T. 2016. A California Nitrogen Mass Balance for 2005. In: Tomich et al. (eds.), *The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment*. University of California Press, Oakland, CA.

<sup>96</sup> Honeycutt, K, Canada, HE, Jenkins, MW, Lund, JR. 2012. Alternative Water Supply Options for Nitrate Contamination. Technical Report 7. In: Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater. Report for the State Water Resources Control Board Report to the Legislature. Center for Watershed Sciences, University of California, Davis.

<sup>97</sup> Moore E and Matalon E. 2011. The Human Costs of Nitrate-Contaminated Drinking Water in the San Joaquin Valley. The Pacific Institute, Oakland, CA

<sup>98</sup> Hall JV, Brajer V and Lurmann FW. 2010. Air Pollution, Health, and Economic Benefits: Lessons from 20 Years of Analysis. *Ecological Economics* 69: 2590–2597.

<sup>99</sup> Hall, JV, Brajer, V, Lurmann, FW. 2008. The Benefits of Meeting Federal Clean Air Standards in the South Coast and San Joaquin Valley Air Basins. California State University-Fullerton, Institute for Economic and Environmental Studies, Fullerton, CA.

<sup>100</sup> Haden VR, Liptzin D, Rosenstock TR, Vanderslice J, Brodt S, Yeo BL, Dahlgren R, Scow K, Riddell J, Feenstra G, Oliver A, Thomas K, Kanter D, and Tomich TP. 2016. Ch. 5 in Tomich et al. (eds.), *The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment*. University of California Press,

Nitrogen use efficiency in crops (estimated as partial nutrient balance) is consistently higher in research trials than on-farm averages, suggesting room for improvement through implementation of key practices such as soil nutrient testing, modifying fertilizer placement and timing, improving irrigation system performance, managing field edge and fallow-season vegetation and organic amendments.<sup>101</sup>

In livestock production systems, managing feed to lower N excretion, collecting manure more frequently, storing it anaerobically and composting and using nitrification inhibitors could reduce N outflows.

Due to the complexity of the nitrogen cycle and the many different forms nitrogen can take, practices to control nitrogen can entail significant trade-offs. Therefore, any successful strategy to reduce nitrogen emissions from agriculture must take a comprehensive systems-based approach. Additionally, instead of a “one-size-fits-all” approach, design of policies should take into account the geographic and agricultural diversity of California.

### Impacts of nitrogen fertilizer use on escalating water treatment costs – Bill Stowe, Des Moines Water Works

Nitrogen use in agriculture escalates the costs of water treatment. Iowa is presently the number 1 producer of corn and soy in the US, and corn and soy are recognized as major contributors to nitrates in water systems. Nitrogen is more difficult to remove from water than phosphorus. Nitrogen travels with water. A tragedy of the commons is the free use of water resource to move waste. The current agricultural system is shifting the costs of agriculture from the producers of food to the consumers of water.

The low cost of fertilizer is a huge issue for nitrogen water pollution. Nitrates are a particular risk to infants below six months of age, who, if left untreated, could become seriously ill or die. Nitrate treatment is not addressed through traditional lime softening/filtration systems and a side-stream treatment is required.

Costs to water treatment at farm level is \$1.5–22 per pound, rising to \$15–47 per pound at municipal treatment facility level: water pollution must be treated at the source, with in-field or edge-of-field solutions.

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Oakland, CA.

<sup>101</sup> Rosenstock TR, Leverenz H, Meyer D, Brodt S, White A, and Zapata C. 2016. Ch. 7 in Tomich et al. (eds.), *The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment*. University of California Press, Oakland, CA.

Billions of dollars are spent in federal agricultural subsidies, with no greater use of conservation practices; there is no tie between federal subsidies and long-term agricultural accountability for environmental protection.

### A positive and practical vision for addressing the nitrate issue – Mark Muller, McKnight Foundation

For decades, a variety of drivers – including market forces, federal policy, government officials, and University researchers – have encouraged farmers to adopt the form of agriculture that dominates the Midwest, that is, corn and soy production. Farmers often feel helpless in the face of large external forces, rather than seeing themselves as agents of change, promoting conservation. To successfully address the pervasive nitrate issues in agricultural regions farmers not only need economically viable options to change cropping systems, but also to shift the market and policy forces that encourage the industrial production model of just a few crops.

To illustrate the conservative nature of agriculture, and what will be needed to make a shift in production practices, it was suggested that the audience partake in a bit of role-play. The audience was encouraged to imagine themselves at a fast food restaurant, and you had just found out about the high fat and calorie content in the hamburgers. Frustrated by the unhealthy food, you start yelling at the cashier in the restaurant. The cashier, of course, would respond that the quality of the food is not his decision; he is just paid to run the register. This is just how farmers often feel in the face of environmental pressures; that they are just responding to market signals and it isn't their decision.

In the view of the dialogues that the McKnight Foundation has carried out throughout the Mississippi Basin, solutions may lie in the combination of regulatory measures and non-regulatory measures such as standards of care for agriculture, defining options for progressive farmers.

What measures might be possible for these progressive farmers to reduce nitrogen loads in the Mississippi Basin? Suggestions include incorporating more conservation practices in current production systems, such as cover cropping and minimal tillage, but also including more soil and water-protecting perennial crops in Midwest agriculture such as pasture, Kernza, and hazelnuts.

It is to be noted that one of the concerns of the initiative is how to get consumers involved talking about water. A Water Summit was convened in Minnesota, but the environmental justice sector did not come; their conclusion was that the process has not empowered people to believe they can get their issues heard.

**Legume contribution to agricultural sustainability and human wellbeing** – Laurie Drinkwater, Cornell University

Why are systems leaking nitrogen? It is due to the changed the structure of agriculture.

By coming to rely increasingly on chemical inputs, such as nitrogen fertilizer, we are decreasing the diversity of the landscape and the natural processes by which we would normally achieve nitrogen fixation.

Although some nitrogen fertilizer does cycle back into the soil, crops still get much of their nitrogen from soil organic matter. Nitrogen leaking is systemic, it is very hard for farmers to manage it and keep it in the system, as nitrates are very mobile. But with less organic matter now in agricultural soils, microbes will not be taking up as much nitrogen.

We will not reach sustainability through the sustainable intensification ‘more crop per drop’ approach. An alternative approach is ecological intensification whereby the ecological integrity of food systems is restored and our dependency on fossil fuel-based inputs is reduced. One fundamental part of this is to increase biodiversity and to use plants to replace artificial inputs. An example of this is the use of legumes to fix nitrogen in the soil. There are around 12,000 species of plant that can fix nitrogen, yet we only use six for 95% of the nitrogen that we fix.

Growth of legumes can increase the storage of soil organic nitrogen reserves. Increasing soil organic matter also improves drought resistance and yield stability.

What will it take to shift from industrial to ecologically based systems? We all agree that food production is too important to let the market determine. Unfortunately, current policies reinforce the industrial model. We should eliminate all yield-based incentive programs and instead we could tax the agro-industrial complex for use of artificial and fossil fuel-based inputs.

## Discussion Points

- Nitrogen dioxide (NO<sub>2</sub>) emissions are central to climate change and these concerns have been behind the California Nitrogen Assessment. However, there is not yet a good understanding of NO<sub>2</sub> cycles. It was further noted that under drought conditions organic practices increase yields. But organic farming is not immune to nitrogen pollution. Nitrogen must be managed through an ecological approach that builds-up microorganisms in the soil. A bigger impact in nitrogen management would come from changing diets and shifting to pasture-based livestock systems.
- Yield-based incentives of commodity programs benefit some farmers, while society as a whole pays: subsidies are distortive and profit maximization is oversold.
- Considering the different forms that nitrogen can take in soil, water and air, health effects are not easy to assess: there is an urgent need for institutional communication in order to capture nitrogen data.
- The possibility of doing nitrogen budgets at farm level is a first step forward.

Monitoring over time would allow accountability. A nitrogen tax, or fertilizer tax, must work closely and carefully to directly involve impacted communities. In many other aspects of the food system, multicultural and equity concerns are successfully understood, but this has not effectively entered into discussions and policies around the nitrate pollution of water. With respect to the legal action underway in Iowa and other areas, there was a discussion as to whether lawsuits are the best way to get producers to pay, or whether it was more viable to build a different system that does not emit such quantities of nitrogen into waterways.

- Industrial agriculture is a material contributor to nitrogen-related pollution because of a subsidy cycle from production to subsidized meals in public schools.
- Identifying effective policy measures and governmental response to address nitrogen externalities is challenging, as the level of complexity is very high. Often, it is only through monetization of nitrogen use and pollution that the issues become of interest.

# CHAPTER 14:

## THE FAT OF THE LAND

**Moderator: Nicolette Hahn Niman**

Author and Farmer

**Libby Bernick**

TruCost – *Hidden costs of palm oil production*

**Cynthia Ong**

LEAP – *Sustainable palm oil initiatives: Can they make a difference?*

**Nina Teicholz**

Journalist and Author – *Big Fat Surprise: Animal fats versus vegetable oils*

**Cynthia Daley**

California State University – *Grass-fed versus grain-fed meat*

**Richard Young**

Policy Director, Sustainable Food Trust – *Can we use true cost accounting to solve the big fat problem?*

## Introduction – Nicolette Hahn Niman, Author and Farmer

A shift in diets away from animal fat towards plant-based fat raises questions about the actual health benefits. History and consequences of that shift are being examined. Which fat should be eaten is arguably one of the defining questions facing sustainable food production and human health today. The true cost of the move away from animal fats to plant-based alternatives comes at the expense of the rainforest in Southeast Asia, and despite evidence over the last 50 years telling us otherwise, eating fats derived from sustainably raised animals, grass-raised animals in particular, is actually much better for health than we have been led to believe.

## Hidden costs of palm oil production – Libby Bernick, TruCost

Palm oil is a very interesting “true cost of food” story, because there has been very rapid and tremendous growth in the industry. In the early 1990’s palm oil production was a small industry that has in 2016 become a \$50 billion industry. 75% of South East Asia palm oil is exported to Europe, China, and to some extent, the US. Creating palm oil plantations involves clearing extensive areas of rainforest, which is prime habitat, resulting in the release of carbon dioxide, a greenhouse gas. In the course of doing so, peat is often burnt, causing very serious smog, haze and other air pollution, so much so that the effects are felt in Singapore over 700 miles away. Indonesia is now the third largest GHG emitter behind the US and China.

The Environmental and Economics of Ecosystems and Biodiversity project for food (TEEB AgFood) commissioned a study to understand the full-cost of the palm oil industry, including the societal costs from environmental impacts to communities, greenhouse gas emissions, water use, fertilizer type, fair wage and workers’ safety. The results add up to \$43 billion<sup>102</sup> in environmental costs to society. To put that in context, the total production value of palm oil is \$50 billion. Therefore, the environmental costs of palm oil are almost equal to its total production value. If the industry had to pay for these externalities – through increased regulation, carbon pricing or reduced water allocations for example – the cost of palm oil would almost double.

These costs vary 3-fold by region and location, so investors looking at specific assets should understand that sustainable management activities can be optimized to improve environmental return.

In light of Trucost research, it’s clear that the current palm oil business model is unsustainable in the long-term because of the environmental costs that society is currently subsidizing. What was believed to be a “healthy oil” has, actually, a very unhealthy environmental cost.

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<sup>102</sup> TEEB for Agriculture and Food, 2015. Interim Report. UNEP.



## Sustainable palm oil initiatives: can they make a difference? – Cynthia Ong, LEAP

South Asia produces 90% of the world's palm oil. As the plantations disrupt primary forests and wildlife, it is not uncommon to see elephants trapped in smallholders' farms on their migration route, in search of food. Polluted rivers from palm oil mill effluents result in mass fish deaths. It is hard to put a cost on such biodiversity disruption and habitat devastation. In addition, smoke hazes have now become constant in South East Asia from forest burning, impacting children and the future.

The Roundtable for Sustainable Palm Oil standards, although not sufficient, are currently used to coalesce and organize civil society, indigenous communities, governments and the private sector in order to start changing practices on the ground and aid small farmers in the Sabah region. Global atmospheric precipitation depends on the equatorial rainforest regions of the Planet and this global ecosystem service cannot be quantified. Change can be triggered through conscious consumption.

## Big fat surprise: animal fats versus vegetable oils – Nina Teicholz, Journalist and Author

In the early 1900s, consumption of animal fats such as lard and butter, which had been the principal cooking fats for all of human history, began to decline. They were replaced by vegetable oils, which first entered the food supply in the form of Crisco shortening, launched in 1911. Crisco, like margarine, whose introduction came soon thereafter, are both vegetable oils that have been hardened, through a process called partial hydrogenation. This was done to make the oils stable and not oxidize. By the 1940s, manufacturers had also figured out how to stabilize oils so that they could be sold as just plain oil—in bottles, for salad dressings and cooking. The overall growth in vegetable oils has been the single biggest increase in any food product over the course of the last 100 years. This trend is mainly due to the fact that vegetable oils came to be cheaper than animal fats.

In the 1950s, researchers, led by University of Minnesota's Professor Ancel Keys, came to believe that the rapid rise in heart disease could be blamed on saturated fats and dietary cholesterol, (an idea that became known as the "Diet Heart Hypothesis"), because together, these raise total cholesterol level in blood. Due in part to the panic created by President Eisenhower's heart attack in 1955 and the general sense of public health urgency about heart disease, the American Heart Association adopted this hypothesis, and in 1961, issued the first-ever recommendation anywhere in the world telling people to avoid saturated fats to prevent heart disease. In subsequent years, many large, long-term, randomized, controlled clinical trials (on more than 25,000 people) were undertaken and no effect of saturated fats on cardiovascular mortality could be found. These results were largely ignored, and in 1980, the US government launched its Dietary Guidelines for Americans, which recommended that Americans cut down on fat, saturated

fats, and cholesterol.

Switching from animal fats to polyunsaturated vegetable oils does indeed lower total cholesterol – but this turns out to not be a reliable indicator for heart disease. In the past five years, more than 14 meta-analyses and rigorous systematic reviews of data on saturated fats been conducted.<sup>103</sup> They conclude that saturated fats are not associated with heart disease and that saturated fats have no effect on cardiovascular mortality. This startling reversal of conventional wisdom has yet to be recognized by public health organizations.

Polyunsaturated vegetable oils such as soybean and corn oil, are highly unstable: especially when heated, they become oxidized and degrade into toxic oxidation products, such as aldehydes. These oxidized products cause massive inflammation. In fact, a number of rigorous clinical trials have shown that diets high polyunsaturated oil cause higher rates of cancer.

Having swapped animal foods for more grains resulted in major macro-nutrient shifts (1965–2011) in the US, with carbohydrates in diets going up (41% for grains).<sup>104</sup> These changes – keeping protein constant but lowering fats and increasing carbohydrates – appear to have fueled the epidemics of obesity/type-2 diabetes.<sup>105</sup> The reasoning is that carbohydrates, especially when they have been refined, trigger the release of insulin, which is now thought to be the king of all hormones for making people fat. Chronic exposure to insulin over time in the blood stream is the path to type 2 diabetes. High-carbohydrate diets also worsen many heart disease risk factors, such as HDL-C, triglycerides, and small, dense LDL.<sup>106</sup>

The research suggests that there are negative externalities of a high-carbohydrate diet, based on vegetable oils, which include cancer, obesity, diabetes and heart disease; these are huge externalities for the entire population.

Animal fats are needed because, compared to industrialized vegetable oils, they are from natural whole foods that are healthier. And crucially, unlike vegetable oils, animal fats are stable and do not oxidize when heated. Because a stable fat is needed for the great majority of food production, the food industry has two economically feasible choices: palm oil or animal fats. Thus, a return to animal fats would mean reducing the current

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<sup>103</sup> <http://www.nutrition-coalition.org/saturated-fats-do-they-cause-heart-disease/>

<sup>104</sup> <https://www.ers.usda.gov/publications/pub-details/?pubid=44220>

<sup>105</sup> Kahn, SE, RL Hull, KM Utzschneider. “Mechanisms linking obesity to insulin resistance and type 2 diabetes.” *Nature*. 2006; 444:840–846; Coppack, S. W., M. D. Jensen, and J. M. Miles/ In vivo regulation of lipolysis in humans. *J Lipid Res*. 1994. 35: 177–193.

<sup>106</sup> [https://www.ncbi.nlm.nih.gov/pubmed/22905670?access\\_num=22905670&link\\_type=MED&dopt=Abstract](https://www.ncbi.nlm.nih.gov/pubmed/22905670?access_num=22905670&link_type=MED&dopt=Abstract)

dependence on palm oil.

## Grass-fed versus grain-fed animal products – Cynthia Daley, California State University

Not all animal fats and other products (meat, milk, eggs) are the same. The saturated fat content of grass-fed beef is significantly different in terms of fatty acid profiles and antioxidant content. A review of thirty years of research<sup>107</sup> in grass-fed beef and standardized comparisons to 20–30 months of age demonstrate that grass-fed animals have fat significantly higher in Omega-3 (a better ratio as compared to Omega-6), which is much more beneficial from a nutritional point of view. While our ancestors lived on an Omega-6:Omega-3 ratio of 1:1, current dietary habits are closer to 20:1,<sup>108</sup> while ideally, it should be 4:1.<sup>109</sup>

When animals are fed grains, they grow quickly and the system looks efficient from a retail perspective, though with problematic environmental effects. Furthermore, the rapid change of nutritional value to the grain-fed animal, remodels its lipids (an accumulation of fats and not of the good kind), resulting in a dramatic loss in Omega-3 uptake – within 3 months. Omega-3 fatty acids are important in diets, reducing the incidence of heart disease and arthritis.

Also, grass-fed animal fats are higher in Trans-Vaccenic Acid (25%) and Conjugated Linoleic Acid (30%), natural antioxidants which have been shown unequivocally to inhibit carcinogens.<sup>110</sup> A study<sup>111</sup> of 3500 people showed that people with highest levels of CLA in their tissues have 50% lower risk of heart attack than those with the lowest level. Full-fat grass-fed dairy products reduce the risk of heart attack, as they contain 5 times more CLA which is absorbed and stored in tissues. Managed intensive grazing adds value to milk through grass and improved antioxidant content.

Producers must be assisted in navigating related issues, such as: fully referenced health benefits, producer contracts, cost studies, certification requirements and recipes for all cuts of grass-fed beef.

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<sup>107</sup> Daley C., A. Abbott, P. Doyle, G. Nader and S. Larson, 2010. A Review of Fatty Acid Profiles and Antioxidant Content in Grass-fed and Grain-fed Beef. *Nutrition Journal* 9:10.

<sup>108</sup> Simopoulos, 1991. Omega-3 Fatty Acids in Health and Disease and in Growth and Development. *Am. J. Clin. Nutr.* American Journal of Clinical Nutrition 54:438–463.

<sup>109</sup> Larsen Hans, 2001. Omega 3 Oils: the Essential Nutrients. Iowa State University.

<sup>110</sup> National Academy of Sciences, 1996. Carcinogens and Anti-carcinogens on the Human Diet.

<sup>111</sup> Smit L.A., Baylin A. and Campos H., 2010. Conjugated Linoleic Acid in Adipose Tissue and Risk of Myocardial Infarction. *American Journal of Clinical Nutrition*, May 2010.

## Can we use true cost accounting to solve the big fat problem? – Richard Young, Policy Director, Sustainable Food Trust

In the 1920s, there were very few cases for coronary heart disease in the UK, yet almost all dietary fats came from animals and were high in saturated fat. However, during the 19<sup>th</sup> century, sugar consumption went up ten-fold, and from the early 20<sup>th</sup> century vegetable oils started to replace animal fats in the diet. From the late 1920s, coronary heart disease started to increase. The Edinburgh Royal Infirmary, for example, had no cases of CHD between 1920–24 but by 1970 it had to deal with 500 cases a year.<sup>112</sup>

The current insatiable demand for vegetable oils has huge environmental costs, including pollution, greenhouse gas emissions, loss of biodiversity, overuse of water and other non-renewable resources. In addition to the problems associated with palm oil, soybean production causes substantial soil degradation and carbon loss, and 70–80% of the oil is used in processed foods, with the rest in biodiesel. Canola, the source of canola oil, is associated with the decline of pollinators, due to high pesticide use and because it is grown as a monoculture and pollinators have no food source once flowering is over. Corn oil has been linked to the rise of obesity.

Consumers have been misled over saturated fat. The switch from animal fats to vegetable oils and from feeding animals on grain instead of grass has dramatically increased the intake of omega-6 fatty acids and reduced omega-3 consumption. This causes inflammation, which is involved in the development of many diseases.<sup>113</sup> Cardiovascular Diseases have mostly declined due to reduced smoking, better medication and medical interventions – not dietary changes – but the incidence of cancer and arguably, dementia has increased.<sup>114</sup>

At the moment, there is not enough animal fat to replace vegetable oils because farmers have been forced to make their animals super-lean. It is also possible to produce much more vegetable oils per area of land than beef fat. But grazing animals can produce both protein and fat at the same time and recognizing the value of the fat, greatly increases the efficiency of the system. Although livestock are a significant source of greenhouse gas emissions, cropland progressively loses carbon to the atmosphere and soil to rivers and oceans, while well-managed grassland sequesters and stores carbon from the atmosphere and prevents erosion.

There is a need to carry-out a comprehensive, unbiased analysis of the true cost of using vegetable oils compared with animal fats on natural capital, human health and society,

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<sup>112</sup> Yellowless W, 1993. A Doctor in the Wilderness, p143, Janus Publishing Co.

<sup>113</sup> Calder P., 2006. n-3 polyunsaturated fatty acids, inflammation, and inflammatory diseases. American Journal of Clinical Nutrition. 83 (6 Suppl): 1505S–1519S

<sup>114</sup> Esterbauer H., 1993. Cytotoxicity and Genotoxicity of Lipid-Oxidation Products. Am. J. Clin. Nutr. American Journal of Clinical Nutrition. 1993 May; 57(5 Suppl):779S–785S; discussion 785S–786S.

with due consideration of fatty acids and micro-nutrient profiles, as well as production efficiency. Such an analysis might just show that the cost of basing diets on vegetable oils instead of grass-fed animal fats is very high.

To increase the availability of healthy animal fats we could: end use of hormone growth promoters in cattle and beta-agonists in pigs; end all use of antibiotic growth promoters; change back to breeds which naturally carry more fat and slaughter animals at older ages. This would greatly increase the supply of lard and tallow. Moreover, grass should again become the basis of cattle feed (instead of grain), yielding healthier fats and protecting soils against degradation.

## Discussion Points

- This very controversial subject of animal and plant-based fats is currently well covered by the media<sup>115</sup>. Unfortunately, all of the research undertaken so far on animal fats does not make a distinction between CAFO and grass-fed animal products. Globally the body of research showing that grass produces healthier meat and healthier fats than oil is substantial, yet it has been largely overlooked and no diet-health studies have yet accounted for the source of meat in the diet and the way it was produced.
- Research<sup>116</sup> also shows that pasture-based production can be carbon neutral. But how could farmers be incentivized to transition away from monoculture, particularly in the Midwest? More farmers would be willing to change, if good practices were to be rewarded; bonds could help smallholders making the transition.
- An ecological, but also social, transformational shift is necessary. There is a need to change government opinion on animal fats in order to reduce dependence on palm oil which contains as much saturated fat as beef fat, and no omega-3. A huge paradigm shift is needed to reflect the science. The Nutrition Coalition gathers different scientists and doctors trying to raise these messages with policy-makers, but vested interests will always attempt to prevent quick change in consumption. Current orthodoxy and ingrained beliefs must be challenged, and reflected in changes to the USDA Dietary Guidelines.
- Moving towards plant-based diets, especially grains and starchy crops high in carbohydrates, is not based on rigorous science – association not causation – and is unlikely to lead to better health outcomes, let alone not being appropriate for groups such as diabetics.

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<sup>115</sup> Ian Lesley, 2016. The Sugar Conspiracy. The Guardian. Tuesday 7 April 2016.

<sup>116</sup> Teves et al. 2016. Role of Ruminants in Reducing Agriculture Carbon Footprint in North America.

# CHAPTER 15:

## FOOD WASTE

### **Moderator – Twilight Greenaway**

Managing Editor, Civil Eats

### **Dana Gunders**

Natural Resources Defense Council – *Food waste in the US*

### **Nadia El-Hage Scialabba**

FAO – *The full cost of food wastage*

### **Dana Frasz**

Food Shift – *The challenges and opportunities of wasted food: realistic strategies to improve food recovery*

### **Mary Risley**

Food Runners – *Redistributing edible food in San Francisco*



## Introduction – Twilight Greenaway, Civil Eats

Each year, 30 % of global food production, or 1.6 Gt of “primary product equivalents”, is lost after harvest (46%) or wasted in shops, households and catering services (54%).

North America has the highest rate of food loss and waste (or wastage) volume per person, 343 kg of food wastage per capita per year, as well as the highest carbon footprint of food wastage of 903 Kg CO<sub>2</sub> e per capita per year.

Food wastage is a growing popular concern and depicting it as an iceberg is a great metaphor of the hidden costs of food loss and waste.

## Food waste in the US – Dana Gunders, Natural Resources Defense Council

In the US, 30 to 40% of food produced is uneaten: this costs \$162–218 billion, depending on whether it is priced according to a retail or wholesale basis.<sup>117</sup> This represents 25% of the total water use in the country, 31% of cropland, 30% of fertilizer use, greenhouse gas emissions worth 33 million cars and 21% of landfill volume.

These numbers are staggering. To put waste in perspective, the water used to produce one egg (50 gallons) is equivalent to taking 11 showers, while a hamburger is worth 90 showers. All turkey that gets thrown-out over Thanksgiving produces as much greenhouse gas emissions as 800,000 trips from New York to San Francisco.

Wasted food also represents a huge loss of nutrition: 141 trillion calories per year. Reducing this loss by 30% would feed 50 million people. By weight, food is wasted on farms (16%), during manufacturing (2%), in homes (43%) and retail businesses (40%). In the latter category, supermarkets and grocery stores waste 8 million tons per year, while the bulk of waste happens in restaurants and other food services (16.5 million tons per year).<sup>118</sup>

A \$18 billion investment in 27 solutions (e.g. waste tracking, smaller plates, produce specifications, tray-less dining, centralized composting, cold chain management, spoilage prevention management) to reduce the US's food waste by 20% would yield \$100 billion in societal economic value over a decade in benefits. These benefits include meals recovered (1.8 billion), business profit (\$2 billion), consumer savings (\$6 billion), jobs created (15,000), along with water savings and reduced greenhouse gas emissions.<sup>119</sup>

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<sup>117</sup> Gunders Dana, 2012. Wasted: How America is Losing up to 40% of its Food from Farm to Fork to Landfill. Natural Resources Defense Council Issue Paper. 21 August 2012.

<sup>118</sup> USDA Economic Research Service. Office of the Chief Economist.

<sup>119</sup> ReFed, 2016. 27 Solutions to Food Waste.



The Natural Resources Defense Council is working on building consumer momentum, reforming food date labels and identifying and piloting model policies and programs. Its Savethefood.com campaign “Cook it, store it, smell it, just don’t waste it” has created a “Best if used by” label for suppliers and stores to use.

The Sustainable Development Goal 12 target to which the US subscribed in September 2015 in order to reduce food waste by 50% by 2030, is a momentum to seize.

## The full-cost of food wastage – Nadia El-Hage Scialabba, FAO

In 2011, the global carbon footprint of food waste was 4.4 Gt CO<sub>2</sub> e per year, equivalent to 87% of global road transport. If food waste was a country, it would be the third largest emitting country in the world, after China and the US.<sup>120</sup>

Globally, food waste has a blue water footprint of about 250 km<sup>3</sup> per year, equivalent to 3 times the volume of Lake Geneva. In 2007 food wastage occupied almost 1.4 billion hectares, equal to about 28% of world’s agricultural land area. The major contributor to food wastage are cereals (34%), followed by meat (21%) and vegetables (21%).<sup>121</sup>

Societal impacts of food wastage were calculated along the food supply chain through the Total Economic Value approach. Consumptive use of natural resources were estimated according to damage cost (such as the cost of cleaning pesticides in water) and the social cost of carbon (for example, property damage due to climate extremes), as well as social wellbeing, calculated in terms of welfare gain or loss.

On a global scale, the cost (based on a 2012 market value) of food wastage was \$936 billion, as much as the GDP of the Netherlands. However, the total bill for food wastage, could amount to at least another \$700 billion per year. This amount is taking into consideration all environmental impacts including greenhouse gas emissions and climate change damages (\$395 billion); water for irrigation and increased water scarcity (\$196 billion); cleared forests and eroded land (\$73 billion); loss of pollinators, fish and other species (\$32 billion).

In addition, the social costs of food waste amounts to one trillion dollars per year. This includes impacts of pesticides on human health (\$153 billion); loss of livelihoods as natural resources become more scarce (\$333 billion); conflicts induced by pressure on natural resources (\$396 billion); and subsidies spent to produce food that is wasted (\$119 billion)<sup>122</sup>.

Should all externalities be accounted for, each dollar of food that is wasted on the market

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<sup>120</sup> FAO, 2015. Food Wastage Footprint and Climate Change.

<sup>121</sup> FAO, 2013. Food Wastage Footprint: Impacts on Natural Resources. Summary Report.

<sup>122</sup> FAO, 2014. Food Wastage Footprint: Full-Cost Accounting. Final Report.

(\$ 1,055 billion) corresponds to another dollar spent for environmental mitigation of the damage it caused (over \$696 billion) and yet another dollar of lost social wellbeing (over \$882 billion). Therefore, the societal costs of food waste are three times the value of the wasted food.

This amount, however, only accounts for the costs that can be calculated. Food wastage has many more costs that cannot be quantified, such as, the loss of wetlands that purify water, or the biodiversity of grasslands, or the value of discarded fish, the scarcity of essential agricultural inputs such as phosphorus, or the increase in food prices because of less supply. Assigning a monetary value to environmental or social impacts will always be an inexact science. Questions arise such as how to value a beautiful landscape or a child's health? However we look at it, reducing food wastage makes sense economically, environmentally and socially.

Reducing food loss by raising consumer awareness, or investing in improved post-harvest infrastructures and reducing food loss, means avoiding using natural resources in the first place, leaving them available for the next harvest or future generations. Food that is about to be wasted on the market can be redirected to charities. Alternatively, if it is not suitable for human consumption, it can be fed to livestock, so that there is less need to produce animal feed. Saving food means saving the resources necessary to produce it.

Food waste used to produce biogas is surely a better option than dumping it in landfills, but this wastage reduction measure is the least environmentally effective.<sup>123</sup> All food reduction measures are different in terms of climate impact and use of water, land and biodiversity. Where investment potential is limited, wastage reduction measures should target high impact commodities (e.g. meat), or activities that specifically address key concerns, such as greenhouse gas emissions.

In line with the Sustainable Development Goal 12 target on reducing food waste by 50% by 2030, global modeling by commodity groups in various regions indicate that meeting this target would result in reducing 38% of the carbon footprint of food waste, or 1.4 Gt CO<sub>2</sub> e/year, equivalent to the greenhouse house emissions of Japan<sup>124</sup>.

Understanding the full-cost of food promotes action to mitigate impacts on natural resources and well-being. By unveiling the hidden costs of food wastage, environmental constituencies have started cooperating with agricultural constituencies by investing in food wastage reduction measures.

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<sup>123</sup> FAO, 2014. Mitigation of Food Wastage Societal Costs.

<sup>124</sup> FAO, 2015. Food Wastage Footprint and Climate Change.

## The challenges and opportunities of wasted food: realistic strategies to improve food recovery – Dana Frasz, Food Shift

California's Silicon Valley is one of the wealthiest places in the US. Yet 1 in 4 people and 1 in 3 children are at risk of hunger in the region. Each year hunger costs the nation \$168 billion,<sup>125</sup> while a new report by ReFed found that \$218 billion each year are spent on growing food that gets thrown away. In addition, this food waste rots in landfills and contributes to climate change. Food waste does not make sense environmentally or financially, and there is an ethical obligation to find a solution to what is a solvable problem.

Many efforts exist in Santa Clara County and across the country that aim to rescue surplus food and feed people. Yet both food and people are still falling through the cracks at alarming rates. Santa Clara County hired Food Shift in early 2015 to help understand the gaps and challenges in the sector and to better understand where there are opportunities for innovation.

Food recovery is logistically and behaviorally complex and to develop effective solutions, there is a need to understand the complexities and challenges within the sector in order to design more effective solutions. The main challenges are infrastructure and capacity; limited innovation and collaboration; inefficient distribution; poor nutritional quality of food; and business knowledge and incentives.

Due to limited staff time, food rescue organizations are often limited in their scope and capacity and focus primarily on the immediate need of feeding people. While these efforts are critical, the sector has not been able to invest in the increased sustainability or innovation that would ultimately lead to long-term systemic solutions. Santa Clara County has become a leading example of investing public dollars to support innovative food recovery.

Some food assistance agencies receive too much food, while others get too little. One agency might get too much milk while another gets an entire pallet of cream cheese, or receives types and quantities of food that are not suited for their population, thus leading to more waste. A good, workable system does not yet exist to broker food amongst the agencies. There is a need for rebalancing and a more coordinated system for distribution and sharing.

Additionally, there are so many people who are left out of current food distribution efforts. There is a real opportunity to work with communities to design food access in a way that has dignity and better meets people's needs. Along those lines, all too often food assistance centers are overwhelmed with donations of unhealthy processed foods. When healthy food is not provided for already vulnerable populations, one is simply adding fuel

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<sup>125</sup> Center for American Progress, Hunger in America: Suffering We All Pay For.

to the fire and contributing to health issues such as obesity and heart disease.

Businesses want to do the right thing but they encounter a lot of barriers, or perceived barriers. Overcoming the myth of liability is a huge challenge and educational opportunity. All potential food donors should know about the 1996 Federal Good Samaritan Act, which states that “A person ... shall not be subject to civil or criminal liability arising from the nature, age, packaging, or condition of apparently wholesome food or an apparently fit grocery product that the person...donates in good faith to a nonprofit organization for ultimate distribution to needy individuals.” This is powerful protection, of which too many potential donors are unaware.

There is also a perceived cost associated with packaging food, even though businesses can take advantage of tax deductions and lower waste disposal costs. Food Shift’s research and implementation program with Andronico’s Community Markets in Berkeley showed that one store could save \$27 000 per year.<sup>126</sup>

In June 2016 Food Shift launched a social enterprise called the Alameda Kitchen, aimed at addressing another key issue, which is the perishability of produce before it can be eaten by the recipients of food assistance organizations. Additional processing is needed to convert this produce into longer-lasting foods, such as soups or frozen foods. Building on the proven success of the DC Central Kitchen model, the Alameda Kitchen transforms fresh fruits and vegetables into nutritious, affordable food products sold in local stores and meals for low-income populations. Part of the project is job training provided for the formerly homeless. This model is holistic, addressing critical infrastructure challenges around food recovery and providing wages, not just meals.

Key principles for sustainable food recovery include: commitment to innovation; increasing capacity and infrastructure before encouraging more donations; a financially sustainable social enterprise; community-driven solutions; cross-sector collaboration; and aiming for highest quality and more nutritious food.

The food rescue system today is dominated by non-profit sector organizations operating on a shoestring, much like the recycling movement was in the 1970s. Large-scale investment in recycling infrastructure occurred in the 1990s due to public policy initiatives at the state and local level. In order to maximize recovery of edible food, this activity needs to be brought out of the shadows, legitimized through public education, and elevated through public policy initiatives. These could include infrastructure investments, grants and loans, contracts, databases, ordinances, and education and outreach programs. With government support, a food recovery service sector could be developed as an extension of the current waste management system and as a way to create jobs in the green economy.

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<sup>126</sup>FoodShift, 2015. Andronico’s Food Recovery and Waste Tracking Program.

Ultimately, this challenge is a great opportunity. By trimming waste and diverting food loss, one can alleviate hunger, create jobs, cut costs for businesses and municipalities, combat climate change, conserve natural resources and cultivate more sustainable communities.

Visit <http://foodshift.net> to find out more.

## Redistributing edible food in San Francisco – Mary Risley, Food Runners

Food banks only stock wrapped produce. Food Runners pick up excess perishable food, such as fish and prepared meals from businesses and delivers it to a shelter where it gets cooked or directly distributed to the needy: 16 tons of food, that otherwise would be thrown away, are delivered weekly by Food Runners in the San Francisco area. Volunteer food runners are however starting all over the country.

About 500 pick-ups are effectuated weekly by volunteers using their own vehicles, bikes or on foot, as well as with donated trucks. Perishables are delivered to a soup kitchen run by nuns, providing 450 lunches a day.

A large number of trays of high quality and diverse food is left over from start-ups and high tech companies (e.g. Twitter, Google) who seek to keep their employees in-doors during the lunch break in order to avoid brain-drain. Thus, about 2 tons of high quality prepared left over food (including 150 meal boxes) a week is rescued by Food Runners and delivered to centers. It is to be noted that restaurants are not the main generators of food leftovers, as they cook by orders.

## Discussion Points

- What is the balance between harvesting the low hanging fruits of food waste and institutionalizing a system that relies on food waste? Rescuing food is laudable but to what extent is this sustainable within the food system?
- Studies have demonstrated that it is twice as valuable to prevent food waste, than to reuse it. This informs us on where investments are most needed. Also, food industries should have a direct channel for donating surplus, without having to rely on food recovery organizations.
- Zero waste is not possible and the SDG target of 50% food waste reduction is already ambitious, especially at farm level where losses are already minimal in the US due to advanced post-harvest technology. Room for substantial improvements is mainly at the consumer level, including learning to cook, making smaller meal portions, using smaller fridges, freezing, and recycling food in the kitchen.
- It is estimated that for household food waste in the UK and the US, 56 to 91% of

consumers misinterpret the “sell-by” dates of food. New standard definitions include only two terminologies: “best of use by” where the brand stands by the quality of the product, and “expires on xx”. Label improvements are estimated to change the behavior of only 10% of consumers but this measure can be implemented at no cost.

- The FAO estimates<sup>127</sup> that in 2050 food requirements of over 3000 calories per person per day will include also production of food that will be wasted at the current 30% rate. Debates over future food security cannot ignore this huge inefficiency in the food system, especially in the face of climate change and increased scarcity of natural resources.

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<sup>127</sup> Alexandratos N. and J. Bruisma, 2012. World Agriculture Towards 2030/50. Food and Agriculture Organization of the United Nations.

# CHAPTER 16:

## PUBLIC HEALTH

**Moderator: Ruth Richardson**

*The Global Alliance for the Future of Food*

**Judy Hatcher**

Pesticide Action Network – *Pesticides and public health*

**Pete Myers**

Environmental Health Sciences – *Endocrine disrupting chemicals*

**Bob Martin**

Food System Policy Program, John Hopkins Center for a Livable Future – *Antibiotic resistance*

**Richard Jackson**

UCLA Fielding School of Public Health – *The food web: Too important to leave to technocrats and corporats*



## Introduction – Ruth Richardson, The Global Alliance for the Future of Food

Talking about public health in the context of true cost accounting of food systems means considering the negative and positive health impacts produced by food and agriculture systems. In financial terms, the negative impact of industrial agriculture on public health may be the largest externality of all. The greatest health threats facing society today are a result of the outputs of the present food system.

For diet-related, non-communicable diseases – like obesity, heart disease, stroke, reproductive health – the numbers are astounding. For example, the American Diabetes Association estimates the cost of diabetes to be \$245 billion in health care in the US in 2012. The FAO has reported on the increasing connection between the irradiation of food and incidence of celiac disease. Many non-communicable diseases are on the rise, and in one valley in California, there has been an increased chance of 59% for leukemia and 70% for stomach cancer, most probably linked with air and drinking water pollution. In particular, endocrine-disrupting chemicals impact on public health, antimicrobial resistance and the chemical exposure of low-income migrant farm workers, all call for an urgent need to redefine US health policies.

One must also consider the positive side of the true cost accounting ledger, such as reduced health care costs and nutritional benefits of consuming fresh fruit and vegetables, or the cultural value of breaking bread together in a community.

This is about the health of communities and children, the health of animals, and the health of the Planet.

## Pesticides and public health – Judy Hatcher, Pesticide Action Network

The real cost of food systems are wide-spread and interconnected. Impacts fall on people with the least influence, power and money; the burden of exposure falls on farm-workers and the rural community. Farm workers face disproportionate exposure to pesticides, causing chronic diseases, including cancer, birth defects and learning disabilities. They carry home in their clothing and on their skin toxic chemicals that contaminate children.

Those living in the proximity of areas testing chemicals or GMOs suffer most, such as for example, 18 tons of restricted pesticide applications per year on the Kauai testing zone in Hawaii. One can imagine what this means to the local island community.

Atrazine has been found in 94% of USDA tested drinking waters<sup>1</sup>. Atrazine is an endocrine-disrupting chemical, resulting in developmental diseases even at low levels of exposure. People who rely on well water are more affected and people are purchasing water in order to avoid nitrate contamination. For example, in Seville, the average income is \$14,000 a year: even though the EPA estimates that the 2% of household income spent on water is affordable, the Community Water Centre has found that people are spending

10% of their income purchasing bottled water, in addition to paying their water bill.

Indigenous people living in the Arctic circle of Alaska have a higher body burden, with Persistent Organic Pollutants and mercury accumulations in the marine food web; they are paying for the choices made farther South through unusually higher levels of cancer and reproductive problems. Glyphosate, the active ingredient of Monsanto's Roundup, is a probable carcinogen<sup>2</sup> that is present in many foods: honey, soy sauce, flour, etc. Small, rural and poor communities do not have access to organic or pesticide-free food.

It is estimated that the cost of preventable environmental hazards, including also greenhouse gas impacts and other pollution, costs California \$254 billion every year. This has the greatest financial impact on families and the State, costing \$208 million a year. In California, environmental pollution contributes 30% of the childhood asthma burden and 15% of the childhood cancer burden. A report on environmental health states that 50% of California childhood cancer cases could be prevented by reducing exposure to hazards: for example, preventing exposure to pesticides alone could save \$19 million a year.<sup>3</sup>

Equity is central to the pesticide conversation: there cannot be sacrifice zones where some people's health is less important. There is a need for authentic partnerships between farmers, farm workers and retailers and a systemic approach to pesticide action. More importantly, people need tools to avoid such negative externalities.

## Endocrine-disrupting chemicals – Pete Myers, Environmental Health Sciences

Endocrine disruptors are chemicals found in pesticides that mimic human hormones and affect reproductive and developmental health; the World Health Organization has declared Endocrine-Disrupting Chemicals (EDCs) a threat to global public health.

EDCs are found mainly in pesticides, but also in plastic Bisphenol A and flame retardants. From field to fork – from the original application of the pesticide in the field, through the processing and handling of materials, to cooking it in homes – each step in the food supply chain is an opportunity for chemical exposure, especially through packaging, and there are multiple pathways for EDCs to enter into the food system.

The price of the health consequences of exposure to EDCs, such as neurological conditions, obesity and diabetes, premature birth and male reproductive defects is \$157 billion euros per year in Europe for the health care system.<sup>4</sup> These costs are most likely underestimated (especially for obesity and diabetes) because of the quality of the data available. It is to be highlighted that although EDCs represent only 5% of pesticides, the health costs are staggering. A similar study is ongoing in the US and the numbers seem similar, though the patterns are different in terms of the mixture of pesticide exposure,

due to different policies.

EDC consumption is mainly linked to fast food. Science is getting more insight into types of food affected and the health impacts, but there is a need to better understand how inter-connected impacts are multiplied. For example, RoundUp is associated with disease, soil loss, biodiversity loss, toxification and economic stability: soils become “addicted” to an herbicide input that might no longer be available in 20 years. Humanity is facing an externality time bomb.

## Antibiotic resistance – Bob Martin, Food System Policy Program, John Hopkins Center for a Livable Future

In 1945, Alexander Flemming won a Nobel Prize for his work on antibiotic resistance and stated that only an ignorant man would use antibiotics on a daily basis. However, this is what the livestock sector is actually doing. The tragedy is that no new antibiotics are being developed for humans, so there is a need to focus on prevention.

FDA data reports<sup>5</sup> that in 2011, over 29 million tons of antibiotics were used in feed and animal production, representing 80% of total antibiotics sold in the US. In 2013, this figure went up to 32 million tons of antibiotics, many of which are the same used in human medicine. Daily low doses of antibiotics are used to compensate for poor housing conditions, due to animal waste and over-crowding in feedlots. If this usage pattern does not change, it will increase the potential mortality of the meat consumed.

Antibiotics are both used for therapeutic purposes when an animal is sick, as well as for non-therapeutic purposes, as growth promoters and for “routine disease prevention”. Resistant bacteria leave the farm via meat that people eat, workers that carry resistant bacteria or through the environment. Environmental contamination of resistant bacteria is very concerning, as the pathways of resistance are unknown.

The Centres for Disease Control and Prevention (CDC) reports<sup>6</sup> that there are 2 million infections per year (but these are not only related to animal contact) in the US, resulting in 23,000 deaths at a cost of \$22 billion annually. The CDC admits that these are low numbers, perhaps by a factor of 10, because data is not collected for antibiotic animal use or animal infections.

Worldwide, 10 million deaths are attributed to antibiotic resistance at a cost of \$100 trillion/year.<sup>7</sup> There are records of *Campylobacter* infections in Canada and the Netherlands that are tied directly to resistant bacteria in poultry. The University of Hong Kong has documented resistant *E. coli* from chicken, causing bladder infections in women, and that same research was replicated in a study from George Washington University which confirms this trend in the US. There was a disturbing story of two children in China who died because of resistance to the last-resort antibiotic Colistin, which is frequently mixed into pig and chicken feed.

There is a need for funding to fight antibiotic resistance in the agriculture sector. In the meantime, what consumers can do is to eat less meat. USDA Dietary guidelines in 2010 recommended 1.8 oz of meat per day, while the Cancer Society recommends a maximum of 3 oz of meat per day. The average US citizens eats over 8 oz of meat per day. Politicians must become aware of the issue of antimicrobial resistance and the role that animal agriculture has in it.

## The food web: too important to leave to technocrats and corpocrats – Richard Jackson, UCLA Fielding School of Public Health

An average farm worker has 100–1000 times the exposure of the general population to toxic substances. Children of farm workers affected by pesticides are very vulnerable. Tracking exposure, or exposure records, is not easy. Although the Academy of Paediatrics and the Health Committee approved a pesticide disclosure bill, the Agriculture Committee killed it. However, the appearance of Tetra-amelia syndrome in which babies are born without arms and legs in the paediatric wards of hospitals in California's Central Valley, triggered the passage of a law requiring the data gaps in pesticide exposure records in California, to be filled.

A report on pesticides in the diets of infants and children led to the 1996 Food Quality Protection Act, the only serious environmental health bill that has passed in the last 30 years. Since then, Californian programs such as Right to Know, California Birth Defects Monitoring Program and the Cancer Registry, has put California well ahead of other states in monitoring the impacts of pesticide exposure.

Other California public health successes include: American Disability Act, the anti-tobacco program that now spreads worldwide and the Berkeley tax on sugar and sweet beverages. There is a lot of pressure on local jurisdictions not to be more progressive than state and federal government. There is a need to block pre-emption, focus on child protection, and consider the larger picture.

## Discussion Points

- Low dose pesticide toxicity, as with glyphosate which was found in all California wines (including organic ones) and in human urine, is hard to bring to the attention of regulators when doses are below what is considered a 'safe' level. There is an urgent need to measure, in an established model system, first what pesticide residue is found in the human population (biomonitoring), then what causative links there are between lab tests and epidemiological data.
- In the 60s, lead poisoning in the blood was considered 60ppm; today it is 5 ppm. With the removal of lead from paints and other products, we've realized that levels we thought were benign were not. We now know that trace levels of lead found in babies today at 3 ppm or less has an impact (exposure in early life is linked to Alzheimer). Repeatedly things we were told were safe, we've

subsequently found they are not. Regulations change from what is considered safe to what is considered toxic. Continued pressure on policy-makers eventually leads to results: the European Parliament has recently voted for multiple restrictions on glyphosate use and some countries, France among them, will ban it.

- The dirty dark secret of toxicological testing is that it is all done at high doses, while it is known that impacts occur at low doses that cannot be predicted at high dose levels, particularly for endocrine-disrupting compounds.
- Change must start locally for policy change. Suppression of science, especially by the biotech industry, is a big issue. For example, when the Bush administration arrived, it fired 6 of the members of the Lead Committee of the National Center for Environmental Health at CDC and replaced them with 4 doctors involved in the lead industry. The level of political pressure is enormous. Medical centers are becoming more focused on high tech procedural medicine and moving further and further away from health. It's interesting that Kaiser Permanente is opening up its own medical school which will be focused on primary care – there's a shortage of primary care doctors.
- There is a need to consider how to create a health-giving system. Environmental health knowledge should counteract the status quo curricula of land-grant schools that are overwhelmingly funded by industry. Nutrition training should be included in both medical and agricultural schools and there is a sea change starting to happen in this. We must look at the sum of factors and impacts, from exposure to different compounds, such as obesogens and high fructose sugars, to physical inactivity due to too much screen time. The different actors working on different aspects of environmental health should find common ground and work together.
- Political contributions to the different committees and chairs are being organized based on the Farm Bill; for example, sugar support was about to be eliminated in 2014 but the four states that grow sugar beet (Minnesota, North Dakota, Idaho and Washington) objected. The sugar industry is the biggest lobby group in the country, so sugar came back into the Bill as a supported commodity. The same applies to global corporate control of seeds, the consolidation of power (through mergers of Syngenta and ChemChina and others) has had an effect on media messages and science. There needs to be an end to the practice of allowing corporations to be identified as 'people', as approved by the Supreme Court. That will probably only happen after money goes out of politics.
- The public is confused by the science around food issues and there is a need to translate scientific research into language that both consumers and policy-makers can understand. It's also important to make clear the context of research, what's its agenda, who's underwriting it, who's talking thing up and who's suppressing it. Scientists should work with journalists to disseminate the outcomes of their work, pushing the research out into the media.

# CHAPTER 17:

## EDUCATION

**Moderator: Laurie David**

Author, Producer and Environmental Advocate

**Angela McKee**

SFUSD's Future Dining Experience – *Student-centered design*

**Richard Dunne**

Headteacher, Ashley CofE primary school – *The harmony principles in education*

**Ted Smith**

Institute for Healthy Air, Water and Soil – *Compassionate schools*

**Alice Waters**

Chez Panisse and The Edible Schoolyard Project – *The values of edible education*



## Introduction - Laurie David, Author, Producer and Environmental Advocate

There are currently more overweight people in the world than underweight, which is evident in the most vulnerable citizens: children. Diabetes rose fourfold over the last quarter century. Advertising disregards children's vulnerability to junk food. Companies use cartoons, bright packaging, celebrity endorsements in their marketing and lobby Congress for their right to market this food to children – their lobbying has gone as far as convincing Congress that pizza counts as one of the recommended five a day fruits and vegetable. Junk food and beverage sponsorship is prolific throughout schools, sports, celebrities and scouts

The true cost of food in the US has everything to do with the environment and social conditions that are making people sick. How could children be protected from the global food companies who want to turn them into life-long customers, regardless of the impact on their health? The next generation must be armed with the skills, tools and information to make better choices and combat the dark forces around food – redesigning cafeterias to create a space that is welcoming and inviting, improving educational attainment and behavior and integrating classrooms with gardens and kitchens.

## Student-centered design - Angela McKee, SFUSD's Future Dining Experience

What can a school district do for its students? San Francisco Unified School District (SFUSD)'s Future Dining Experience is revolutionizing the food itself, along with how and where students eat. It serves over 35,000 school meals a day, including free or reduced lunches. About 61% of students qualify for this service, which mean that a large number of students rely on the service for their daily calories.

Schools were previously buying frozen meals from the Midwest and students did not enjoy it, which meant that they often went hungry and consequently had a hard time learning. Over the last ten years, the Board of Education succeeded in passing the Feeding Every Hungry Child resolution that entitles all children to a school lunch. In addition, a Wellness Policy removed competitive foods from the meal line, meaning everyone ate the same. Sugary foods and high fat foods were also removed from vending machines.

Food quality and sourcing has improved by partnering with Revolution Foods, a company that provides local fresh produce, antibiotic-free meat and food without artificial preservatives and colorants.

SFUSD's Future Dining Experience analyzed why students were not eating and realized that was because they weren't enjoying the food and the cafeteria was outdated, had long lines and was crowded. Students were given the opportunity to reimagine their cafeteria and redesigned it (in collaboration with Ideo designers), transforming it into a welcoming and comfortable space which made the act of eating more enjoyable, further enhanced by



high quality meals.

This healthy food sourcing and space redesign effort is being expanded to cover all 18 districts, for all students to become entitled to a dignified meal experience. Last year the USDA and UC Berkley gave a \$2 million grant to assess the impact of the SFUSD's Future Dining Experience on health and wellness.

## The Harmony Principles in Education - Richard Dunne, Headteacher, Ashley CofE primary school

In deepening young people's understanding of the sort of practices needed to develop and to lead towards a more sustainable future, Nature's principles of Harmony<sup>128</sup> are a good place to start. These are based on seven key principles.

**The Principle of Geometry** – On a macro and micro scale, Nature is geometric. Nature's geometric patterns and forms are seen everywhere and at all times, reminding us

that the natural world has an order, a rhythm and a symmetry to it that creates balance and harmony. The starting point for this geometry is the circle. When geometry is seen in Nature, a different understanding of everything begins. From an education perspective, looking at the world through its geometry and realizing that its patterns and symmetries are also inside us, as much as they are around us, one learns to appreciate that Nature has the most incredible structure to it. There are many ways in which one can weave this understanding into learning, linking subjects such as math, art and science together, for example when circles are used to create the form of a six petals flower. Educating young people in this way helps them to make sense of their world and themselves because they start to see that the patterns in Nature around them are in them, too. It gives greater purpose to what they do, as they are learning to appreciate how life works.

**The Principle of Interdependence** – Everything is connected. Nature's systems are wholly inter-dependent and inter-connected, nothing is separate. Each element within an ecosystem has a value and a role to play. When certain elements within the system are lost or in any way degraded, the system is weaker and poorer for it. This understanding of interconnection is important for education. How can learning be tied-up together more meaningfully, linking subjects to projects or themes and giving greater flow to the learning, rather than teaching in piecemeal, disjointed ways? How might one engage more fully with communities, building relationships with those who could enrich learning and with whom one can develop a stronger sense of togetherness?

**The Principle of the Cycle** – Nature depends upon cycles that have limits. Nature works in circles and cycles – life cycles, seasonal cycles, carbon cycles, water cycles – it is not linear. Nothing is wasted. Everything feeds back into the cycle to regenerate and renew it.

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<sup>128</sup> HRH The Prince of Wales, 2010. Harmony: a New Way of Looking at our World.

Just as importantly, whilst there are times of fruitful abundance in Nature, there are also times when things die back and decay, creating a limit to what is produced and consumed. Growth is not endless. As one learns from Nature's cycles, how might schools and organizations create better, more cyclical systems? How can one consume less, waste less or not at all, and understand the importance of limit in the way one lives and acts? In the throw-away culture, are there better ways to close the loop on current practices?

**The Principle of Diversity – There is strength in diversity.** Nature's great strength is in its diversity. This diversity is appreciated in the rich variety of plant and animal species, in the myriad forms of a leaf, or wildflower, or fruit. It is also seen in people's own uniqueness and difference. This rich diversity ensures that Nature is resilient, too. Biodiversity in the natural world is something to treasure and preserve. Often, a monoculture of learning is created in schools, with young people all learning the same thing in the same way. Yet, if the right framework is provided for learning and applying appropriate skills, there are great opportunities for young people to respond in diverse ways to the task, or project in hand. Similarly, a monoculture of food and crops is generally grown and consumed, often in ways that deplete and exhaust soils. How can one promote and nurture diversity in what is learnt, grown and eaten? Most importantly, how can one cherish and celebrate the diversity that exists in Nature and in one another?

**The Principle of Health and Well-Being – Life needs to be healthy.** The essence of Nature is health and well-being. Consequently, when one is in Nature, one also feels well. Nature rejuvenates, heals, restores spirit, captures imagination and makes one feel alive. Nature calms and uplifts and is a constant source of inspiration. When one is attuned to the essence of Nature, peace is found. So how can health and well-being be nurtured in how young people learn and live? The best learning combines meaningful, engaging tasks with the development of key skills and knowledge. Much of the meaning in these tasks comes from a deep understanding of how Nature works and how one responds to what is learnt. So the more one can take young people beyond the classroom and connect them to Nature, the more their well-being is likely to be enhanced. As part of this learning process, time for stillness and reflection, and time to be mindful, has a critical role to play in nurturing a sense of well-being.

**The Principle of Beauty – Beauty is inherent in the world.** Nature's outcomes are both beautiful and functional. What is seen in Nature is pleasing to the eye, but there is also great purpose to this beauty. Everything created has a function that plays an integral part in the success of the whole system. The beauty in Nature is in its patterns and shapes and symmetries, in its movements and colors, in its sounds and textures and flavors. Observing this beauty at work is fundamental to creating our own beauty in the world. This is important for young people to realize. So how are young people enabled to appreciate beauty and the beautiful outcomes one wants to create with them? It is known that tests and assessments are a fundamental part of learning (that will not change) but surely the outcomes of the work need to be more beautiful and have greater meaning than a test? How much can one mimic Nature's beauty in what is designed and created?

**The Principle of Oneness – We are Nature.** The final principle of Nature is the principle of oneness. Nature teaches us that we are all one. The patterns seen around us in Nature exist in us, too. We are Nature. When one notices that the Fibonacci spiral of our curled index finger is the same shape as that of a snail shell or an unfurled fern, or the galaxy's swirling spiral across the night sky, one understands this. With this understanding, one also realizes that when one damages, degrades or pollutes Nature, it is done to oneself as well, because humans are wholly dependent on the health and well-being of the world. The starting point therefore is to value the natural world and to treat it with the greatest respect because it sustains life. With such demands on natural resources, one must educate young people to understand how to value and respect these resources and live within the carrying-capacity of the world.

All these Principles form an integral whole, reinforcing how important it is to create joined up, cohesive learning with meaningful outcomes that help young people to find well-being and purpose in their own work and lives. This is not an ideal. It is based on a carefully planned and delivered curriculum that sees learning in a much broader context than classroom based, teacher taught lessons. It sets learning in real life and gives young people a lead role in creating the vision and the practices that will take us to a more harmonious, more sustainable future.

## Compassionate schools - Ted Smith, Institute for Healthy Air, Water and Soil

Children's food choices are not rational and mostly driven by colorfulness, even more so if artificial, and children are not equipped to make good decisions. The school system is probably the best place to start to equip the cognitive, spiritual function of a young person. Unfortunately, this is not being addressed in schools.

In Louisville, Kentucky, a refocusing of elementary school education is being brought about; students are given the tools needed to make good decisions for their food choices. It starts by spending more time understanding how the human body works, spending more time being in touch with their own body, such as stretching, and learning to take better control of it. There is a focus on mindfulness with a view to regulating cognitive function, as children have very busy brains. Social/emotional learning empowers young people to take more control over things they feel are overwhelming, such as thinking about something that happened at home or in school. At last, nutrition comes into play in terms of where the food comes from, what friends are eating, time spent at home eating, for children to better control what they are putting into their bodies.

In the attempt to protect consumers from being exploited by the ads of the food industry for unhealthy foods, children are given the tools to make better food choices.

## The values of edible education - Alice Waters, Chez Panisse and The Edible Schoolyard Project

People must be won over, not by telling them what to eat but by making something so beautiful that they can't resist, whether in the classroom or the dining room. This is the ethos behind Chez Panisse: try to reach people through their senses – this is the pathway to the mind. It really works.

We are becoming what we eat, and what we eat is fast food and we're digesting the values of a fast food culture, where everything is fast, cheap and easily available 24/7.

We need to bring children into a new relationship with food. The Edible Schoolyard Project is working with middle school children in Berkeley in a school with 1000 children who speak 22 different languages in their home environment. They are being taught using Slow Food principles, and studying academic subjects in the garden and in the kitchen.

We know that children love to get outside the classroom and learn by doing. Nature is a great thing to have on our side. When children are in the garden planting seeds, they're eating raspberries, while learning names of edible flowers. Older children mentor younger children. And there isn't an academic subject that cannot be enriched by experiences in garden and kitchen classrooms.

We need to make school lunch an academic subject. Imagine a cafeteria that has been redesigned so that children can see the kitchen where the workers are cooking and farmers are dropping off the food. We want to elevate the work of the kitchen and for children to participate in making and serving the food. When children grow food and cook it, they want to eat it, and when older children are serving younger children, the younger children want to eat the food too. The idea that children are serving each other is empowering. They have acquired the principles of harmony, they know about sustainability, and they have deeply digested nourishment.

Taste is a major factor about school food; the smell and taste of food is not usually good in schools. This comes from the fact that many Americans have never really learned to cook, and we've grown food only for quantity, rather than for taste.

It is shocking the way that fast food culture has taken over terms such as natural, sustainable, healthy, communal, grass-fed, cage-free, etc. and they've put their own twist on it. There is a need to go back to the values of the 60s, holding hands and sharing food and other gestures which are the basis of our human values.

Young people offer hope. The Edible Schoolyard Project has been collecting on its website for the past 4 years, all of the schools with programs on gardening, cooking or food curricula: with initially 900 members registered, the ESY Network now has grown to more than 5,500, and we are always welcoming more.

This is a movement about coming back to our senses, really. This is a delicious revolution.

## Discussion Points

- Advertising can be counter-acted by shifting to a questioning culture that challenges the status quo. Advertising must be banned from schools and hospitals and YMCAs.
- Increased funding must go to school meals in order to displace attention from snack and beverages machines. Soda taxes could fund free school food. This is being implemented in England and Mexico, and quite successfully. In the UK, universal free hot school meals for 3 – 7 year olds were introduced by the government; spending of £9 billion a year for 16,000 schools has not only transformed the food culture, but also learning abilities.
- School food plans must source organic produce, so that teachers and farmers support each other in healing the land and people through a model of *school-supported agriculture* and food for life. Food should not only be good, clean and fair but also easy to cook, seasonal and affordable.

# CHAPTER 18:

## COMMUNICATION

**Moderator: Scott Cullen**

*GRACE Communications Foundation*

**Douglas Gayeton**

*Lexicon of Sustainability – Storytelling tools for activists*

**David Mermin**

*Lake Research Partners – Building a food movement*

**Urvashi Rangan**

*Consumers Union – Harnessing the voice of consumers and civil society*

**Tom Philpott**

*Mother Jones – Communicating the food movement*



## Introduction - Moderator: Scott Cullen

Communication around true cost accounting is challenging, especially because people fear higher food prices.

## Storytelling tools for activists - Douglas Gayeton, Lexicon of Sustainability

The Lexicon of Sustainability captures complex terms and concepts (e.g. soil food web, antibiotic-free) when talking about sustainable food. For example, the food waste topic includes obscure terms, such as gleaning, fallen fruit, food rescue, the compost circuit, nose-to-tail, etc. Through images, without words or the website, concepts are explained. As a content maker, we are concerned about information waste; we are always thinking about how to create content that can be specific to a million different audiences. We are so fragmented that we have to take our content to people wherever they are. We take our ideas and try to put them into as many different platforms as is possible.

Work is carried out on the ground with people, with a view to giving them story-telling tools that they can use in their communities. Issues are no longer too complicated for public understanding when a Lexicon campaign is being run.

## Building a food movement - David Mermin, Lake Research Partners

A national survey<sup>129</sup> of 1000 registered voters was conducted on 16–22 September 2015. Focus group participants representing a varied demographic of voters were asked about their attitudes towards food and food issues. Results had a margin of error +/- 3.1% at the 95% confidence interval. The survey showed that voters understand clearly that there is a problem in the food system, that it's not meeting everyone's needs, and they want change. For example, a Latina mother in Denver said: "I think that if they're going to subsidize junk food, why can't they flip it and subsidize healthy food?"

Generally, voters give high marks for the availability of food, but affordability lags behind. Availability of healthy food and food safety get mixed answers, while the affordability of healthy food and the sustainability of agriculture is rated low.

Voters (94%) express the strongest concerns around the impacts of food to children, as one-third of children will develop Type 2 Diabetes today and 85% are concerned that today's children are expected to live shorter lives than their parents. 89% of voters are also concerned with the overuse of antibiotics in healthy farm animals, leading to antibiotic-resistant diseases, making thousands of people sick each year.

Voters also express strong concern around the influence of money in politics: in the last 3

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<sup>129</sup> Lake Research Partners and Bellwether Research and Consulting, 2016. Building a Food Movement.



months, big food and agrochemical industries have spent \$15 million to lobby members of Congress; food and agricultural companies spent over \$76 million in campaign contributions to members and candidates for Congress in the 2014 elections; the federal government recommends a diet of 50% fruits and vegetables, while less than 1% of farm support goes towards fruits and vegetables; the federal government does not provide enough support for sustainable farming practices that can meet the food needs of the nation, while protecting the environment.

Voters (50%) favor limiting subsidies to the largest farm businesses and overwhelmingly, voters (75%) favor incentives to encourage sustainable farming practices.

Messaging focused on re-setting the goals of US food system – from profit to health – finds overwhelming agreement among voters, especially regarding the necessity for health and access, particularly to Latinos, women and younger voters.

## Harnessing the voice of consumers and civil society - Urvashi Rangan, Consumers Union

Communication is multi-dimensional; we have to think about how we target our audiences. How do we layer out information for people and frame it? It's really a kind of communication journey. A Tweet cannot communicate complex messages. But we need to be able to provide the context behind stories without overwhelming our audiences with complexity. You give the bad news, but you also have to give people a message that empowers them and puts them in the driver's seat. Consumers' longer-term choices, policy change and advocacy efforts are all inter-linked.

Placing an under-pinning and quantitative reasoning behind the safety and healthiness of products – quantifying the benefits of sustainability – can move the masses. There is a need for more research dollars to deliver credible numbers. For instance, it was found that grass-fed beef has less E.coli and multi-drug resistance than conventional.

Also, communication often goes wrong. It so important to control the message. Headlines must first be true to the report they refer to. Problems must be addressed in a very measured manner, not hyped-up.

## Communicating the food movement - Tom Philpott, Mother Jones

In 1977, the Food and Drug Administration (FDA) was about to ban the preventive use of antibiotics but, as the Agriculture Committee in Congress threatened not to fund the FDA if they went ahead with this, the proposed rule went to ice for many decades. In the meantime, livestock systems intensified and tripled antibiotic use. Although in the last 4-5 years, the FDA has implemented a voluntary program for reducing antibiotic use, the decision to remove antibiotics can only be taken on the basis of a cost-benefit analysis of companies profitability. Thus, a true cost account of animal antibiotic use is needed to bring policy change.

Today, 40 years later, an FDA cost-benefit analysis is based on how companies define their costs and benefits. The costs relate to the profitability of the company, and the benefits are cheap meat, feeding the world and 'American's loved meat'. Therefore, documenting and redefining societal costs and benefits are necessary. The industry has been able to define those costs and benefits, but the equation now needs to be re-examined, showing other costs besides the bottom-line.

Regarding the GMO debate, the industry realized that an emotional debate over the safety of GMOs would not be good for them, so they called upon quite narrowly-focused scientists (e.g. microbiologists and plant breeders) as spokespersons to give 'scientific' answers about the safety of GMOs. But science like everything, is embedded in the economic system. The job of reporters is to broaden and contextualize debates like that around GMOs. We must take on the challenge of communicating the complexity of the issues facing us like the dangers of low-level toxicity of pesticides over the long term versus more obvious acute and immediate affects of pesticides. There is a tendency for chemical companies only to look at the dangers of the chemicals that it produces in terms of acute effects while the long-term low level exposure should be of equal concern. It's really critical for us as communicators to take on the challenge of making this clear.

One of the questions that is concerning is how to we explain issues without sensationalizing or overselling them? The headline writer is always going to want the most sensational headline, but that can oversimplify issues and make the writer look bad.

## Discussion Points

- With an acknowledgment of the complexity of the issues discussed around food production, messaging should be kept simple, so that the essence of the idea can be clearly communicated to people.
- There is a need for the topline information of the sensational press article, to connect all the way down to the deep root of contextualized information. The gold standard of journalism is a narrative that gives hooks the reader into a story process, and they then hunger for that next detail because the narrative is pushing that forward.
- If you want to create a movement, the message has to be simple enough for people to understand it at face-value. If you can't reduce it to something that you can tell another person and keep it intact, then you've got an information problem.
- How do we communicate the enormity of what true cost accounting means in a way that people can comprehend, because what most people are going to hear is that true cost accounting is going to make food more expensive – which most people don't want to hear? One thing that is important is to communicate how people can get most out of their dollar by providing tips (e.g. going to a farmers market or freezing seasonal produce) on how to get better cost. Trying to give

people actual facts on how to get the most out of their dollar while not cheapening what true value is.

- In the *status quo* system, quality is not accounted for. In the broad economic system, food price discussions must be matched with higher minimum wage jobs, as it is the food and agriculture workers who are the first to be excluded, should food prices rise. More public investment and more focus is needed on ensuring equality of access. Even with today's prices, the majority of voters are concerned about food affordability.
- In communicating, every problem should be presented with a proposed solution and the mechanism that can create change.

# CHAPTER 19:

## INVESTING IN SUSTAINABLE AGRICULTURE

**Moderator: Ali Partovi**

Technology Entrepreneur and Investor

**Craig Wichner**

Farmland LP – *The return on investment of sustainable farmland*

**Libby Bernick**

TruCost – *Understanding sustainable agriculture: Opportunities and outcomes using true cost accounting*

**Randy Hayes**

Foundation Earth – *Biosphere-smart agriculture and World Bank loans*

**Mariela Cedeño**

Mandela Marketplace – *Financing the food system with an equity lens*

**Respondent: Woody Tasch**

Slow Money – *Investing as if food, farms and fertility mattered*



## Introduction - Moderator: Ali Partovi

Capitalism can be a powerful force for good. It can generate new wealth and redistribute wealth and create change, disrupting the status quo. A key part of that is figuring out how to align incentives, so that the changes that we want come with greater profitability. How can the power of the market be harnessed to drive change? Can strategic investments in market shares discourage intensive agriculture, therefore improving the economic climate for sustainable food production? How and why are investors beginning to move away from big industry in favor of companies and projects that deliver environmental and social benefits? How can large banks and businesses be convinced to do the same? Can it be demonstrated that sustainable agriculture is actually more profitable in the long-run?

Recent trends amongst investors, new loan models for sustainable local food systems, and global versus local investment are being explored.

## The return on investment of sustainable farmland - Craig Wichner, Farmland LP

Since 2009, Farmland LP has invested in the conversion of conventionally managed farmland to sustainable organic agriculture. The mission is to demonstrate that well-managed sustainable agriculture is more profitable than chemical-dependent agriculture. Currently, over 10,000 acres of farmland are owned in California and Oregon, representing a \$110 million in assets, employing 50 finance and farm professionals. The company was certified as the “Best of the World” business corporation in 2013, 2014 and 2015 for its financial and social returns.

Price premiums are given for organic, sustainable and locally grown food which helps drive the topline economics. Farmland LP specializes in bringing livestock back onto cropland, and manages rotations to demonstrate both economic and environmental benefits. Crop diversity is important in order to reduce risk factors. Economies of scale are counteracted by aggregating farmland acreage and leasing it to other farmers as certified organic land, so they can specialize and rotate around farms without worrying about capital exposure. As such, both sustainable crop rotations and specialization are secured.

Today, Costco has become the largest seller of organic food (10%) in the US, with \$4 billion a year, surpassing WholeFoods sales.<sup>130</sup> While consumer demand for organic is high, supply is not sufficient: the whole organic market, which could easily triple, is

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<sup>130</sup> Jelinek Craig, 2016. We cannot get enough organics to stay in business day in and day out. CEO Statement at 2016 shareholder meeting.

constrained by a lack of organic farmland, as it takes 3 years to fully convert land.

Organic food demand has grown by 15% annually and organic food sales were \$43 billion (5% of all US food sales) in 2015.<sup>131</sup> However, the supply of organic farmland is only growing at 6% per year and thus not keeping the pace with market growth: the gap is about \$80 billion, in terms of shortfall in organic farmland to meet the demand.

Today, the US farmland market is about \$2.4 trillion, or the same economic value as all the shopping malls and retail space, or one tenth of the value of all the homes in the country. About 40% of US farmland is leased and it's a form of commercial real estate land. Farmland LP converts the land they lease from conventional management (53% of US lands grow corn and soy only) into high value, sustainably produced organic crops. It is to be noted that only 1% of US farmlands are institutionally owned, so the land market is very fragmented and inefficient.

Benefits of sustainable agriculture are manifold, from price premiums (50-200%) to delivering three times more jobs per acre, being more profitable and delivering more societal benefits. Price premiums are not limited to organic produce but extend to grass-fed beef, locally grown and other sustainable products. What is interesting about sustainable practices are the rotations which, over time (3-7 years), reduce costs (e.g. less weeds to deal with) and increase profitability, even in the absence of price premiums. This is all compelling from an investor perspective, while creating synergies with farmers in bridging the transition period.

## Understanding sustainable agriculture: opportunities and outcomes using true cost accounting - Libby Bernick, TruCost

Capital from investors can be directed towards sustainable business models by putting a value on environmental assets. Institutional asset owners around the world, such as pension funds, hold about \$36 trillion in wealth, of which \$22 trillion is in the US. These institutional asset owners are concerned with environmental issues.

The first trend noticed is that large asset owners (up to 35% of holdings are real assets in agriculture, timber or the like) are now starting to measure the environmental performance of their portfolio (e.g. the Sovereign Wealth Fund measured the carbon footprint of 12 New Zealand dairy farms) to better understand risks and benefits.

A second trend is green bonds (i.e. a bond directed towards a green project, such as renewable energy systems). In 2016, \$50 billion worth of green bonds were issued. Standards are currently being written about how to include agriculture in these bonds that, so far, have largely focused on carbon. However, these standards do not consider the

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<sup>131</sup> Organic Trade Association, 2016. Organic Industry Survey.

full range of sustainable agriculture benefits and this could be an opportunity to explore.

The third trend is more investors wanting to understand the link between financial reward and risk and environmental performance if they invested in sustainable agriculture. The trigger is that the credit risk is lower by investing in green buildings, as the payback ability of loans is greater.

So what is missing in the sustainable agriculture and investors' conversation? How much investment is really needed to turn things around? This needs to be quantified. For example, it was estimated that \$100 trillion of investments are needed to fix climate change and \$7-14 billion for agricultural systems to adapt to climate change.

Investments taken out from high carbon systems need to be re-invested elsewhere, such as in sustainable agriculture. Risk reduction is a real cost, and accounting for it properly will create a change to the bottom line.

## Biosphere-smart agriculture and World Bank loans - Randy Hayes, Foundation Earth

Building a just and ecological society requires under-cutting the profitability of toxic farming. When institutions such as the World Bank loan vast sums to industrial agriculture it results in a lot of toxic runoff (called externalities) polluting streams, rivers, oceans, and people. We need to stop money shifting from the banks to toxic farming. The *Biosphere Smart Agriculture*<sup>132</sup> report includes recommendations to the World Bank to make this shift.

1. Banks need to set-up the internal procedures to quantify the externalities of agricultural loans prior to any decision.
2. Externalities need to be sized against planetary life-support system boundaries so we can assess the cumulative impacts as we go along.
3. Incentives for loan managers to follow this approach are necessary to better ensure the policy is enacted.

This approach could halt financing damaging agricultural projects and foster restorative agroecology.

Arguably, giant agrifood companies are operating under a '*cheater economics model*' given that they can externalize their pollution costs for free. Economist Herman Daly clarifies that such practices are shifting these costs onto the backs of other people, other species, natural systems, and future generations. That is the cheat. And tragically it is

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<sup>132</sup> Imhoff Dan, 2015. *Biosphere-Smart Agriculture in a True Cost Economy: Policy Recommendations to the World Bank*. Produced by Foundation Earth and Watershed Media.



undercutting of the planet's ability to support life, including ours.

The solution starts with courageously exposing these unstated externalities. Clarify that ecological impacts that are not external to the biosphere. Demand an end to agribusiness subsidies (corporate welfare).

Shining the light of day on *cheater economics* will do a lot to eliminate this problem. Remember that the objective is less to internalize externalities than to pointedly eliminate externalities. Without subsidies the business field is leveled. On a level playing field, agroecology (ecological farming) will outperform the toxic industrial model, allowing for a more *True Cost Economy* and a better world.

## Financing the food system with an equity lens - Mariela Cedeño, Mandela Marketplace

Institutional and structural disinvestment imposed on historically marginalized people and communities of color have created a gap in access to assets, resources and networks. These same communities are also left out of conversations and market efforts centered on sustainable food production and consumption. Food systems can counter this disinvestment by catalyzing economic development efforts that strengthen local economic opportunities and capitalize on market gaps. Investing in, and building opportunities for, historically marginalized people to launch food enterprises and own the local food economy is important for the creation of sustainable communities.

Since 2004, Mandela MarketPlace's resources and assets have been purposed towards catalyzing and supporting community-driven food ventures and increasing access to healthy food. The Mandela Foods Cooperative, Zella's Soulful Kitchen, and Mandela Foods Distribution – all community driven, owned, and/or operated food businesses – provide tangible examples that highlight the viability of investing in a community-owned food system. In tandem, Mandela MarketPlace also provides access to low-cost, responsive capital products that invest in local communities and counter the effects of long-term disinvestment and systemic racism. Mandela's Harvest-to-Market loan, as an example, allows sustainable, under-resourced growers to pay back loans with the products that they grow on their farms, instead of cash which is often hard to come by during low-season.

By re-investing in historically dis-invested communities, Mandela MarketPlace seeks to shift the dynamic of inequitable access to assets, resources and networks, and create opportunities through an integrated food system. At each juncture of the food system, opportunity presents itself to build skills, capacity and business acumen – while honoring and dignifying local culture. Integrated markets also multiply positive economic outcomes by capturing/recycling money within local economies. Mandela MarketPlace sees the success of its model rooted in three basic components: community engagement and empowerment, financial and educational investment in individuals to drive change and continued support to sustain community ownership.

## Investing as if food, farms and fertility mattered - Respondent: Woody Tasch, Slow Money

The cross-cutting frameworks are institutional versus individual, and global versus local. Who is doing the investing – institutions or individuals? Slow Money is about individual investments, as local as possible, seeking to plant seeds for something called ‘nurture capital’ which is a radical new way for large numbers of individuals to put their money to work locally. Since 2010, Slow Money facilitated over \$46 million for over 500 small food enterprises, from more than 1,500 individual investors over six years, in dozens of communities. Tens of thousands of people have attended Slow Money public meetings, large and small, regional and national. Investing ranged from crowd funding of \$2000 to \$3 million. The system is, by fiduciary conventions, inefficient, fragmented and slow. But it is providing the kind of capital that many small-scale, diversified organic growers need. Connecting individual investors to the places where they live is a key part of preserving and restoring community, and it requires a fundamental rethinking about risk and return.

Institutions gather money from individuals but individuals have very little to say about the way institutions use their investments. However, individuals can decide to put part of their investments in local systems that better respond to their needs. This is what Slow Money means by “bringing money back down to earth.” Since 1960, the New York Stock Exchange has grown a few thousand times (from 3 million to 5 billion daily shares traded). Just as today there is a wide recognition that the land needs to be healed, people’s psyches as investors also need to be healed. Venture capital is not the appropriate tool for this. A Community Supported Agriculture-like model for investing is needed, such as Slow Money.

After a period where everything in the last century has accelerated (from greenhouse gases to global population and trading volume), the current era is about integration, rebalancing and reconnection—of people and place, and also of investment and philanthropy.

The paradigm shift is captured in a little poem:

Circulation versus percolation  
Monoculture versus diversity  
Transactions versus relationships  
Profitability versus fertility

The values on the left are the industrial agriculture model, the values on the right represent the restorative model for food and finance.

## Discussion Points

- Industrial food can be avoided by eating staples and maintaining the health of people and of the land. Sustainable agriculture workers and consumers are healthier and sustainable agriculture is naturally on the rise.
- At scale, after restoring soil fertility, organic agriculture will become cheaper. Today, an average commodity farmer in the US owns \$8 million of equipment – but this is not true of the average organic farmer. Scale is very important and the organic food system is still at a very early stage. The investment costs for converting to organically managed lands are in the range of 8–12% of the land value: this is a reasonable amount for investors, but not for land owners.
- Investment companies are driving up the cost of land: what is the pathway to ownership? Land prices are driven by a number of factors and crop insurance plays a role. Getting the next generation of farmers on the land is the biggest issue facing people and relevant institutions have no idea of the scope and scale of the problem: this is a \$2.4 trillion problem.
- Community-leased lands must be long-term for farmers to invest into organic conversion. Companies such as Farmland LP rent lands and ensure sustainable management, and as people grow their businesses they can get access to more land. This provides a pathway to ownership, as they become more bankable. In the long-term, Farmland LP will try to become publicly traded, so that people could invest in the managed farms. This can be viewed as a capitalist cooperative.
- A United Nations agricultural assessment<sup>133</sup> estimated the cost of global conversion to sustainable agriculture to be one third of what is currently spent on agricultural subsidies, or \$140 billion.
- Ownership of land does not guarantee that lands remain in agriculture across generations. As scaling-up progresses, specialists are created and the cooperative idea preserves collective assets.

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<sup>133</sup> UNEP, 2011. Green Economy Report.

# CHAPTER 20:

## PRICING THE PRICELESS

**Moderator – Owsley Brown III**

The Sustainable Food Alliance

**Bishop Marc Andrus**

Bishop of California – *The higher purpose of agriculture*

**Pavan Sukhdev**

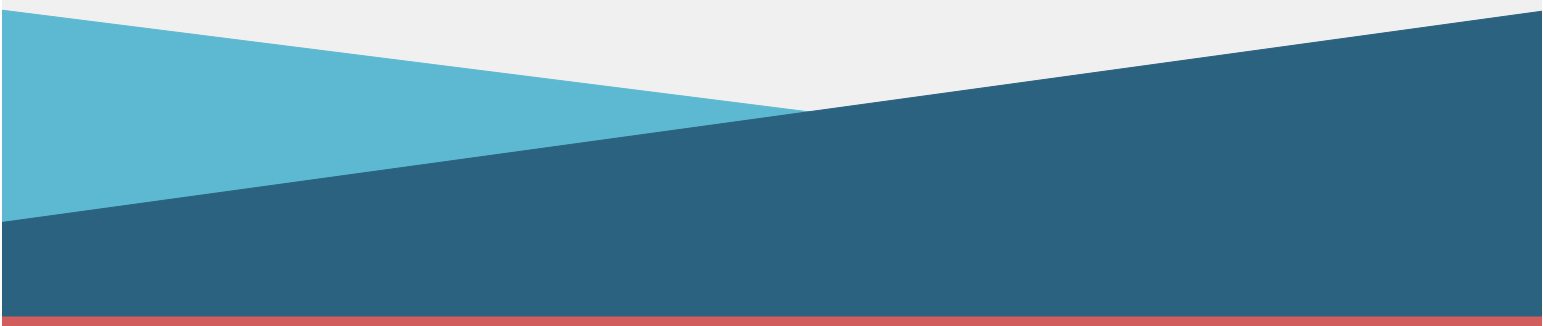
TEEB – *The invisible economics of eco-agri-food systems*

**Paul Shapiro**

Humane Society of the United States – *Animal welfare in agriculture*

**John Ikerd**

Author, Economist – *Social and ethical values*



## Introduction - Moderator – Owsley Brown III

How do you really put a price on the priceless? Morality and ethics should be the barometer or compass for decision-making when giving a price to priceless resources. The inter-connectedness of all things requires a holistic approach to this question as to all life experiences.

## The higher purpose of agriculture - Bishop Marc Andrus, Bishop of California

Why is it necessary to put a price on the priceless? The trigger for all academics is the experience of wonder, at both the microscopic and macroscopic levels. Wonder may come from a sense of recognition of relatedness to all that is. Then one becomes interested in the value of what is given and you recognize relationship. We start becoming a universe of subjects, rather than subject to objects, and this leads to something greater: we become a universe conscious of its interconnected quality.

This vision has been deliberately embraced by many archaic religions, including Shamanism, Hinduism and even Christianity; it tries to inhabit the lives of other creatures from inside, through empathy, rather than viewing them as objects.

Embracing a non-karmic vision of reincarnation means that individuals become completely interconnected, they become “all of life” and the value of each being becomes infinite. With this, people value and guard life around them.

## The invisible economics of eco-agri-food systems - Pavan Sukhdev, TEEB

What actually is valuation about? Price and value are two different things – value is what you receive, price is what you pay. Putting nature on the balance sheet *per se* is not the goal of true cost accounting. Rather, the goal is to bring an economic argument into conservation policy. When nature gives us valuable services, the chances are that no one is paying for those services – these are the gifts of nature, and the gifts of nature are largely public goods. Public goods have nothing to do with markets – they have a value but not a price. The solution to the problems of public goods, the ‘tragedy of the commons’, is simply to make better policies that manage public goods – get policies right.

Valuation is a human institution whereby value should be first recognized – when Yosemite became a national park, it didn’t have a price, it just had a value; then value can be demonstrated – you can determine what it is worth; and finally, value can be captured – someone has paid and someone has received money and benefits for managing the commons in a certain way; a deal has been struck (e.g. payments for environmental services for farmers to change practices to preserve clean water).

Market solutions may be appropriate in 10% of cases, but most often the solution requires changing norms, regulations, policies and economic mechanisms, that is, incentives and disincentives to change behaviors that destroy nature's free benefits. This is what The Economics of Ecosystems and Biodiversity (TEEB) project is trying to tackle.

The natural capital contribution of a nation's GDP is often rather low: for example, agriculture, forestry and fisheries represent just 10% of GDP in Brazil and 16% of GDP in India. However, in these countries, nature-dependent rural poor and forest dwellers are as many as 20 million and 352 million respectively. In those same countries, nature and ecosystem services consumed by the poor, as a percentage of the "GDP of the poor", is 89% and 47%, respectively.<sup>134</sup> The message to policy-makers is that the destruction of the GDP of the poor is not development: what is needed is a development that guards the resources of the poor.

Typical large corporations impact many stakeholder classes and capital categories, including those in community and public ownership. Agriculture and food systems produce both visible and invisible outcomes for humans, biodiversity and ecosystems. Therefore, it is the economic invisibility of nature that is at the heart of the on-going TEEBAgriFood project.

## Animal welfare in agriculture - Paul Shapiro, Humane Society of the United States

There are agricultural externalities that are easy to monetize, such as the cost of a Salmonella outbreak, but what is the price of animal suffering? Can we even put a price on welfare, or is it simply an ethical issue without a financial value?

One example that suggests animal welfare does have an impact financially is the SeaWorld controversy over the documentary Blackfish.<sup>135</sup> This resulted in the company's share price dropping enormously after the documentary was aired by CNN: here, cruelty towards orcas could be given a tangible dollar loss. Similarly, factory farming wants to keep people in the dark. But revelatory events, like Blackfish documents, are gradually closing down factory farms, and many restaurants are moving away from sourcing industrially produced meat because of the risk of tarnishing their image. Studies show that animal welfare is second only to employment practices in shoppers' concerns over what they purchase.<sup>136</sup> Animal welfare must now be considered a consumer value that

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<sup>134</sup> Gundimeda and Sukhdev, 2009 The Economics of Ecosystems and Biodiversity . TEEB for National and International Policy.

<sup>135</sup> <http://www.blackfishmovie.com>

<sup>136</sup> Food Market Institute, 2015. U.S. Grocery Shopper Trends 2015. Executive Summary.

retailers need to take into consideration.

There is a large gap between what people want and what is actually happening to farm animals. For example, in the US, 9 out of 10 egg cartons come from animals locked in cages that cannot even spread their wings or move for their entire life. Animal cruelty is the norm in the US food system, not the exception.

Putting a price on animal suffering was attempted by Oklahoma State University.<sup>137</sup> Banning animal gestation crates creates an average value of \$0.34 per pound but only costs an extra \$0.065 per pound. Similarly, a transition to cage-free eggs represents just 1-2 cents more per egg. Defending factory farming on economic grounds, that is, for savings of a few cents per egg, is perplexing.

Policies are changing rapidly throughout the States, with restrictions on gestation crates in Oregon, Colorado, Michigan, Maine, Ohio, Rhode Island, Arizona, California, battery cages in Michigan and Ohio, tail-docking in Rhode Island, Ohio and California and foie gras practices in California. However, the biggest progress has been made in the corporate sector: in the last year, every grocery store in the country, from Walmart to the smallest shop, has requested 100% cage-free eggs from their suppliers.

However, the root of the problem is consumption of industrially produced livestock products. Today, 22 million US citizens consider themselves vegetarian, which is a low proportion of the population, but 113 million people indicate they use meat alternative products.<sup>138</sup> Today, citizens are consuming 10% less meat than 8 years ago.<sup>139</sup> Meat consumption has been steadily declining and related institutions are gradually fading away. One must now think twice about holding long-term positions in meat industry stocks or exchange-traded securities.

This is sea change. Animals exist in their own right. With no more cages and crates, a new type of future is possible.

## Social and ethical values - John Ikerd, Author, Economist

It is difficult to calculate the full economic cost of food. It is difficult to isolate specific cause-and-effect relationships in complex systems that function within even more complex economies, societies, and ecosystems – such as the food system. Problems are difficult or impossible to solve due of their complexity, which leads to incomplete, contradictory and ever-changing information and data requirements.

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<sup>137</sup> Seibert L. and Bailey F, 2011. Production Costs and Animal Welfare for Four Stylized Hog Productions Systems.

<sup>138</sup> Mintel, 2013. More than One-Third of Americans Consume Meat Alternatives, but Only a Fraction are Actually Vegetarians. 12 August 2013.

<sup>139</sup> Nasdaq, 2015. How the “Death of Meat” Could Impact Your Portfolio.



Even if a strong argument can be made for a specific cause and effect relationship, there is no way of *accurately assigning* economic values to positive or negative economic impacts on nature and society. Disagreements regarding the magnitude of external economic cost often turns out to be little more than intellectual duels among economists using different methods, models and initial assumptions. Economic estimates may be essential in bringing public attention to the importance of economic externalities. However, public policy initiatives and political movements must rely primarily on social and ethical values.

A number of policy experts are saying that, "economics is now the language of public policy." Advocates argue that what is good for nature and society is also good for the economy. It simply is not true. The economy obviously depends on nature and society over the long run, but economic value is inherently short-run in nature. That's why corporate economic planning horizons are five to seven years, at most – not decades or generations.

Unlike corporations, most ordinary people do not make purely economic decisions but pay premiums for some things and avoid buying others based on social and ethical values. Changes over time in the non-economic values of consumers will create new economic opportunities for businesses. However, relying solely on market incentives allows ethical decisions to be decided by one-dollar-one-vote, rather than one-person-one vote.

Even more important, the "true value" of nature and society simply cannot be fully translated into economic value. Economists ask how much money people would be "willing to pay" for a given ecosystem service, such as a public park, a scenic landscape, or an endangered species of animal. But is the "true value" of nature determined by what humans are willing to pay for it? It is even more troublesome to try to place an economic value on social relationships that contribute to the greater good of humanity. It makes no more sense to ask how many dollars a loving relationship is worth than to ask how much love a dollar is worth. Many of the most important things in life are simply **priceless**.

It is time for a fundamental change in political strategy, if the health and integrity of the food system is to be secured. The basic problem is a cultural preoccupation with economic value. Everything of use to humans, including everything of economic value, ultimately comes from the earth. However, the economy does not value all of the useful things the earth has to offer; it only values things that are scarce. The basic problem is that things of nature and society often become ecologically and socially scarce long before they become economically scarce and thus take on economic value. By the time the living things of the earth become economically valuable, it may be too late. The earth may die.

The bottom line is that the language must change regarding public policy, in order to address people, not things. If the ecological, social and economic integrity of the food system are to be sustained, along with the economy and humanity, there is a need to create a new social movement that gives ethical and social values priority over economic

values. Internalizing economic externalities, while necessary, will never be sufficient. Priority must be given to those things upon which the integrity of society and the future of humanity ultimately depend. The highest priority must be given to the priceless.

## Discussion Points

- Depending on market forces is a systemic problem. There is a disconnection between price and value. But how much should a product price manifest value? Price should be contained in the wider value of things.
- Policies should not allow what is ethically unacceptable; as with slavery in the past, animal welfare today ought to be protected.
- Food systems are being recreated and respect for life is the key for change.

# CHAPTER 21:

## METHODS AND METRICS

**Moderator: Alexander Müller**

Study Leader of the UNEP hosted project TEEB<sub>AgFood</sub>

**Harpinder Sandhu**

Flinders University – *A sustainability assessment tool*

**Nadia El-Hage Scialabba**

Food and Agriculture Organization of the United Nations (FAO) – *Sustainability assessment of food and agriculture systems*

**Eli Fenichel**

Yale School of Forestry and Environmental Studies – *Measuring natural capital: From rhetoric to reality*

**Levi Stewart**

Sustainability Accounting Standards Board – *Outline of sustainability metrics for investor guidance*

**Tobias Bandel**

Soil & More International – *Road-Testing of Full-Cost Accounting*

## Introduction

There are over 200 sustainability standards in operation today<sup>140</sup> but it is very difficult to understand what is behind each. What is needed is a single standardized framework in order to facilitate dialogue among different stakeholders, and especially in order to compare different sustainability assessments.

### A sustainability assessment tool – Harpinder Sandhu, Flinders University

Today's agriculture is facing four main global challenges: declining natural resources, climate change, market volatility and changing consumption patterns. For these global challenges, there is need for a global methodology. We need a system that we can apply universally.

Externalities in agriculture need to be measured before estimating their economic value. The economic value of externalities is required to influence economic and policy environments, to improve sustainable farming practices and to bring transparency into our food production system.

We want to be able to assess the true cost of production all over the world using a single sustainability assessment tool.

Agricultural systems are overly focused on yield. They generally take into account agricultural inputs and outputs and sometimes consider labor laws and environmental pollution. But they overlook many other externalities including ecosystem services (pollination, for example). A sustainability assessment of agriculture should take into account all positive and negative externalities, including farm production value, as well as invisible social and environmental costs and benefits of farming.

A global study assessed more than 100 countries and estimated the value of just two ecosystem services: the biological control of insect pests and mineralization of fertilizers. This informed the development of a tool for assessing farm sustainability. This tool should be expanded for application throughout the food chain. This will be done through the TEEB AgFood project. The tool can be used at a farm level, at a distribution level and at a consumer level. At present, this has only been used at a farm level.

Accounting for various externalities requires a holistic sustainability assessment tool in order to: adopt technologies that have less detrimental impacts on human health and the environment; inform consumer choices for products that have higher environmental and social benefits and fewer environmental costs; and develop a uniform metric system that can be used by the food and agriculture industry in a label or as a standard at a global level.

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<sup>140</sup> International Trade Centre' Standards Map: [www.standardsmap.org](http://www.standardsmap.org)

## Sustainability assessment of food and agriculture systems – Nadia El-Hage Scialabba, Food and Agriculture Organization of the United Nations (FAO)

Among the different monetary valuation approaches to environmental services, the use of market data is perhaps the most defensible approach. The Total Economic Value includes: direct use value (direct harvest, pollination services), indirect use value (water purification, soil carbon sequestration) and non-use value of natural resources (for others or future generations). Use values can be monetized through direct market value, production function, replacement costs or costs of avoided damage. Non-use values are usually monetized through hedonic pricing<sup>141</sup> and travel costs that are rather subjective.

Even when market data is used, monetization remains an inaccurate proxy for societal values. Market prices of carbon or water may be lower than the true economic value, as market prices may be distorted by policy failures (e.g. carbon taxes). When the Social Cost of Carbon is chosen, costs vary between \$85 to \$112 per ton of CO<sub>2</sub>e, depending on coverage and the choice of key parameters such as a discount rate and time-horizon. Water use costs do not reflect the contribution to water scarcity (\$2.02 to \$18.8/m<sup>3</sup>). Replacement costs underestimate the bundle of ecosystem services. Avoided damage costs involve annual average damages associated with different return periods (5, 30, 50, 100 years). These are only a few examples of methodological challenges to monetization.

For social welfare, the traditional approach of quality-adjusted life years (QALYs), based on revealed preferences, also uses proxy markets, while raising ethical and equity concerns. A new approach, the Subjective Wellbeing Valuation, measures individual life satisfaction as people actually experience it in real life, then monetizes it, for example through health conditions, estimating the marginal rate of income substitution.

An FAO study<sup>142</sup> evaluated the environmental cost of global agriculture, including 80% of all plant and livestock commodities, as \$3 trillion/year. This materiality study informed the work of the Natural Capital Coalition and more specifically, the Natural Capital Protocol (NCP) sector guide for Food and Beverages, launched in July 2016. The NCP is a standardized framework that outlines why, what and how businesses can identify their impacts and dependencies on natural capital; NCP however, does not prescribe methods for valuations.

In 2013, the FAO published its Guidelines for Sustainability Assessment of Food and Agriculture systems (SAFA). In order to avoid green washing, any assessment framework must start by defining boundaries, as the choice of spatial boundaries of operations determines the performance' outcome. An assessment also needs to determine the

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<sup>141</sup> [http://www.ecosystemvaluation.org/hedonic\\_pricing.htm](http://www.ecosystemvaluation.org/hedonic_pricing.htm)

<sup>142</sup> FAO, 2015. Natural Capital Impacts in Agriculture: Supporting Better Decision-Making

baseline for future assessments, with a view to seek continuous improvements. SAFA offers a multi-purpose framework for governments, businesses and NGOs for assessing sustainability along four dimensions. The Good Governance dimension of SAFA includes a sub-theme on Full-Cost Accounting (FCA), whereby enterprises are rated positively or negatively according to the existence or absence of an FCA regime in their accounting process. The Environment Integrity dimension of SAFA follows a semi-quantitative multi-criteria analysis and quantitative life-cycle analysis approach to benchmark (avoided) harm, or restoration of natural resources. The Social Wellbeing dimension of SAFA is based on rights and thresholds which are set above legal requirements. The Economic Resilience dimension of SAFA places profitability of enterprises within a long-ranging context that focuses on stability and risk management.

Each SAFA dimension has themes with universal sustainability goals. The 21 SAFA themes are then disaggregated into 58 sub-themes with objectives related to food and agriculture supply chains, including crops, livestock, fisheries and aquaculture production and processing enterprises. Lastly, a set of 116 default indicators are proposed to fulfil the sub-themes' objectives. When SAFA is applied, users can customize the framework by discarding or adding indicators more relevant to their operation's context.

In response to SAFA's community of practice, the FAO has developed a user-friendly open access software for Windows and Mackintosh, for self-assessment enterprises entitled *SAFA Tool 2.2.40*. Also, a simpler SAFA Smallholders App was developed for use on Android cell phones and tablets,<sup>143</sup> including 44 indicators that do not require actual measurements. These tools facilitate visualizing value-chain performance through "Sustainability Polygons" that point to hotspots along the 21 SAFA Themes.

Like most valuation techniques, SAFA scores and weight qualitative and quantitative indicators, based on data and expert judgement. The 1000s of applications of SAFA in different contexts of the world indicate that full-cost accounting usually performs poorly, especially at farm level. While synergies exist between Governance and all other sustainability pillars, the largest trade-offs occur within the Environmental pillar, even larger than the trade-offs with other sustainability pillars.

SAFA's Sustainability Polygon displays trade-offs and synergies along 21 themes that cannot be further aggregated. The potential monetization of impacts would offer a common denominator for the aggregation of environmental, social and economic outcomes of an intervention – should agreed metrics be developed. SAFA offers a starting point for the development of a universal economic valuation methodology for food system externalities.

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<sup>143</sup> Downloadable from: [www.fao.org/nr/sustainability](http://www.fao.org/nr/sustainability)

## Measuring natural capital: from rhetoric to reality – Eli Fenichel, Yale School of Forestry and Environmental Studies

What cannot be measured cannot be managed. There is a need for a useful, measurable, headline indicator to help guide policy. Such a metric needs to be grounded in well-established economic accounting and scientific theory to have a chance of affecting change.

Gross Domestic Product (GDP) is fundamentally a short-run indicator of income (a flow). Long-run wealth (a stock) metrics have promise and several institutions<sup>144</sup> are working on this, including major players such as the World Bank<sup>145</sup> and even the US White House. Worrying about wealth and thinking of nature as a capital is not new.<sup>146</sup> In 1910, Theodore Roosevelt said: “The nation behaves well if it treats its natural resources as assets which it must turn over to the next generation increased, and not impaired, in value”.<sup>147</sup>

The question is how to operationalize a system that allows ‘apple-to-apple’ comparisons with traditional values of capital. The Achilles heel of wealth accounting has been determining the correct price at which to value natural capital.<sup>148</sup> The price at which to value natural capital is what is needed to determine natural capital prices for comprehensive wealth accounting and downscaling wealth accounting to help local actors.

Nature is a productive base that can sustain a flow of services to people: this is a great metaphor of capital. Very serious policy actors are interested and active in operationalizing, including the World Bank initiative on Wealth Accounting and the Valuation of Ecosystem Services (WAVES), and others.

Natural capital assets can be valued symmetrically with traditional capital assets: prices are incremental, not average.<sup>149</sup> For example, it is possible to measure the loss in value stored in an aquifer via groundwater withdrawals in Kansas. The value of freshwater stored in Kansas aquifers declined between \$31–\$110 million per year over a decade

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<sup>144</sup> UNU-IHDO and UNEP, 2014. Inclusive Wealth Report 2014. Measuring Progress Towards Sustainability. Cambridge University Press.

<sup>145</sup> WB, 2011. The Changing Wealth of Nations. World Bank, Washington D.C.

<sup>146</sup> See 1906 The Nature of Capital and Income.

<sup>147</sup> Theodore Roosevelt speech to the Colorado Livestock Association, Denver, Colorado, 29 August 1910.

<sup>148</sup> Smulders S., 2012. An Arrow in the Achilles' Heel of Sustainability and Wealth Accounting. *Environ. Devel. Econ.* 17(3):368–372.

<sup>149</sup> Fenichel, E. P., and J. K. Abbott. 2014. Natural Capital from Metaphor to Measurement. *Journal of the Association of Environmental and Resource Economists* 1:1–27.



(1996–2005), due to new technology and a lack of institutional adjustment, or changes to the rule for using water. The Kansas budget surplus in 2005 was \$113 million. The USDA Agricultural Research Service estimates that the net investment in Kansas farms overall declined in real terms over that decade.<sup>150</sup> Declining investments should be a red flag and raise concern, though it is not clear whether Kansas water use violated sustainability criteria. Sustainability criteria would be satisfied if Kansas made investments, in size similar to the declines in water wealth, in other areas of agricultural or natural, human, or other capital stocks. It seems reasonable to set up a sovereign wealth fund (like an oil fund).

Sustainability does not guarantee good outcomes. When measuring sustainability, what matters is the change in wealth. Absolute or total value does not matter, but change matters. When interactive systems are considered, prices actually reflect limits and opportunities of substitution – which is what sustainability is really about. There is a need to get away from environmental, agricultural and other sectoral policy. Sustainability accounting needs to be at the heart of macro-economic policy so that environmental, agricultural and other concerns can be fully internalized.

## Outline of sustainability metrics for investor guidance – Levi Stewart, Sustainability Accounting Standards Board

Global trends are driving the business case for sustainability. Investor pressures include shareholder resolutions for improved sustainability issues, sustainable investment strategies and calls for divestment. Economic pressures include resource constraints (e.g. water and energy), commodity price volatility (e.g. oil and natural gas), climate change and evolving customer demands for sustainable products. Regulatory pressures include environmental regulation (e.g. California AB 32, Clean Air Act) and regulations on product and consumer safety by the Food and Drug Administration of the EU Food Safety Authority.

An increasing share of global assets is managed with sustainability in mind. Sustainable and responsible investing strategies, in line with the UN Principles for Responsible Investment, grew exponentially from 11% in 2012 to 18% in 2014 (representing \$7 billion) under professional management in the US.<sup>151</sup>

Investors are dissatisfied with current environmental, social and governance (ESG) disclosures, in terms of financial quantification of Environmental, Social and Governance (ESG) risks, comparability, relevance, materiality of key performance indicators and

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<sup>150</sup> Fenichel E.P., L.K. Abbott, J. Bayham, B. Whitney, E.M.K. Haacker and L. Pfeiffer, 2016. Measuring the Value of Groundwater and Other Forms of Natural Capital. PNAS, Vol. 113, No. 9, pp. 2382–2387.

<sup>151</sup> Forum for Sustainable and Responsible Investment, 2016. Current and Past Trend Reports.

process to identify material issues.<sup>152</sup> Improved non-financial disclosure enhances market efficiency.

The mission of the Sustainability Accounting Standards Board (SASB), accredited by the American National Standards Institute, is to develop and disseminate sustainability accounting standards that help public corporations disclose material and decision-useful information to investors. This is accomplished through evidence-based research and stakeholder participation. Using the SASB framework, Harvard researchers found that 80% of disclosures are immaterial, having no correlation to positive performance.<sup>153</sup>

Increasing consumer demand for sustainability is appreciated when considering the dramatic growth of the organic food retail (\$35 billion in the US in 2013) that are certified to third-party environmental and/or social standards. Also, there is a growing consumer concern with over-dosing meat and poultry with antibiotics. In 2011, 29.9 million antibiotic products were sold for meat and poultry production, while 7.7 million antibiotic products were sold to treat sick people in that same year.<sup>154</sup>

For investors to be able to compare side-by-side fundamentals of sustainable performance, SASB standards enable peer-to-peer comparisons. By measuring and reporting on sustainability, enterprises are financially impactful and better able to benchmark peer performance and manage risks.

## Road-testing full-cost accounting – Tobias Bandel, Soil & More International

Rather than waiting for 'perfect' metrics or developing its own, Soil & More International has synchronized existing metrics and methodologies and applied it to a number of its projects. Full-cost accounting studies have so far been applied to different commodity groups (i.e. fruits, vegetables, milk, coffee and tea) in nine countries (Argentina, Chile, Costa Rica, Egypt, Germany, India, Mexico, Netherlands, South Africa), comparing sustainable production (biodynamic agriculture) with business-as-usual.

The Cool Farm Tool is used to assess operations' outputs, such as greenhouse gas emissions and carbon sequestration per unit of product or acreage, as well as soil build-up. The Universal Soil Loss Equation is used to derive erosion data. Water tools, such as ClimWat, CroWat and GreyWat are used to assess water use and water pollution by unit of

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<sup>152</sup> PwC, 2014. Sustainability Goals Mainstream.

<sup>153</sup> Mozaffar K, G. Serafeim and Y. Aaron, 2015. Corporate Sustainability: First Evidence on Materiality. Working Paper of the Harvard Business School.

<sup>154</sup> FDA, 2014. Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals. Food and Drug Administration, Department of Health and Human Services. September 2014.

product or acreage. Where possible, loss of livelihoods due to environmental degradation and individual health damage due to pesticide use, were calculated. These externalities were then monetized, according to the valuation approach and unit values given by the FAO.<sup>155</sup>

The results were used in the company's reporting, communications and marketing.<sup>156</sup> Organic and biodynamic products on the market with Nature & More labels already carry true cost accounting information. In fact, the Sustainability Flower, which is found on such products offers cost/benefit figures of organic versus conventional produce, including costs for climate, water and soil. Biodiversity, health and livelihood cost estimates are still a work in progress.

There is more collective data in existence than most people may expect, though social and health valuation remains challenging, especially at product level. It is important to begin the process of full-cost accounting, even with imperfections, in order to learn by doing and to involve consumers in the development stages.

## Discussion Points

- The sustainability bottom line is that it is all about trade-offs and substitution, which depends on management skills and knowledge.
- There is a need for a true cost accounting “system” that guides people through a comprehensive framework encompassing different scopes, from national wealth assessments, through to certification of products, to reporting to investors. While indicators will differ according to the scope, the framework of true cost accounting should be standardized.
- GDP is not enough and natural capital should become part of the equation for the wealth of nations. The unifying factor is the commons and these are being depleted, for both present and future generations. A unique set of principles is needed. A universal true cost accounting framework should develop an understanding of universal values, from farms to nations. The challenge is to present complexity in an easy-to-understand metric.
- SAFA could be a starting point, as it offers a universal protocol and a checklist of key performance indicators. The biggest endeavor is to agree on how to measure and monetize values using market-associated pricing.

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<sup>155</sup> FAO, 2014. Food Wastage Footprint: Full-Cost Accounting. Final Report.

<sup>156</sup> [www.soilandmore.com](http://www.soilandmore.com)

# CHAPTER 22:

## THE FUTURE OF FOOD?

**Moderator: Thomas Harttung**

Co-Founder and Chair of Aarstiderne and Chair of the Sustainable Food Trust

**Josh Tetrick**

Hampton Creek – *Reimagining the food we love*

**David Lee**

Impossible Foods – *The Impossible Burger: Food without compromise*

**Jonathan Wolfson**

TerraVia – *Harnessing the power of algae: the earth's original superfood*

**Shakirah Simley**

Bi-Rite – *People, power, policy: revolutionizing real, good food*

**Respondent: Volkert Engelsman**

Eosta and Nature & More – *Questioning the future of food*

## Introduction – Thomas Harttung, Co-Founder and Chair of Aarstiderne and Chair of the Sustainable Food Trust

The future is already here, it is just unevenly distributed. Back in the 1970s, veterans of the sustainable agriculture movement came from unusual backgrounds and had ‘wacky’ ideas. By the mid-90s, the sustainable agriculture crowd was welcoming and inclusive to newcomers. Today, a third wave is coming, and there is a need to listen with an open mind.

In this session, representatives from food companies describe their long-term vision for the food system, while challenging the prevailing orthodoxy: from easy choices for busy mothers, with so-called cheap food being convenient and ‘tasty’; through plant-based burgers that meet the taste of beef-loving Millennials; to algae-based superfoods, as an alternative sustainable and healthy food source. The question is, how do we ensure that our food systems are not only local, but also accountable for their contribution to health, people and planet?

## Re-imagining the food we love – Josh Tetrick, Hampton Creek

What would it look like if we started over? Not just in the context of food, but in the context of systems such as healthcare, education and transportation?

Thinking about food in particular, one answer to this question is to create a system in which the right food choice – the one that is better for the environment, more supportive of farmers, the one that uses less land and water – is the food choice that is more affordable, that tastes great and that is the easiest choice. How do we create a food system where it is impossible not to do the right thing? If we could create that system then food would be a real platform for change, food would reconnect us to our values; food would be more food, it could be a vehicle for fixing a lot of the problems we face.

One of the things that we thought about at Hampton Creek was that there are 400,000 species of plants that we can eat, but for some crazy reason, we’ve become addicted to four: corn, soy, wheat and sugar. We raised \$250 million to create a food technology platform, with a team of computational biochemists looking through all these plant species and their molecular properties to find ways to use these varied plants – such as Sorghum, which doesn’t use a lot of land, it doesn’t take a lot of water – to make food better. The Discovery Platform integrates molecular food and scientific data in an automated, high throughput platform that processes: raw material preparation (hulling and milling of 30 plant sources a week); protein candidate identification (protein extraction, precipitation and quantification of 960 plant samples a week); data generation (molecular assays of 150 plant samples a week and functionality assays of 30–100 plant samples a week); and ingredient discovery (predictive modeling, model validation and candidate testing). This future food facility covers an area of 95,000 square feet and tackles 563 different food products.

We're also interested in doing things that have never been done before: micro-nutrients deficiency is a huge problem in the world, so what if we could create a nutrient dense product for kids that was fun to play with and to eat?

Big brands are being replaced with "Just" products, such as Just Mayonnaise: we have partnerships with almost every retailer in the nation. We have a 5-year agreement with the Compass Group, Bon Appetit Management. This has enabled the good thing to become the easiest thing, and even if one does not care, or does not have the means or time, Just products are to be found everywhere, from fancy restaurants to The Dollar Tree.

## The Impossible Burger: food without compromise – David Lee, Impossible Foods

No matter how hard we try to change consumer behavior, food choices are primarily driven by the ability to satisfy a craving. Focusing food campaigns on costs and negatives creates a guilt feeling. A more positive approach has a bigger impact, especially if consumers don't have to compromise on taste.

With this recognition, Impossible Foods creates food that satisfies taste, and in particular, appeals to the hardcore meat eaters. Hamburgers are the largest contributors to climate change and Millennials are the first generation interested in knowing what they are putting into their bodies. Therefore, meat and dairy food-like products created directly from plants became interesting to Impossible, in view of a \$1 trillion opportunity.

Five years ago, research was undertaken to help understand what makes meat taste like meat, and a secret component was discovered: heme. This transforms simple, natural nutrients (i.e. amino acids, vitamins, fatty acids, simple sugars and additional nutrients) into a meat flavor. Subsequently, a unique and systematic approach to making food followed 4 processes: protein discovery; reverse engineering; flavor creation; and material transformation.

Isolated plant proteins create the desired characteristics of animal-based food. The first product is the "Impossible Burger", made from the root nodules of a soy plant, i.e. 'legume hemoglobin'. It tastes like beef, and the product can only get better.

Having carried out the market-testing phase of the new product, the company is now partnering with chefs and tastemakers. Production has increased from 100 to 400 pounds in the first six months of 2016. Premium launch in 2017 will include restaurants, breweries and Better Burger. In 2018, expansion will target full-service restaurants, fast, casual and national chains. 2019 will hit the mass market, including expansion in food services, retail and international reach.

The hamburger cost will be at, or lower than, the cost of a common 820g beef burger. This can be achieved because production uses less resources: 99% less land occupation (3.9 meter<sup>2</sup> per kg of Impossible Foods); 89% less greenhouse gases (7.3 Kg CO<sub>2</sub> e per kg

of Impossible Foods); and 85% less water usage (2 379 liters per kg of Impossible Foods).

The total available market for Impossible Burger includes: \$2 billion on the US premium market; \$35 billion on the US commodity market; and over \$100 billion as a global market opportunity.

The intention of the company is to go beyond this first product, using the unique ingredient heme which makes chicken taste like chicken, and dairy taste like dairy. The project is backed by visionary investors, including Bill Gates, Google Ventures, USB, Viking, Horizon Ventures and Khosla Ventures.

## Harnessing the power of algae: the Earth's original superfood – Jonathan Wolfson, TerraVia

Established thirteen years ago, TerraVia harnesses the power of algae, the mother of all plants, and earth's original superfood, to improve the lives of people and planet.

All plants originally came from the ancestral green algae and still today there is a great number and diversity of species. It is the Earth's original superfood, with phenomenal nutritional properties: it contains twice the omegas of chia seeds; nine times more fiber than kale; and twice the protein of spinach.

Sustainability is about doing more with less and decreasing the environmental footprint of production. But nothing would matter if the taste was not great.

Over a decade of research, with an investment of \$500 million, was carried out to identify the right algae with the desired benefits, as well as undertaking extensive safety work on the new ingredients, and ensuring regulatory approvals in a wide variety of locations.

Two platforms were developed for algae products: oil and powder. The Thrive Culinary Algae Oil Health is the best oil for the heart as it has more than 90% monounsaturated fats, and less than 4% saturated fat (75% less saturated fat than olive oil). In addition, the oil's high smoke-point allows for good high heat cooking (thus, no risk of carcinogens) – there is nothing else like it.

AlgaVia is a whole-algae liquid powder, naturally encapsulated, with a very high protein content. The natural encapsulation enables the incorporation of more proteins in the food than any other product; bread or crackers can have twice the level of proteins and fibers and are still crunchy and have a low glycemic index. Products have an excellent taste, texture and functionality, while being whole food, gluten-free, vegan and free of known allergens.

Among the host of solutions to the food system, the role of algae-foods is three fold, as they contain 3 times the protein yield of soy, lower carbon emissions per kg of protein and kg of oil and similar yields to palm oil but without the deforestation.



## People, power, policy: revolutionizing real, good food – Shakirah Simley, Bi-Rite

Supermarkets are increasingly becoming food deserts, as healthy fresh food is hard to access and in some cases non-existent. Bi-Rite Market is a family-owned business in San Francisco that now has blossomed into a food mecca. It has 320 highly trained employees across five locations, including two markets, a creamery, a catering arm and an organic farm.

If good food were a religion, Bi-Rite would be its church, with shelves full of farm-grown produce and sustainably sourced meat and fish. Revenues have grown from \$2 to \$45 million a year. Sales per square foot are five times more than a successful Safeway. How was this achieved?

Bi-Rite creates community through food. Meaningful relationships are nurtured with those working along all sectors of the food chain. The vision targets people, policy and power because the future of food is about people.

Fixing the food system starts by fixing labor conditions, including those working on farms, in factories and on the store floor. People are hired, trained and promoted: 38% of total expenses are spent on staff wages and benefits, including paid sick leave, health, vision and dental insurance, profit-sharing, meals with every shift and a schedule that is communicated 2-3 weeks ahead. This policy is working and the staff turnover is well below the industry average. Farmers and other suppliers also receive a higher than average price. The true cost of good food is more expensive, especially when the health and wellbeing of producers and workers is prioritized. This should not be an outlier, but the standard.

Millennials are young and hungry for change. They will inherit the Earth – 20-30 year olds have an estimated spending power of \$2.45 trillion, making up the largest share of the US workforce. They are also the most racially diverse generation in the country's history, with 43% identifying as non-white and half of them identifying as 'foodies'. They are skeptical about the one-dollar burger, are saying no to GMOs and are forcing Big Food to go cage-free.

However, Millennials also have the highest levels of student loan debt and unemployment (3.5 million from 18-24 years), and 1 in 5 are living in poverty. It is time to harness the attention and energy of this value-driven, food-obsessed generation in order to drive real change in the future of food: hire, train, mentor and pay fairly.

Food justice parallels racial injustice. Young people of color disproportionately bear the burden of nutrition-related diseases and poverty. One cannot talk about what's on the table unless one is honest about who has a seat at the table and who is sitting at the head of the table. Collective power can be leveraged, but individual behavior in the grocery aisle is not enough. There is a need for policy change, including local soda taxes, State-



wide GMO labeling, date labels to reduce food waste, national wealth inequality policy and emigration reform are all part of the equation.

It is important to empower communities and tackle corporate control. Local is power, collaboration is power, engagement is power, and knowledge is power. The future of food is being written now, what kind of author will you be?

## Questioning the future of food – Volkert Engelsman, Eosta and Nature & More

How do you measure your contribution to health, people and the planet? There is no such thing as sustainability without transparency, so how do you make these contributions transparent? Do you hold yourself accountable to stakeholders representing health, people and the planet?

Josh stressed that the most important factor is price, and the easy access to people like single moms living-out of a white envelope and shopping at Walmart. Big companies like Walmart, or the Dollar Tree, actually have top people who care: if you can build relationships with the stakeholders of the biggest companies in the world instead of throwing rocks at them, it is possible to work with them to build something different.

David highlighted the need for absolute transparency and rigor. Profit is not the enemy and long-term minded investors are needed. Consumers of the Impossible Burger will not be influenced by knowing all the costs and impacts of the ingredients, so much as craving for taste. Investors asking about the ecological balance sheet are not an issue, as lighter footprints have been considered upfront by Impossible. Impacts should be known in order to convince Millennials to buy novel products. But the heart of the story is the great tasting burger.

Jonathan mentioned that being a public company requires transparency. A commitment was made to invest heavily in measuring the impact of all operations and a very detailed sustainability report is published every quarter. Consumers have a right to know, and the presence of many caring Millennials in the company drive increasing accountability.

Shakirah noted that the way transparency and sustainability are defined differs among people. A radical business model is beholden to farmers, the soil and the environment – not stakeholders. Funding for good local food does not match high-tech food and there is need to unpack who's sitting at the table. Although there is space for all to work together, she mentioned that she was rather doubtful.

## Discussion Points

- While private companies are working on alternatives to factory farm products, public policies continue to artificially depress conventional produce prices. Big companies involved in innovations are already lobbying USDA for their own

interests, so there is room for them to consider getting involved in the on-going discussions for the next Farm Bill.

- Novel foods (i.e. Just mayonnaise, Impossible Burger, algae oil) are all highly processed, which makes them diametrically opposed to what is advocated by the sustainable agriculture movement. Processed food is energy-intensive and may present concerns about additives and human safety. Chiefly, novel food ignores the cultural dimension of producing and eating, whereby food is shared and enjoyed as a “communion” with others and with the land. Eating should be as close as possible to its primary source.
- While the cultural dimension of food could only be unanimously agreed-upon by all, the question at heart is scalability. How scalable could a local, wholefood system be for all (including to the ‘non-foodies’ of the planet) in the current conditions of climate change and resource scarcity? Scaling up, especially if all natural and human resource impacts are to be addressed, requires innovation. Moving away from animal-based systems, or palm oil plantations, and towards food tech solutions is one way ahead. In this respect, it was recalled that making a heavy use of science and innovation does not necessarily mean including synthetics in foods; for example, yeast is used as a source of heme.
- Food and nutrition science is complex to navigate. Current innovations are focusing on developing good oils, because saturated fats have been demonized. At the same time, emerging research is indicating that saturated fats in grass-fed meat are actually good for health. Beyond science, algal nutritional benefits are considered guaranteed, due to the fact that algae have always existed. The companies that presented their innovations here are routinely and voluntarily investing in measuring the footprint of their operations and products, while being transparent, accountable and standing by their work.
- In conclusion, it appears that the future of food will see the parallel development of two types of populations: foodies who seek local wholefoods, and those pursuing convenient high-tech food.

# CHAPTER 23:

## IGNITE SPEECHES

**Moderator: Ken Wilson**

Former Executive Director of the Christensen

**FundGuillermo Castilleja**

Gordon and Betty Moore Foundation – *Collective search for solutions*

**Doria Robinson**

Urban Tilth – Food sovereignty for all

**Anna Lappé**

Author and Educator – *Opportunities for change exist*

**Whendee Silve**

U. C. Berkeley – More scientists are needed to join the true cost accounting ranks

**Peter Lehner**

Earthjustice – Rough (under)estimate of the true cost of American food

**Laurie David**

Author, Producer and Environmental Advocate – *Prioritizing child obesity*

**Douglas Gayeton**

Lexicon of Sustainability – *Investing in true cost accounting messaging*

**Angela McKee**

San Francisco Unified School District's Future Dining Experience – *School for improved health*

**Nicolette Hahn Niman**

Writer, attorney and livestock rancher – *Embracing complexity*

**Christy Brown**

Founder and Board Chair, Institute for Healthy Air, Water and Soil – *All together for a healthy Planet*

## Introduction – Ken Wilson, Former Executive Director of the Christensen Found

In the last few decades, there has been an undeniable transformation in the food system. But there are still deep fissures in the system and a desperate need for further change. The food justice and sustainable agriculture agenda still have significant work to do to become part of the same movement.

However, change is coming, and a new generation is growing with different groups of people seeing things in a new light. The true cost process can encourage questions, inspire ideas and open up a new way of looking at what is wrong, and what could be different in future food systems.

## A collective search for solutions – Guillermo Castilleja, Gordon and Betty Moore Foundation

What inspires most is the passion brought to discussions on change in the food system, especially in terms of the collective search for solutions. Solutions are found when the complexity of the food system is understood, recognizing that problems will not be solved by addressing them from a single perspective. The American food system is not the only system that needs to change and the food systems of other countries are equally complex. An article co-written by Kofi Annan<sup>157</sup> states that “The new African food system should be built around the idea that agriculture is about more than producing calories: it is about changing society. Its five components should be: valuing smallholder farmers; empowering women; focusing on the quality, as well as the quantity of food; creating a thriving rural economy; and protecting the environment.” The same holds for the US. Finding a solution is joyful. We are not here to fight with others, but to all work together.

## Food sovereignty for all – Doria Robinson, Urban Tilth

One of the most inspiring speakers was John Ikerd, who stressed that in order to move forward in a positive way towards food sovereignty, building relationships and maintaining values is required. In order to design a food system that serves all – without forgetting that food is a right for everyone, including those working on the ground – everyone’s voice must be included in the planning process. Much work is still required to bridge the gap between the sustainable food movement and the food justice agenda.

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<sup>157</sup> Dryden Sam and Kofi Annan, 2015. Food and the Transformation of Africa. Foreign Affairs Journal.

## Opportunities for change exist – Anna Lappé, Author and Educator

The gravity of the problems faced by the food system motivates action, as there is huge potential to find the required solutions. It is shocking to learn that endocrine disrupting chemicals in the EU alone cost \$170 billion per year<sup>158</sup> and that the US figure is most probably of the same magnitude. There are incredible opportunities in terms of policy and advocacy. Powerful examples include The Good Food Purchasing Program, the Fight for \$15 and advocacy efforts for a soda tax to be applied in other cities as a matter of priority.

## More scientists are needed to join the true cost accounting ranks – Wendy Silver, U. C. Berkeley

Understanding the true cost of food is much more complex than one can imagine. More science is needed on a number of aspects and to this end there is a need to convince more scientists to work on this topic. A vision of the collective goals of true cost accounting is needed, in order to guide joint work.

## A rough (under)estimate of the true cost of American food – Peter Lehner, Earthjustice

A very rough analysis of all the data quoted even just by some of the speakers here, suggests that the true cost of American food is at least double the apparent cost. The apparent cost of food includes the value of farming and farm-related activities, which according to the USDA is \$850 billion, plus the value of food retail and all food services, which according to US Economic Research Service (ERS) is \$800 billion, for a total of \$1.6 trillion a year – that's what we pay to eat.

The 'true costs' of food and agriculture, however, are higher. A few of those detailed here at this conference include:

- Healthcare costs, given by Tyler Norris, of at least \$960 billion;
- Workers living wage: 22 million workers paid approximately \$10/hour – that's \$5/hour below the proposed minimum wage ;
- Farm Bill subsidies to farmers of \$13 billion;

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<sup>158</sup> Leonardo Trasande, R. Thomas Zoeller, Ulla Hass, Andreas Kortenkamp, Philippe Grandjean, John Peterson Myers, Joseph DiGangi, Martine Bellanger, Russ Hauser, Juliette Legler, Niels E. Skakkebaek, and Jerrold J. Heindel, 2015. Estimating Burden and Disease Costs of Exposure to Endocrine-Disrupting Chemicals in the European Union – The Journal of Clinical Endocrinology & Metabolism Vol 100. Issue 4.

- Soil loss (\$40/acre/year x 300 million acres farmed half time, according to the Corn/Soy Panel) of \$6 billion;
- Water pollution (according to the Nitrogen Panel), ranging from \$97–\$625 billion, with the average of \$360 billion;
- Water use (at 355 billion/gal/day for US water use times 0.3 for 30% agriculture use) times \$0.0015 (average cost of water per gallon) x 365 days/year) totaling \$58 billion;
- Greenhouse gas emissions (6 860 MMT CO<sub>2</sub>e/year times 0.09 (agriculture = 9%) per \$36/ton Social Cost of Carbon) is \$22 billion.

The total additional costs of the food system, without accounting for animal and human suffering, cancer costs, food waste (almost another \$1 trillion), lost productivity, wildlife and other societal costs, is over \$1.6 trillion per year.

Therefore, a low estimate of the total costs of food as it is produced in the US is \$3.2 trillion. The environmental and social externalities could be at least twice the food market price. By changing what food we produce and how we produce it, we can significantly cut the true cost of food.

## Prioritizing child obesity – Laurie David, Author, Producer and Environmental Advocate

One in three people in the US today are overweight or obese, and this is also the first generation of children that will have a lifespan that is at least 5 years shorter than their parents. The food movement must communicate big bold messages that permeate popular culture. Soda is the tobacco of the food industry, and at present, the ‘low hanging fruit’ of prevention is the soda tax. A new study has just been released, stating that taxing sugary drinks would save half a million children from obesity.<sup>159</sup> The money raised from the soda tax should be directed to schools that need it most, to promote better and healthier food for young people.

## Investing in true cost accounting messages – Douglas Gayeton, Lexicon of Sustainability

While making the film ‘The Tale of Two Chickens’, it was very challenging to simply

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<sup>159</sup> Michael W. Long, Steven L. Gortmaker, PhD, Zachary J. Ward, MPH, Stephen C. Resch, PhD, Marj L. Moodie, DrPH, Gary Sacks, PhD, Boyd A. Swinburn, MD, Rob C. Carter, PhD, Y. Claire Wang, MD, ScD, 2015. Cost Effectiveness of a Sugar-Sweetened Beverage Excise Tax in the US. American Journal of Preventive Medicine. Vol49. Issue 1. 112–123

explain what true cost is about. Climate change messaging provides an example of the disconnect that exists between the true scale of the problem and what ordinary people could do. How are we going to explain 'true cost' when we leave this conference? There is a need to find the stories about true cost accounting that can be told to families, friends and colleagues. True cost accounting must become real, personal and something that everyone can engage with.

School food for improved health – Angela McKee, San Francisco Unified School District's Future Dining Experience

Cafeterias are often the most under-invested space in US communities, yet they have a great potential to create community in schools and help eliminate social problems. The current school food system isn't good and a lack of high quality food is inhibiting young people's ability to learn. In the San Francisco School District, the Future Dining Experience is using school food as a tool to promote improved mental health and growth in students. The power of food to build communities must be re-thought. By investing in quality food in schools, we show young people respect for their bodies and minds.

Embracing complexity – Nicolette Hahn Niman, Writer, attorney and livestock rancher

Hearing the views of real farmers is very inspiring. Embracing complexity, as done here, is key to building a sustainable food system. Experts bring their diverse special knowledge and share with others. A most inspiring quote from The Center for Ecoliteracy made the point that farming happens in nature, and that nature is always a system. Only humans make linear machines. The food system is inherently complex because it starts with nature, everything is related and interconnected. People must always think systemically, think holistically, and most importantly, farmers should never be alienated from the food system, as this is really where sustainable food production has to start.

All together for a healthy Planet – Christy Brown, Founder and Board Chair, Institute for Healthy Air, Water and Soil

Prince Charles, one of the world's greatest global leaders, understands human inter-connectedness with nature. The word's health, particularly healthy air, water and soil, must be embraced by all. Those working in financial health, nutritional health, physical health, cultural health, spiritual health, intellectual health, psychological health and environmental health are at the centre of finding the solutions needed to save a desperately unhealthy planet. Our silos must be broken and when the food movement reconvenes again, the groups must be larger and all-inclusive. Those present here represent billions of people and billions of dollars of influence, and it is only by joining together under the umbrella of health that the necessary changes can be made.



## Conclusions

- These ‘Ignite’ presentations are beautiful, powerful, truthful, clarifying and motivating; they realize the need to embrace complexity and diversity in order to solve the problems with the food system. What must also be used, tackled and talked about more is the word ‘race’, in order to bring our whole selves into this discussion and unlock many truths for all.
- The scale of the problem in the food system is very shocking. However, true cost accounting, if implemented correctly, can help speed up the transformation that is needed. More work must be done, particularly regarding health, as this is arguably the largest externality of all, while not much is known about it as yet. As Lady Eve Balfour, founder of the Soil Association once said: “Instead of the contemporary obsession with disease and its causes, [we] set out to discover the causes of health.”<sup>160</sup> This provides an important line of work to follow and go forward.
- Food businesses must show new leadership, keeping up with the changing buying habits of millennials by being transparent about environmental, health and social justice issues. The policy environment for food and agriculture must also change. Tax dollars should not go to food producers, unless they are delivering public goods. In addition, the communications agenda is hugely important, because these messages must be made accessible and easy to understand for both the public and policy-makers.
- The Case Study Session was most inspiring in featuring the three courageous farmers who allowed their farms to be assessed. This symbolises a new chapter in moving towards monetizing all food system externalities, both positive and negative, ultimately in order to move towards a more honest pricing of food.

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<sup>160</sup> Lady Eve Balfour, 1977. Towards a Sustainable Agriculture: The Living Soil. An address given by the late Lady Eve Balfour to an IFOAM conference in Switzerland in 1977.

# SPEAKERS' BIOGRAPHIES





### **Bishop Marc Andrus**

Eighth Bishop of California in The Episcopal Church

The Rt. Rev. Marc Handley Andrus is the eighth bishop of the Episcopal Diocese of California. He was installed as bishop in 2006 — a position of oversight for a diocese comprised of 27,000 communicants in Alameda, Contra Costa, Marin, San Francisco, and San Mateo Counties, and the cities of Los Altos and part of Palo Alto.



### **Viney Aneja**

Professor in the Department of Marine, Earth, and Atmospheric Sciences at North Carolina State University

Dr. Aneja was recently appointed to the US Environmental Protection Agency's Board of Scientific Counselors Executive Committee, and Chair of the BOSC Subcommittee for Air, Climate, and Energy research program. At North Carolina State University, Dr. Aneja has developed one of the nation's leading agricultural air-quality and climate research programs.



### **Dennis Baldocchi**

Professor of Biometeorology at the University of California, Berkeley

Dennis's research focuses on measuring and modeling trace gas exchange between vegetation, land and the atmosphere. Reared on a walnut and almond ranch in California, he has a special interest in the water-food nexus and is doing work on water use by crops and the role of climate change on winter chill accumulation by orchards in California.



### **Tobias Bandel**

Managing Partner, Soil and More

After graduating in agricultural sciences at University of Hohenheim, Germany, Tobias Bandel worked as cultivation and export manager for fresh fruits and vegetables at the Sekem Group, Egypt. Apart from his trading activity, he was involved in various agribusiness projects in cooperation with the IFC/Worldbank and USAID, such as the development of traceability and communication tools to link small-scale farmers to export markets. After a short employment as business development manager at EOSTA BV, a Dutch trading company for organic fresh produce, Tobias Bandel co-founded Soil & More International BV. In his position as managing partner, he is mainly responsible for the company's technical and commercial development.



**Fedele Bauccio**

Chief Executive Officer and Cofounder of Bon Appétit Management Company

Bon Appétit Management Company provides food service to over 650 cafés in 31 states across America. Together Fedele and Bon Appétit have revolutionized the food service industry, both by introducing fresh, made-from-scratch food to the contract market and by pioneering environmentally and socially responsible practices designed to create a more sustainable food system.



**Sarah Bell**

Program Director for the 11th Hour Project

Sarah directs the Foundation's program in ecological agriculture and regional food systems. She sits on the boards of Pie Ranch and the Environmental Grantmakers Association and holds a B.A. in both English Literature and French from the University of Colorado. Sarah is an enthusiastic supporter of permaculture and former student at the Regenerative Design Institute in Bolinas.



**Libby Bernick**

Senior Vice President of North America, Trucost

Libby manages Trucost's North American business unit, working with investors and multinational corporations to account for the financial, environmental, and social costs of policies and investments. Libby has worked for over 25 years with businesses to use environmental data to inform strategy and investment decisions.



**George Boody**

Executive Director of the Land Stewardship Project

The Land Stewardship Project wants to see more successful family farmers raising crops and livestock on the land in ways that protect our water, provide wildlife habitat and produce nutritious food for all. In addition to management responsibilities, George co-directs interdisciplinary projects that measure and predict ecological and financial benefits from diversified farming systems.



**Sonja Brodt**

Academic Coordinator of Agriculture, Resources and the Environment at the Agricultural Sustainability Institute at the University of California, Davis.

Sonja's goal is to integrate social science and agroecological perspectives to

design sustainable food and farming systems for the future. Major recent projects include co-editing and co-authoring the California Nitrogen Assessment. She also spearheads a research initiative on life cycle assessment of greenhouse gas emissions and other environmental impacts of California food production and supply chains.



### **Christina Lee Brown**

Founder and Board Chair of the Institute of Healthy Air, Water and Soil

Christy has always been deeply committed to social responsibility and community service. Originally from Maryland, she married Owsley Brown in 1968 and lives in Louisville, Kentucky. In 1985, Christy founded the Center for Interfaith Relations and went on to launch the first US Festival of Faiths, also in Louisville, which is now in its seventeenth year.



### **Owsley Brown III**

Director of the Sustainable Food Alliance

Owsley was born and raised in Louisville, Kentucky. After graduating from the University of Virginia he began working in the wine business in Northern California. In 2005 he founded *Magnanimus Wine Group*, a wine production company that produces award-winning wines made from sustainably farmed vineyards. Owsley is also a documentary filmmaker.



### **Lara Bryant**

Soil Health Fellow at Natural Resources Defense Council

Lara promotes soil health practices and policies that protect water quality, use water more efficiently, and help farms to be more resilient to climate change. Prior to joining NRDC, Lara worked for several years on sustainable agricultural policy at the National Wildlife Federation and World Resources Institute.



### **Hamilton Candee**

Partner at Altshuler Berzon LLP

Hamilton was formerly a Senior Attorney in the San Francisco Office of the Natural Resources Defense Council and Co-Director of NRDC's Western Water Project. He has been involved in a variety of efforts to restore ecosystems, protect endangered species, encourage water conservation and promote other environmental reforms in federal and state water policy. He is a member of the Board of Trustees of the NRDC Action Fund.



**Guillermo Castilleja**

Chief Program Officer, Environmental Conservation, the Gordon and Betty Moore Foundation

Guillermo is the newly appointed senior fellow for the Gordon and Betty Moore Foundation, and oversees strategy for their environmental conservation program, which seeks to protect critical ecosystems and balance long-term conservation with sustainable use. The program includes an interlinked trio of market-based approaches to conservation as well as initiatives that focus on the Andes–Amazon, Marine Conservation and Wild Salmon Ecosystems.



**Mariela Cedeño**

Director of Social Enterprise and Microfinance at Mandela MarketPlace

Mandela MarketPlace works to improve health, create wealth and build assets through cooperative food enterprises in low-income communities. Mariela works to strengthen the triple bottom line approach that is the foundation of their food-based enterprises, while shaping strategies to build the assets of the community members engaged in cultivating our local economy and food system.



**Rich Collins**

President and Farmer at California Endive Farms

At the age of 22, Rich spent a year working, learning and exploring European agriculture, where he focused on the production of endive. After returning home, he gained a degree in Agricultural and Managerial Economics from UC Davis and created California Endive Farms, becoming the only producer of endive in North America.



**Jana Compton**

Ecologist with the US EPA's Office of Research and Development

Jana studies the sources and effects of nutrients at different scales, from microbes to the nation. She earned her graduate degrees in forest ecosystems and biogeochemistry at the University of Washington and was a member of the faculty at the University of Rhode Island prior to joining the Environmental Protection Agency in 1999.



**Craig Cox**

Environmental Working Group Senior Vice President for Agriculture and Natural Resources

Craig began his career in conservation in 1977 as a field biologist. Since then, he has worked for the National Academy of Sciences, the Senate Committee on Agriculture, Nutrition and Forestry, the USDA and the Soil and Water Conservation Society. Craig now leads the Environmental Working Group's research and advocacy work in agriculture, renewable energy, and climate change.



### **Richard Cruse**

Director of the Iowa Water Center

Richard received his undergraduate degree from Iowa State University and graduate degrees from the University of Minnesota. He is a fellow of the American Society of Agronomy and the Soil Science Society of America. He received the President's Leadership Award from the Soil and Water Conservation Society in 2011. His research focus is soil erosion and water related issues.



### **Scott Cullen**

Executive Director of the GRACE Communications Foundation

GRACE Communications Foundation highlights the interconnections of food, water and energy, educating consumers and policy makers through web-based initiatives such as the Eat Well Guide, The Meatrix, Sustainable Table, Meatless Monday, Healthy Monday and Kids Cook Monday. Scott is an environmental attorney and previously worked on coastal, marine and energy issues with a number of non-profits.



### **Cynthia Daley**

Professor and Director of the Organic Dairy Program, California State University Chico and Owner of Sweet Grass Organic Dairy, Inc

Dr. Daley's primary focus has been to establish an applied research program to improve the sustainability of organic dairy farms through improved soil fertility, enhanced grazing practices and value added marketing. She has also worked to establish the nutritional benefits of grazing on lipid and antioxidant profiles in grass-fed milk and beef.



### **Paula Daniels**

Chair, Center for Good Food Purchasing

Paula is founder and chair emeritus of the LA Food Policy Council, and cofounder and Chair of the Center for Good Food Purchasing. She was recently a Resident Fellow at the Bellagio Center of the Rockefeller Foundation, is a Stanton Fellow (awarded by the Durfee Foundation), a



2015 Pritzker Environment and Sustainability Education Fellow at the UCLA Institute of the Environment and Sustainability and in 2013 was the Lee Chair in Real Estate Law and Urban Planning at the College of Environmental Design, UC Berkeley.



### **Laurie David**

Author, producer, and environmental advocate

For over a decade, Laurie has brought her passion and dedication to a variety of important environmental and food issues. Laurie was a producer on the Academy award-winning *An Inconvenient Truth* and executive producer on *Fed Up*, a feature-length documentary that examines the surprising truth about how our food is making us sick.



### **Laurie Drinkwater**

Professor in the School of Integrative Plant Science at Cornell University

Laurie's research focuses on understanding the mechanisms governing carbon, nitrogen and phosphorus cycling in agroecosystems at scales ranging from the rhizosphere, where plant-microbial interactions dominate, to the field and landscape scale, where human interventions strongly influence ecosystem processes. The purpose of her research program is to improve the ecological efficiency and sustainability of agricultural systems.



### **Richard Dunne**

Headteacher of Ashley CofE Primary School, UK

Richard's school has developed a curriculum that applies learning to real life and gives the children a lead role. The school has won a range of awards, including two international awards for energy conservation initiatives led by the children, one national award for food growing and provision and a best educational visits award.



### **Scott Edwards**

Co-director of the Food and Water Justice project at Food and Water Watch

Scott joined Food and Water Watch in 2011 after spending eleven years as Director of Advocacy at Waterkeeper Alliance. Since joining Food and Water Watch, Scott continues to focus on reforming unsustainable agricultural systems, while also opposing market-based approaches to pollution control, water privatization efforts and irresponsible fracking.



**Nadia El-Hage Scialabba**

Senior Natural Resources Officer of the Food and Agriculture Organization of the United Nations (FAO)

Nadia El-Hage Scialabba has been with the FAO since 1985, having held different positions in the Fisheries, Agriculture and Environment Departments. Now Senior Natural Resources Officer, she is always entrusted to mainstream environment and sustainable development considerations into food and agriculture systems.



**Volkert Engelsman**

Chief Executive of Eosta and Nature & More

After graduating, Volkert worked for Cargill Inc. USA before founding Eosta in 1990. The Dutch company is presently Europe's largest and fastest growing importer, packer and distributor of organically grown fresh produce. Earlier this year, Eosta launched the True Cost of Food initiative, which promotes the idea that food prices should reflect the hidden environmental and social costs of food production.



**Jim Erdahl**

Owner and Operator of J-ACE Farms, Inc

Jim is a fourth generation farmer. After receiving his Associate of Science degree in 1980, Jim began his career working in farming with his father. In his quest for the definition of sustainability, Jim draws upon his passion for the exchange of new ideas and his belief that being a farmer is a privilege and not a right.



**Eli Fenichel**

Assistant Professor of Bioeconomics and Ecosystem Management at the Yale School of Forestry and Environmental Studies

After two years in the Peace Corps and nearly a year working for World Wildlife Fund on conservation projects, Dr. Fenichel realized that economic solutions were required for what seemed to be environmental problems. At Yale, he teaches graduate level courses in applied math, natural capital, natural resource economics and quantitative decision making.



**Jonathan Foley**

Executive Director of the California Academy of Sciences

Dr. Foley is also the William R. and Gretchen B. Kimball Chair. In this role, he leads the greenest museum on the planet and one of the most future-focused scientific institutions in the world. A world-renowned scientist, his work focuses on the sustainability of our planet and the ecosystems and

natural resources we depend on.



### **Dana Frasz**

Founder and Director of Food Shift

Dana is a visionary systems thinker with 13 years of food recovery, management and entrepreneurship experience including launching her own award-winning food recovery group at Sarah Lawrence College and spending three years at Ashoka. Acknowledging that the current food system is leaving both food and people falling through the cracks, Dana launched Food Shift in 2012.



### **Leah Garcés**

USA Director for Compassion in World Farming

Leah has worked to advance higher welfare for farm animals for the last 15 years and has authored many reports and articles. She focuses primarily on collaboration with US food businesses and making real and practical improvements for farm animals, particularly poultry.



### **Douglas Gayeton**

Founder of the Lexicon of Sustainability

Douglas co-founded the Lexicon of Sustainability with Laura Howard-Gayeton in 2009 and they continue to oversee the project from a series of barns on a goat farm near Petaluma, California. An information architect, filmmaker, photographer and writer, he has created award-winning work at the boundaries of traditional and converging media since the early 90s.



### **Barbara Gemmill-Herren**

Consultant to the World Agroforestry Centre

Before working as a consultant to the World Agroforestry Centre, Dr. Gemmill-Herren, worked for 11 years at the UN Food and Agriculture Organization (FAO). There, she was responsible for their work on Ecosystem Services in Agricultural Production, and was central to their new focus on Agroecology.



### **Oliver Gottfried**

Senior Advocacy and Collaborations Advisor for Oxfam America

Oliver Gottfried is the campaign manager of Oxfam's poultry worker justice

campaign, which aims to improve working conditions and compensation for America's 250,000 poultry workers. Prior to Oxfam America, Oliver spent 14 years leading campaign and advocacy work for political campaigns and labor unions across the United States.



### **Twilight Greenaway**

Managing Editor of *Civil Eats*

Twilight Greenaway is the managing editor of *Civil Eats*. Her articles about food and farming have appeared in *The New York Times*, NPR.org, *The Guardian*, *TakePart*, *Modern Farmer*, *Food and Wine*, *Gastronomica* and *Grist*, where she served as the food editor from 2011–2012.



### **Dana Gunders**

Senior Scientist on Food and Agriculture at the Natural Resources Defense Council

Dana leads the Natural Resources Defense Council's work on reducing food waste, with a focus on advancing market and policy initiatives to promote sustainability. She recently published her first book, the *Waste-Free Kitchen Handbook*, which offers a consumer guide to reducing wasted food from the grocery store to the kitchen.



### **Andrew Gunther**

Project Director at A Greener World and Program Director of Animal Welfare Approved

In 2008, Andrew became Program Director for Animal Welfare Approved and spearheaded the program's unprecedented growth, increasing the number of approved farms tenfold. In 2014, he launched A Greener World as a source of positive solutions for the growing food and farming crisis.



### **Michael Hamm**

Professor of Sustainable Agriculture at Michigan State University

Dr. Hamm has a B.A. in Biology from Northwestern University and a Ph.D. in Human Nutrition from the University of Minnesota. He currently is affiliated with the Departments of Community Sustainability, Plant, Soil and Microbial Sciences and Food Science and Human Nutrition. His appointment encompasses teaching, research and outreach.



### **Thomas Harttung**

Co-Founder and Chair of Aarstiderne and Chair of the Sustainable Food Trust

Thomas Harttung farms at Barritskov in Denmark, a Demeter certified

organic family estate, growing milling grains and vegetables combined with a beef herd. Thomas serves on the board of the Nordic Food Lab, the MAD Food Symposium and Haver til Maver, Denmark's leading edible schoolyard organization.



### **Judy Hatcher**

Executive Director of Pesticide Action Network North America

Prior to joining Pesticide Action Network in 2012, Judy worked as a grant maker, a program manager, a consultant and a trainer for social justice groups all over the country including National People's Action, Amnesty International USA, the Funding Exchange, the Crossroads Fund and the Center for Community Change.



### **Randy Hayes**

Executive Director at Foundation Earth

Randy has written widely on a number of issues including the true cost economic model, agroecology and food as a key solution. As a former filmmaker and Rainforest Action Network founder, he is a veteran of many high-visibility corporate accountability campaigns and has advocated for the rights of indigenous peoples.



### **Steve Hilton**

Author and Chief Executive of Crowdpac

Steve Hilton is cofounder and CEO of Crowdpac, a Silicon Valley political tech startup, a visiting professor at Stanford University and author of the book *More Human: Designing a World Where People Come First*. He was formerly senior adviser to Prime Minister David Cameron and played a leading role in the modernization of the Conservative Party and in the implementation of its government reform program.



### **Patrick Holden**

Chief Executive of the Sustainable Food Trust

After studying biodynamic agriculture, Patrick established a mixed community farm in Wales in 1973, which now produces milk from an 85 cow Ayrshire dairy herd, made into a single farm cheddar style cheese. He was the founding Chair of the British Organic Farmers in 1982, before joining the Soil Association, where he worked for nearly 20 years.



### **John Ikerd**

Emeritus Professor of Agricultural Economics, University of Missouri, Columbia



John was raised on a small dairy farm and studied agricultural economics at the University of Missouri. Over thirty years he held positions at North Carolina State University, Oklahoma State University, University of Georgia, and the University of Missouri before retiring in 2000. He now spends his time writing and speaking on issues related to sustainability, with an emphasis on agricultural and economic sustainability.



**Dan Imhoff**

Author, publisher and small-scale farmer

Dan's many books include *Farming with the Wild: Enhancing Biodiversity on Farms and Ranches*; *CAFO: The Tragedy of Industrial Animal Factories*; *Food Fight: The Citizen's Guide to the Next Food and Farm Bill* and *Farming and the Fate of Wild Nature*. He has a small farm in Northern California.



**Richard Jackson**

Professor in the Fielding School of Public Health at the University of California, Los Angeles

Richard is a pediatrician and professor and has served in many leadership positions with the California Health Department. For nine years he was Director of the CDC's National Center for Environmental Health in Atlanta and received the Presidential Distinguished Service award. In 2011 he was elected to the Institute of Medicine of the National Academy of Sciences.



**Janaki Jagannath**

Coordinator of the San Joaquin Valley Sustainable Agriculture Collaborative, Community Alliance for Agroecology.

Janaki is coordinator for a group of rural NGOs working to advance agricultural and environmental policy towards justice for communities bearing the burden of California's food system. Previously Janaki assisted in curriculum development for a new Sustainable Agriculture and Food Systems degree at UC Davis.



**Saru Jayaraman**

Co-Founder and Co-Director of the Restaurant Opportunities Centers United

After 9/11, together with displaced World Trade Center workers, Saru co-founded Restaurant Opportunities Centers, which now has more than 18,000 worker members, 150 employer partners, and several thousand consumer members in over 30 cities nationwide. Saru authored *Behind the Kitchen Door*, a national bestseller, and *Forked: A New Standard for American Dining*, released in 2016.



### **Kendra Kimbirauskas**

Chief Executive of the Socially Responsible Agricultural Project

Kendra is an Oregon-based farmer. She leads SRAP, a national non-profit, in its grassroots advocacy, organizing informational campaigns to hold concentrated animal feeding operations (CAFO's) accountable for the pollution, public health threats and environmental destruction they create in rural communities across the nation.



### **Richard King**

Farmer and Educator

Richard grew up on a small farm. His professional career with the USDA Natural Resources Conservation Service included 36 years of experience as a rangeland specialist, ecologist and biologist. Since retirement from NRCS in 2012, he enjoys helping people learn Holistic Management®. He has practiced Holistic Management on his great grandparent's small farm since 1991 and is profitably converting dry-farmed annual grassland to perennial grassland and oaks.



### **Claire Kremen**

Professor in the Department of Environmental Science, Policy and Management at University of California, Berkeley

Claire Kremen is an ecologist focusing on the nexus between sustainable agriculture, conservation of biodiversity and ecosystem services. Her current research focuses on exploring the ecological, social and economic benefits, costs and barriers to adoption of diversified farming systems, and on restoring pollination and pest control services in intensively farmed landscapes in California. She co-directs the Center for Diversified Farming Systems and the Berkeley Food Institute at the University of California.



### **Corby Kummer**

Senior Editor at The Atlantic

Corby's work in *The Atlantic* has established him as one of the most widely read, authoritative, and creative food writers in the United States. He is also a frequent food commentator on television and radio. He was educated at Yale and is the recipient of five James Beard Journalism Awards.



### **Anna Lappé**

Author and food systems expert

Anna is a national bestselling author, an internationally recognized expert on food systems and an advocate for justice and sustainability along the food chain. Her research on food and farming systems has taken her to



more than 20 countries and 100 US cities. She is also the co-founder of the Small Planet Institute and Fund.



**David Lee**

Chief Operations Officer and Chief Financial Officer for Impossible Foods

David leads Impossible Foods' marketing, finance, human resources, IT, facilities and supply chain functions. Prior to Impossible Foods, David Lee was the Chief Financial Officer of Zynga, a \$2 billion public company, where he led the company's finance, accounting, corporate development and human resources operations.



**Peter Lehner**

Senior Attorney at Earthjustice

Peter directs Earthjustice's sustainable food and agriculture program, developing strategies to reduce the negative impacts of food production on health, environment and climate and to promote a more environmentally sound agricultural system. Previously, Peter has worked for the Natural Resources Defense Council and served as chief of the Environmental Protection Bureau of the New York State Attorney General's office.



**Joann Lo**

Co-Director of the Food Chain Workers Alliance

Joann is the Co-Director of the Food Chain Workers Alliance and was the first staff member of the Alliance when she began in November 2009. The daughter of immigrants from Taiwan, she graduated from Yale University with a degree in Environmental Biology and has organized unions and a worker center. In 2000, Joann was one of two staff who started the Garment Worker Center.



**H. Kim Lyerly**

Professor at Duke University School of Medicine

Dr. Lyerly is Professor of Cancer Research, Professor of Surgery, Associate Professor of Pathology and Assistant Professor of Immunology at Duke University, North Carolina. In 2008, he was appointed to serve on the National Cancer Advisory Board. He has also been a member of the Scientific Advisory Board of the Susan G. Komen for the Cure Foundation.



**Theresa Marquez**

Mission Executive of CROPP Cooperative, Organic Valley and Organic Prairie

Theresa has been a passionate advocate for organic food and farming since 1978 and is considered a pioneer of the natural foods movement. Theresa spent 17 years as Chief Marketing Executive of Organic Valley, and she loves her current role as Organic Valley's Mission Executive.



**Bob Martin**

Program Director of the Food System Policy Program at the Center for a Livable Future

Bob's current role is to enhance policy efforts based on research conducted by the Center and other organizations. Previously, Bob worked for the Pew Charitable Trusts, where he served as a senior officer at the Pew Environment Group following the dissemination of his work on Industrial Farm Animal Production.



**Angela McKee**

Project Manager for San Francisco Unified School District's Future Dining Experience

Angela works to create a student-centered, financially stable meal system that creatively engages students in eating great food. Prior to SFUSD's Future Dining Experience, Angela was the Sales Strategy Manager at La Cocina where she focused on launching women-owned food businesses.



**David Mermin**

Partner at Lake Research Partners

David, a pollster and political strategist for over 20 years, is a partner at Lake Research Partners and heads the firm's Bay Area office. He advises incumbents and challengers at all levels of the electoral process, as well as a wide range of advocacy organizations, independent expenditures, foundations and labor unions.



**Kathleen Merrigan**

Executive Director of Sustainability at the George Washington University

Kathleen serves as a Professor of Public Policy at George Washington University, and leads the George Washington Sustainability Collaborative and George Washington Food Institute. She is a board director for both the Stone Barns Center for Food and Agriculture and Food Corps. From 2009–2013, Merrigan was US Deputy Secretary and Chief Operating Officer of the US Department of Agriculture.



**David R. Montgomery**

MacArthur Fellow and Professor of Geomorphology at the University of Washington

An internationally recognized geologist who studies how erosion shapes topography and the effects of geological processes on ecological systems and human societies, Dr. Montgomery completed his Ph.D. in Geomorphology at UC Berkeley. His latest book, *The Hidden Half of Nature: The Microbial Roots of Life and Health* is co-authored with his wife, Anne Biklé, and his forthcoming book *Growing A Revolution: Bringing Our Soil Back to Life* will be published in May 2017.



### **Alexander Müller**

Study Leader of the UNEP hosted project TEEBAGFood

Alexander is study leader for *The Economics of Ecosystems and Biodiversity for Agriculture and Food* (TEEBAGFood). From 2006 until 2013 he served as Assistant Director General of the Food and Agriculture Organization of the United Nations and was responsible for the Department for Natural Resources and Environment.



### **Mark Muller**

Program director for the Mississippi River program at the McKnight Foundation

Mark became director of McKnight in 2015. Prior to this, he worked for 14 years at the Institute for Agriculture and Trade Policy (IATP), an organization that promotes resilient food systems, communities and ecosystems. He served as IATP's director of the Environment and Agriculture, Food Justice and Food and Community Fellows programs.



### **Pete Myers**

Founder, Chief Executive and Chief Scientist of Environmental Health Sciences

Dr. Myers earned his biological sciences doctorate from UC Berkeley. He previously served as Director of the W. Alton Jones Foundation in Charlottesville, Virginia and co-authored *Our Stolen Future*. He is now actively involved in primary research on the impacts of endocrine disruption on human health.



### **Keeve Nachman**

Assistant Professor in the Department of Environmental Health Sciences at the Johns Hopkins Bloomberg School of Public Health

Keeve is interested in the interface between science and policy in relation to public health and environmental problems associated with the food system. His research aims to generate the scientific evidence needed to support decisions that mitigate human exposure to chemical and microbial hazards associated with food production.



**Kristine Nichols**

Chief Scientist at the Rodale Institute

Dr. Nichols joined the Rodale Institute after working as a soil microbiologist with the USDA, Agricultural Research Service Northern Great Plains Research Laboratory in Mandan, ND for over seven years. Since 1993, she has studied arbuscular mycorrhizal fungi – a plant-root symbiont.



**Danielle Nierenberg**

President and Co-Founder of Food Tank

Danielle is the Co-Founder and President of Food Tank, a non-profit organization focused on building a global community for safe, healthy, nourished eaters. She is an expert on sustainable agriculture and food issues and has written extensively on gender and population, the spread of factory farming in the developing world and innovations in sustainable agriculture.



**Nicolette Hahn Niman**

Writer, Attorney and Livestock Rancher

Nicolette is the author of *Defending Beef: The Case for Sustainable Meat Production* and *Righteous Porkchop: Finding a Life and Good Food Beyond Factory Farms*. She has also written for the New York Times, The Wall Street Journal, and Los Angeles Times. Previously, she was Senior Attorney at the Waterkeeper Alliance and a lawyer for the National Wildlife Federation.



**Tyler Norris**

Vice President of Total Health Partnerships at Kaiser Permanente

Tyler Norris, MDiv, is an entrepreneur and founder of over a dozen businesses and social ventures. His three decades of service in the public, private and non-profit sectors have focused on population health, community vitality and equitable prosperity. From January 2017, Tyler becomes Chief Executive, Institute for Mental Health and Wellness.



**Matthew O'Neal**

Associate Professor of Entomology

Dr. O'Neal conducts research and teaches at Iowa State University, to develop ecologically and economically sustainable insect pest management programs for soybeans. He explores multiple approaches to prevent pest outbreaks and conserve beneficial insects. He is also program chair for the Graduate Program in Sustainable Agriculture at ISU.



### **Cynthia Ong**

Founder of LEAP: Land, Empowerment, Animals, People

Cynthia engages in facilitating processes, partnerships and projects that provoke ecologically sustainable co-existence between groups, communities, regions and nations. Cynthia was the founder of LEAP, which has helped birth multiple long-term partnerships and organizations coalescing around systemic solutions and change.



### **Ali Partovi**

Angel investor, start-up advisor and serial entrepreneur

Ali has backed Airbnb, Dropbox, Uber and Zappos, as well as food and farming companies like Thrive Market, Bright Farms and Farmigo. He is a general partner in Farmland LP, a real estate fund focused on scaling organic, sustainable agriculture. He serves on the board of FoodCorps, a non-profit focused on food in public schools.



### **Tom Philpott**

Food and agriculture correspondent for Mother Jones magazine

Tom is the food and agriculture correspondent for *Mother Jones* magazine, maintaining the *Food for Thought* blog and writing features and columns on the politics and economics of food and agriculture. Previously, Tom worked for five years as a columnist, food editor and senior food writer for the online environmental site *Grist*.



### **Urvashi Rangan**

Executive Director of CR's Food Safety and Sustainability Center

Urvashi leads the Consumer Reports Consumer Safety and Sustainability Group. She is also the Executive Director of CR's Food Safety and Sustainability Center and its website. Urvashi manages a team of public health-based scientists in testing, research, risk assessment, analysis and advocacy/lobby work for safety and food sustainability.



### **Jenny Rempel**

Sustainable Agriculture Program Coordinator at the Community Water Center

Jenny works with farmers, farmworkers, and low-income rural residents to develop groundwater management programs that ensure community health and create more equitable and sustainable agricultural systems. Jenny graduated from Stanford University with a degree in interdisciplinary environmental science and policy.





### **Ruth Richardson**

Executive Director of the Global Alliance for the Future of Food

The Global Alliance for the Future of Food is a unique coalition of foundations committed to help shift food and agriculture systems towards greater sustainability, security and equity. In this capacity Ruth serves on the Steering Committee of *TEEB for Food and Agriculture* led by [UNEP](#) and on the Advisory Committee of the Global Urban Food Policy Pact.



### **Mary Risley**

Founder of Food Runners

A pioneering figure in the Bay Area food community, Mary started Tante Marie's Cooking School as a full-time professional school over 35 years ago. In 1987, she founded Food Runners, a grass roots organization picking up excess food from businesses and delivering it directly to agencies feeding the hungry in San Francisco.



### **Walter Robb**

Co-Chief Executive of Whole Foods Market

Walter joined Whole Foods Market in 1991. He is on the board of directors for both the Whole Planet Foundation and the Retail Industry Leaders Association. Robb is an ardent organic advocate and has served on the board of directors of the Organic Trade Association and the Organic Center for Education and Promotion.



### **Doria Robinson**

Executive Director of Urban Tilth

Doria is a third generation resident of Richmond, California and the Executive Director of Urban Tilth, a community-based organization dedicated to cultivating a more sustainable, healthy and just food system. She is passionate about exploring how physical, social and economic health is dependent upon ecological health and how the restoration of one depends on the restoration of the other.



### **Joel Salatin**

Farmer, lecturer and author

Joel is a farmer in Virginia's Shenandoah Valley and is famous for his innovative integrated livestock system. The farm provides food for more than 5,000 families, 10 retail outlets, and 50 restaurants through on-farm sales and buying clubs. His speaking and writing reflect dirt-under-the-fingernails experience. He passionately defends small farms, local food systems, and the right to opt out of the conventional food paradigm.



### **Harpinder Sandhu**

Lecturer and Research Fellow at Flinders University

Dr. Sandhu obtained a PhD in Agroecology from Lincoln University New Zealand. His research involves integration of environmental economics and ecology for understanding of the complex socio-ecological and economic dimensions of ecosystem services. Harpinder leads research in agricultural development, agroecology and valuation of ecosystem services.



### **Wendy Schmidt**

President of the Schmidt Family Foundation

Wendy works to advance the development of renewable energy and the wiser use of natural resources. The Foundation houses its grant-making operation in the 11<sup>th</sup> Hour Project, which supports more than 150 nonprofit organizations in program areas including climate and energy, ecological agriculture, human rights, and our maritime connection.



### **Howard-Yana Shapiro**

Mars, UC Davis, MIT and The World Agroforestry Centre

Howard-Yana has more than 45 years' experience working with sustainable agricultural and agroforestry systems, systems biology, molecular biology, plant genetics, pattern recognition, and plant breeding. He has worked with indigenous communities, NGO's, governmental agencies and the private sector around the world.



### **Paul Shapiro**

Vice President of Farm Animal Protection for the Humane Society of the United States

Paul Shapiro directs one of the organization's biggest advocacy teams, spearheading legislative initiatives to prevent farm animal abuse, engaging with major food corporations to help remove the cruelest agribusiness practices from their supply chains, and leading a nationwide campaign to increase demand for plant-based proteins by reducing consumption of animal products.



### **Whendee Silver**

Professor of Ecosystem Ecology and Biogeochemistry at U. C. Berkeley

Professor Silver studies the causes, consequences, and potential solutions to climate change. Her research spans the basic science of the role of fluctuating redox on biogeochemical dynamics, to research in the Sacramento-San Joaquin Delta and California's grasslands with direct policy relevance for climate change mitigation. She is the lead scientist of



the Marin Carbon Project.



**Shakirah Simley**

Community Programs Manager for Bi-Rite

Shakirah has a decade of experience working on food equity issues; her recent projects include professional development training for at-risk high-schoolers, and advising storeowners in low-income neighborhoods who want to sell healthier food. Prior to Bi-Rite, Shakirah worked with community organizations and indigenous groups to advocate for policy initiatives that addressed the root causes of childhood obesity.



**Jim Slama**

Founder of FamilyFarmed

Under Slama's leadership, FamilyFarmed has become an important catalyst, helping to build a robust Good Food cluster in Chicago while expanding the national scope and impact of its work. FamilyFarmed's highest profile event is the Good Food Trade Show, held each March in Chicago.



**Ted Smith**

Executive Director of the Institute for Healthy Air, Water and Soil

Dr. Smith serves as the Institute's first Executive Director and sets direction for Urban Laboratory Projects of the Institute. Ted is also Chief of Civic Innovation for the City of Louisville where he is focused on bringing new technologies to solve big social challenges.



**Naomi Starkman**

Founder and Editor-in-Chief of Civil Eats

Naomi Starkman is a 2015–16 John S. Knight Journalism Fellow at Stanford and a founding board member of the Food and Environment Reporting Network. Naomi served as the Director of Communications and Policy at Slow Food Nation and has worked as a media consultant at *Newsweek*, *The New Yorker*, *Vanity Fair*, *GQ*, and *WIRED* magazines.



**Levi Stewart**

Sector Analyst at the Sustainability Accounting Standards Board

Levi's work at the Sustainability Accounting Standards Board includes the development of provisional standards for meat, poultry and dairy, and processed foods industries. Currently, he is responsible for continued engagement with companies and investors in these industries to bring about the codification of standards that are relevant, cost-effective, and

decision useful.



### **William Stowe**

Chief Executive and General Manager of Des Moines Water Works

Des Moines Water Works (DMWW) is a regional utility that protects public health and promotes economic development by delivering outstanding quality water affordably in reliable quantities. DMWW works closely with business, environmental, consumer and agricultural leaders to advocate for better stewardship of water resources and clean water initiatives throughout Central Iowa.



### **Albert Straus**

Founder and Chief Executive Officer of Straus Family Creamery

Albert is an advocate for organic, non-GMO dairy production, environmental stewardship, and family farms. Straus dairy led the way in becoming the first certified organic dairy west of the Mississippi River. Straus Family Creamery, founded in 1994, was the first 100% certified organic creamery in the United States.



### **Pavan Sukhdev**

Founder and Chief Executive of GIST Advisory

Pavan is a sustainability thought leader and an experienced innovator in sustainability metrics. He is an influential voice amongst business leaders, national environmental policy makers and international institutions on environmental issues and sustainable development in practice. In 2008, Pavan was appointed Study Leader for the project *The Economics of Ecosystems and Biodiversity* (TEEB).



### **Woody Tasch**

Founder and Chair of the Slow Money Institute

Woody is the author of *Inquiries into the Nature of Slow Money: Investing as if Food, Farms, and Fertility Mattered*. Since 2010, dozens of local Slow Money networks and investment clubs have catalyzed the flow of more than \$46 million into over 470 local and organic food enterprises in the US, Canada and France.



### **Nina Teicholz**

Investigative journalist and author

Nina is an investigative journalist and author of the International bestseller, *The Big Fat Surprise*, which upended conventional wisdom on dietary fat and challenged the very core of nutrition policy. Before taking a

deep dive into researching nutrition science for nearly a decade, Teicholz was a reporter for National Public Radio and wrote for the *Wall Street Journal*, *New York Times*, *Washington Post*, *The New Yorker*, and *The Economist*.



### **Josh Tetrick**

Founder and Chief Executive Officer of Hampton Creek

Josh founded Hampton Creek in 2011 and has built the company around this question: “What would it look like if we started over in food?” Best known as the maker of Just Mayo, Hampton Creek is innovating to bring healthy, sustainable, and affordable food to everyone, everywhere.



### **Ann Thrupp**

Executive Director of Berkeley Food Institute

Ann has extensive experience in sustainable and organic agriculture and food systems and for over 25 years she has been a pioneer in this field. She has held leadership positions in non-profit organizations, government, academia, and as a practitioner and educator in sustainable agriculture, natural resource management, and environmental/food justice.



### **Eugene Turner**

Boyd Professor at Louisiana State University

Eugene conducts research and teaches courses on wetlands, ecosystem sustainability, and the couplings between land-use and low oxygen zones (Dead Zones), especially in the northern Gulf of Mexico. He is active in ‘Green Lands, Blue Waters’, which promotes sustainable farming through perennial grasses.



### **Alice Waters**

Owner of Chez Panisse restaurant Founder of the Edible Schoolyard Project

Alice Waters is a chef, author, and food activist. She has been a champion of local, sustainable agriculture for over four decades. The Edible Schoolyard Project advocates for a free school lunch for all children and a sustainable food curriculum in every public school. She has been Vice President of Slow Food International since 2002.



### **Seth Watkins**

*Farmer*

Seth is a fourth generation steward of his family farm in Clarinda, Iowa. He has a cow-calf enterprise of 600 and grows hay and corn for feed. Until 1998, Seth’s operation consisted of maximizing production to increase profit, but a profound revelation meant that he changed focus away from

the balance sheet towards making sure he had happy cows.



**Craig Wichner**

Co-Founder and Managing Partner, Farmland LP

Craig directs Farmland LP's investment program, overseeing property acquisitions, leases and sales, and manages the business affairs of VF Holdings and its sponsored funds. Craig is also a co-founder and Managing Director of Vitality Farms and serves on the board of BN Ranch, Bill Niman's successor company to Niman Ranch, Inc.



**Ken Wilson**

Former Executive Director of The Christensen Fund

From 2002 until 2015, Dr. Wilson served as Executive Director of The Christensen Fund, a private foundation focused on the adaptive interweave of people and place, culture and ecology. Ken has held a variety of leadership roles in international philanthropy, including as past president of International Funders for Indigenous Peoples, and on the Seva Foundation.



**Jonathan Wolfson**

Chief Executive Officer and Chair of TerraVia

Jonathan co-founded TerraVia (formerly Solazyme) in 2003. TerraVia is a next generation food, nutrition and specialty ingredients company that harnesses the power of algae, the mother of all plants, and Earth's original superfood. Headquartered in San Francisco, the company's mission is to create products that are truly better for people and the planet.



**Richard Young**

Policy Director of the Sustainable Food Trust

Richard Young has been an editor of the journal *New Farmer and Grower* and Chair of the Soil Association's Symbol Committee, which drew up detailed organic farming standards in the UK in the 1980s. As a devoted cattle and sheep farmer, he is a strong supporter of the benefits associated with meat from grass-fed animals.

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The Sustainable Food Trust would like to express our deep gratitude towards the conference sponsors, without whom the conference would not have been possible.

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## APPENDIX: A TALE OF TWO CHICKENS

Debuting at The True Cost of American Food Conference, *A Tale of Two Chickens* is a short animated film which illustrates how we are paying a high price for food in hidden ways and why we need true cost accounting in our food and farming systems.

### FILM SCRIPT

This is a tale of two chickens.

One raised on pasture and the other raised on a factory farm.

How is it possible that a chicken is now cheaper, pound for pound, than bread?

A factory farmed chicken is raised in a warehouse, in intensely crowded conditions.

And its feed ... comes from crops that depend on industrial farming practices whose pesticides and fertilizers degrade our biodiversity, soil and water.

The pasture-raised chicken leads a healthy life, with much of it spent outside. Its feed is grown without the use of synthetic pesticides.

Waste from a factory farmed poultry operation can pollute waterways and emits large amounts of gases like ammonia which pollutes the air we breathe and nitrous oxide which thins the ozone layer and contributes to climate change.

While forcing people to work for low pay in often-hazardous conditions.

The intense crowding of poultry in these environments also increases the likelihood of sickness and infection, and often requires the use of preventative antibiotics.

Humans who eat these chickens they can develop infections resistant to these very same antibiotics, which can lead to serious health problems.

And it's your taxes which help support many of these farming practices through agricultural subsidies.

When you add up all these hidden costs, cheaper chicken isn't so cheap after all.

Who's to blame?

Food producers are stuck in an economic system that mainly rewards those who produce us food at the cheapest price.

It's a story that repeats with carrots, apples and peas, meat milk and cheese. Even



breakfast cereal.

This rigged, cheap food system has two prices:

The one you pay now.

And the one we all pay later.

At some point we need to ask ourselves ...

Why do we support such a destructive system?

There are six things we can do to change our food system.

What if we decided to reward producers for food that benefits the environment and improves public health?

What if we linked Farm Bill subsidies, crop insurance and food stamps to encourage more sustainable farming food products?

What if chemical fertilizers and pesticides were taxed thereby encouraging farmers to reduce their use and adopt more carbon friendly soil practices?

And what if health insurance providers incentivized people with healthier diets?

What if investors supported community-based sustainable businesses?

And what if the marketplace paid workers a living wage and gave them safer working conditions?

By making the right choices we help create the food system we all want to see for ourselves, our families and our community. You can start by telling people the Tale of Two Chickens. It's just one of many stories which will change the way we look at food.

## ACKNOWLEDGEMENTS

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